Measured and Derived Geotechnical Parameters and Results

Bretagne Nord-Ouest Preliminary Geotechnical Site Investigation | Manche Ouest

F255276-REP-001 04 | 7 April 2026

IFE

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7 April 2026

Attention: Jérôme MINVIELLE

Dear Mr MINVIELLE

Please find below the final Measured and Derived Geotechnical Parameters report. It was prepared by Antonios Laskos and Emilie Morin under the supervision of Kah Jun Lee, in accordance with Call-Off n° 1406589196 between Direction Générale de l'Energie et du Climat - DGEC and Fugro France SAS.

If you require any additional information or clarification, please do not hesitate to contact us.

Thank you for the opportunity to participate in this project.

Yours sincerely,

Antonios Laskos

Project Geotechnical Engineer

Reporting Structure

Geotechnical Report
Bretagne Nord-Ouest Preliminary Geotechnical Site Investigation

Operational Report	Measured and Derived Geotechnical Parameters and Results
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Quality Assurance Record

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2	Geotechnical Description and Profiles	ALA/EMO	KJL	JPI
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List of Plates		ALA/EMO	KJL	JPI
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Notes
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Executive Summary

Introduction

Direction Générale de l'Energie et du Climat - DGEC contracted Fugro France to carry out a preliminary geotechnical site investigation and provide ground information for future windfarm site development in Bretagne Nord-Ouest, France.

The geotechnical fieldwork was conducted by the MV Fugro Zephyr vessel from 13 August to 25 August 2025.

This report details the measured and derived geotechnical parameters and final results for the investigated locations. It presents:

1. A description of the geotechnical site investigation;
2. Geotechnical logs and descriptions of the soil strata;
3. Results of the in situ testing, sampling and laboratory testing;
4. Final positioning and water depth measurements.

Fieldwork

Table S.1.1 shows the number of test locations.

Table S.1.1: Summary of test locations

Test Type	Total No. of Test Locations	No. of Retest Locations
Downhole Mode		
Composite Borehole (CPT/sampling/coring)	13	1
Sampling Borehole (sampling/coring)	-	1*

Notes
CPT = Cone penetration test
* = Only rock coring was performed for one borehole

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Abbreviations

AZCL	Assumed zone of core loss
BHA	Bottom-hole assembly
BNO	Bretagne Nord-Ouest
BSF	Below seafloor
BTS	Brazilian tensile strength
CA	CERCHAR abrasivity
CAI	CERCHAR abrasivity Index
CIU	Consolidated isotropically undrained triaxial
CPT	Cone penetration test
DGEC	Direction Générale de l'Energie et du Climat
LAT	Lowest Astronomical Tide
MV	Marine Vessel
PCD	Polycrystalline diamond
PD	Particle density
PI	Plasticity index
PLT	Point load test
PP	Pocket penetrometer
PSD	Particle size distribution
PVC	Polyvinyl chloride
RC	Rock core

RQD	Rock quality designation
SCR	Solid core recovery
SD	Slake durability
SMC	Saturation moisture content
SRB	Sulphate reducing bacteria
TCR	Total core recovery
TRT	Thermal resistivity test
UCS	Uniaxial compressive strength
UTM	Universal Transverse Mercator
WIP	Wireline push

1. Project Information

1.1 Introduction

Direction Générale de l'Energie et du Climat - DGEC contracted Fugro France to carry out a preliminary geotechnical site investigation and provide ground information at the floating windfarm locations of the development area in Bretagne Nord-Ouest (BNO), France.

Downhole CPT, sampling and coring operations were conducted by the MV Fugro Zephyr vessel between 13 August 2025 and 25 August 2025.

Mobilisation took place alongside the port of Brest, France on 12 August 2025. The demobilisation date took place in the port of Le Havre on 26 August 2025.

Plate 1.1 is a map showing the general location of the investigated area. Plate 1.2 is a detailed plan of the area.

1.2 Scope of Report

This report details the measured and derived geotechnical parameters and final results for the investigated locations. It presents:

1. A description of the geotechnical site investigation;
2. Geotechnical logs and descriptions of the soil strata;
3. Results of the in situ testing, sampling, and laboratory testing;
4. Final positioning and water depth measurements.

1.3 Summary of Fieldwork

Table 1.1 summarises the fieldwork carried out during the site investigation. For full details, see operational report (Fugro, 2025).

Table 1.1: Summary of fieldwork

Location Name	Final Penetration Depth [m BSF]	Final Recovery Depth [m BSF]	Sampling and Testing Details
GM-BNO-OWF-BH01	20.50	20.50	2 CPTs, 17 RCs
GM-BNO-OWF-BH02	21.00	21.00	1 CPT, 22 RCs
GM-BNO-OWF-BH03	20.50	20.10	7 CPTs, 3 WIPs, 14 RCs
GM-BNO-OWF-BH03_a*	2.00	2.00	2 RCs
GM-BNO-OWF-BH04	20.20	20.00	1 CPT, 1 WIP, 19 RCs
GM-BNO-OWF-BH07	20.50	20.30	3 CPTs, 3 WIPs, 11 RCs
GM-BNO-OWF-BH08	20.50	20.45	1 CPT, 17 RCs
GM-BNO-OWF-BH10	20.00	20.00	8 CPTs, 5 WIPs, 8 RCs
GM-BNO-OWF-BH11	20.50	20.50	2 CPTs, 16 RCs

Location Name	Final Penetration Depth [m BSF]	Final Recovery Depth [m BSF]	Sampling and Testing Details
GM-BNO-OWF-BH12	20.50	20.50	2 CPTs, 17 RCs
GM-BNO-OWF-BH12_a*	2.35	2.35	1 CPT, 1 RC
GM-BNO-OWF-BH13	21.15	21.10	8 CPTs, 4 WIPs, 12 RCs
GM-BNO-OWF-BH15	20.20	19.20	3 CPTs, 18 RCs
GM-BNO-OWF-BH17	20.50	20.50	2 CPTs, 19 RCs
GM-BNO-OWF-BH19	20.50	20.25	3 CPTs, 1 WIP, 16 RCs

Note(s):
BSF = Below seafloor
CPT = Cone penetration test
WIP = Wireline push sample
RC = Rock core
* = Re-test locations were performed due to low sample recoveries for the first meters at original locations

1.4 Data Sources

The data used in the preparation of this report were obtained during the offshore site investigation, which included downhole cone penetration testing (CPT), wireline push sampling (WIP), S Geobor coring, and offshore and onshore laboratory testing.

1.5 Geodetic Data

Appendix E summarises the borehole coordinates and water depths of the investigated locations. The coordinates presented in these positioning reports are the calculated location coordinates. Coordinates for all boreholes are expressed using the Universal Transverse Mercator (UTM) projection 30 N, World Geodetic System 1984, International Spheroid, with a central meridian of 3° West.

Measured water depths were reduced to the Lowest Astronomical Tide (LAT) based on chart datum FR Bathyelli.

The user must consider the accuracy of all measurements, particularly where use may differ from original intentions. For example, water depths presented are indicative only and serve to establish test depths below seafloor only and should not be used for design purposes, such as estimating current or wave forces on structures.

1.6 Guidelines on Use of Report

Appendix A outlines the limitations of this report in terms of a range of considerations including, but not limited to, its purpose, its scope, the data on which it is based, its use by third parties, possible future changes in design procedures and possible changes in the conditions at the site over time. It represents a clear exposition of the constraints which apply to all reports issued by Fugro. It should be noted that these guidelines do not in any way supersede the terms and conditions of the contract between Fugro and DGEC.

2. Geotechnical Description and Profiles

2.1 Introduction

This section presents geotechnical logs for the investigated area. Based on onshore and offshore laboratory test results, and in situ test data, the logs indicate measured and inferred:

- Sample and cone penetration test (CPT) depths;
- Ground layering, including classifications of undrained shear strength (s_u) in fine-grained cohesive soils;
- Rock core recovery parameters (TCR, SCR and RQD);
- Measured water content and unit weight (γ);
- Measured s_u values from strength tests;
- Interpreted s_u from CPT data;
- Relative density (D_r) interpreted from CPT data;
- Interpreted effective angle of internal friction (ϕ') from CPT data;
- Measured unconfined compressive strength (UCS);
- Measured point load index strength ($IS_{(50)}$).

Plate 2.1 defines the symbols and terms used in the geotechnical logs. Geotechnical logs are presented in plates 2.2 to 2.26.

2.2 Interpretation of Undrained Shear Strength from Cone Penetration Tests

In fine-grained cohesive (clay) soils, undrained shear strength (s_u) was interpreted from CPT data using Equation 2.1.

$$s_u = q_n / N_{kt}$$

Equation 2.1

Where:

s_u = Inferred undrained shear strength [kPa]
q_n = Net cone resistance [kPa]
N_{kt} = Empirical factor relating cone resistance to undrained shear strength

Cone factor (N_{kt}) values of 15 and 20 were adopted to infer the s_u profiles presented in the geotechnical logs. A best fit unit weight profile drawn from offshore laboratory tests was used to derive the overburden pressure. Appendix B further details the methods used to infer q_n from CPT data.

2.3 Interpretation of Relative Density from Cone Penetration Tests

The relative density of coarse-grained cohesionless soils was estimated using the relationship proposed by Jamiolkowski et al. (2003), and presented in Equations 2.2 and 2.3.

$$D_r(dry) = \frac{1}{0.0296} \cdot ln\left[q_c \Big/ 2.494 \cdot \left[\frac{\sigma'_{v0} \cdot \left[\frac{1+2\cdot K_0}{3}\right]}{100}\right]^{0.46}\right]$$

Equation 2.2

$$D_r(saturated) = \left[\frac{-1.87 + 2.32 \cdot ln\frac{1000 \cdot q_c}{(100 \cdot \sigma'_{v0})^{0.5}}}{100} + 1\right] \cdot D_r(dry)$$

Equation 2.3

Where:

D_r (dry) = Estimated relative density [%]
D_r (saturated) = Estimated saturated relative density [%]
q_c = Measured cone resistance [MPa]
σ'_{v0} = Vertical effective overburden stress [kPa]
K_0 = Coefficient of lateral earth pressure

The sensitivity of inferred relative density to changes in estimated horizontal stress can be evaluated using Jamiolkowski et al.'s (2003) chart, which presents a relationship between relative density, cone resistance and mean effective stress. Values of K_0 of 0.5 and 1.0 were used to estimate the relative density D_r (saturated) presented in the borehole logs.

2.4 Derivation of Internal Friction Angle from Cone Penetration Tests

The correlation proposed by Mayne (2007) as per Equation 2.4 is used to derive the internal friction angle for cohesionless soils.

$$\phi' = 17.6 + 11.0 \log \frac{100}{(\sigma'_{v0}/100)^{0.5}}$$

Equation 2.4

Where:

ϕ' = Friction angle [°]
σ'_{v0} = in situ effective vertical stress [kPa]

The derived friction angle with Mayne's method is presented on the borehole logs.

2.5 Derivation of Unconfined Compressive Strength from Point Load Index

The correlation proposed by Broch and Franklin (1972) as per Equation 2.5 is used to derive the unconfined compressive strength from the corrected point load index $Is_{(50)}$ for rocks.

$$UCS = k \cdot Is_{(50)}$$

Equation 2.5

Where:

UCS = Unconfined compressive strength [MPa]

k = Empirical conversion factor

$Is_{(50)}$ = Point load strength index corrected to a standard equivalent core diameter of 50 mm [MPa]

Assumed k factor of 10 was adopted for the conversion of $Is_{(50)}$ to UCS. The calibration of the k factor is out of the scope of this report.

2.6 Discontinuity Logging

Fracture core logging was performed during the offshore site investigation for each core. This includes:

- Type of discontinuity;
- Spacing;
- Discontinuity state;
- Dipping;
- Roughness at intermediate scale;
- Roughness at small scale;
- Aperture;
- Spacing;
- Infilling.

For each location, the discontinuities were gathered and assessed by type of fracture in order to provide a fracture description for each rock layer into the geotechnical logs.

Detailed discontinuity logs are presented in plates 2.27 to 2.70.

2.7 Discussion of Results

Plates 2.2 to 2.26 present geotechnical logs for the tested locations. The soil and rock profiles shown are based on analysed CPT data, visual descriptions of recovered samples, and the results of offshore and onshore laboratory testing. Sections 2.2 to 2.4 outline the methods used to interpret the CPT results.

Soil descriptions are based on BS 5930:2015+A1:2020 (BSI, 2015), ISO 14688-1:2017 (ISO, 2017a) and ISO 14688-2:2017 (ISO, 2017b). The limits of consistency in predominantly cohesive soils follow BSI 5930:2015+A1:2020, and in predominantly coarse-grained soils Lambe and Whitman (1969). Appendix C details the limits of consistency used.

The description of the carbonate content presented on the geotechnical logs was carried out in accordance with ISO 14688-1:2017 (ISO, 2017a) and ISO 14688-2:2017 (ISO, 2017b). A first qualitative determination was done during sample description by the application of droplets of dilute hydrochloric acid (10 % HCl). The carbonate content test conducted during onshore laboratory testing phase confirmed soil descriptions performed during fieldwork.

The description of the organic matter presented on the geotechnical logs was carried out in accordance with ISO 14688-1:2017 (ISO, 2017a) and ISO 14688-2:2017 (ISO, 2017b) following onshore laboratory testing phase.

Modifications on main soil types and secondary fractions were carried out on the log descriptions based on particle size distribution test and plasticity index results. In case of a discrepancy between these test outcomes, priority is given to the plasticity index results, as it determines the main soil behaviour. In accordance with ISO 14688-1:2017 (ISO, 2017a), the intermediate terms of "silty CLAY" or "clayey SILT" is used for material that is borderline in behaviour between clay and silt.

Soil strength classifications are based on the results of soil strength tests, advanced laboratory strength tests, and interpreted CPT data. Consistency was assessed in the field following ISO 14688-1:2017 (ISO, 2017a) and BS 5930:2015+A1:2020 (BSI, 2015). Terms of s_u always take precedence when considering the strata described and should not be confused with consistency. Consistency and s_u of the soil are not directly comparable; large differences between the two can be due to a number of factors, including soil fabric, sample quality and moisture content. Consistency descriptions are not included in the geotechnical logs as they are more applicable to individual samples than to an entire soil layer.

CPT cone resistance may be influenced by the material ahead of and behind the penetrating cone. The cone starts to sense a change in strata type before it reaches the new material and continues to sense a past strata material even after entering a new one. Consequently, the CPT does not always measure accurately the in situ mechanical properties in thin soil beds.

The distance over which the cone senses an interface decreases with material stiffness. Narrow soft strata layer less than 100 mm thick can be fully detected by cone resistance, whereas stiff strata layers may need to be at least 750 mm thick for cone resistance to reach its full value (Lunne et al., 1997). The CPT will detect stiff strata layers, but their strength could be underestimated if the layer under investigation is less than 750 mm thick. This effect scales when using cones of a larger diameter (Lunne et al., 1997).

With reference to the above and using engineering judgement, sublayer behaviour (drained or undrained) was assigned during CPT processing and geotechnical log drafting. Where sublayers were assigned a behaviour different to the main layer behaviour, the thickness and stiffness of the layer and its effect on the CPT cone should be considered when deriving representative engineering profiles.

Rock descriptions are based on ISO 14689:2017 (ISO, 2017c) and fracture state indices are following BS 5930:2015+A1:2020 (BSI, 2015). Appendix C details the rock strength and weathering classification for soft rocks.

Unconfined compressive strength of rock layers was assessed visually during fieldwork according to ISO 14689:2017 (ISO, 2017c) and was updated with uniaxial compressive stress (UCS) test results. When UCS result is not available, the unconfined compressive strength was

derived from the corrected point load strength index ($Is_{(50)}$) using an assumed k factor of 20. When both UCS and $Is_{(50)}$ are not available, the unconfined compressive strength derived from field description is kept.

3. In Situ Test Data

3.1 Introduction

A total of 44 successful combined downhole CPTs were completed in 14 geotechnical boreholes using the Fugro WISON® MkV system.

See Fugro (2025a) for details of the testing systems and equipment used.

3.2 Cone Penetration Tests

Cones with a projected area of 10 cm^2 and a 5-tonne capacity (CP10 cones) were used for the testing, and pore pressure measurements were made on the shoulder of the cone. Corresponding net area ratio of the cone, alpha (α) and net area ratio of the friction sleeve, beta (β) values for the cones used were respectively 0.75 and 0.00. In harder soils, a cone with a projected area of 5 cm^2 and an 8- tonne capacity (CP5 cones) was used, with corresponding alpha (α) and beta (β) values of 0.75 and 0.00.

The Fugro SEADEVIL® seabed system provided a reaction weight of approximately 14 tonnes for the tests.

Digital signals from the cones transmitted from the seabed unit and stored for subsequent computer processing included:

- Penetration;
- Cone resistance (q_c);
- Sleeve friction (f_s);
- Pore-water pressure (u).

Zero readings were taken on deck before and after each test and monitored to ensure that the cone channels did not drift beyond acceptable limits during the test. The zero readings taken at the start and end of the test are absolute values of pressure expressed as MPa.

Hydrostatic offsets were applied to the cone readings before penetration started and the values presented are relative to seabed.

Tests were terminated at the operator's discretion. When deciding to stop a test, the senior operator took into account the total thrust applied to the cone, the tip resistance and the soil conditions through which the cone had passed.

Cones used in this project were calibrated prior to mobilisation in Fugro's onshore laboratory in Nootdorp, the Netherlands. Plates 3.1 to 3.45 present the cone calibration certificates. Table 3.1 summarises the test numbers, depth ranges and cones used for the tests.

Table 3.1: Summary of downhole cone penetration tests

Location	CPT Number	Depth Range [m BSF]	Cones Used
BNO-OWF-BH01	CPT01-CPT02	0.00-4.32	CP10 1706-2834
BNO-OWF-BH02	CPT01	0.00-0.14	CP10 1706-2584
BNO-OWF-BH03	CPT01-CPT02	0.00-1.92	CP10 1706-2834
	CPT03-CPT06	3.00-14.83	CP10 1706-2584
BNO-OWF-BH04	CPT01	0.00-0.15	CP10 1706-2584
BNO-OWF-BH07	CPT01-CPT03	0.00-6.31	CP10 1706-2584
BNO-OWF-BH08	CPT01	0.00-0.16	CP10 1706-2851
BNO-OWF-BH10	CPT01-CPT05	0.00-12.50	CP10 1706-2672
	CPT06-CPT08	13.50-19.98	CP10 1706-2851
BNO-OWF-BH11	CPT01-CPT02	0.00-2.36	CP10 1706-2851
BNO-OWF-BH12	CPT01-CPT02	0.00-2.86	CP10 1706-2851
BNO-OWF-BH12-a	CPT01	0.00-2.35	CP10 1706-2851
BNO-OWF-BH13	CPT01-CPT02	0.00-1.01	CP10 1706-2851
	CPT03-CPT05	4.00-11.31	CP10 1706-2834
	CPT06-CPT08	12.00-20.35	CP5 1703-0085
BNO-OWF-BH15	CPT01-CPT03	0.00-14.90	CP10 1706-2584
BNO-OWF-BH17	CPT01-CPT02	0.00-8.08	CP10 1706-2584
BNO-OWF-BH19	CPT01-CPT03	0.00-5.61	CP10 1706-2672

Notes
CPT = Cone penetration test
BSF = Below seafloor

3.3 Test Results

The results of the CPT tests are presented as follows:

- Plates 3.46 to 3.60 present the measured (q_c, f_s and u) and derived parameters (q_n, q_t, B_q, f_t, R_f, R_{ft}) obtained during the tests;
- Plates 3.61 to 3.75 present the normalised (Q_{tn}, Q_t and F_r) and classification parameters (I_c, I_{SBT}, γ, S_u, D_r);
- Plates 3.76 to 3.89 present the zero loads of the cone before and after each test, and the subsequent amount of drift and the corresponding application classes as per ISO 19901-8:2014 (ISO, 2014c).

3.3.1 Discussion of Cone Penetration Test Results

The CPT results obtained during the geotechnical site investigation were generally of good quality and characterised the in-situ soil conditions when compared with recovered samples and adjacent CPT locations. The hydrostatic offsets measured before the start of each test

were monitored to ensure that the measured value was within acceptable limits of the theoretical value.

The zero readings taken on deck before and after each test did not drift beyond acceptable limits during the test. Good results were observed at all tested locations. The majority of the tests satisfied the requirements for Class 1 or Class 2 based on the zero drift test classifications outlined by ISO 19901-8:2023 (ISO, 2023).

3.4 Operational constraints

The in-situ testing operations were completed successfully without any significant challenges. Sample disturbance due to drilling or overflushing was observed in some tests. When this occurred, start depth of tests was adjusted accordingly. CPT results present only data representative of in situ conditions. Further details are available in the operational report (Fugro, 2025a).

Table 3.2 details the operational constraints in chronological order.

Table 3.2: In situ testing operational constraints

Location	Depth [m BSF]	Test No.	Description
BNO-OWF-BH02	0.00	CPT01	Test aborted. Risk to damage equipment as per operator's discretion. No retesting
BNO-OWF-BH03	0.00	CPT01	Test not classified. Drift on the f_s due to long stay in the mousehole
	1.80	CPT02	Test not classified. Significant drift on the f_s due to long stay in the mousehole. The same cone was used for CPT03, and application class 1 was achieved
BNO-OWF-BH04	0.00	CPT01	Test aborted. Equipment malfunction, lost tip of cone CP10-CF80PB10-P1E1M1-V1, 1706-2584. Coring from same depth
BNO-OWF-BH08	0.00	CPT01	Test aborted. Risk to damage equipment as per operator's discretion due to obstacle. Coring from same depth
BNO-OWF-BH11	0.00	CPT01	Test aborted. Risk to damage equipment as per operator's discretion. No retesting
	2.00	CPT02	Test aborted. Start depth changed to 2.33 m BSF due to slight disturbance/overflush. Coring from 2.00 m
BNO-OWF-BH12-a	1.00	CPT01	Test aborted. Risk to damage equipment as per operator's discretion. No retesting, end of borehole
BNO-OWF-BH13	1.00	CPT02	Test not classified. Probable cobble in the bit. Cone changed
BNO-OWF-BH17	0.00	CPT01	Test aborted. Risk to damage equipment as per operator's discretion. Coring from same depth
	8.00	CPT02	Test aborted. Risk to damage equipment as per operator's discretion. Coring from same depth
BNO-OWF-BH19	0.00	CPT01	MMO spotted dolphins, 20 mins standby
Notes			

Location	Depth [m BSF]	Test No.	Description
BSF = Below seafloor CPT = Cone penetration test			

3.5 Practice for Cone Penetration Testing

Table 3.3 summarises the specifications of the CPT equipment used.

Table 3.3: Practice for cone penetration testing

Test Control	
General Procedure	According to ISO 19901-8:2014 (ISO, 2014c) Refer to document titled Cone Penetration Test (Appendix B)
Metrological Confirmation	According to ISO 10012:2003 (ISO, 2003) (Appendix B)
Target Application Class	Class 1 or Class 2 in accordance with ISO 19901-8:2014 (ISO, 2014c)
Test Termination	Refer to document titled Cone Penetration Test (Appendix B)
Downhole Cone Penetration Testing Apparatus	
Thrust Machine	Fugro WISON® MkV
Mounting of Thrust Machine	Fixed
Reaction Equipment	Fugro SEADEVIL®
Push Rods	1.5 m (CP10 and CP5)
Push Rod Casing	Stainless steel
Penetrometer Type	CP10 (10 cm^2) and CP5 (5 cm^2) piezocone
Communication	Fibre optic
Test Results	
Data Processing and Management	Discovery GeoVisual, Topaz
Depth Reference Level	Seabed
Water Depth Reference	LAT
Depth Correction for Penetrometer Inclination	No
Notes LAT = Lowest Astronomical Tide	

4. Sampling Data

4.1 Overview

A total of 17 downhole wireline push (WIP) samples and 209 rock core (RC) samples were taken from 15 geotechnical boreholes.

Plates 4.1 to 4.122 present the photographs of the acquired samples and plates 4.123 to 4.138 present the samples acquired during the fieldwork with the testing performed offshore and onshore.

4.2 Downhole Samples

Table 4.1 summarises the downhole sampling and coring equipment used during the fieldwork.

Table 4.1: Sampling equipment

Sampler Type	Inside Diameter D_1 [mm]	Outside Diameter D_2 [mm]	Inside Diameter D_3 [mm]	Wall Thickness [mm]	Tube Length* [mm]	Sample Length* [mm]	Rate of Penetration† [mm/s]
Thin-walled 3″ tube	72.0	76.0	72.0	2.0	1028.0	950.0	20.0
Thick-walled 3″ tube	72.0	80.0	72.0	4.0	1028.0	950.0	20.0
Thick-walled 2″ tube	53.0	60.3	53.1	3.6	1028.0	950.0	20.0
S Geobor core liner	102.0	105.0	102.0	1.0	1500.0	1500.0	n/a†

Notes
D_1 = Inside diameter of cutting shoe
D_2 = Greatest outside diameter of sample tube and/or cutting shoe
D_3 = Inside diameter of flush portion of sample tube or liner
n/a = Not applicable
* = Stated manufactured length. If cutting edge becomes blunted during sampling process, tubes may be trimmed to sharpen it
† = Rate of penetration of S Geobor varies depending on ground conditions

4.2.1 Downhole Push Samples

The downhole push samples were taken using Fugro's wireline WIPSAMPLER in combination with seamless 3″ WIP thin-walled tubes. To prevent buckling, 2″ and 3″ WIP thick-walled tubes were used where dense to very dense sand soils (2″ tubes) or very high strength clay soils (3″ tubes) were expected. In cohesionless material, a core catcher was used in conjunction with the 3″ WIP thin-walled and 2″ WIP thick-walled tubes to prevent the sample from slipping out of the tube during recovery to deck.

The thick-walled 2" (53 mm) tubes were only used for dense cohesionless material. The sample tube was pushed into the soil at a constant rate of 20 mm/s using the reaction obtained by clamping the drill pipe at seafloor with the Fugro SEADEVIL® system.

4.2.2 SEADEVIL SQ Core Samples

The SEADEVIL® SQ coring system utilises the S Geobor wireline triple tube core barrel. The S Geobor is a triple tube core barrel which cuts an "S" size core sample with outer diameter of 102 mm. It has a plastic core liner, which is seated within the inner barrel assembly, considerably reducing friction between the core and the inner tube and enhancing core recovery.

The S Geobor has an individual bottom-hole assembly (BHA) and a selection of diamond, tungsten and PCD coring bits available depending on the type of rock being cored. The inner barrel is lowered and latched into the Geobor BHA. On retrieval of the inner barrel the S Geobor system returns cores of 100 mm diameter and up to 1.5 m in length.

The core liner is a rigid, transparent PVC tube with a wall thickness of approximately 1 mm that fits inside the S Geobor core barrel inner tube. The core samples are recovered within the core liner tube and removed from the inner barrel between each consecutive run. The sample can be retained within the core liner tube sealed at both ends and placed into the core box. This minimises handling induced core disturbance, both on the drill deck and during subsequent transport of the core sample to the offshore laboratory and onshore core store.

S Geobor cores samples were cored in cohesionless material and rock units. Decision was made together with client representative to switch from WIP samples or CPT to core sampling when low or no recovery was obtained, this guided with predicted stratigraphy from geophysical limits.

4.3 Sampling Operational Issues

The fieldwork was performed successfully overall, with no significant challenges during sampling operations.

Table 4.2 lists the operational issues in chronological order.

Table 4.2: Summary of operational constraints: sampling

Location	Depth [m BSF]	Test No.	Description
BNO-OWF-BH19	1.00	RC02	AZCL between 1.05 m and 2.00 m BSF
	5.50	RC04	Top 4 cm disturbed by CPT03, AZCL between 6.00 and 6.50 m BSF
	6.50	RC05	AZCL between 7.00 m and 7.50 m BSF
	8.50	RC07	AZCL between 9.35 m and 9.50 m BSF
	9.50	RC08	AZCL between 10.40 m and 11.00 m BSF

Location	Depth [m BSF]	Test No.	Description
	13.00	RC11	AZCL between 13.80 m and 14.50 m BSF
	14.50	RC12	AZCL between 15.30 m and 15.50 m BSF
	16.50	RC14	AZCL between 17.55 m and 18.00 m BSF
	18.00	RC15	AZCL between 18.95 m and 19.00 m BSF
	19.00	RC16	AZCL between 20.25 m and 20.50 m BSF
BNO-OWF-BH10	0.00	RC01	AZCL between 0.00 m and 0.55 m BSF
	1.00	W01	No recovery
	1.00	RC02	Top 13 cm disturbed by W01
	2.00	RC03	No recovery
	2.50	RC04	AZCL between 3.20 m and 3.50 m BSF
	7.50	RC05	AZCL between 8.20 m and 8.50 m BSF
	15.00	RC06	AZCL between 15.70 m and 16.00 m BSF
BNO-OWF-BH08	0.00	RC01	AZCL between 0.00 m and 0.05 m BSF
	4.50	RC05	AZCL between 5.20 m and 5.50 m BSF
	5.50	RC06	AZCL between 6.40 m and 6.50 m BSF
	7.50	RC08	AZCL between 8.40 m and 8.50 m BSF
	11.00	RC11	AZCL between 12.35 m and 12.50 m BSF
	12.50	RC12	AZCL between 13.85 m and 14.00 m BSF
	14.00	RC13	AZCL between 15.35 m and 15.50 m BSF
	17.00	RC15	AZCL between 18.10 m and 18.50 m BSF
	18.50	RC16	AZCL between 19.40 m and 19.50 m BSF
	19.50	RC17	AZCL between 20.45 m and 20.50 m BSF
BNO-OWF-BH11	1.00	RC02	AZCL between 1.40 m and 2.00 m BSF
	2.00	RC03	Top 36 cm disturbed by CPT02
	3.50	RC04	AZCL between 3.50 m and 3.60 m BSF
	9.50	RC08	AZCL between 10.60 m and 11.00 m BSF
	11.00	RC09	AZCL between 11.90 m and 12.00 m BSF
	12.00	RC10	AZCL between 12.75 m and 13.00 m BSF
	13.00	RC11	AZCL between 14.30 m and 14.50 m BSF
	15.50	RC13	AZCL between 16.70 m and 16.80 m BSF
	18.30	RC15	AZCL between 19.40 m and 19.50 m BSF
BNO-OWF-BH12	0.00	RC01	AZCL between 0.40 m and 1.00 m BSF
	1.00	RC02	AZCL between 0.10 m and 1.00 m BSF
	3.00	RC03	AZCL between 3.80 m and 4.00 m BSF
	4.00	RC04	AZCL between 4.85 m and 5.00 m BSF
	6.00	RC06	AZCL between 6.75 m and 7.00 m BSF

Location	Depth [m BSF]	Test No.	Description
	7.00	RC07	No recovery
	12.00	RC11	AZCL between 13.40 m and 13.50 m BSF
	13.50	RC12	AZCL between 14.45 m and 14.50 m BSF
	14.50	RC13	AZCL between 15.40 m and 15.50 m BSF
	15.50	RC14	AZCL between 16.60 m and 17.00 m BSF
	17.00	RC15	AZCL between 17.90 m and 18.00 m BSF
BNO-OWF-BH12-a	0.00	RC01	AZCL between 0.80 m and 1.00 m BSF
BNO-OWF-BH01	0.00	RC01	AZCL between 0.20 m and 0.80 m BSF
	0.80	RC02	AZCL between 1.05 m and 1.80 m BSF
	2.20	RC04	AZCL between 2.40 m and 3.00 m BSF
	5.00	RC07	AZCL between 5.95 m and 6.00 m BSF
BNO-OWF-BH03	0.00	RC01	No recovery
	0.30	RC02	No recovery
	1.30	RC03	No recovery
	3.20	RC05	AZCL between 3.65 m and 4.00 m BSF
	4.00	RC06	AZCL between 4.00 m and 4.10 m BSF
	5.00	RC07	AZCL between 5.70 m and 6.00 m BSF
	7.00	RC09	AZCL between 8.25 m and 8.50 m BSF
	19.00	RC14	AZCL between 19.00 m and 19.10 m BSF and between 20.00 m and 20.50 m BSF
BNO-OWF-BH13	0.00	RC01	No recovery
	1.00	RC02	AZCL between 1.10 m and 2.00 m BSF
	2.00	RC03	AZCL between 2.55 m and 3.00 m BSF
	3.00	RC04	Top 25 cm disturbed by CPT02. AZCL between 3.65 m and 4.00 m BSF
	5.50	RC05	AZCL between 6.40 m and 6.50 m BSF
	8.00	W01	No recovery
	9.00	RC07	AZCL between 9.65 m and 10.00 m BSF
	10.00	RC08	AZCL between 10.75 m and 11.00 m BSF
	16.00	W03	No recovery
	16.00	RC09	AZCL between 16.00 m and 16.05 m BSF
	18.00	RC11	AZCL between 18.00 m and 18.30 m BSF
	18.50	RC12	AZCL between 18.90 m and 19.00 m BSF
BNO-OWF-BH15	0.00	RC01	Top 37 cm disturbed by CPT01. AZCL between 0.67 and 1.00 m BSF
	1.50	RC03	AZCL between 2.45 m and 2.50 m BSF
	2.50	RC04	No recovery

Location	Depth [m BSF]	Test No.	Description
	3.00	RC05	AZCL between 3.85 m and 4.00 m BSF
	5.50	RC08	AZCL between 6.90 m and 7.00 m BSF
	10.00	RC11	AZCL between 10.75 m and 11.00 m BSF
	11.00	RC12	AZCL between 11.80 m and 12.00 m BSF
	18.70	RC18	AZCL between 19.20 m and 20.20 m BSF
BNO-OWF-BH02	0.00	RC01	AZCL between 0.00 m and 0.20 m BSF
	1.00	RC02	AZCL between 1.70 m and 2.00 m BSF
	2.00	RC03	AZCL between 2.30 m and 3.00 m BSF
	3.00	RC04	AZCL between 3.40 m and 4.00 m BSF
	4.00	RC05	AZCL between 4.20 m and 4.50 m BSF
	4.50	RC06	AZCL between 5.15 m and 5.50 m BSF
	5.50	RC07	AZCL between 6.05 m and 6.50 m BSF
	6.50	RC08	AZCL between 6.55 m and 7.00 m BSF
	7.00	RC09	AZCL between 7.25 m and 7.70 m BSF
	7.70	RC10	AZCL between 8.10 m and 8.50 m BSF
	8.50	RC11	AZCL between 9.05 m and 9.20 m BSF
	9.20	RC12	No recovery
	9.70	RC13	No recovery
	10.20	RC14	No recovery
	11.20	RC15	AZCL between 11.40 m and 11.70 m BSF
	11.70	RC16	AZCL between 12.60 m and 12.70 m BSF
BNO-OWF-BH17	0.00	RC01	AZCL between 0.75 m and 1.00 m BSF
	1.00	RC02	AZCL between 1.80 m and 2.00 m BSF
	2.00	RC03	AZCL between 2.50 m and 3.00 m BSF
	4.00	RC05	AZCL between 4.80 m and 5.00 m BSF
	5.00	RC06	AZCL between 5.10 m and 6.00 m BSF
	6.00	RC07	AZCL between 6.50 m and 7.00 m BSF
	7.00	RC08	AZCL between 7.60 m and 8.00 m BSF
	15.50	RC16	AZCL between 16.60 m and 17.00 m BSF
BNO-OWF-BH07	6.50	W03	No recovery
	6.50	RC01	AZCL between 6.50 m and 6.60 m BSF and 7.20 and 7.50 m BSF
	10.50	RC05	AZCL between 11.90 m and 12.00 m BSF
	13.50	RC07	AZCL between 14.80 m and 15.00 m BSF
	15.00	RC08	AZCL between 16.10 m and 16.50 m BSF
	16.50	RC09	AZCL between 17.90 m and 18.00 m BSF
	18.00	RC10	AZCL between 19.40 m and 19.50 m BSF

Location	Depth [m BSF]	Test No.	Description
	19.50	RC11	AZCL between 20.30 m and 20.50 m BSF
BNO-OWF-BH04	0.00	RC01	Top 15 cm disturbed by CPT01, AZCL between 0.75 m and 0.85 m BSF
	0.80	RC02	AZCL between 1.10 m and 1.80 m BSF
	1.80	RC03	No recovery
	2.80	RC04	No recovery
	3.30	RC05	No recovery
	3.50	W01	No recovery
	4.00	RC07	AZCL between 4.55 m and 5.00 m BSF
	5.00	RC08	AZCL between 5.70 m and 6.00 m BSF
	6.00	RC09	AZCL between 6.85 m and 7.00 m BSF
	7.00	RC10	AZCL between 8.05 m and 8.20 m BSF
	8.20	RC11	AZCL between 9.30 m and 9.70 m BSF
	9.70	RC12	AZCL between 11.15 m and 11.20 m BSF
	12.70	RC14	AZCL between 14.10 m and 14.20 m BSF
	14.20	RC15	AZCL between 15.15 m and 15.70 m BSF
	16.70	RC17	AZCL between 17.00 m and 17.20 m BSF
	17.20	RC18	AZCL between 18.60 m and 18.70 m BSF
	18.70	RC19	AZCL between 20.00 m and 20.20 m BSF

Notes
AZCL = Assumed zone of core loss
BSF = Below seafloor
RC = Rock core

4.4 Practice for Sample Handling

Immediately after recovery, the samples were extruded from their tubes, photographed and visually described. Some basic index tests were performed based on this visual description, including moisture content determination, bulk and dry density determination, index strength tests (pocket penetrometer). Thermal resistivity tests were performed in shallow sediments up to 6.00 m BSF. Additional tests included sulphate reducing bacteria tests. In clay, some sections were selected for intact preservation for further testing in onshore laboratory. Any remaining lengths are preserved in bags.

After recovery the core barrel to deck, core liner was opened to expose the rock core samples for photographing, logging, testing and sampling. Core recovery parameters, total core recovery, (TCR), solid core recovery (SCR), rock quality designation (RQD) was also recorded as follow:

- TCR was recorded as the total length of core recovered;

- SCR was recorded as core with a full diameter, but not necessarily a full circumference, measured along the core axis;
- RQD was recorded as solid core of lengths greater than or equal to 100 mm.

Selection of rock cores were wrapped in cling film and aluminium foil, placed in cardboard hemi-cylinders for support. Plastic foam padding was inserted above and below the remaining core samples to prevent damage during shipping before they were inserted in plastic liners. Liners were placed inside plastic lay flats and packed in wooden core boxes.

All soil and rock samples were stored in a reefer container at 7°C.

Full visual descriptions and detailed fracture logging were made of the recovered samples in accordance with BS 5930:2015+A1:2020 (BSI, 2015), ISO 14688-1:2017 (ISO, 2017a), ISO 14688-2:2017 (ISO, 2017b) and ISO 14689:2017 (ISO, 2017c). Table 4.3 summarises the procedures for WIP sample handling and Table 4.4 summarises the procedure for handling of S Geobor samples.

Table 4.3: Practice for handling WIP samples

Stage	Process	Description
Initial sample handling	Initial handling	Detach sample tube from WIPSAMPLER
	Push samples	Transfer to site laboratory
Site geotechnical laboratory	Push samples	Extrude sample from sample tube Measure recovery Photograph sample Make visual geotechnical description of sample Test soil where appropriate (e.g. water content, unit weight, pocket penetrometer, torvane, fall cone, reaction to 10 % hydrochloric acid) Thermal resistivity tests (TRT) to be conducted at frequency agreed on board according to procedure defined in Fugro document F255271-TN-002 02 (Fugro, 2025b) Sulphate Reducing Bacteria (SRB) measurement was conducted at frequency agreed on board according to protocol defined in Fugro document F255271-TN-003 02 (Fugro, 2025c)
Sample protection	Packaging of disturbed material (bag subsamples)	Pack disturbed material in double bulk bags Label each bag
	Packaging of undisturbed material (wax subsamples)	Wrap in cling film (add label) Wrap in aluminium foil Insert in cardboard tube (add label) Add wax to seal sample in tube Insert waxed sample into inflatable packaging (add label)
Onboard sample storage	n/a	Samples stored in a reefer container
Sample transport	n/a	Pack samples into plastic boxes and strap to pallet

Stage	Process	Description
		Wrap pallets in heavy-duty shrink film
Notes n/a = Not applicable		

Table 4.4: Practice for handling S Geobor core samples

Stage	Process	Description
Initial sample handling	Initial handling	On-deck removal of core from barrel and put in a wooden core box Note top and bottom of core
	Core liner	Place in liner splitter and split the liner Remove drill mud and clean the core Place the core back in the core box Transfer to site laboratory
Site geotechnical laboratory	Core sample	Make visual geotechnical description of sample Identify any AZCL and indicate with foam stick Asses TCR, SCR and RQD Make fracture logging Photograph sample Test soil and rock where appropriate (water content, unit weight, PLT, reaction to 10 % hydrochloric acid) Thermal resistivity tests (TRT) to be conducted at frequency agreed on board according to procedure defined in Fugro document F255271-TN-001 (Fugro, 2024a) Sulphate reducing bacteria (SRB) measurement was conducted at frequency agreed on board according to protocol defined in Fugro document F255271-TN-002 (Fugro, 2024b)
Sample protection	Packaging of disturbed material (bag subsamples)	Pack disturbed material or remains from PLT tests in double bulk bags Label each bag
	Packaging of undisturbed material (wax subsamples)	Wrap in cling film (add label) Wrap in aluminium foil Insert in cardboard tube (add label) Add wax to seal sample in tube Store wax sample in plastic box
	Core sample	Foam stick placed in core liner in case of short recovery or wax samples Top and bottom sections of liners capped and taped (labelled) Liner shall be labelled Liner placed inside a plastic lay flat, and closed with tie wraps Place core liner back into the core box Label core box and lock it with tie wraps

Stage	Process	Description
Onboard sample storage	n/a	Samples stored in a reefer container
Sample transport	Wax subsamples	Pack samples into plastic boxes and strap to pallet Wrap pallets in heavy-duty shrink film
	Core boxes	Secure cores to pallet Wrap pallets in heavy-duty shrink film

Notes
n/a = Not applicable
AZCL = Assumed Zone of Core Loss
PLT = Point Load Test
RQD = Rock Quality Designation
SCR = Solid Core Recovery
TCR = Total Core Recovery

5. Laboratory Test Data

5.1 Introduction

Laboratory tests were carried out in accordance with the standards listed in Appendix D where it is also noted which tests are accredited. The results relate only to the samples tested and are considered to be representative of those samples.

The summary of laboratory test results sheets (plates 5.1 to 5.53) present tabulated results from onshore and offshore laboratory testing.

Table 5.1 summarises the performed tests offshore and onshore according to the soil type and the preservation condition necessary for the tests to be performed.

Refer to the summary of laboratory test results for full sample descriptions. The geotechnical descriptions given in the individual test reports are indicative only of the specimens tested.

Table 5.1: Summary of offshore and onshore laboratory tests

Tests	Soil/rock Type	Sample Type	Condition
Offshore			
Moisture content & bulk density	Cohesive and cohesionless soil	-	Disturbed
Visual Carbonate content assessment	Cohesive and cohesionless soil	-	Disturbed
Thermal resistivity test (TRT)	Cohesive soil, fine cohesionless soil - non gravelly, and rock	Performed in Shelby tube immediately after sampling	Undisturbed
Sulphate reducing bacteria (SRB)	Cohesive soil, cohesionless soil, and rock	-	Undisturbed
Point Load test (PLT)	Rock	-	Undisturbed
Index soil strength pocket penetrometer (PP)	Cohesive soil and rock – residual soil	-	Undisturbed
Onshore			
Plasticity index (PI)	Cohesive soil	Wax/Bag	Undisturbed/Disturbed
Particle size distribution (PSD)	Cohesive and cohesionless soil	Wax/Bag	Undisturbed/Disturbed
Particle density (PD)	Cohesive and cohesionless soil	Wax/Bag	Undisturbed/Disturbed
Consolidated isotropically undrained triaxial (CIU)	Cohesive soil	Wax	Undisturbed

Tests	Soil/rock Type	Sample Type	Condition
Chemical tests	Cohesive and cohesionless soil	Wax/Bag	Undisturbed/Disturbed
Uniaxial compressive strength (UCS)	Rock	Wax	Undisturbed
Brazilian indirect tensile strength (BTS)	Rock	Wax	Undisturbed
Slake durability	Rock	Wax/Bag	Undisturbed/Disturbed
CERCHAR Abrasivity	Rock	Wax/Bag	Undisturbed/Disturbed
Porosity and Particle density	Rock	Wax	Undisturbed
Notes - = Not applicable			

5.2 Soil Testing

5.2.1 Index Laboratory Tests

Basic index laboratory tests completed offshore on soils obtained during the site investigation included soil description, colour identification using Munsell Color (2009) charts, water content (w), unit weight (γ), dry unit weight (γ_d) and pocket penetrometer (PP).

Decisions to perform PP tests were based on soil type, soil strength, and gravel and shell fragments contents.

Except for sulphate reducing bacteria (SRB) and thermal resistivity (TRT) tests, the test results are presented in the geotechnical logs (plates 2.2 to 2.26) and the summary of laboratory test results sheets (plates 5.1 to 5.53)

Further index tests were performed onshore including particle size distribution (PSD), plasticity index (PI) and particle density (PD).

5.2.1.1 Water Content and Wet and Dry Density Determination

Water content* (w) (also called moisture content) and unit weight (γ) were measured in representative samples from the investigated locations. Dry unit weight (γ_d) was then inferred from the measured γ and w content values.

The geotechnical logs (plates 2.2 to 2.26) and the summary of laboratory test results sheets (plates 5.1 to 5.53) present the individual test results.

5.2.1.2 Index Soil Strength

Index undrained shear strength (s_u) for cohesive soil samples was measured using PP. The summary of laboratory test results sheets (plates 5.1 to 5.53) present tables showing the

* The terms 'water content' and 'moisture content' may both be used in this report depending on the terminology of the applicable standard.

individual test results. The geotechnical logs (plates 2.2 to 2.26) present the individual test results graphically.

The results generally agree well with s_u derived from CPT data using cone factor values (N_{kt}) of 15 and 20.

5.2.1.3 Plasticity Index

One liquid and plastic limit test was conducted on a selected specimen of fine-grained soil to assess plasticity. Plate 5.54 summarises the test result and plate 5.55 presents the plasticity chart.

The sample was classified as low plasticity.

5.2.1.4 Particle Size Distribution

Two sieve and sedimentation tests were conducted on selected samples to confirm the geotechnical descriptions made offshore. Plate 5.56 summarises the test result and plates 5.57 to 5.58 present the composite PSD curves.

Layer descriptions were updated accordingly based on PSD test result as mentioned in section 2.6.

5.2.1.5 Particle Density

Two particle density (PD) tests were conducted on selected cohesionless and cohesive soil samples. Plates 5.59 summarises the test results.

5.2.2 Triaxial Tests

5.2.2.1 Consolidated Isotropically Undrained Triaxial Tests

One consolidated isotropically undrained triaxial compression test (CIUc) was conducted on a selected sample.

The sample was consolidated to a best estimate of their in-situ stress conditions, based on estimates of the overburden and lateral earth pressures. As is standard Fugro practice, CIUc test failure is taken at 10% axial strain except where the peak deviator stress occurred at a lower axial strain. Plate 5.60 summarises the test result and plates 5.61 to 5.69 present the individual test result.

The test result is considered to be representative of the soil tested, and Su given by CIU is within the same range as Su derived from PP and CPT.

5.2.3 Thermal Resistivity Tests

Thermal resistivity tests (TRT) are conducted to measure the capacity of the ground to conduct or to dissipate heat. A total of four valid tests were performed offshore on a selected soil sample from within the top 6.00 m BSF. Plate 5.70 to 5.73 summarises the tests performed offshore.

One TRT was performed onshore as well on a selected soil sample from within the top 6.00 m BSF. TEMPOS Thermal Properties analyser package kit was used for testing. Plate 5.74 summarises the test result and plate 5.75 presents the individual test result.

For all tests, the deviation between two results remains below 15% and the error rate (r^{-2}) remains below 0.01.

5.2.4 Chemical Testing

Chemical testing was carried out at third-party laboratories. The results relate only to the samples tested and are considered to be representative of those samples.

Appendix D lists the laboratory testing standards and statements to be used for the chemical tests.

5.2.4.1 Carbonate Content

A total of 16 carbonate content tests were conducted on selected samples (on soil and carbonate rock). Plates 5.76 summarise the test results.

Layer descriptions were updated accordingly based on carbonate content test results as mentioned in section 2.6.

5.2.4.2 Organic Content

A total of 16 loss on ignition tests were conducted to measure the organic content on selected samples (on soil and carbonate rock). Plates 5.77 summarise the test results.

Layer descriptions were updated accordingly based on organic content test results as mentioned in section 2.6.

5.2.4.3 Chloride Content

A total of 16 water soluble chloride tests will be conducted on selected samples (on soil and carbonate rock). Plates 5.78 summarise the test results.

5.2.4.4 Sulphate Content and pH

A total of 16 total sulphate content tests and pH measurements were conducted on selected samples (on soil and carbonate rock). Plates 5.78 to 5.79 summarise the test results.

5.2.4.5 Sulphate Reducing Bacteria

A total of 39 sulphate reducing bacteria tests were conducted offshore on selected soil samples and residual soil of weathered rock to determine the presence of sulphate reducing bacteria at approximately every 5 m and when presence of organic matter, along the borehole. Sig Sulphide® SRB kits from Echa were used for these tests.

Test results are presented in plates 5.80 to 5.118. Table 5.2 summarises the SRB tests qualitative interpretation after six days.

Table 5.2: Summary of SRB test results

Location	Sample	Depth [m BSF]	Qualitative interpretation – Day 6	SRB Concentration [SRB/ml]
BNO-OWF-BH01	RC05	3.60	Heavy Contamination	>100000
BNO-OWF-BH01	RC08	6.50	Heavy Contamination	>100000
BNO-OWF-BH01	RC11	11.15	Heavy Contamination	>100000
BNO-OWF-BH02	RC06	5.85	Heavy Contamination	>100000
BNO-OWF-BH02	RC15	11.30	Heavy Contamination	>100000
BNO-OWF-BH02	RC19	16.20	Heavy Contamination	>100000
BNO-OWF-BH02	RC22	21.00	Heavy Contamination	>100000
BNO-OWF-BH03	RC05	3.30	Heavy Contamination	>100000
BNO-OWF-BH03	RC09	7.80	Heavy Contamination	>100000
BNO-OWF-BH03	W01	10.80	Moderate Contamination	100 - 1000
BNO-OWF-BH03	W03	15.05	Moderate Contamination	1000 - 10000
BNO-OWF-BH03_a	RC02	1.70	Light Contamination	10 - 100
BNO-OWF-BH04	RC06	3.85	Heavy Contamination	>100000
BNO-OWF-BH04	RC11	9.15	Heavy Contamination	>100000
BNO-OWF-BH04	RC18	18.25	Heavy Contamination	>100000
BNO-OWF-BH07	RC04	9.95	Heavy Contamination	>100000
BNO-OWF-BH08	RC05	5.00	Heavy Contamination	>100000
BNO-OWF-BH08	RC11	11.60	Heavy Contamination	>100000
BNO-OWF-BH10	RC01	0.80	Heavy Contamination	10000 - 100000
BNO-OWF-BH10	W02	5.50	Heavy Contamination	>100000
BNO-OWF-BH10	W04	10.50	Heavy Contamination	>100000
BNO-OWF-BH10	RC06	15.25	Heavy Contamination	>100000
BNO-OWF-BH10	RC08	19.20	Heavy Contamination	10000 - 100000
BNO-OWF-BH11	RC01	0.55	Moderate Contamination	100 - 1000
BNO-OWF-BH11	RC09	11.10	Heavy Contamination	>100000
BNO-OWF-BH12	RC05	5.40	Light Contamination	<10
BNO-OWF-BH12	RC09	9.30	Light Contamination	10 - 100
BNO-OWF-BH13	RC03	2.20	Heavy Contamination	>100000
BNO-OWF-BH13	RC05	5.90	Heavy Contamination	>100000
BNO-OWF-BH13	RC08	10.60	Heavy Contamination	10000 - 100000
BNO-OWF-BH13	RC10	17.90	Light Contamination	<10
BNO-OWF-BH13	W04	20.75	Heavy Contamination	>100000
BNO-OWF-BH15	RC02	1.20	Heavy Contamination	>100000
BNO-OWF-BH15	RC08	6.10	Heavy Contamination	>100000
BNO-OWF-BH15	RC11	10.40	Heavy Contamination	>100000
BNO-OWF-BH15	RC14	15.45	Heavy Contamination	>100000

Location	Sample	Depth [m BSF]	Qualitative interpretation – Day 6	SRB Concentration [SRB/ml]
BNO-OWF-BH17	RC08	7.50	Heavy Contamination	10000 - 100000
BNO-OWF-BH17	RC15	15.40	Heavy Contamination	>100000
BNO-OWF-BH19	W01	3.65	Heavy Contamination	10000 - 100000
Notes BSF = Below seafloor RC = Rock core				

5.3 Rock Testing

5.3.1 Rock Porosity and Particle Density Tests

A total of 29 porosity tests by Saturation Moisture Content (SMC) and particle density tests were performed on selected rock samples. Plates 5.119 to 5.121 summarise the test results of the rock porosity tests and plates 5.122 to 5.123 summarise the test results of the rock particle density tests.

5.3.2 Point Load Tests

A total of 317 Point Load tests (PLT) were performed offshore. Direct results are expressed as an index of resistance normalised to a 50 mm diameter sample (Is50). Plates 5.124 to 5.130 summarise the test results of the PLTs performed offshore.

A total of 27 sets of 3 PLTs were conducted onshore. Table 5.3 presents the unsuitable specimens for PLT testing. Plates 5.131 to 5.138 summarise the test results.

Table 5.3: Unsuitable specimens for PLT testing

Location	Sample	Depth [m BSF]	Remarks
BNO-OWF-BH01	09-5	8.15	Cancelled because the sample was not sent to Geolabs
BNO-OWF-BH03	11-3	16.45	Too weak (able to push finger into the sample). No suitable sample for relocation
BNO-OWF-BH04	11-2	8.40	Cancelled because the sample was not sent to Geolabs
Notes BSF = Below seafloor			

5.3.3 Uniaxial Compressive Strength Tests

Uniaxial compressive strength (UCS) tests were performed to obtain the unconfined compressive strength.

Two categories of UCS tests were performed:

- A total of 15 UCS Type 1 tests, with strength only;
- A total of 8 UCS Type 2 tests, with stress-strain graph and Young's modulus.

Due to the anticipated weak nature of the rock material, where the rock specimens are susceptible to disintegration during sample preparation, test specimen with height to diameter ratio (H/D) of 2.5 which is the minimum H/D ratio according to the ISRM (2007) was foreseen difficult to achieve. In agreement with the client, the minimum H/D ratio has been reduced to 1.8 before laboratory testing started. However, during the testing phase, it has come to our attention that H/D of 1.8 remains difficult to achieve for this rock type. To ensure sufficient quantity of UCS data, in agreement with the client, the minimum H/D was further reduced to 1.5. Table 5.4 details the constraints of each sample.

Plates 5.139 to 5.141 summarise the test results and plates 5.142 to 5.164 present the individual test results.

Table 5.4: Constraints of UCS tests

Location	Sample	Depth [m BSF]	Specimen H/D ratio	Remarks
BNO-OWF-BH01	09-5	8.15	-	Cancelled, sample not sent to Geolabs
BNO-OWF-BH01	06-2	4.65	1.5:1	UCS performed with reduced H/D ratio
BNO-OWF-BH01	12-3	12.00	1.6:1	UCS performed with reduced H/D ratio
BNO-OWF-BH01	15-6	17.10	1.6:1	UCS performed with reduced H/D ratio
BHO-OWF-BH02	17-2	12.70	1.7:1	UCS performed with reduced H/D ratio
BNO-OWF-BH03	11-3	16.45	1.6:1	Too weak (able to push finger into the sample). No suitable sample for relocation
BNO-OWF-BH03	12-4	17.80	1.4:1	No suitable sample for relocation, PLT performed instead
BNO-OWF-BH03_a	02-2	1.20	-	Transducer malfunction, therefore, Young's modulus is not measured. Converted to UCS type 1
BNO-OWF-BH04	19-2	18.95	1.5:1	UCS performed with reduced H/D ratio
BNO-OWF-BH08	08-1	7.50	1.5:1	UCS performed with reduced H/D ratio
BNO-OWF-BH08	10-2	10.00	1.7:1	UCS performed with reduced H/D ratio
BNO-OWF-BH11	07-2	8.75	1.7:1	UCS performed with reduced H/D ratio
BNO-OWF-BH12	11-3	13.15	1.5:1	UCS performed with reduced H/D ratio
BNO-OWF-BH13	09-3	16.75	1.4:1	No suitable sample for relocation
BNO-OWF-BH15	12-3	11.45	1.5:1	UCS performed with reduced H/D ratio
BNO-OWF-BH17	18-3	18.65	1.7:1	UCS performed with reduced H/D ratio

Notes
BSF = Below seafloor
UCS = Uniaxial compressive strength
PLT = Point load test

5.3.4 Brazilian Indirect Tensile Strength Tests

A total of 14 brazilian indirect tensile strength tests were performed in the longitudinal way to infer the tensile strength of the rock as per ISRM suggested methods (Ulusay, 2015). Plates

5.165 to 5.166 summarise the test results and plates 5.167 to 5.180 present the individual test results.

5.3.5 CERCHAR Abrasivity Tests

A total of 25 CERCHAR Abrasivity (CA) tests were conducted to assess the abrasivity property of the rock material. CA tests were performed by scratching the rock surface using a standardised steel pin over a distance of 10 mm under static load of 7 kg. The resulting wear on the steel tip was measured to determine the CERCHAR Abrasivity Index (CAI). Table 5.5 presents the unsuitable specimens for testing. Plates 5.181 to 5.182 summarise the test results and plates 5.183 to 5.202 present the individual test results.

Table 5.5: Unsuitable specimens for CERCHAR testing

Location	Sample	Depth [m BSF]	Remarks
BNO-OWF-BH01	06-2	4.65	Absence of suitable intact lumps post-UCS and PLT testing
BNO-OWF-BH04	12-3	10.50	Too weak, the pin with a normal load of 70 N indents the rock surface instead of scratching it. No suitable sample for relocation
BNO-OWF-BH12	17-2	19.35	Too weak, the pin with a normal load of 70 N indents the rock surface instead of scratching it. No suitable sample for relocation
BNO-OWF-BH17	13-2	11.60	Too weak, the pin with a normal load of 70 N indents the rock surface instead of scratching it. Relocated to sample 13-4
Notes BSF = Below seafloor			

5.3.6 Slake Durability

A total of 24 slake durability (SD) tests were conducted on selected rock samples to assess their resistance to weakening and disintegration. Plates 5.203 to 5.205 summarise the test results. Table 5.6 presents the unsuitable specimens for testing.

Table 5.6: Unsuitable specimens for Slake Durability testing

Location	Sample	Depth [m BSF]	Remarks
BNO-OWF-BH01	06-2	4.65	Absence of suitable intact lumps post-UCS and PLT testing
BNO-OWF-BH13	04-1	3.00	Insufficient sample, less than 10 lumps weighing 40-60g each. No suitable sample for relocation
BNO-OWF-BH17	03-1	2.00	Absence of suitable intact lumps (extremely weak). No suitable sample for relocation
Notes BSF = Below seafloor			

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7. Symbols and Terms

Every effort is made to avoid duplication or inconsistency in the use of symbols and terms in this report. However, this is not always possible as some different terms are commonly represented by the same symbol; similarly, some terms have multiple representations.

For example, I_p and PI both mean plasticity index, and I_L and LI both mean liquidity index, while a can mean both acceleration and net area ratio of cone penetrometer, depending on the context.

Table 7.1 presents symbols and terms that may be used in this report.

Table 7.1: Symbols and terms

Symbol	Unit	Full Term or Definition
General		
A	m^2	Area
a	m/s^2	Acceleration
B	m	Width
D	m	Diameter
d	m	Depth
g	m/s^2	Acceleration due to gravity [g = 9.81 m/s^2]
h	m	Height or thickness
h_{sf}	m	Height of reference point above seafloor
i	-	Inclination
L	m	Length
ln	-	Natural logarithm
log	-	Logarithm base 10
m	kg	Mass
t	s	Time
V	m^3	Volume
v	m/s	Velocity
W	kN	Weight
w or MC	%	Moisture content
W50	-	WIP sample in sample tube of 50 mm internal diameter
W72		WIP sample in sample tube of 72 mm internal diameter
z	m	Penetration or depth below reference level (usually ground surface) or height above seafloor for drilling mode in situ probe zero reference readings
Stress Strain		
E	MPa	Modulus of linear deformation (Young's modulus)

Symbol	Unit	Full Term or Definition
E_u	MPa	Modulus of linear deformation (Young's modulus for undrained stress change)
E_d	MPa	Modulus of linear deformation (Young's modulus for drained stress change)
G	MPa	Modulus of shear deformation (shear modulus)
G_{max}	MPa	Shear modulus at small strain or initial (small strain) shear modulus
U	MPa	Pore-water pressure
u_0	MPa	Hydrostatic pore pressure relative to seafloor or phreatic surface
u_f	kPa	Pore-water pressure at failure
Δu	kPa	Change in pore-water pressure
$\Delta\sigma_v$	kPa	Change in total vertical stress
$\Delta\sigma'_v$	kPa	Change in effective vertical stress
ε	%	Linear strain
ε_1, ε_2, ε_3,	%	Principal strains
ε_{50}	%	Vertical strain at half the maximum deviator stress
ε_v	%	Vertical strain
ε_{vf}	%	Vertical strain at failure
γ	%	Shear strain
μ	-	Coefficient of friction
ν	-	Poisson's ratio
ν_u	-	Poisson's ratio for undrained stress change
ν_d	-	Poisson's ratio for drained stress change
σ	kPa	Total stress
σ'	kPa	Effective stress
σ_1, σ_2, σ_3	kPa	Principal stresses
σ'_h	kPa	Effective horizontal stress
σ'_{h0}	kPa	In situ horizontal effective stress
σ'_v	kPa	Effective vertical stress
σ_{v0}	kPa	Total vertical stress relative to ground surface or phreatic surface
σ'_{v0}or p'_0	kPa	In situ vertical effective stress
σ'_{vc}	kPa	Vertical effective consolidation stress
σ'_r	kPa	Radial effective stress
τ	kPa	Shear stress
Physical Ground Characteristics		
Density and Unit Weights		
γ	kN/m^3	Unit weight of ground (or bulk unit weight or total unit weight)
γ_d	kN/m^3	Unit weight of dry ground

Symbol	Unit	Full Term or Definition
γ_s	kN/m^3	Unit weight of solid particles
γ_w	kN/m^3	Unit weight of water
γ_{dmin}	kN/m^3	Minimum index (dry) unit weight
γ_{dmax}	kN/m^3	Maximum index (dry) unit weight
γ' or γ_{sub}	kN/m^3	Unit weight of submerged ground or soil
ρ	Mg/m^3 [= t/m^3]	Density of ground/soil or bulk density
ρ_d	Mg/m^3 [= t/m^3]	Density of dry ground/soil or dry density
ρ_s	Mg/m^3 [= t/m^3]	Density of solid particles
σ_ω	Mg/m^3 [= t/m^3]	Density of water
D_r	-, %	Relative density [= $\gamma_{dmax}\ (\gamma_d - \gamma_{dmin})/\gamma_d(\gamma_{dmax} - \gamma_{dmin})$]
e	-	Void ratio
e_0	-	Initial void ratio
G_s	-	Specific gravity of solid particle
I_d	-, %	Density index [=$(\gamma_d - \gamma_{dmin})/\gamma_d(\gamma_{dmax} - \gamma_{dmin})$]
n	-, %	Porosity
w	%	Water content
S_r	%	Degree of saturation
Consistency		
w_L	%	Liquid limit
w_P	%	Plastic limit
I_P or PI	%	Plasticity index [= $w_L - w_P$]
I_L or LI	%	Liquidity index [= $(w - w_P)/(w_L - w_P)$]
I_C	%	Consistency index [= $(w_L - w)/(w_L - w_P)$]
Particle Size		
D	mm	Particle diameter
D_n	mm	n% diameter [$n\% < D$]
C_u	-	Uniformity coefficient [= D_{60}/D_{10}]
C_c	-	Curvature coefficient [= $(D_{30})2/D_{10}D_{60}$]
Hydraulic Properties		
k	m/s	Coefficient of permeability
k_v	m/s	Coefficient of vertical permeability
k_h	m/s	Coefficient of horizontal permeability
Mechanical Ground Characteristics		
Cone Penetration Test		
A_c	mm^2	Cross-sectional projected area of the cone
A_n	mm^2	Cross-sectional area of load cell or shaft
A_s	mm^2	Surface area of friction sleeve

Symbol	Unit	Full Term or Definition
a	-	Net area ratio of the cone penetrometer
B_q	-	Pore pressure ratio
Δ_{u1}, Δ_{u2}, Δ_{u3}	MPa	Excess pore pressure at filter locations 1, 2 and 3
F_r	%	Normalised friction ratio [= f_t/q_n]
f_s	MPa	Sleeve friction or measured sleeve friction
f_t	MPa	Measured sleeve friction corrected for pore pressure effects
i	°	Inclination
K	-	Adjustment factor for ratio of pore pressure at u_1 to u_2 location
l	m	Penetration length
N_c	-	Cone factor between q_c and s_u or c_u
N_k	-	Cone factor between q_n and s_u or c_u
Q_t	-	Normalised cone resistance [= q_n/σ'_{v0}]
q_c	MPa	Cone resistance or measured cone resistance
q_n	MPa	Net cone resistance
q_t	MPa	Corrected cone resistance (i.e. total cone resistance) or cone penetration resistance corrected for pore-water pressure effects
R_f	%	Friction ratio
R_{ft}	%	Corrected friction ratio [= f_s/q_t or f_t/q_t]
R_{ftn}	%	Net friction ratio
U	-	Normalised excess pore pressure
u	MPa	Pore pressure
u_0	MPa	In situ pore pressure
u_1, u_2, u_3	MPa	Pore pressure measured at locations 1, 2 and 3
u_i	MPa	Measured pore pressure at the start of the dissipation test
u_t	MPa	Measured pore pressure at time t during a dissipation test
α	-	Ratio of the cone shaft to the area of the cone face
β	-	Pore-water pressure correction factor (CPTu)
Strength of Soil		
$s_u$or c_u	kPa	Undrained shear strength or undrained (undisturbed) shear strength of soil
s_{ufv}	kPa	Shear strength by field vane testing
$s_{ufv,rem}$	kPa	Remoulded shear strength by field vane testing
$s_{ufv,res}$	kPa	Residual shear strength by field vane testing
s_{uu} or $s_{u^{UU}}$	kPa	Undrained shear strength from UU test or static unconsolidated undrained triaxial shear strength
s_u/σ'_{v0} or c_u/σ'_{v0}	-	Undrained strength ratio
φ' or ϕ'	° (degree)	Effective angle of internal friction
ε_{50}	%	Strain at 50% of peak deviator stress (or ε_c)

Symbol	Unit	Full Term or Definition
E_{50}	MPa	Young's modulus at 50% of peak deviator stress
$c_{u;r}$ or $s_u(R)$	kPa	Undrained shear strength of remoulded soil
C_R	kPa	Undrained residual shear strength
S_t	-	Soil sensitivity [=$c_u/c_{u;r}$ or $s_u/s_u(R)$]
tan ϕ	° (degree)	Internal friction
ϕ_u	° (degree)	Undrained friction angle
ϕ_d	° (degree)	Drained friction angle
Consolidation (One-Dimensional)		
C_c	-	Compression index
C_s	-	Swelling index (or recompression)
c_v	m^2/s	Coefficient of consolidation
e	-	Void ratio
m_v	m^2/MN	Coefficient of compressibility
OCR	-	Overconsolidation ratio [=σ'_p/σ'_{vo} or p'_c/p'_0]
p	kPa	Vertical pressure
$p'_c = \sigma'_p$	kPa	Preconsolidation stress
YSR	-	Yield stress ratio [= $\sigma'_{vy}/\sigma'_{v0}$]
Dp	kPa	$p'_c - p'_0$
σ_{vy}	kPa	Effective vertical yield stress in oedometer compression
σ'_{v0}	kPa	Effective in situ vertical stress (or p'_0)
Geotechnical Design		
Earth Pressure		
δ	° (degree)	Angle of interface friction (between ground and foundation)
K	-	Coefficient of lateral earth pressure
K_a	-	Coefficient of active earth pressure
K_p	-	Coefficient of passive earth pressure
K_0	-	Coefficient of earth pressure at rest [= $\sigma'_{h0}/\sigma'_{v0}$]
$K_{0,nc}$	-	K_0 for normally consolidated soil
$K_{0,oc}$	-	K_0 for overconsolidated soil

Notes
Hyphen (-) in Unit column means no unit applies
Single prime (') applies to effective stress

List of Plates

1. Project Information

2. Geotechnical Description and Profiles

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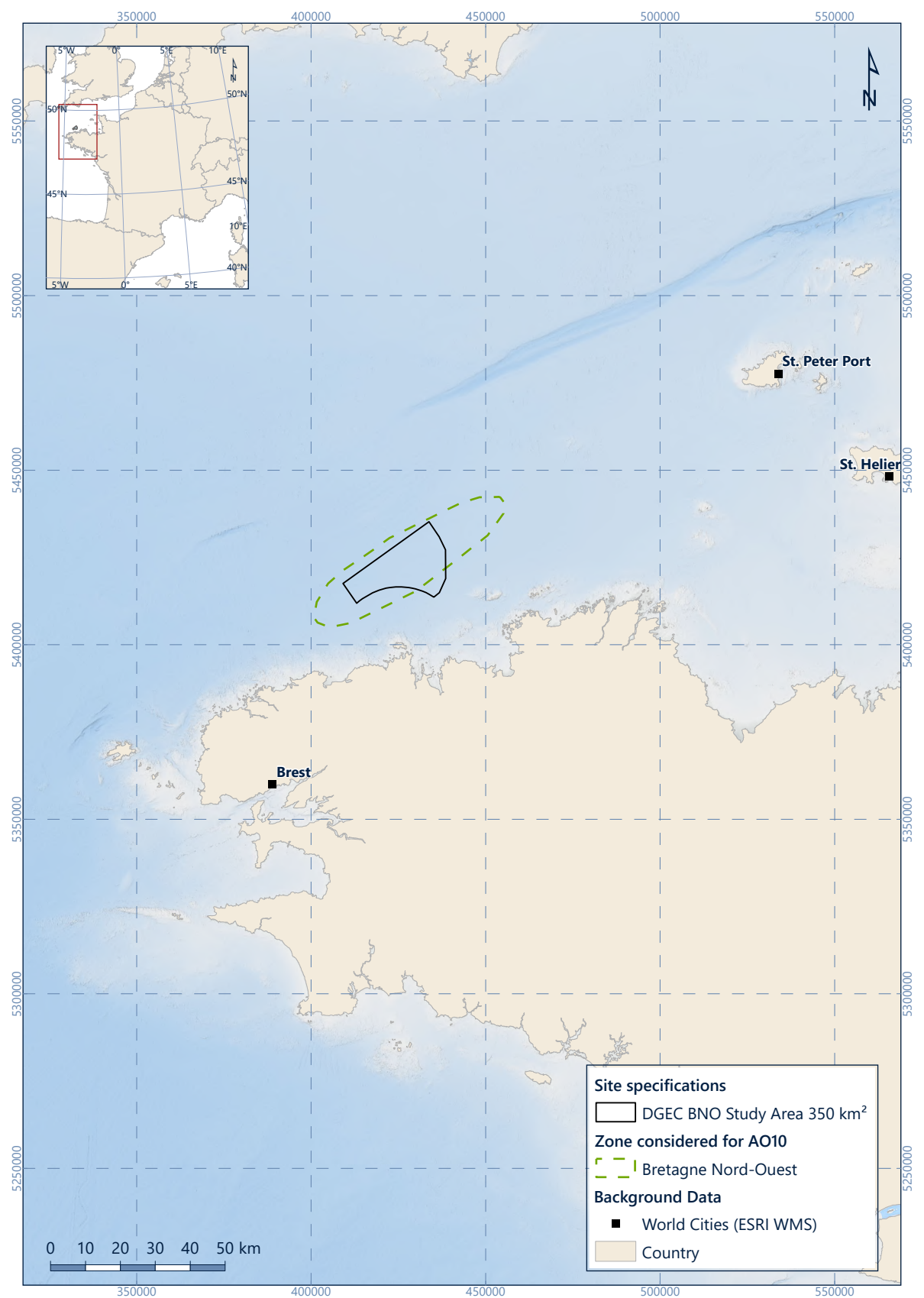
4. Sampling Data

5. Laboratory Test Data

1. Project Information

Title	Plate No.
Frontispiece	1.1
Detailed Location Plan	1.2



Coordinate System: WGS 1984 UTM Zone 30N **Caveats:** Esri, 2025;

410000
420000
430000
440000
5430000
5420000
5410000

BNO-OWF-BH03
BNO-OWF-BH03-a
BNO-OWF-BH15
BNO-OWF-BH01
BNO-OWF-BH02
BNO-OWF-BH13
BNO-OWF-BH12-a
BNO-OWF-BH12
BNO-OWF-BH17
BNO-OWF-BH11
BNO-OWF-BH04
BNO-OWF-BH07
BNO-OWF-BH19
BNO-OWF-BH10
BNO-OWF-BH08

N

LEGEND

DGEC BNO Study Area 350 km²

Type of borehole

Rotary borehole drilling and sampling

Rotary borehole drilling, sampling and testing

NOTES

Caveats: Flanders Marine Institute (2023). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 12. Esri (2025). Esri, Garmin, NaturalVue

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GEODETIC PARAMETERS

GRID SYSTEM	WGS 1984 UTM Zone 30N (EPSG:32630)
PROJECTION	Transverse Mercator
GEODETIC DATUM	WGS 1984

FUGRO

DETAILED LOCATION PLAN

Bretagne Nord Ouest Site Investigation

Scale 1:118 875
at original A3 page size

0 1 2 3 4 km

Project number: F255276
Project report: F255276-REP-001

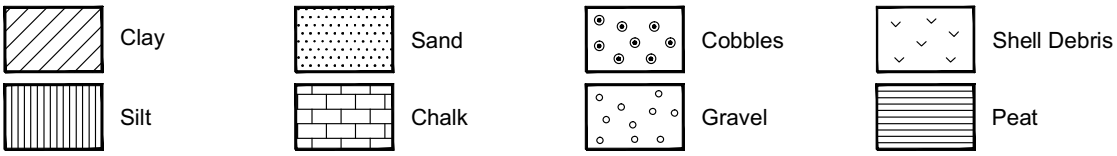
Plate 1.2

2. Geotechnical Description and Profiles

Title	Plate No.
List of Symbols and Classification Systems Used	2.1
Geotechnical Logs	2.2 to 2.26
Discontinuity logs	2.27 to 2.70

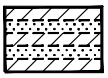
Drawn by : DRF Date : 31/07/2013
Filename: J:\...\CAD\Symbols_and_Terms_Used_on_Geotechnical_Logs_ISO.dwg

SOIL IDENTIFICATION SYMBOLS

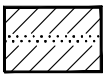


Note:
These soil identification symbols differ from BS 5930 (1999) but they are used to conform with those generally adopted for offshore purposes
Vertical symbols on the log indicate a soil mixture of primary, secondary and tertiary constituents as presented in the soil descriptions

SOIL STRUCTURE SYMBOLS



Interbedded/laminated Soil A and Soil B

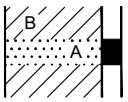


Bed of Soil A in layer of Soil B

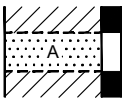
Note:

1. Pockets are not continuous through the sample
2. Partings are 1 to 2 grains thick
3. Thinly laminated is under 6 mm thick
4. Thickly laminated is from 6 mm to 20 mm thick
5. Very thinly bedded is from 20 mm to 60 mm thick
6. Thinly bedded is from 60 mm to 200 mm thick
7. Medium bedded is from 200 mm to 600 mm thick
8. Thickly bedded is from 600 mm to 2000 mm thick
9. Very thickly bedded is over 2000 mm thick

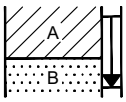
SOIL STRATIFICATION SYMBOLS



Bed of Soil A found in layer of Soil B detected by sampling



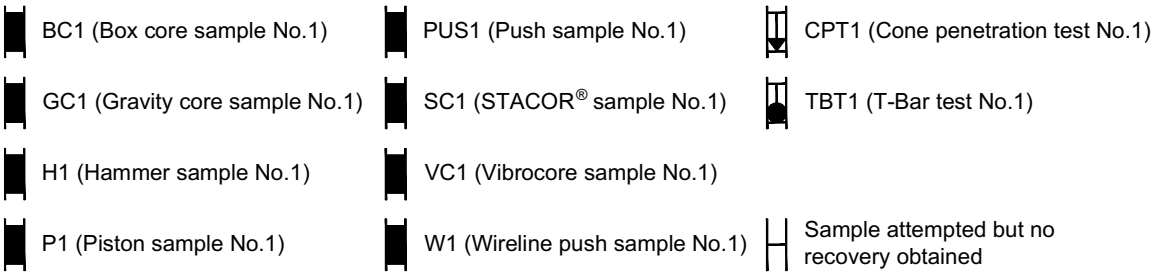
Layer of Soil A detected during drilling



Layer change from Soil A to Soil B detected during cone penetration test

Note:
Depth and thickness of layers detected during drilling are less accurate than those determined by sampling or cone penetration tests

SOIL SAMPLING AND TESTING SYMBOLS



TERMS FOR SOIL STRENGTH AND DENSITY

Fine-grained Soils

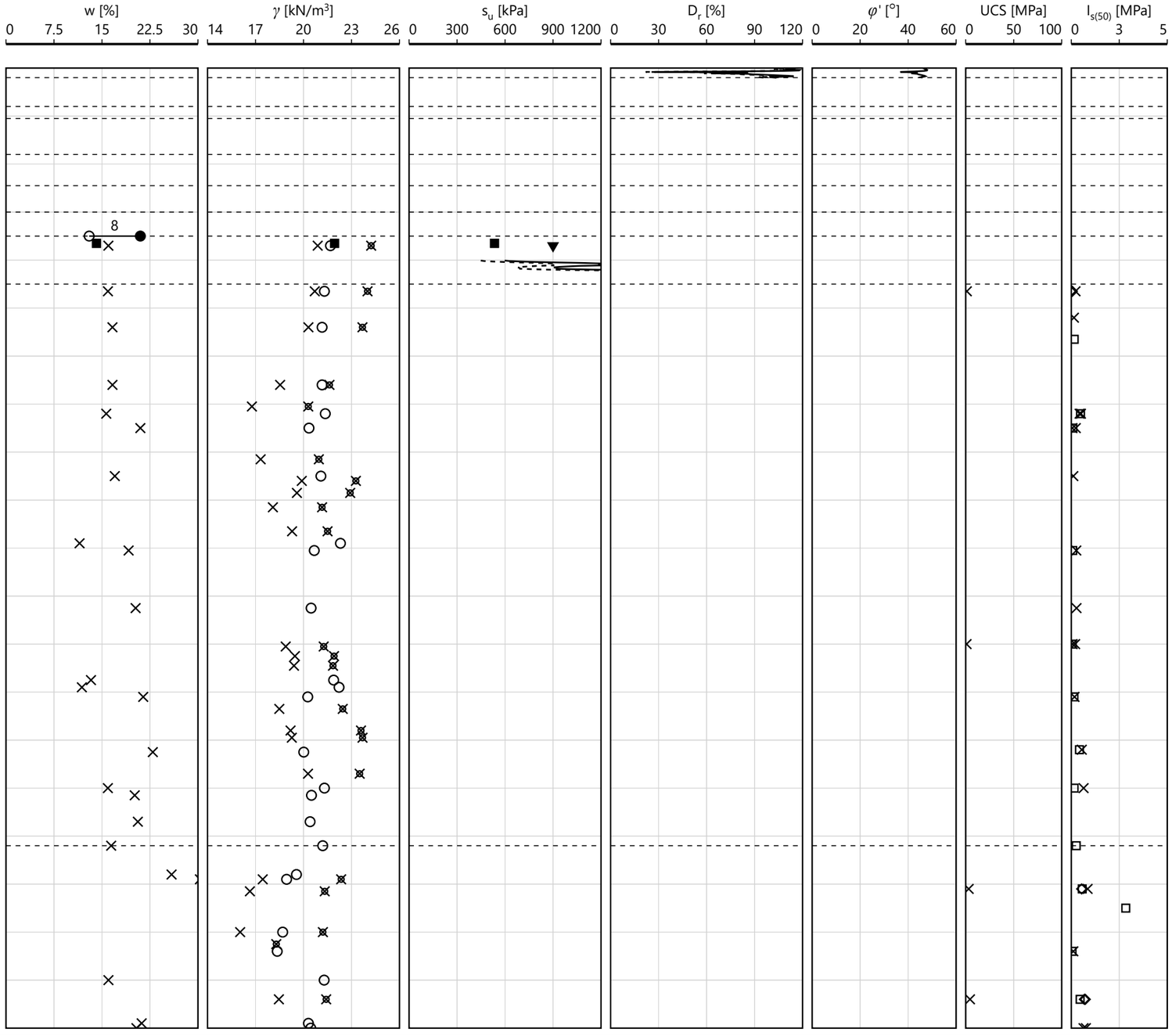
Term	Undrained Shear Strength [kPa]
Extremely low	< 10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high	300 – 600
Ultra high	> 600

Coarse-grained Soils

Term	Estimated Relative Density [%]
Very loose	0 – 15
Loose	15 – 35
Medium dense	35 – 65
Dense	65 – 85
Very dense	85 – 100

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.20 m - very dense multi-coloured subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, granite and other igneous and metamorphic lithologies	25	0	0
RC02				25	0	0
			From 0.20 m to 0.80 m - no recovery			
RC03			From 0.80 m to 1.05 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, granite and other igneous and metamorphic lithologies	100	0	0
RC04				31	0	0
			From 1.05 m to 1.80 m - no recovery			
RC05	CPT02		From 1.80 m to 2.45 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, granite and other igneous and metamorphic lithologies	100	0	0
RC06				100	100	100
			From 2.45 m to 3.00 m - no recovery			
RC07			From 3.00 m to 3.50 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, granite and other igneous and metamorphic lithologies	95	93	78
RC08			From 3.50 m to 4.50 m - extremely high strength grey (2.5Y 6/1) slightly sandy silty highly calcareous CLAY - with medium spaced thin laminae of silt	100	92	66
RC09			From 4.50 m to 16.20 m - calcareous extremely weak to very weak partially weathered grey (2.5Y 6/1) CALCARENITE with occasional glauconite crystals and fine to medium gravel-size bioclasts and medium spaced thin beds of light grey fine to medium sand-size grain calcarenite	100	97	93
RC10				100	95	81
			Bedding fractures are very closely to medium spaced occasionally widely spaced (25/291/1585) subhorizontal undulating rough to smooth tight to very tight occasionally open infilled with clay			
RC11				100	96	87
			Incipient fractures are very widely spaced (140/3900/8790) subhorizontal very tight clean			
RC12				100	97	93
RC13				100	93	90
RC14				100	100	91
			From 16.20 m to 20.50 m - calcareous very weak partially weathered light brownish grey (2.5Y 6/2) CALCARENITE with rare fine to coarse gravel-size bioclasts			
RC15			Bedding fractures are closely to medium spaced (40/204/1195) subhorizontal planar to undulating rough open to wide infilled with clay	100	90	63
RC16			From 18.42 m to 18.45 m - Joint is 30 degree inclined undulating rough very tight clean	100	90	73
RC17			From 17.50 m to 17.65 m - strong unweathered light grey (2.5Y 7/2) with frequent glauconite crystals	100	97	96

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH01

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

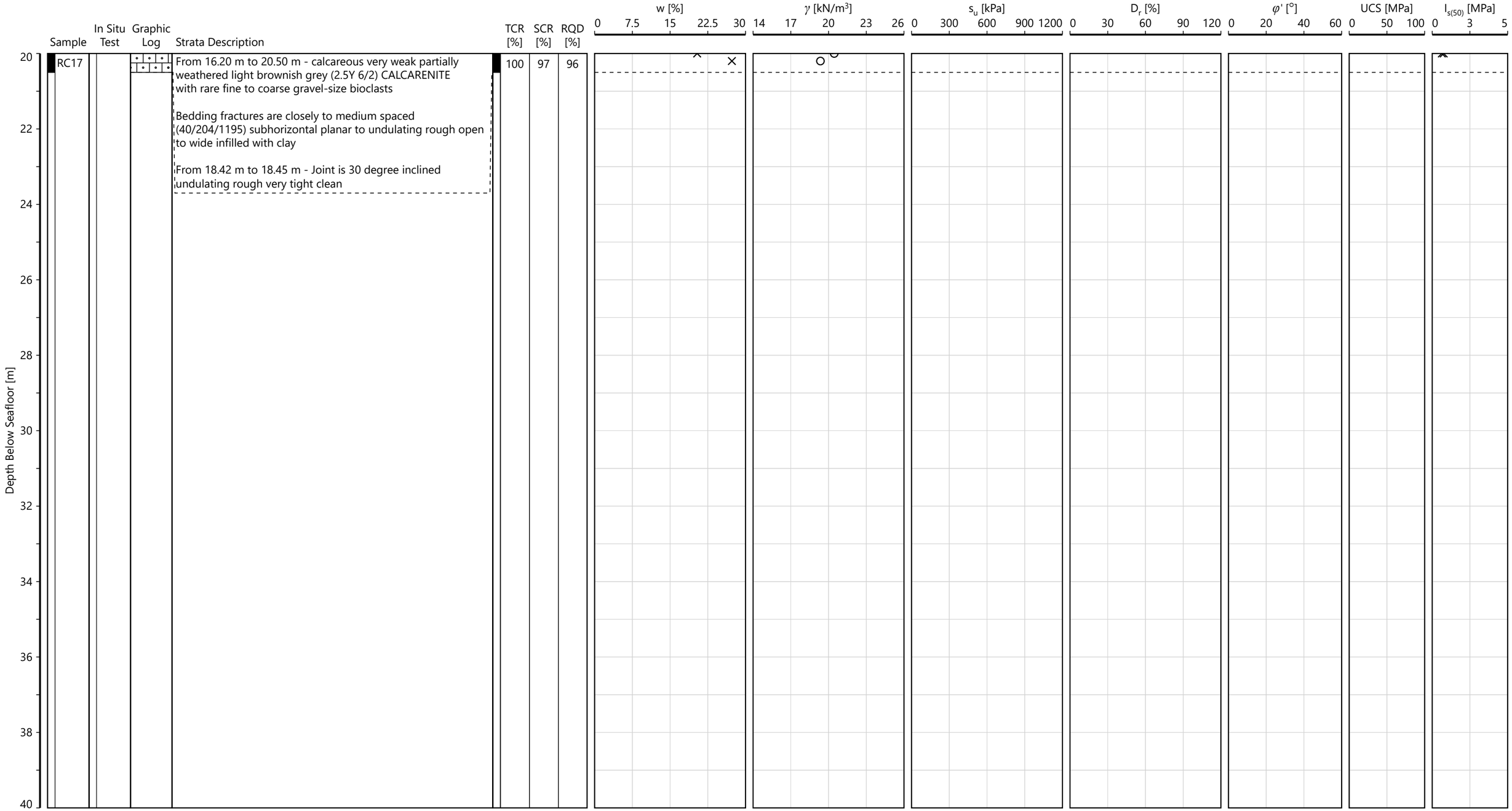
Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH01	427075.8	5428214.4	85.40	19-Aug-2025 - 19-Aug-2025	Fugro Zephyr	EOH at 20.5 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC17			From 16.20 m to 20.50 m - calcareous very weak partially weathered light brownish grey (2.5Y 6/2) CALCARENITE with rare fine to coarse gravel-size bioclasts Bedding fractures are closely to medium spaced (40/204/1195) subhorizontal planar to undulating rough open to wide infilled with clay From 18.42 m to 18.45 m - Joint is 30 degree inclined undulating rough very tight clean	100	97	96



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH01

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH01	427075.8	5428214.4	85.40	19-Aug-2025 - 19-Aug-2025	Fugro Zephyr	EOH at 20.5 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.35 m - multi-coloured subangular to subrounded GRAVEL of various lithologies with a medium subrounded cobbles of various lithologies	80	60	53
RC02			From 0.35 m to 9.05 m - limited recovery of calcareous fractured weak partially weathered very pale brown (10YR 7/3) CALCARENITE	70	18	18
RC03				30	13	13
RC04			Bedding fractures are closely to widely spaced (50/578/2210) subhorizontal planar to stepped rough occasionally smooth very tight clean	40	11	11
RC05			Joints are closely to very widely spaced (85/1307/4375) subhorizontal to subvertical undulating occasionally planar to stepped rough to smooth very tight clean	40	0	0
RC06				65	15	0
RC07			From 4.80 m to 4.95 m - calcareous reworked very pale brown (10YR 8/4) calcarenite	55	19	0
RC08				10	10	0
RC09			From 7.00 m to 9.05 m - very weak	36	13	0
RC10				50	31	0
RC11				79	56	0
RC12			From 9.05 m to 11.20 m - no recovery	0	0	0
RC13				0	0	0
RC14			From 11.20 m to 17.15 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE	0	0	0
RC15			Bedding fractures are very closely to medium spaced (40/211/1010) subhorizontal planar to undulating rough to smooth very tight occasionally tight clean occasionally infilled with sandy clay	0	0	0
RC16				40	0	0
RC17			Joints are very closely to medium spaced (5/221/800) subhorizontal to subvertical undulating occasionally planar to stepped smooth to rough very tight clean	90	49	12
RC18			From 17.15 m to 21.00 m - thickly interbedded calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy silty gravel. Clasts are weak very pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) with yellow (10YR 8/6) staining and calcareous very weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	100	80	43
RC19				87	61	19
RC20			Bedding fractures are very closely to closely spaced (30/166/990) subhorizontal planar to undulating rough very tight clean	100	57	23
RC21			Joints are extremely closely to widely spaced (35/319/1295) subhorizontal to subvertical planar occasionally undulating rough very tight clean	100	55	8
RC22				100	25	0

Depth Below Seafloor [m]

w [%] 0 7.5 15 22.5 30

γ [kN/m^3] 14 17 20 23 26

s_u [kPa] 0 300 600 900 1200

D_r [%] 0 30 60 90 120

φ' [°] 0 20 40 60

UCS [MPa] 0 50 100

$I_{s(50)}$ [MPa] 0 3 5

GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH02

Sample Details:
W Wison Push Sampler (WIP)
RC Rock Coring Sample
Disturbed/Undisturbed Sample

Core Details:
TCR Total Core Recovery
SCR Solid Core Recovery
RQD Rock Quality Designation

In Situ test Details:
CPT Cone penetration test

Water Content (w):
Water Content
Liquid Limit
Plastic Limit
Plasticity index
CAU
CIU
OED
DSS

Unit weight (γ) :
Unit weight from volume mass calculation
Unit weight from Moisture Content
Dry Unit weight
CAU
CIU
OED
DSS
Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
Pocket penetrometer
Torvane
UU-triaxial
CAU
CIU
DSS
s_u from CPT: N_{kt}= 15
s_u from CPT: N_{kt}= 20
Slashed symbols refer to tests on remoulded soil

Relative density (D_r) :
Relative density from CPT: K_0=0.5
Relative density from CPT: K_0=1.0

Friction angle (φ') :
Derived from CPT (Mayne, 2007)
CD triaxial
DS-Shear box

Unconfined Compressive Strength (UCS) :
UCS

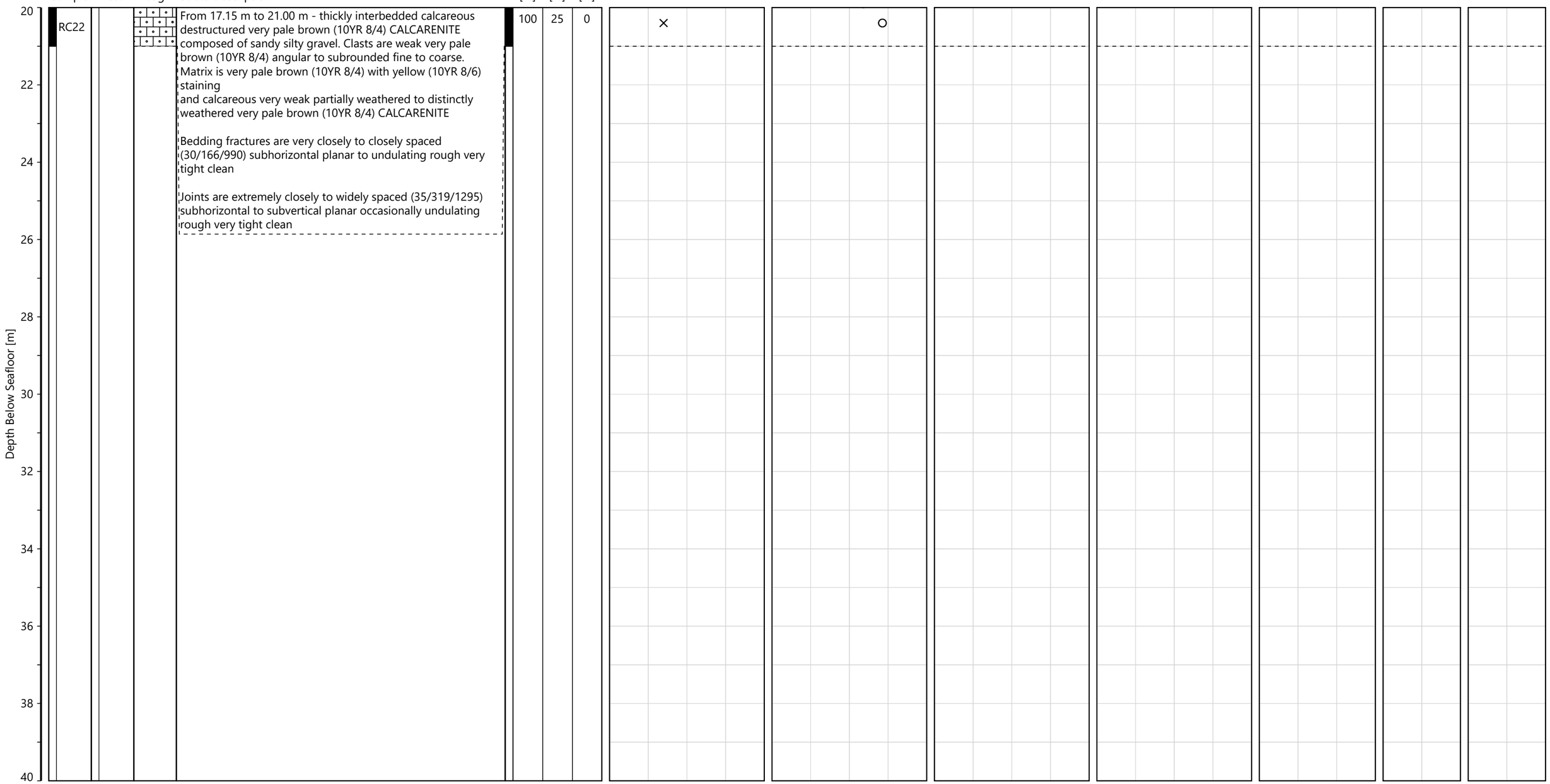
Point Load Index Strength ($I_{s(50)}$) :
$I_{s(50)}$axial
$I_{s(50)}$diametral
$I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.4
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH02	437799.0	5426682.6	80.20	21-Aug-2025 - 22-Aug-2025	Fugro Zephyr	EOH at 21.00 m BSF

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC22			From 17.15 m to 21.00 m - thickly interbedded calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy silty gravel. Clasts are weak very pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) with yellow (10YR 8/6) staining and calcareous very weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE Bedding fractures are very closely to closely spaced (30/166/990) subhorizontal planar to undulating rough very tight clean Joints are extremely closely to widely spaced (35/319/1295) subhorizontal to subvertical planar occasionally undulating rough very tight clean	100	25	0



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH02

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- × Water Content
- ● Liquid Limit
- ○ Plastic Limit
- ○● Plasticity index
- ◒ CAU
- ■ CIU
- □ OED
- ◪ DSS

Unit weight (γ) :
- ⊗ Unit weight from volume mass calculation
- ○ Unit weight from Moisture Content
- × Dry Unit weight
- ◒ CAU
- ■ CIU
- □ OED
- ◪ DSS
- —— Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- ▼ Pocket penetrometer
- ▲ Torvane
- ● UU-triaxial
- ◒ CAU
- ■ CIU
- ◪ DSS

Slashed symbols refer to tests on remoulded soil

—— s_u from CPT: N_{kt}= 15

- - - s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- —— Relative density from CPT: K_0=0.5
- - - Relative density from CPT: K_0=1.0

Friction angle (φ') :
- —— Derived from CPT (Mayne, 2007)
- ◆ CD triaxial
- ● DS-Shear box

Unconfined Compressive Strength (UCS) :
- × UCS

Point Load Index Strength ($I_{s(50)}$) :
- × $I_{s(50)}$axial
- □ $I_{s(50)}$diametral
- ◇ $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

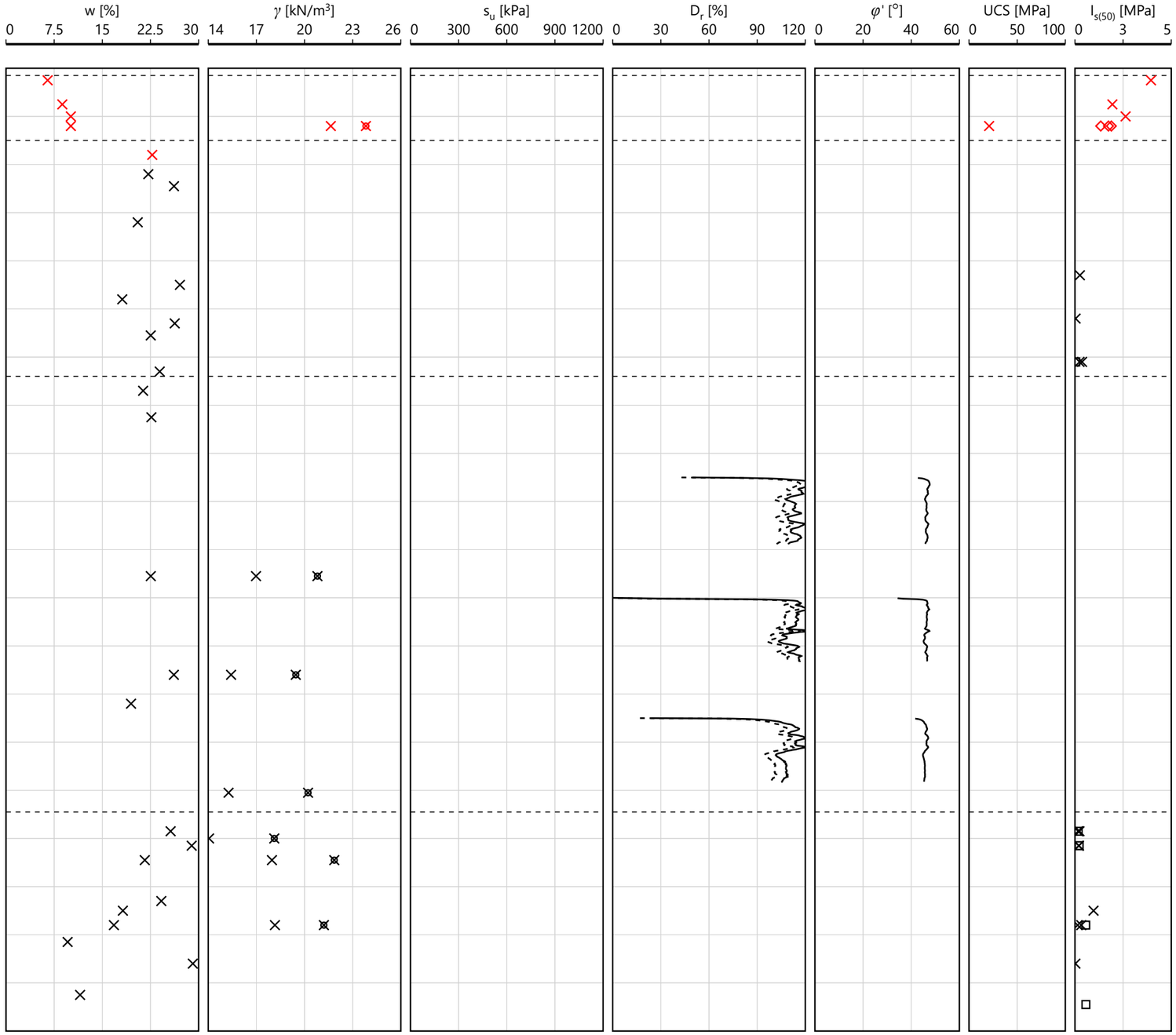
Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
—— BNO-OWF-BH02	437799.0	5426682.6	80.20	21-Aug-2025 - 22-Aug-2025	Fugro Zephyr	EOH at 21.00 m BSF

Water depths are relative to Chart Datum LAT

Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.15 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of limestone and various lithologies	100	45	0
RC02						
RC01						
RC03	CPT02		From 0.15 m to 1.50 m - calcareous moderately weak partially weathered light yellowish brown (10YR 6/4) CALCARENITE	0	0	0
RC02						
RC04	CPT03		Bedding fractures are very closely to closely spaced (20/103/820) subhorizontal planar rough partly open to open occasionally infilled with silty matrix occasionally with reddish brown staining	100	50	50
RC05				0	0	0
RC06			At 0.70 m - Incipient fracture is subhorizontal very tight clean	100	8	0
RC07			From 1.50 m to 6.40 m - medium interbedded calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE and calcareous destructured to reworked very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty very clayey gravel. Clasts are very weak angular to subrounded medium to coarse	45	2	0
RC08				90	15	0
RC09	CPT04		Bedding fractures are very closely to closely spaced occasionally widely spaced (20/153/1445) subhorizontal undulating to stepped rough to smooth very tight clean	70	40	0
				100	51	31
			Joints are widely to very widely spaced (10/980/2710) 45 degree inclined undulating rough very tight clean	83	3	0
W01			From 6.40 m to 15.45 m - calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of silty sandy gravel. Clasts are very weak to weak subangular to subrounded fine to coarse			
	CPT05		Bedding fractures are closely to medium spaced (10/1810/8270) subhorizontal undulating very tight clean			
W02			From 7.00 m to 7.10 m - Joint is 60 degree inclined undulating rough very tight clean			
	CPT06		From 15.45 m to 20.50 m - calcareous very weak partially weathered very pale brown (10YR 8/3) CALCARENITE	80	70	55
W03						
RC10			Bedding fractures are very closely to medium spaced (30/129/730) subhorizontal planar very tight to open occasionally infilled with silty sandy gravels	100	67	55
RC11				100	90	82
RC12			Incipient fractures are medium to very widely spaced (575/1683/3235) subhorizontal to 20 degree inclined very tight clean	100	89	35
RC13	CPT07		From 19.22 m to 19.27 m - Joint is subvertical undulating rough partly open clean with orange staining	67	51	17
RC14			From 18.30 m to 19.00 m - calcareous extremely weak partially weathered to distinctly weathered			

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH03
BNO-OWF-BH03-a

Sample Details:
W Wison Push Sampler (WIP)
RC Rock Coring Sample
Disturbed/Undisturbed Sample
Core Details:
TCR Total Core Recovery
SCR Solid Core Recovery
RQD Rock Quality Designation
In Situ test Details:
CPT Cone penetration test

Water Content (w):
Water Content
Liquid Limit
Plastic Limit
Plasticity index
CAU
CIU
OED
DSS

Unit weight (γ) :
Unit weight from volume mass calculation
Unit weight from Moisture Content
Dry Unit weight
CAU
CIU
OED
DSS
Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
Pocket penetrometer
Torvane
UU-triaxial
CAU
CIU
DSS
s_u from CPT: N_{kt}= 15
s_u from CPT: N_{kt}= 20
Slashed symbols refer to tests on remoulded soil

Relative density (D_r) :
Relative density from CPT: K_0=0.5
Relative density from CPT: K_0=1.0

Friction angle (φ') :
Derived from CPT (Mayne, 2007)
CD triaxial
DS-Shear box

Unconfined Compressive Strength (UCS) :
UCS

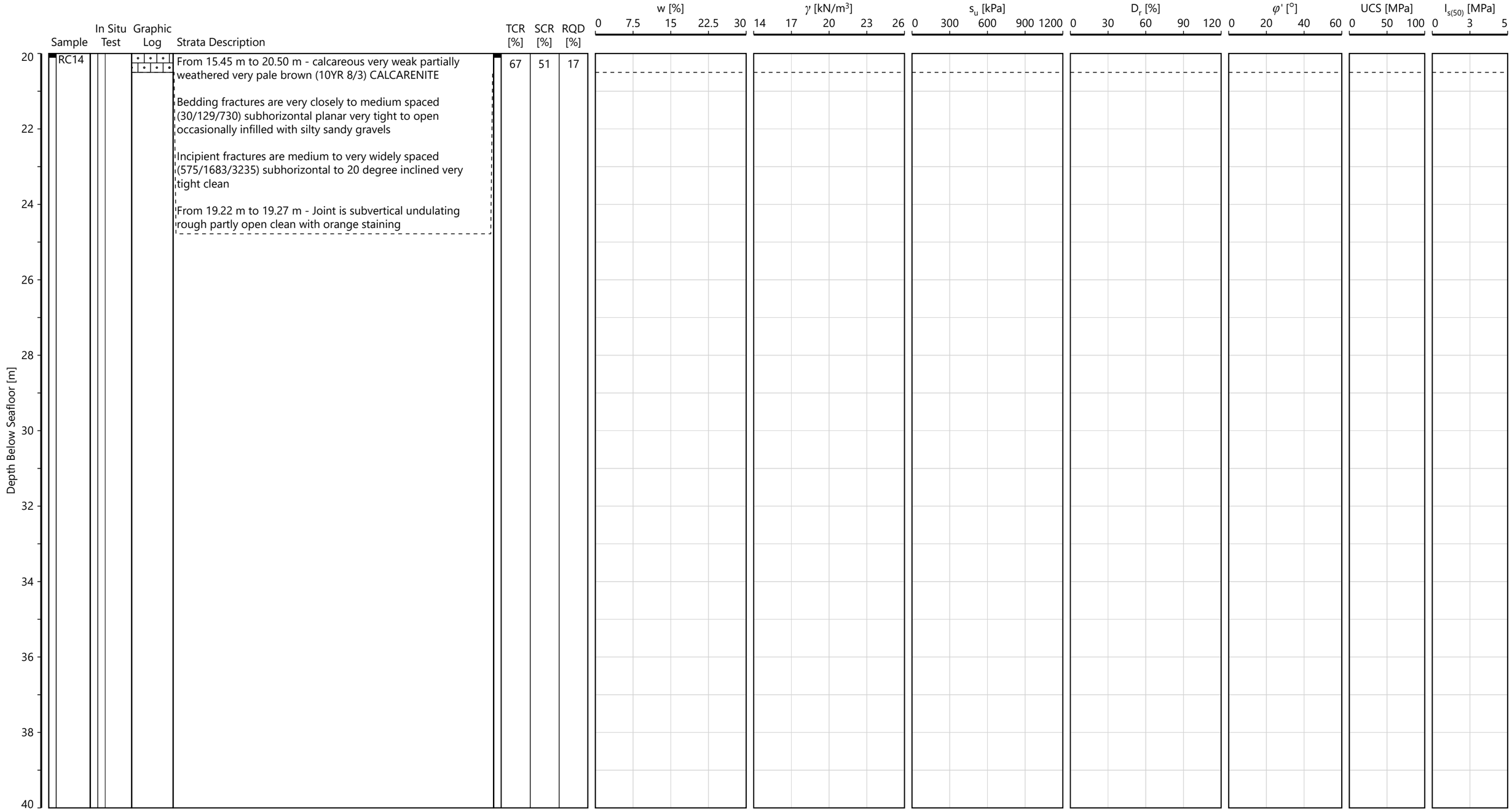
Point Load Index Strength ($I_{s(50)}$) :
$I_{s(50)}$axial
$I_{s(50)}$diametral
$I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH03	431213.7	5432684.6	84.50	20-Aug-2025 - 20-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF
BNO-OWF-BH03-a	431214.2	5432689.9	84.44	20-Aug-2025 - 22-Aug-2025	Fugro Zephyr	EOH at 2.00 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.6
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC14			From 15.45 m to 20.50 m - calcareous very weak partially weathered very pale brown (10YR 8/3) CALCARENITE Bedding fractures are very closely to medium spaced (30/129/730) subhorizontal planar very tight to open occasionally infilled with silty sandy gravels Incipient fractures are medium to very widely spaced (575/1683/3235) subhorizontal to 20 degree inclined very tight clean From 19.22 m to 19.27 m - Joint is subvertical undulating rough partly open clean with orange staining	67	51	17



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH03
BNO-OWF-BH03-a

Sample Details:
W Wison Push Sampler (WIP)
RC Rock Coring Sample
Disturbed/Undisturbed Sample
Core Details:
TCR Total Core Recovery
SCR Solid Core Recovery
RQD Rock Quality Designation
In Situ test Details:
CPT Cone penetration test

Water Content (w):
Water Content
Liquid Limit
Plastic Limit
Plasticity index
CAU
CIU
OED
DSS

Unit weight (γ) :
Unit weight from volume mass calculation
Unit weight from Moisture Content
Dry Unit weight
CAU
CIU
OED
DSS
Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
Pocket penetrometer
Torvane
UU-triaxial
CAU
CIU
DSS
Slashed symbols refer to tests on remoulded soil
s_u from CPT: N_{kt}= 15
s_u from CPT: N_{kt}= 20

Relative density (D_r) :
Relative density from CPT: K_0=0.5
Relative density from CPT: K_0=1.0

Friction angle (φ') :
Derived from CPT (Mayne, 2007)
CD triaxial
DS-Shear box

Unconfined Compressive Strength (UCS) :
UCS

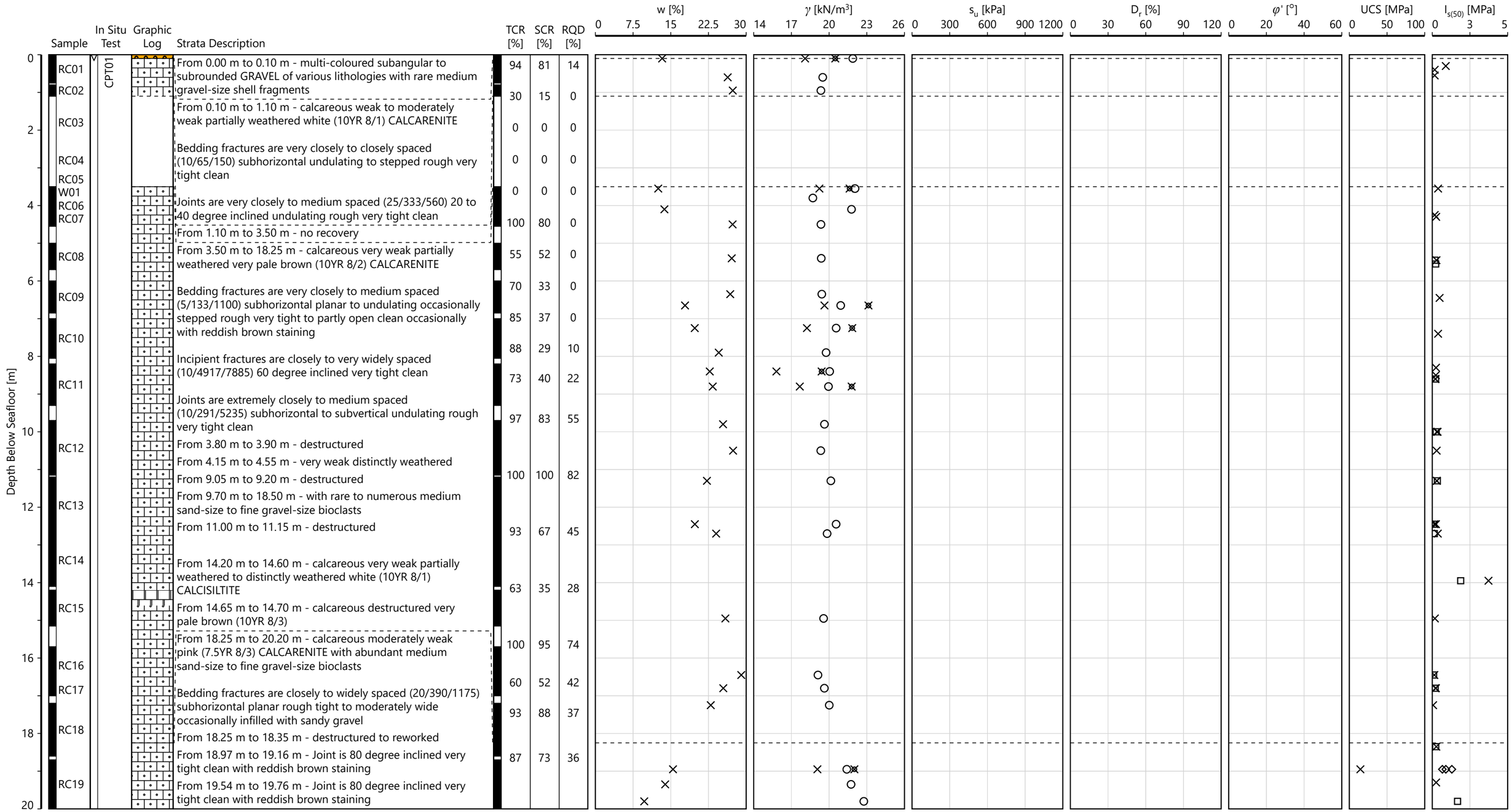
Point Load Index Strength ($I_{s(50)}$) :
$I_{s(50)}$axial
$I_{s(50)}$diametral
$I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.7
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH03	431213.7	5432684.6	84.50	20-Aug-2025 - 20-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF
BNO-OWF-BH03-a	431214.2	5432689.9	84.44	20-Aug-2025 - 22-Aug-2025	Fugro Zephyr	EOH at 2.00 m BSF

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.10 m - multi-coloured subangular to subrounded GRAVEL of various lithologies with rare medium gravel-size shell fragments	94	81	14
RC02			From 0.10 m to 1.10 m - calcareous weak to moderately weak partially weathered white (10YR 8/1) CALCARENITE Bedding fractures are very closely to closely spaced (10/65/150) subhorizontal undulating to stepped rough very tight clean	30	15	0
RC03				0	0	0
RC04				0	0	0
RC05						
W01			Joints are very closely to medium spaced (25/333/560) 20 to 40 degree inclined undulating rough very tight clean	0	0	0
RC06						
RC07			From 1.10 m to 3.50 m - no recovery	100	80	0
RC08			From 3.50 m to 18.25 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE	55	52	0
RC09			Bedding fractures are very closely to medium spaced (5/133/1100) subhorizontal planar to undulating occasionally stepped rough very tight to partly open clean occasionally with reddish brown staining	70	33	0
RC10				85	37	0
RC11			Incipient fractures are closely to very widely spaced (10/4917/7885) 60 degree inclined very tight clean Joints are extremely closely to medium spaced (10/291/5235) subhorizontal to subvertical undulating rough very tight clean	88	29	10
RC12			From 3.80 m to 3.90 m - destructured From 4.15 m to 4.55 m - very weak distinctly weathered From 9.05 m to 9.20 m - destructured From 9.70 m to 18.50 m - with rare to numerous medium sand-size to fine gravel-size bioclasts From 11.00 m to 11.15 m - destructured	73	40	22
RC13				97	83	55
RC14			From 14.20 m to 14.60 m - calcareous very weak partially weathered to distinctly weathered white (10YR 8/1) CALCISILTITE	100	100	82
RC15			From 14.65 m to 14.70 m - calcareous destructured very pale brown (10YR 8/3)	63	35	28
RC16			From 18.25 m to 20.20 m - calcareous moderately weak pink (7.5YR 8/3) CALCARENITE with abundant medium sand-size to fine gravel-size bioclasts	100	95	74
RC17			Bedding fractures are closely to widely spaced (20/390/1175) subhorizontal planar rough tight to moderately wide occasionally infilled with sandy gravel	60	52	42
RC18			From 18.25 m to 18.35 m - destructured to reworked From 18.97 m to 19.16 m - Joint is 80 degree inclined very tight clean with reddish brown staining	93	88	37
RC19			From 19.54 m to 19.76 m - Joint is 80 degree inclined very tight clean with reddish brown staining	87	73	36



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH04

Sample Details:

W	Wison Push Sampler (WIP)
RC	Rock Coring Sample
	Disturbed/Undisturbed Sample

Core Details:

TCR	Total Core Recovery
SCR	Solid Core Recovery
RQD	Rock Quality Designation

In Situ test Details:

CPT	Cone penetration test

Water Content (w):

- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :

- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :

- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :

- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :

- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :

- UCS

Point Load Index Strength ($I_{s(50)}$) :

- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH04	426592.7	5418623.6	82.60	25-Aug-2025 - 25-Aug-2025	Fugro Zephyr	EOH at 20.20 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.8
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

FUGRO

Sample | In Situ Test | Graphic Log | Strata Description | TCR [%] | SCR [%] | RQD [%] | w [%] | γ [kN/m^3] | s_u [kPa] | D_r [%] | φ' [°] | UCS [MPa] | $I_{s(50)}$ [MPa]

Depth Below Seafloor [m]

From 18.25 m to 20.20 m - calcareous moderately weak pink (7.5YR 8/3) CALCARENITE with abundant medium sand-size to fine gravel-size bioclasts

Bedding fractures are closely to widely spaced (20/390/1175) subhorizontal planar rough tight to moderately wide occasionally infilled with sandy gravel

GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH04

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH04	426592.7	5418623.6	82.60	25-Aug-2025 - 25-Aug-2025	Fugro Zephyr	EOH at 20.20 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**

Coordinate system : WGS 84 / UTM zone 30N

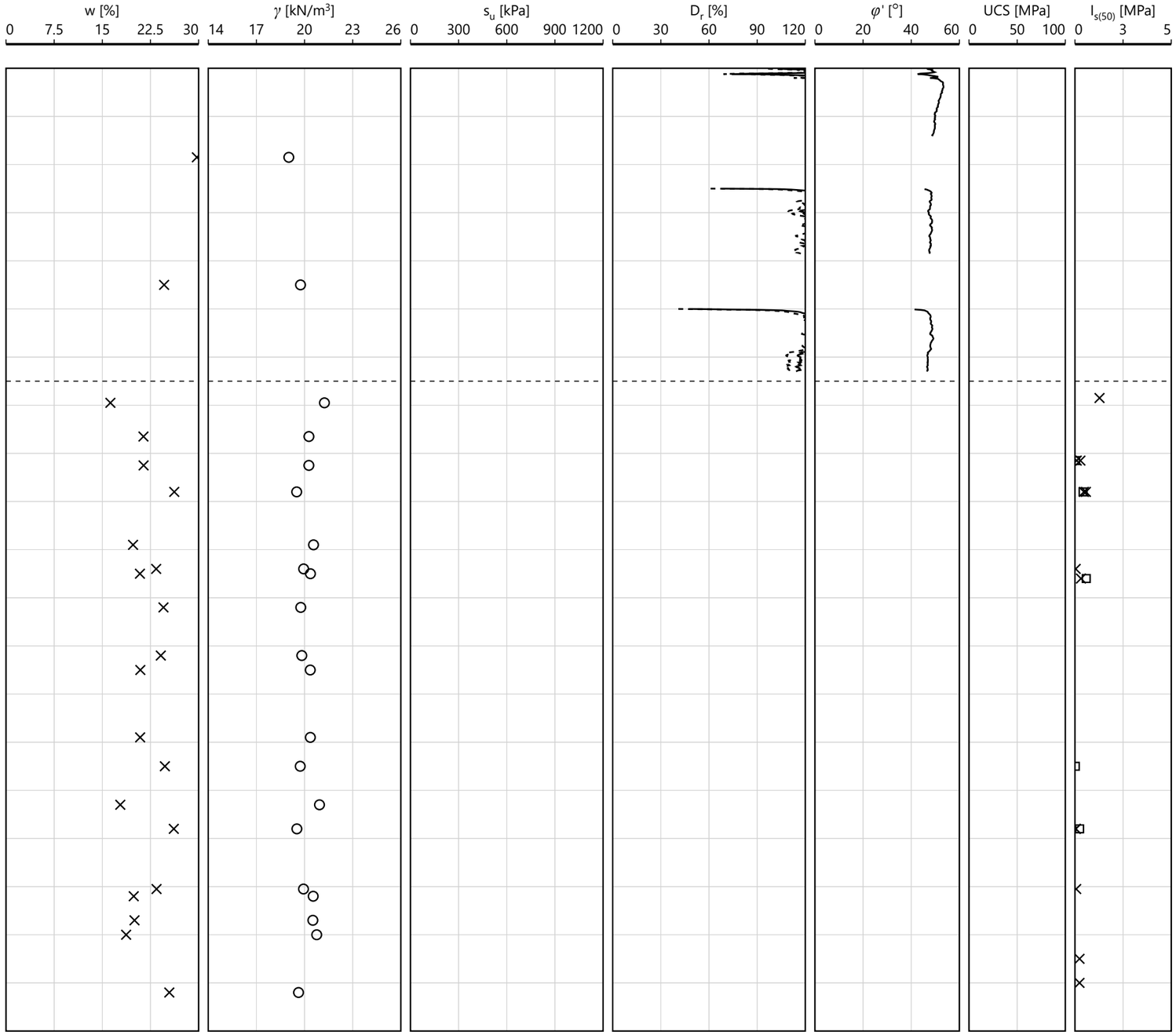
Water Depth Method: CTD Probe

Water depths are relative to Chart Datum LAT

Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
	CPT01		From 0.00 m to 6.50 m - calcareous extremely weak to very weak partially weathered pink (7.5YR 8/3) CALCARENITE with reddish yellow (5YR 7/6) stains			
W01			Bedding fractures are very closely to closely spaced (10/159/1835) subhorizontal occasionally 10 degree inclined planar to undulating rough very tight clean			
	CPT02		Joints are extremely closely to closely spaced (5/139/1925) 15 to 20 degree inclined planar to undulating rough very tight clean			
W02						
	CPT03					
W03						
RC01			From 6.50 m to 20.50 m - thinly to thickly interbedded calcareous very weak partially weathered pink (5YR 7/4) CALCARENITE with occasional to frequent fine gravel-size bioclasts and occasional brown (7YR 4/2) oxidation staining and medium beds of calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of sandy silty gravel. Clasts are extremely weak subangular to subrounded fine to medium	60	60	25
RC02				100	50	50
RC03				100	80	41
RC04			Bedding fractures are closely to medium spaced (20/233/1080) subhorizontal undulating occasionally planar to stepped rough to smooth very tight to tight clean occasionally infilled with silty sand	100	27	16
RC05			At 17.72 m - Incipient fracture is subhorizontal very tight clean	93	79	23
RC06			Joints are closely spaced (15/520/6730) subhorizontal to subvertical undulating rough very tight clean	100	42	31
RC07			From 6.50 m to 7.20 m - moderately weak to medium strong	87	40	19
RC08			From 13.65 m to 13.80 m - very pale brown (10YR 8/4) with rare fine gravel-size bioclasts and frequent light red (2.5YR 6/6) staining	73	53	28
RC09			From 14.05 m to 15.20 m - with rare fine gravel-size bioclasts	93	62	49
RC10				93	59	17
RC11				80	40	25

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH07

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

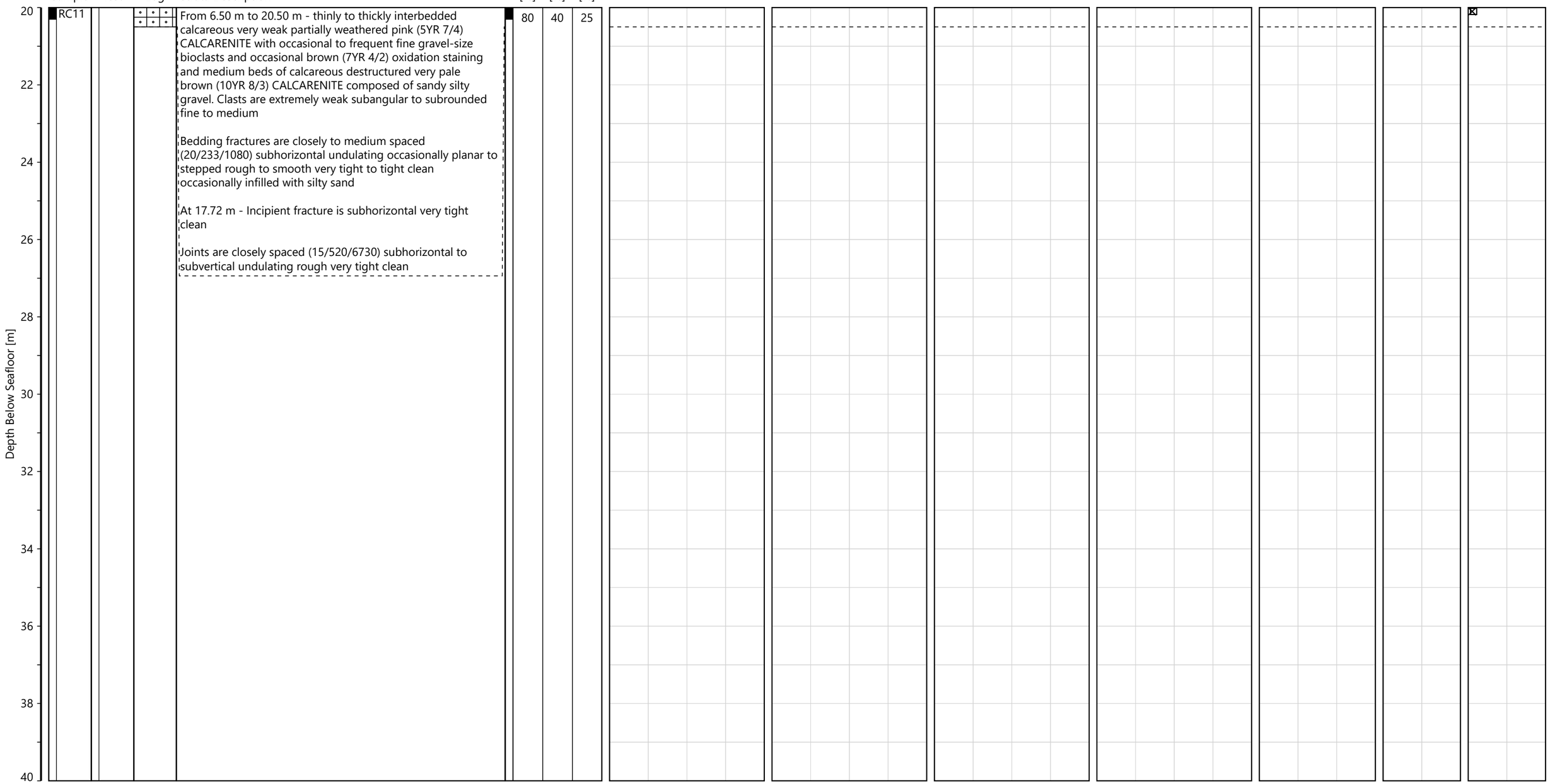
Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH07	434030.6	5417960.7	79.98	23-Aug-2025 - 23-Aug-2025	Fugro Zephyr	20.50 m BSFRecovery to 20.30

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.10
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC11			From 6.50 m to 20.50 m - thinly to thickly interbedded calcareous very weak partially weathered pink (5YR 7/4) CALCARENITE with occasional to frequent fine gravel-size bioclasts and occasional brown (7YR 4/2) oxidation staining and medium beds of calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of sandy silty gravel. Clasts are extremely weak subangular to subrounded fine to medium Bedding fractures are closely to medium spaced (20/233/1080) subhorizontal undulating occasionally planar to stepped rough to smooth very tight to tight clean occasionally infilled with silty sand At 17.72 m - Incipient fracture is subhorizontal very tight clean Joints are closely spaced (15/520/6730) subhorizontal to subvertical undulating rough very tight clean	80	40	25



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH07

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

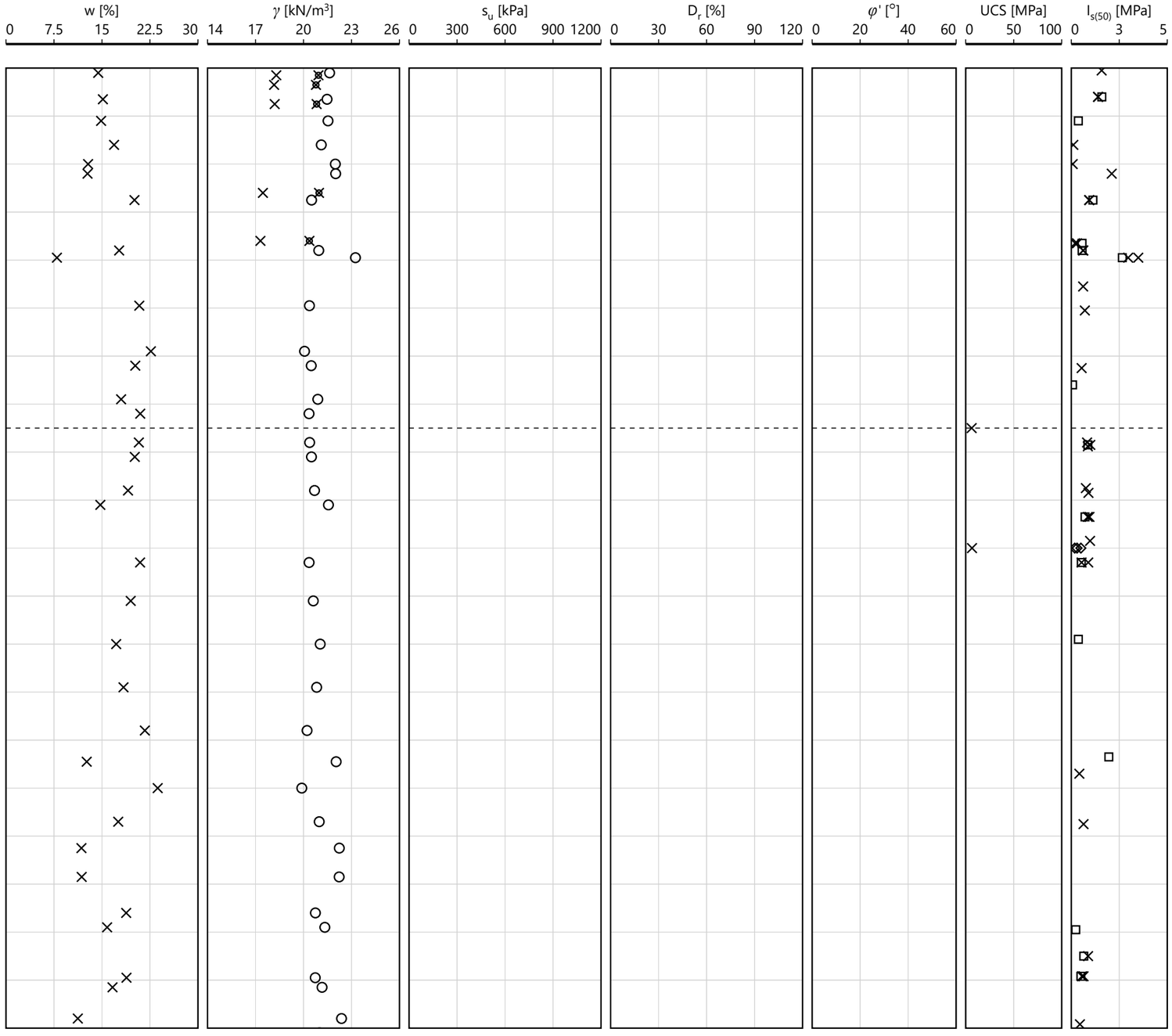
Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH07	434030.6	5417960.7	79.98	23-Aug-2025 - 23-Aug-2025	Fugro Zephyr	20.50 m BSFRecovery to 20.30

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 7.50 m - medium to thickly interbedded weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE and calcareous destructured pinkish white (7.5YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are weak subangular to subrounded fine to coarse	95	95	80
RC02				100	92	89
RC03			Bedding fractures are closely to widely spaced (20/427/1500) subhorizontal stepped occasionally planar to undulating rough very tight clean	100	95	95
RC04			From 4.21 m to 4.32 m - Incipient fracture is 80 degree inclined stepped rough very tight clean	100	69	67
RC05			Joints are widely to very widely spaced (1475/2500/3885) 60 to 70 degree inclined undulating to stepped rough very tight clean	70	56	48
RC06				90	30	20
RC07				100	50	50
RC08			From 7.50 m to 20.50 m - calcareous weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	90	87	64
RC09			Bedding fractures are closely to widely spaced (10/447/2390) subhorizontal undulating rough very tight to open occasionally infilled with silt and clay	100	70	60
RC10			At 16.83 m - Incipient fracture is subhorizontal undulating rough very tight clean	100	100	100
RC11			Joints are medium to widely spaced occasionally extremely closely spaced (15/621/3060) 40 to 75 degree inclined undulating rough very tight clean	90	52	45
			From 9.05 m to 9.35 m - distinctly weathered	90	67	67
RC12				90	79	57
RC13				100	59	24
RC14				73	36	25
RC15			From 17.40 m to 17.70 m - destructured pinkish white (75YR 8/2) calcarenite composed of silty sandy gravel. Clasts are weak pinkish white (75YR 8/2) angular to subangular fine to coarse. Matrix is very pale brown (10YR 8/4)	90	90	85
RC16			From 17.40 m to 20.45 m - very pale brown (10YR 8/4)	95	54	0
RC17			From 19.55 m to 19.85 m - weak to moderately weak distinctly weathered			

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH08

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

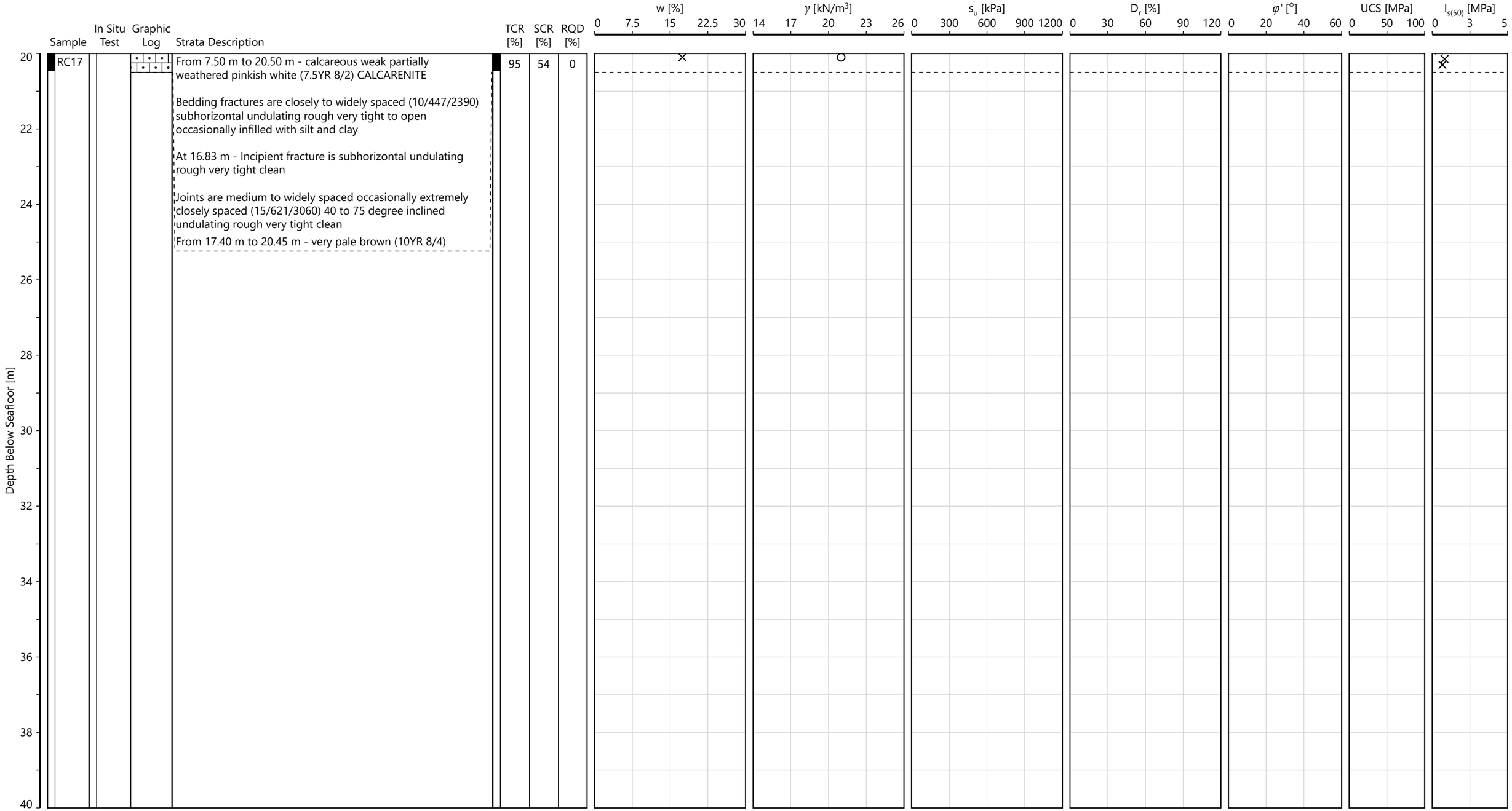
Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH08	414111.1	5413632.7	85.80	15-Aug-2025 - 16-Aug-2025	Fugro Zephyr	EOH at 20.45 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.12
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC17			From 7.50 m to 20.50 m - calcareous weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE Bedding fractures are closely to widely spaced (10/447/2390) subhorizontal undulating rough very tight to open occasionally infilled with silt and clay At 16.83 m - Incipient fracture is subhorizontal undulating rough very tight clean Joints are medium to widely spaced occasionally extremely closely spaced (15/621/3060) 40 to 75 degree inclined undulating rough very tight clean From 17.40 m to 20.45 m - very pale brown (10YR 8/4)	95	54	0



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH08

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

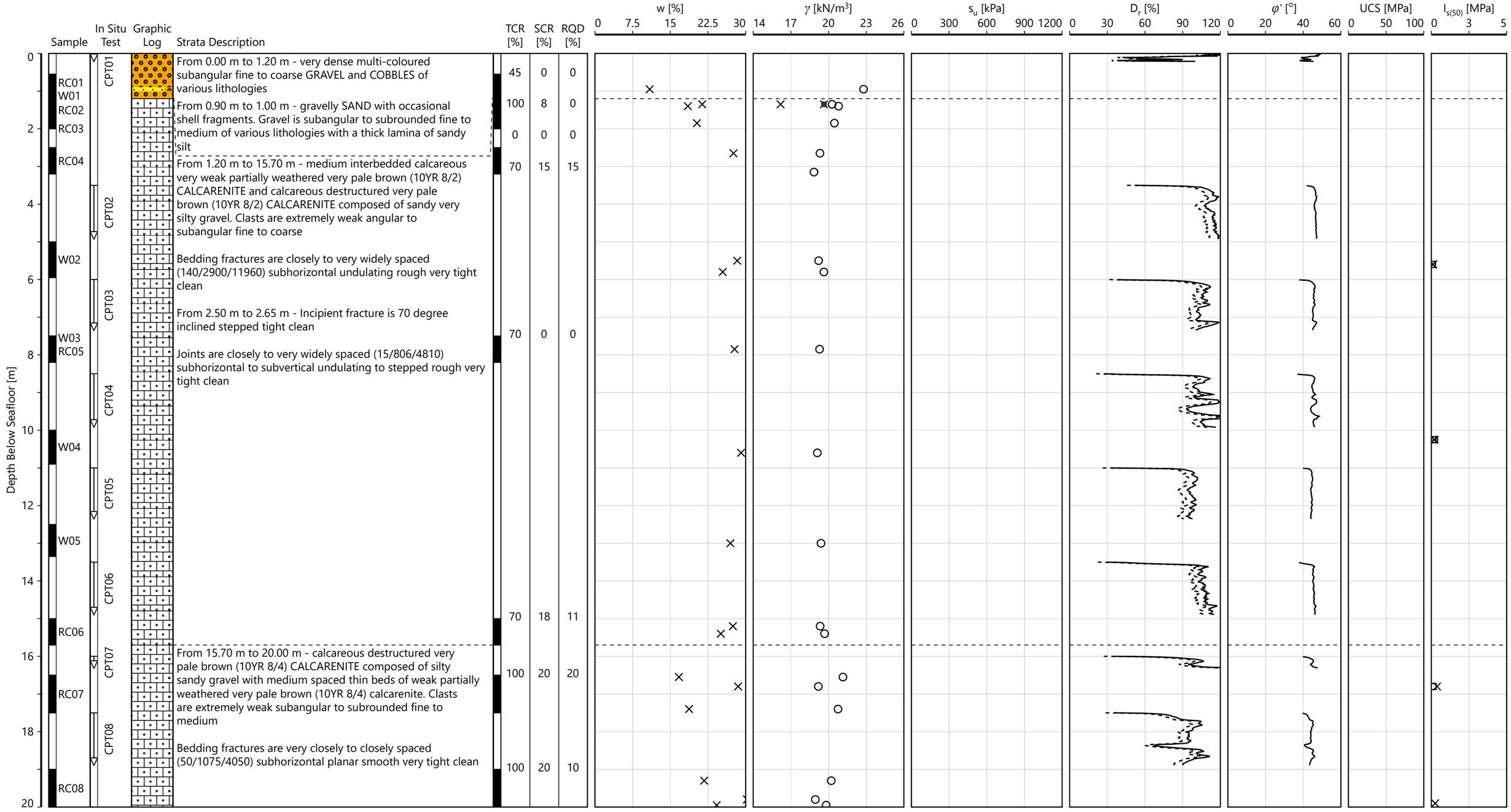
Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH08	414111.1	5413632.7	85.80	15-Aug-2025 - 16-Aug-2025	Fugro Zephyr	EOH at 20.45 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01 W01	CPT01		From 0.00 m to 1.20 m - very dense multi-coloured subangular fine to coarse GRAVEL and COBBLES of various lithologies	45	0	0
RC02			From 0.90 m to 1.00 m - gravelly SAND with occasional shell fragments. Gravel is subangular to subrounded fine to medium of various lithologies with a thick lamina of sandy silt	100	8	0
RC03				0	0	0
RC04	CPT02		From 1.20 m to 15.70 m - medium interbedded calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE and calcareous destructured very pale brown (10YR 8/2) CALCARENITE composed of sandy very silty gravel. Clasts are extremely weak angular to subangular fine to coarse Bedding fractures are closely to very widely spaced (140/2900/11960) subhorizontal undulating rough very tight clean	70	15	15
W02						
W03 RC05	CPT03		From 2.50 m to 2.65 m - Incipient fracture is 70 degree inclined stepped tight clean Joints are closely to very widely spaced (15/806/4810) subhorizontal to subvertical undulating to stepped rough very tight clean	70	0	0
W04	CPT04					
W05	CPT05					
RC06	CPT06			70	18	11
RC07	CPT07		From 15.70 m to 20.00 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of silty sandy gravel with medium spaced thin beds of weak partially weathered very pale brown (10YR 8/4) calcarenite. Clasts are extremely weak subangular to subrounded fine to medium Bedding fractures are very closely to closely spaced (50/1075/4050) subhorizontal planar smooth very tight clean	100	20	20
RC08	CPT08			100	20	10



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH10

Sample Details:

W	Wison Push Sampler (WIP)
RC	Rock Coring Sample
	Disturbed/Undisturbed Sample

Core Details:

TCR	Total Core Recovery
SCR	Solid Core Recovery
RQD	Rock Quality Designation

In Situ test Details:

CPT	Cone penetration test

Water Content (w):

- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :

- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :

- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :

- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :

- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :

- UCS

Point Load Index Strength ($I_{s(50)}$) :

- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH10	411963.3	5415669.8	87.70	14-Aug-2025 - 15-Aug-2025	Fugro Zephyr	EOH at 20.0 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.14
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.15 m - very dense multi-coloured subangular to subrounded COBBLES of various lithologies (with a low subangular to subrounded medium to coarse gravel content)	100	19	0
RC02				40	0	0
RC03	CPT02		From 0.15 m to 13.75 m - calcareous very weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE. Bedding fractures are medium to very widely spaced (60/913/2650) subhorizontal occasionally 10 to 20 degree inclined planar occasionally undulating to stepped rough very tight to tight clean occasionally with reddish brown staining	73	33	13
RC04				93	56	50
RC05			Incipient fractures are very widely spaced (40/2267/5330) subhorizontal to 10 degree inclined stepped tight clean	100	67	40
RC06			Joints are very widely spaced (80/2267/6260) 10 to 30 degree inclined planar to undulating rough very tight clean From 2.00 m to 2.40 m - destructured very pale brown (10YR 8/2) calcarenite composed of gravelly silty sand. Clasts are very weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	100	87	87
RC07				100	99	91
RC08			From 5.90 m to 6.10 m - destructured very pale brown (10YR 8/2) calcarenite composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2) From 6.65 m to 6.80 m - distinctly weathered	73	71	57
RC09				90	67	67
RC10				75	61	61
RC11			From 13.75 m to 20.50 m - medium to thickly interbedded calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE and calcareous destructured very pale brown (10YR 8/2) CALCARENITE composed of sandy very silty gravel. Clasts are very weak subangular to subrounded medium to coarse	87	50	50
RC12				100	37	29
RC13			Bedding fractures are widely spaced (10/1125/3760) subhorizontal planar rough very tight clean	92	81	81
RC14			From 19.95 m to 19.99 m - Joint is 50 degree inclined stepped rough tight infilled with clay	100	93	93
RC15			From 16.95 m to 17.20 m - weak	92	63	63
RC16				100	48	46

Depth Below Seafloor [m]

w [%] 0 7.5 15 22.5 30

γ [kN/m^3] 14 17 20 23 26

s_u [kPa] 0 300 600 900 1200

D_r [%] 0 30 60 90 120

φ' [°] 0 20 40 60

UCS [MPa] 0 50 100

$I_{s(50)}$ [MPa] 0 3 5

GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH11

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

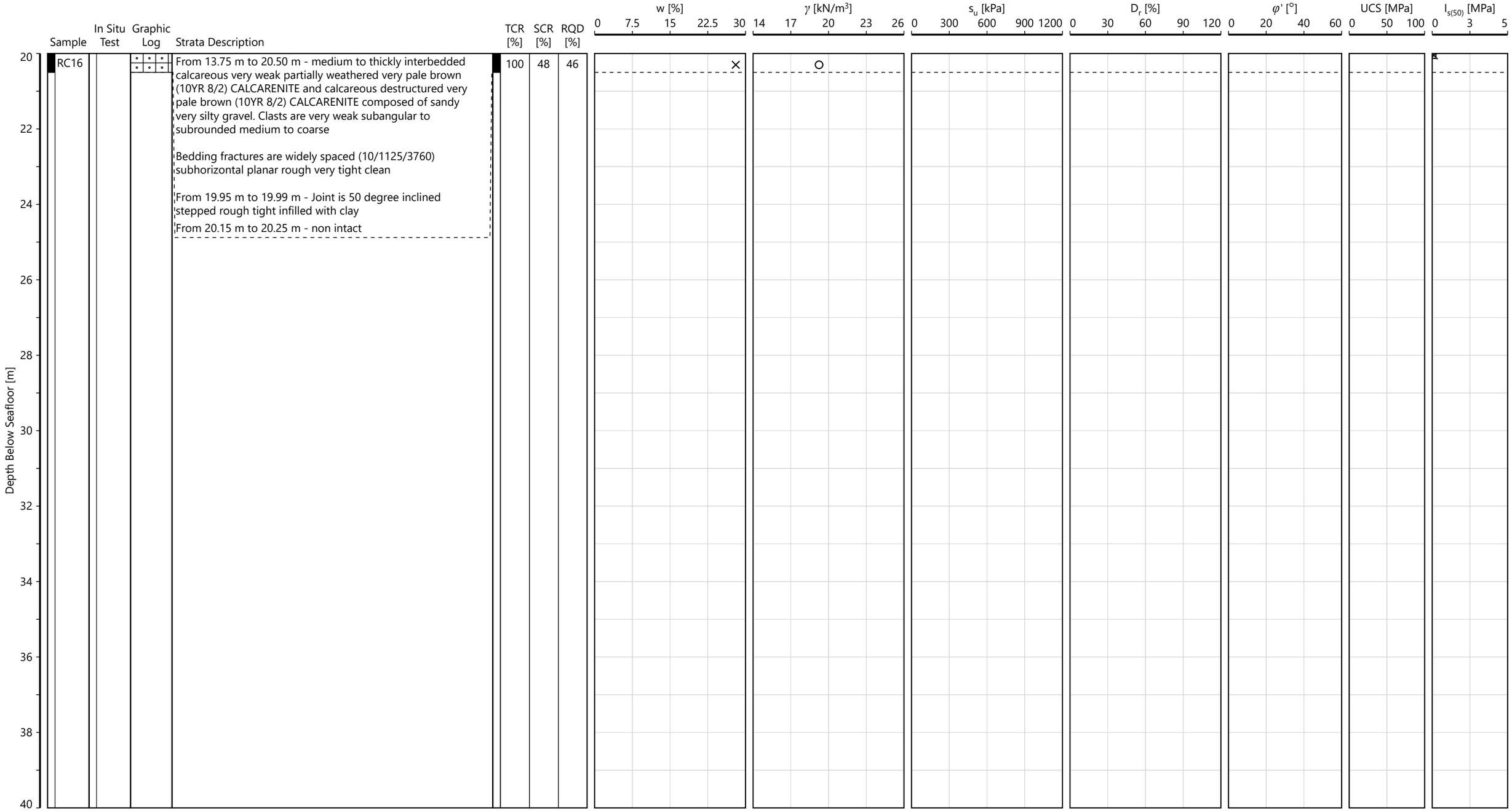
Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH11	416829.8	5421236.9	86.80	16-Aug-2025 - 16-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.15
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC16			From 13.75 m to 20.50 m - medium to thickly interbedded calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE and calcareous destructured very pale brown (10YR 8/2) CALCARENITE composed of sandy very silty gravel. Clasts are very weak subangular to subrounded medium to coarse Bedding fractures are widely spaced (10/1125/3760) subhorizontal planar rough very tight clean From 19.95 m to 19.99 m - Joint is 50 degree inclined stepped rough tight infilled with clay From 20.15 m to 20.25 m - non intact	100	48	46



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH11

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

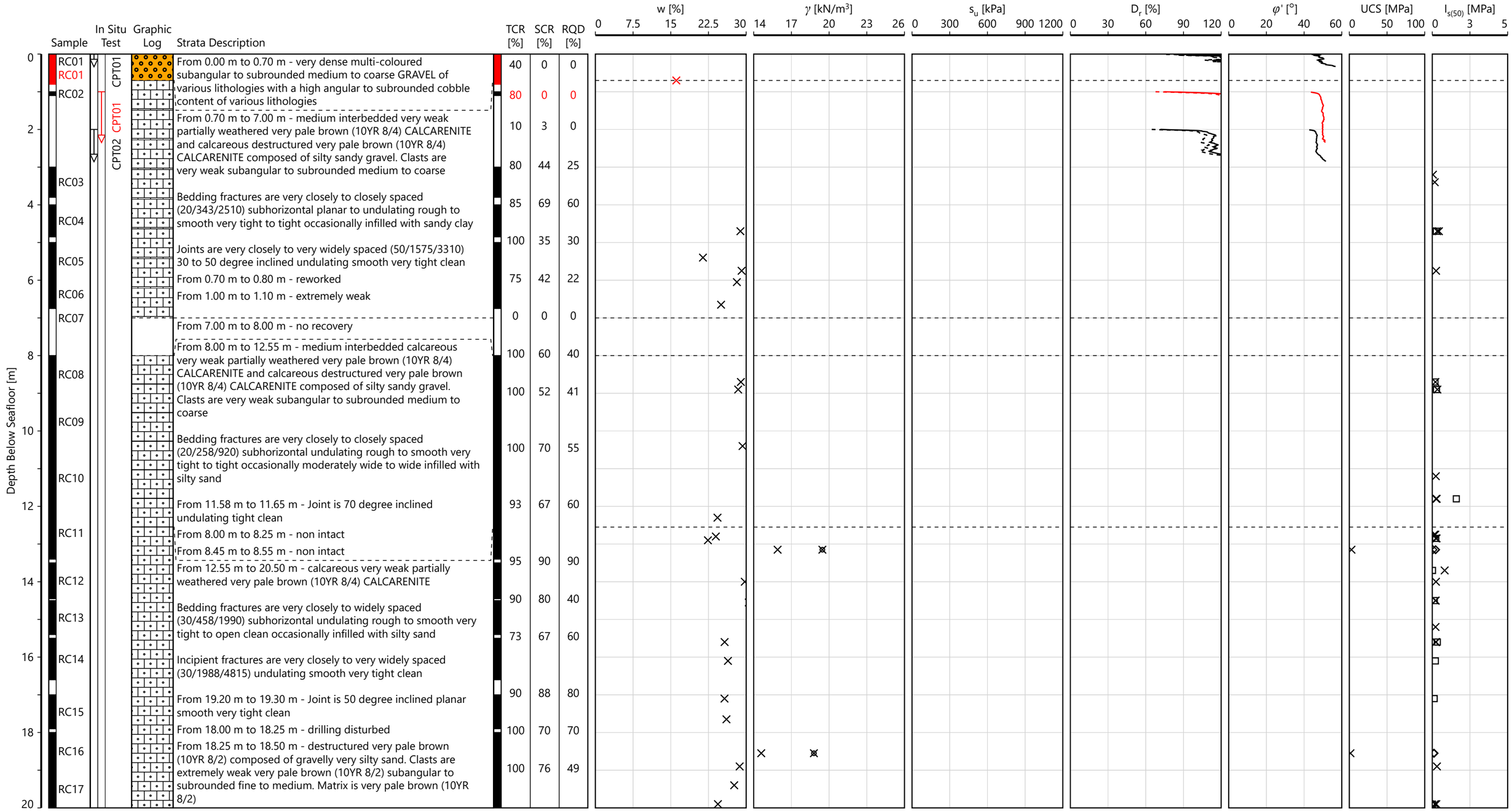
Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH11	416829.8	5421236.9	86.80	16-Aug-2025 - 16-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH12
BNO-OWF-BH12-a

Sample Details:
W Wison Push Sampler (WIP)
RC Rock Coring Sample
Disturbed/Undisturbed Sample

Core Details:
TCR Total Core Recovery
SCR Solid Core Recovery
RQD Rock Quality Designation

In Situ test Details:
CPT Cone penetration test

Water Content (w):
Water Content
Liquid Limit
Plastic Limit
Plasticity index
CAU
CIU
OED
DSS

Unit weight (γ) :
Unit weight from volume mass calculation
Unit weight from Moisture Content
Dry Unit weight
CAU
CIU
OED
DSS
Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
Pocket penetrometer
Torvane
UU-triaxial
CAU
CIU
DSS
s_u from CPT: N_{kt}= 15
s_u from CPT: N_{kt}= 20
Slashed symbols refer to tests on remoulded soil

Relative density (D_r) :
Relative density from CPT: K_0=0.5
Relative density from CPT: K_0=1.0

Friction angle (φ') :
Derived from CPT (Mayne, 2007)
CD triaxial
DS-Shear box

Unconfined Compressive Strength (UCS) :
UCS

Point Load Index Strength ($I_{s(50)}$) :
$I_{s(50)}$axial
$I_{s(50)}$diametral
$I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.17
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH12	421008.9	5423622.0	85.60	17-Aug-2025 - 17-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF
BNO-OWF-BH12-a	421009.4	5423626.8	85.50	17-Aug-2025 - 17-Aug-2025	Fugro Zephyr	EOH at 2.35 m BSF

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC17			From 12.55 m to 20.50 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE Bedding fractures are very closely to widely spaced (30/458/1990) subhorizontal undulating rough to smooth very tight to open clean occasionally infilled with silty sand Incipient fractures are very closely to very widely spaced (30/1988/4815) undulating smooth very tight clean From 19.20 m to 19.30 m - Joint is 50 degree inclined planar smooth very tight clean From 20.05 m to 20.25 m - destructured very pale brown (10YR 8/3) composed of silty very sandy gravel. Clasts are extremely weak very pale brown (10YR 8/2) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/2)	100	76	49

Depth Below Seafloor [m]: 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

w [%]: 0, 7.5, 15, 22.5, 30

γ [kN/m^3]: 14, 17, 20, 23, 26

s_u [kPa]: 0, 300, 600, 900, 1200

D_r [%]: 0, 30, 60, 90, 120

φ' [°]: 0, 20, 40, 60

UCS [MPa]: 0, 50, 100

$I_{s(50)}$ [MPa]: 0, 3, 5

GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH12
BNO-OWF-BH12-a

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

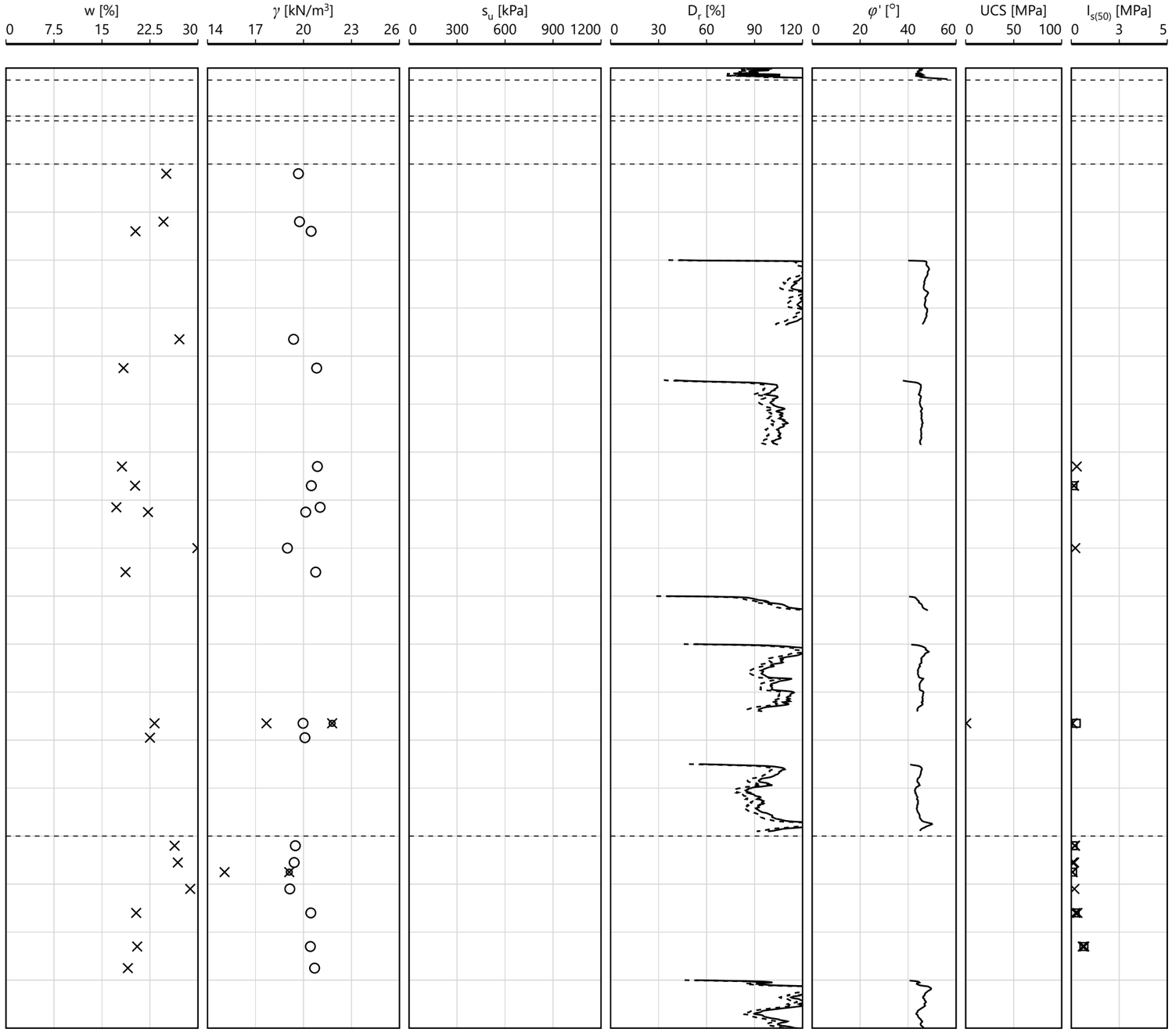
Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.18

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH12	421008.9	5423622.0	85.60	17-Aug-2025 - 17-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF
BNO-OWF-BH12-a	421009.4	5423626.8	85.50	17-Aug-2025 - 17-Aug-2025	Fugro Zephyr	EOH at 2.35 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.25 m - very dense GRAVEL	0	0	0
			From 0.25 m to 1.00 m - no recovery			
RC02	CPT02		From 1.00 m to 1.10 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE	10	0	0
			From 1.10 m to 2.00 m - no recovery	55	7	0
RC03			From 2.00 m to 16.00 m - medium interbedded calcareous extremely weak partially weathered very pale brown (10YR 8/4) CALCARENITE and calcareous destructured to reworked very pale brown (10YR 8/2) CALCARENITE composed of gravelly very silty sand. Clasts are extremely weak subangular to subrounded medium to coarse	65	20	16
RC04						
	CPT03					
RC05				90	10	0
	CPT04		Bedding fractures are closely spaced (20/268/5600) subhorizontal planar to stepped rough occasionally smooth very tight to partly open occasionally infilled with silt Incipient fractures are closely to widely spaced (50/2000/6570) subhorizontal planar rough very tight clean			
W01			Joints are very closely spaced occasionally medium to very widely spaced (5/1556/12705) 20 degree inclined to subvertical stepped rough very tight to tight clean	100	77	52
RC06			From 8.10 m to 8.20 m - distinctly weathered			
RC07				65	39	0
RC08				75	35	18
	CPT05					
	CPT06		From 16.00 m to 21.10 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE Bedding fractures are extremely closely to closely spaced (10/108/1950) subhorizontal undulating occasionally planar rough very tight occasionally tight to partly open clean with reddish brown staining occasionally infilled with silt			
W02						
	CPT07					
W03			From 16.05 m to 17.85 m - with rare fine sand-size to fine gravel-size glauconite crystals	95	95	55
RC09			From 17.85 m to 18.00 m - calcareous destructured to reworked very pale brown (10YR 8/2) composed of gravelly very silty sand. Clasts are very weak to weak very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	100	80	18
RC10						
RC11			From 18.60 m to 18.90 m - calcareous destructured to reworked very pale brown (10YR 8/2) composed of gravelly silty sand. Clasts are extremely weak to weak very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	40	40	40
RC12				80	6	0
	CPT08					

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH13

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ') :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

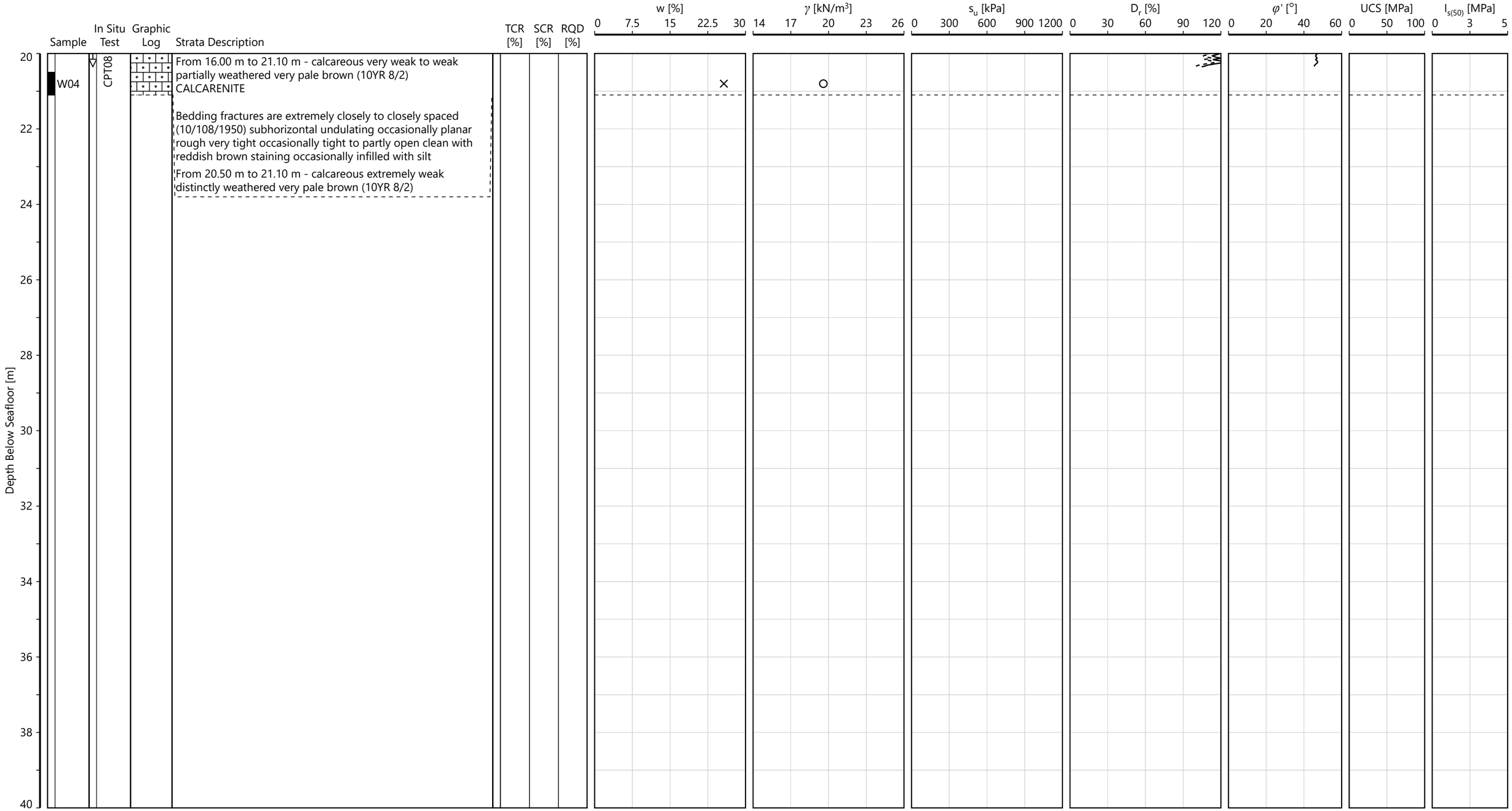
Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$ axial
- $I_{s(50)}$ diametral
- $I_{s(50)}$ irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH13	426180.9	5425025.9	83.30	18-Aug-2025 - 19-Aug-2025	Fugro Zephyr	EOH at 21.10 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH13

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

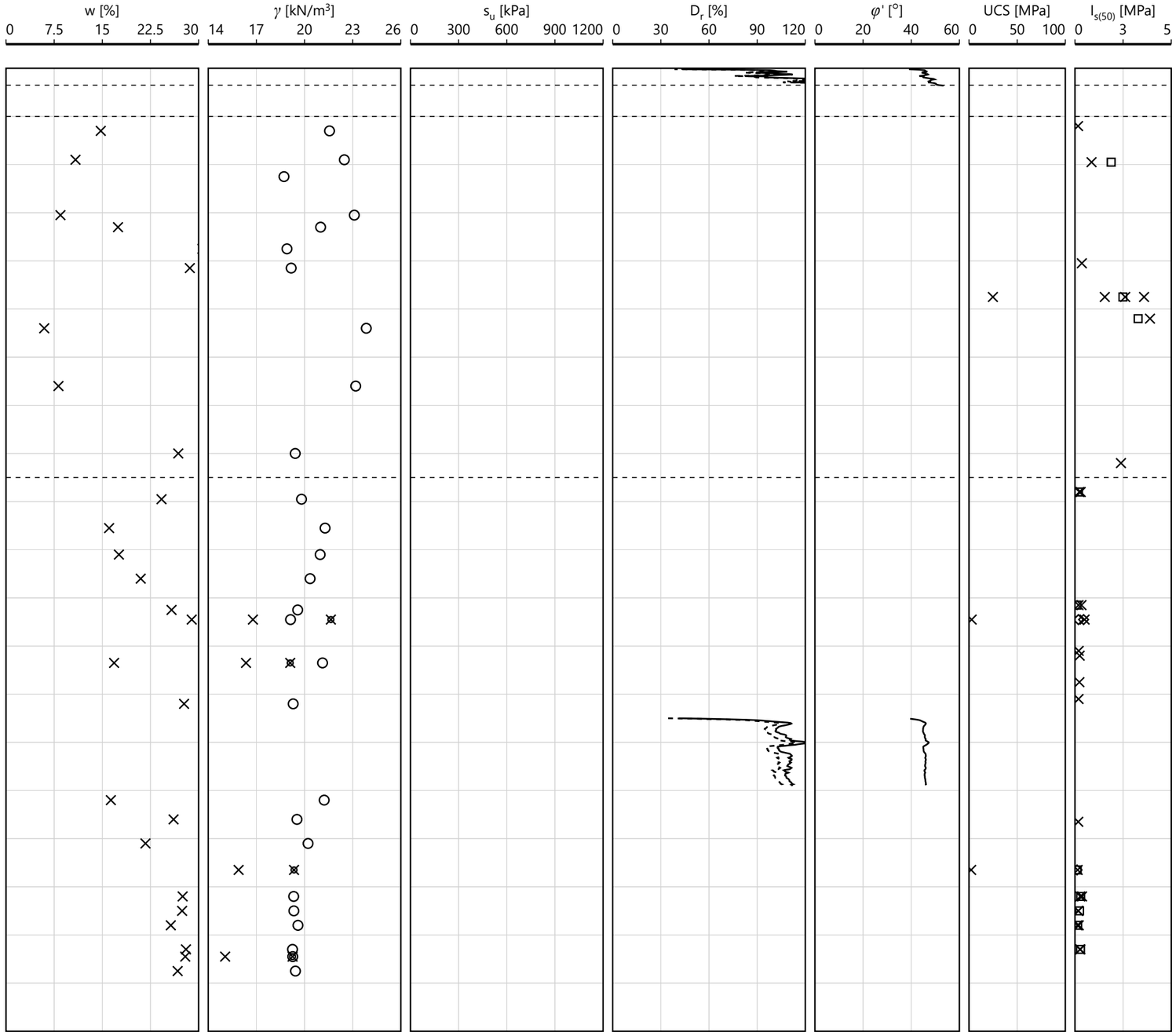
Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH13	426180.9	5425025.9	83.30	18-Aug-2025 - 19-Aug-2025	Fugro Zephyr	EOH at 21.10 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.35 m - very dense GRAVEL	30	0	0
RC02			From 0.35 m to 1.00 m - calcareous reworked light yellowish brown (10YR 6/4) CALCARENITE composed of sandy slight gravelly clay. Clasts are extremely weak dark yellowish brown (10YR 6/4) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/4)	100	62	46
RC03				95	53	12
RC04			From 1.00 m to 8.50 m - medium interbedded calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE and calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of gravelly sandy clay with yellowish brown (5YR 5/3) staining. Clasts are moderately weak subangular to subrounded fine to coarse	0	0	0
RC05				85	8	0
RC06				100	100	64
RC07			Bedding fractures are very closely to medium spaced (30/177/950) subhorizontal undulating occasionally planar or stepped rough to smooth very tight occasionally tight to open clean occasionally infilled with sandy clay	100	91	73
RC08				93	47	17
RC09			Joints are extremely closely to closely spaced (0/173/110) 20 to 50 degree inclined to subvertical undulating to stepped rough to smooth very tight clean occasionally infilled with sandy clay	100	77	43
			From 2.25 m to 2.50 m - destructured	100	35	25
RC10			From 2.50 m to 3.00 m - no recovery			
	CPT02		From 4.50 m to 8.50 m - beds are moderately weak to medium strong partially weathered	75	31	0
RC11			From 8.50 m to 20.20 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional to frequent fine to medium gravel-size bioclasts	80	80	50
RC12						
RC13			Bedding fractures are very closely to closely spaced occasionally medium to very widely spaced (50/200/4510) subhorizontal planar occasionally undulating or steepped rough to smooth very tight to tight clean occasionally infilled with sandy clay	100	91	20
	CPT03		Joints are extremely closely to closely spaced (5/239/4485) 20 to 50 degree inclined to subvertical undulating to planar rough very tight clean rarely infilled with sandy clay			
RC14			From 15.00 m to 15.60 m - destructed	100	38	0
RC15				100	93	93
RC16				100	100	100
RC17				100	100	94
RC18				33	17	11
			From 19.20 m to 20.20 m - assumed zone of core loss			

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH15

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.21
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH15	432314.7	5429579.0	81.00	21-Aug-2025 - 21-Aug-2025	Fugro Zephyr	EOH at 20.20 m BSF

FUGRO

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
			From 8.50 m to 20.20 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional to frequent fine to medium gravel-size bioclasts Bedding fractures are very closely to closely spaced occasionally medium to very widely spaced (50/200/4510) subhorizontal planar occasionally undulating or steepped rough to smooth very tight to tight clean occasionally infilled with sandy clay Joints are extremely closely to closely spaced (5/239/4485) 20 to 50 degree inclined to subvertical undulating to planar rough very tight clean rarely infilled with sandy clay From 19.20 m to 20.20 m - assumed zone of core loss			

Depth Below Seafloor [m]: 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

w [%]: 0, 7.5, 15, 22.5, 30

γ [kN/m^3]: 14, 17, 20, 23, 26

s_u [kPa]: 0, 300, 600, 900, 1200

D_r [%]: 0, 30, 60, 90, 120

φ' [°]: 0, 20, 40, 60

UCS [MPa]: 0, 50, 100

$I_{s(50)}$ [MPa]: 0, 3, 5

GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH15

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH15	432314.7	5429579.0	81.00	21-Aug-2025 - 21-Aug-2025	Fugro Zephyr	EOH at 20.20 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 3.00 m - calcareous highly fractured moderately weak to medium strong partially weathered to distinctly weathered pale brown (10YR 6/3) CALCARENITE	75	27	0
RC02			Bedding fractures are very closely to medium spaced (20/161/580) subhorizontal planar rough to smooth tight to open infilled with sandy clay	80	20	13
RC03			From 0.40 m to 0.55 m - extremely weak to very weak distinctly weathered	50	13	0
RC04			From 1.35 m to 3.00 m - thinly interbedded with calcareous distinctly weathered CALCARENITE	100	76	50
RC05			From 3.00 m to 7.45 m - calcareous extremely weak partially weathered brown (10YR 5/3) CALCARENITE.	80	18	0
RC06			Bedding fractures are very closely to closely spaced (20/123/1295) subhorizontal planar to undulating rough very tight to open clean	10	4	0
RC07			From 3.94 m to 3.99 m - Joint is subvertical planar rough very tight clean	50	16	0
RC08			From 7.45 m to 10.30 m - calcareous destructured light grey (10YR 7/1) CALCARENITE composed of silty sandy gravel. Clasts are very weak subangular to subrounded fine to coarse	60	25	0
RC09	CPT02		Bedding fractures are very closely to widely spaced (10/317/1135) subhorizontal planar rough very tight to partly open clean	100	33	25
RC10			Incipient fractures are medium to widely spaced (200/950/1870) subhorizontal very tight clean	100	30	0
RC11			From 9.07 m to 9.26 m - Joint is 80 degree inclined planar rough open clean	100	67	67
RC12			From 9.07 m to 9.32 m -Joint is subvertical planar rough open infilled with fine to medium gravels From 7.45 m to 10.30 m - very weak partially weathered	100	85	32
RC13			From 10.30 m to 18.00 m - calcareous extremely weak partially weathered to distinctly weathered light brownish grey (10YR 6/2) CALCARENITE	100	95	34
RC14			Bedding fractures are very closely to closely spaced (10/79/710) subhorizontal planar to undulating rough occasionally smooth very tight to open clean occasionally infilled with sandy silt	100	61	48
RC15			Incipient fractures are widely to very widely spaced (1240/2567/5110) 10 to 60 degree inclined very tight clean	100	31	16
RC16			Joints are extremely closely to very widely spaced (65/1925/5750) 40 to 45 degree inclined undulating rough very tight clean From 14.65 m to 15.35 m - destructured From 17.45 m to 18.00 m - destructured	73	33	7
RC17			From 18.00 m to 20.50 m - thinly interbedded calcareous very weak partially weathered light grey (2.5Y 7/2) CALCARENITE and calcareous very weak partially weathered light olive brown (2.5Y 5/3) CALCISILTITE with occasional fine to medium gravel-sized fossil impressions	100	68	22
RC18			Bedding fractures are very closely to closely spaced (10/95/500) subhorizontal planar smooth very tight clean	100	90	43
RC19			Joints are extremely closely to widely spaced (5/833/1425) subhorizontal to subvertical undulating to stepped rough to smooth very tight clean	100	84	7

Depth Below Seafloor [m]

w [%] 0 7.5 15 22.5 30

γ [kN/m^3] 14 17 20 23 26

s_u [kPa] 0 300 600 900 1200

D_r [%] 0 30 60 90 120

φ' [°] 0 20 40 60

UCS [MPa] 0 50 100

$I_{s(50)}$ [MPa] 0 3 5

GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH17

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

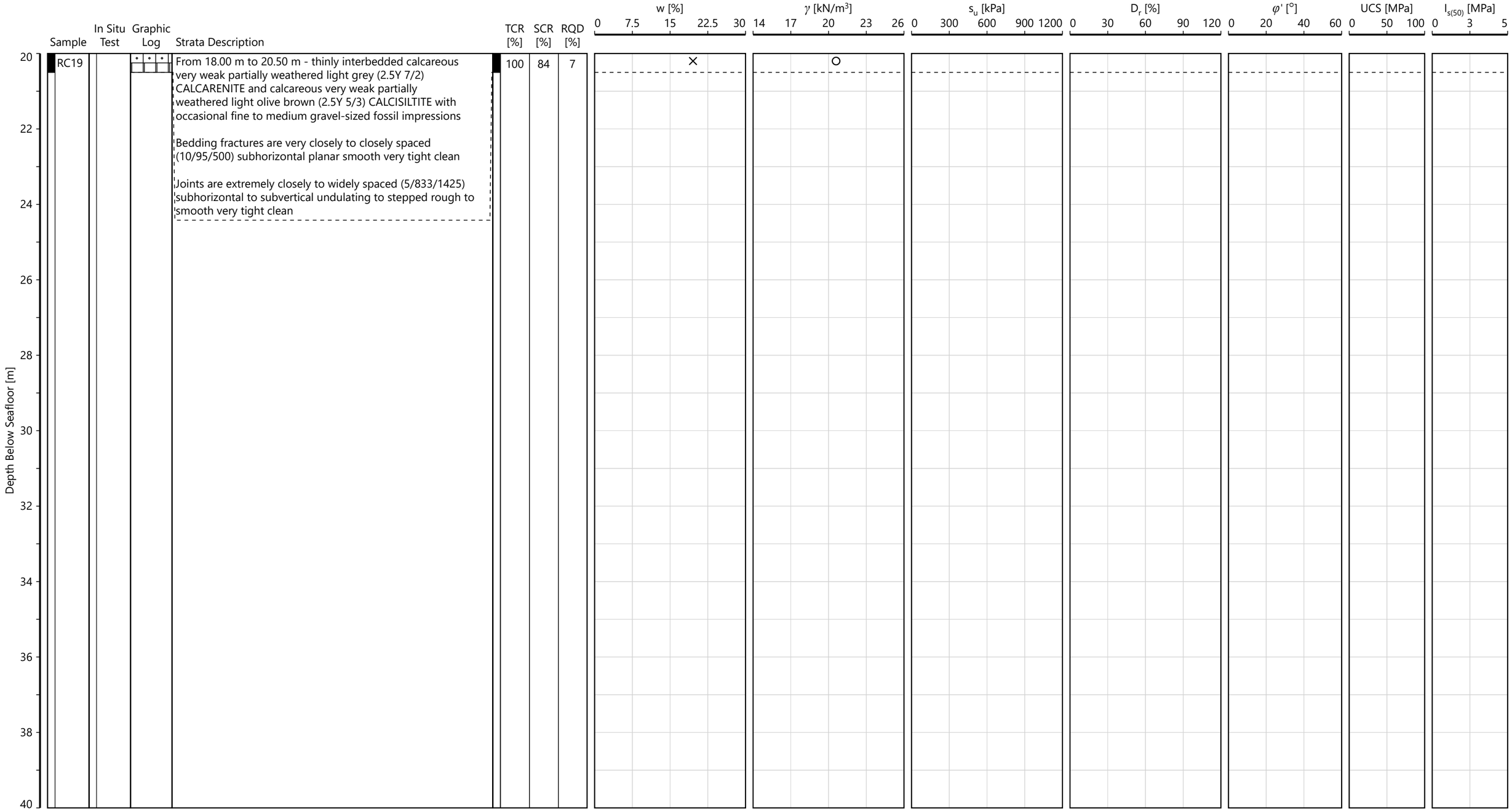
Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH17	437034.1	5421322.7	80.20	22-Aug-2025 - 23-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe
F255276-REP-001 | Measured and Derived Geotechnical Parameters and Results
Plate 2.23
Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC19			From 18.00 m to 20.50 m - thinly interbedded calcareous very weak partially weathered light grey (2.5Y 7/2) CALCARENITE and calcareous very weak partially weathered light olive brown (2.5Y 5/3) CALCISILTITE with occasional fine to medium gravel-sized fossil impressions Bedding fractures are very closely to closely spaced (10/95/500) subhorizontal planar smooth very tight clean Joints are extremely closely to widely spaced (5/833/1425) subhorizontal to subvertical undulating to stepped rough to smooth very tight clean	100	84	7



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH17

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

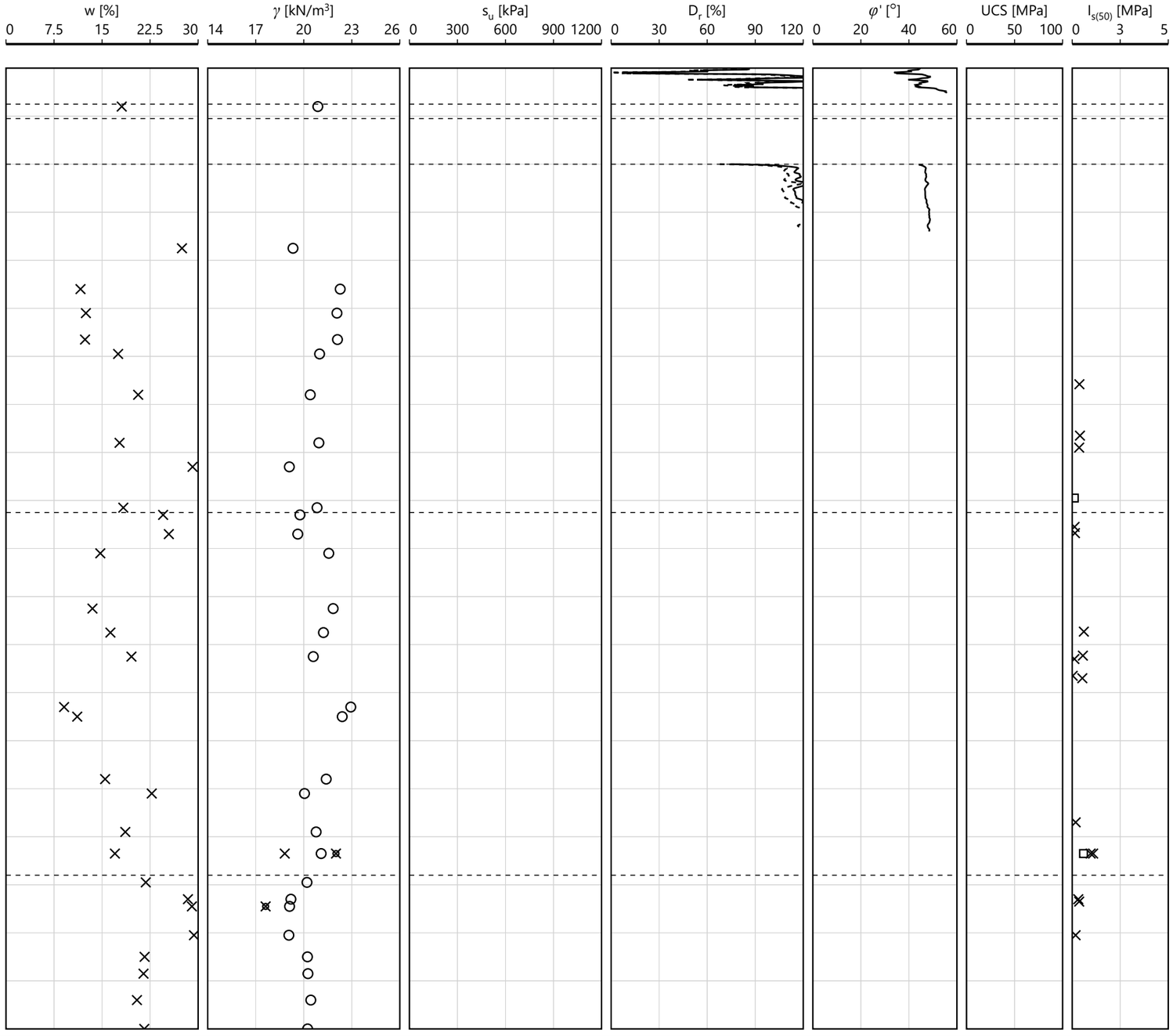
Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH17	437034.1	5421322.7	80.20	22-Aug-2025 - 23-Aug-2025	Fugro Zephyr	EOH at 20.50 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC01	CPT01		From 0.00 m to 0.75 m - very dense multi-coloured GRAVEL of limestone and various lithologies with subangular to subrounded cobbles	100	30	0
RC02			From 0.75 m to 1.05 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	5	5	0
	CPT02		From 1.05 m to 2.00 m - no recovery			
W01			From 2.00 m to 9.25 m - medium to thickly interbedded calcareous very weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE and calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty gravel. Clasts are extremely weak angular to subrounded medium to coarse			
RC03				100	25	0
RC04	CPT03			60	5	0
RC05			Bedding fractures are very widely spaced (1215/2417/3505) subhorizontal planar to undulating rough very tight clean	50	31	27
RC06			Joints are very widely spaced (1135/2417/3175) 40 to 50 degree inclined undulating very tight clean with reddish brown staining	100	65	65
RC07			From 4.50 m to 4.80 m - moderately weak to medium strong	85	33	12
RC08			From 9.25 m to 16.80 m - calcareous very weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	60	42	39
RC09			Bedding fractures are very closely to closely spaced (10/178/2340) subhorizontal undulating rough very tight clean	100	70	26
RC10			Joints are closely to widely spaced (45/1079/2200) subhorizontal to subvertical undulating rough very tight clean occasionally with reddish brown staining	100	45	38
RC11				53	5	0
			From 13.80 m to 14.50 m - assumed zone of core loss			
RC12			From 16.80 m to 20.50 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty gravel. Clasts are very weak angular to subrounded medium to coarse	80	69	57
RC13			Bedding fractures are closely spaced (35/617/2275) subhorizontal planar to undulating rough very tight clean	100	84	27
RC14			Joints are very closely to widely spaced (50/925/1760) 30 to 40 degree inclined undulating rough very tight clean with reddish brown staining	70	29	0
RC15			From 17.20 m to 18.30 m - very weak partially weathered	95	20	15
RC16			From 18.80 m to 18.95 m - very weak partially weathered From 19.80 m to 20.25 m - yellow (2.5Y 7/8)	83	0	0

Depth Below Seafloor [m]



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH19

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

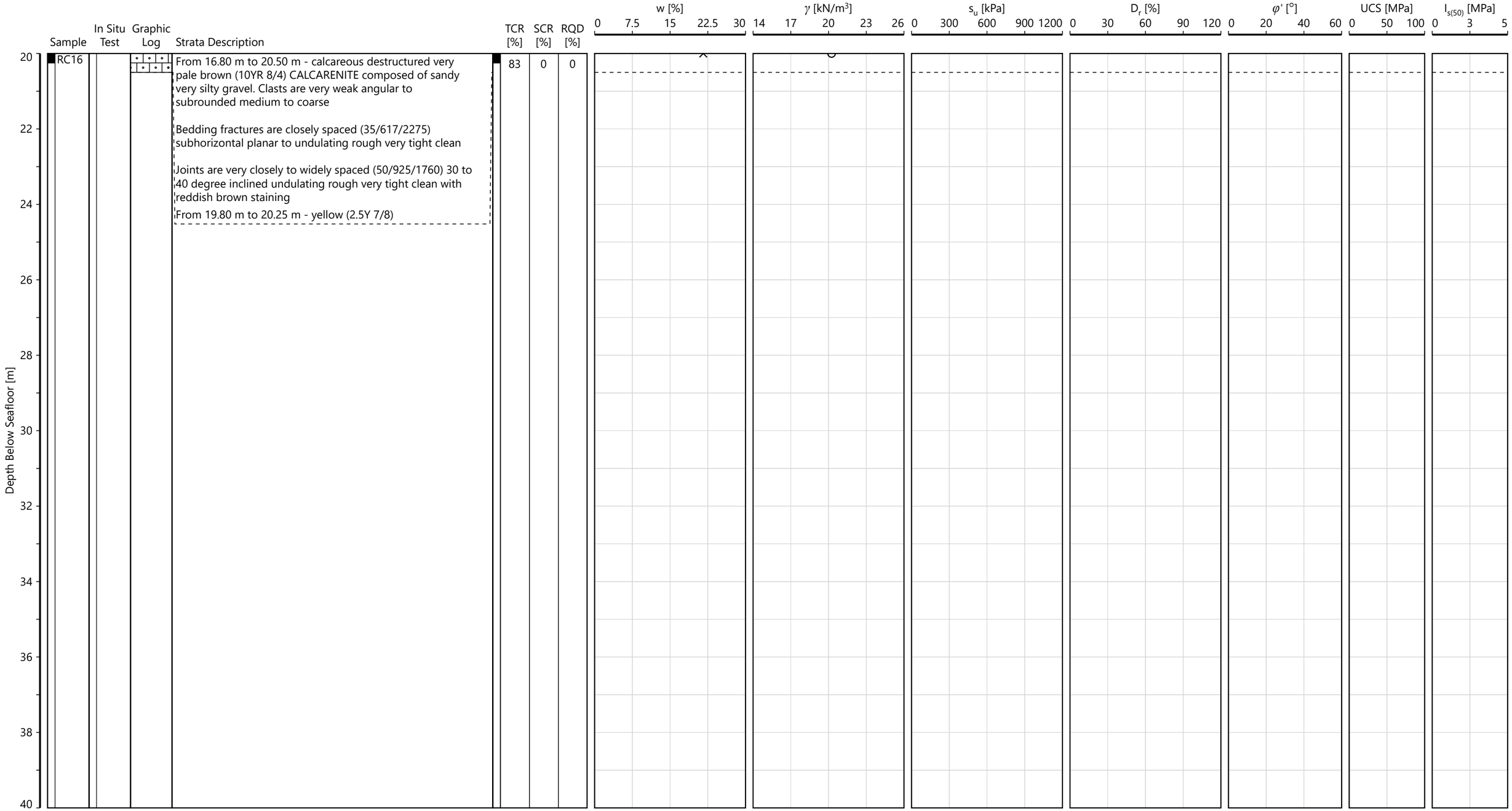
Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$ axial
- $I_{s(50)}$ diametral
- $I_{s(50)}$ irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH19	409659.8	5417657.1	90.47	13-Aug-2025 - 14-Aug-2025	Fugro Zephyr	EOH at 20.25 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Sample	In Situ Test	Graphic Log	Strata Description	TCR [%]	SCR [%]	RQD [%]
RC16			From 16.80 m to 20.50 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty gravel. Clasts are very weak angular to subrounded medium to coarse Bedding fractures are closely spaced (35/617/2275) subhorizontal planar to undulating rough very tight clean Joints are very closely to widely spaced (50/925/1760) 30 to 40 degree inclined undulating rough very tight clean with reddish brown staining From 19.80 m to 20.25 m - yellow (2.5Y 7/8)	83	0	0



GEOTECHNICAL LOG

Soil profile interpreted from details recorded in the following boreholes:

BNO-OWF-BH19

Sample Details:
- W Wison Push Sampler (WIP)
- RC Rock Coring Sample
- Disturbed/Undisturbed Sample

Core Details:
- TCR Total Core Recovery
- SCR Solid Core Recovery
- RQD Rock Quality Designation

In Situ test Details:
- CPT Cone penetration test

Water Content (w):
- Water Content
- Liquid Limit
- Plastic Limit
- Plasticity index
- CAU
- CIU
- OED
- DSS

Unit weight (γ) :
- Unit weight from volume mass calculation
- Unit weight from Moisture Content
- Dry Unit weight
- CAU
- CIU
- OED
- DSS
- Unit weight from CPT

Undrained Shear Strength Tests (s_u) :
- Pocket penetrometer
- Torvane
- UU-triaxial
- CAU
- CIU
- DSS

Slashed symbols refer to tests on remoulded soil

- s_u from CPT: N_{kt}= 15
- s_u from CPT: N_{kt}= 20

Relative density (D_r) :
- Relative density from CPT: K_0=0.5
- Relative density from CPT: K_0=1.0

Friction angle (φ') :
- Derived from CPT (Mayne, 2007)
- CD triaxial
- DS-Shear box

Unconfined Compressive Strength (UCS) :
- UCS

Point Load Index Strength ($I_{s(50)}$) :
- $I_{s(50)}$axial
- $I_{s(50)}$diametral
- $I_{s(50)}$irregular lump

Project Title : **Bretagne Nord Ouest OWF Preliminary Geotech SI**
Coordinate system : WGS 84 / UTM zone 30N
Water Depth Method: CTD Probe

Location	Easting [m]	Northing [m]	Water depth [m]	Date	Vessel	Comments
BNO-OWF-BH19	409659.8	5417657.1	90.47	13-Aug-2025 - 14-Aug-2025	Fugro Zephyr	EOH at 20.25 m BSF

Water depths are relative to Chart Datum LAT
Water depths are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_001	4.50	4.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_002	4.62	4.62	FR	DI	0	-	-	-	-	-	120	Close
FR_003	4.67	4.67	FR	DI	0	-	-	-	-	-	50	Very Close
FR_004	4.87	4.87	FR	DI	0	-	-	-	-	-	200	Medium
FR_005	5.00	5.00	FR	DI	0	-	-	-	-	-	130	Close
FR_006	5.00	5.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_001	5.10	5.10	B	NAT	0	U	ro	VT	N	-	100	Close
B_002	5.15	5.15	B	NAT	0	U	ro	VT	N	-	50	Very Close
FR_007	5.21	5.21	FR	DI	0	-	-	-	-	-	60	Very Close
B_003	5.31	5.31	B	NAT	0	P	ro	VT	N	-	100	Close
FR_008	5.41	5.41	FR	DI	0	-	-	-	-	-	100	Close
B_004	5.62	5.62	B	NAT	0	U	ro	O	Y	sand	210	Medium
FR_009	5.81	5.81	FR	DI	0	-	-	-	-	-	190	Close
FR_010	5.95	5.95	FR	DI	0	-	-	-	-	-	140	Close
NR_001	5.95	6.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_011	6.00	6.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_005	6.10	6.10	B	NAT	0	U	ro	MW	Y	clay	100	Close
B_006	6.17	6.17	B	NAT	0	U	ro	VT	N	-	70	Close
B_007	6.21	6.21	B	NAT	0	U	ro	VT	N	-	40	Very Close
B_008	6.30	6.30	B	NAT	0	U	ro	VT	N	-	90	Close
NI_001	6.30	6.34	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_009	6.34	6.34	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_012	6.42	6.42	FR	DI	0	-	-	-	-	-	80	Close
B_010	6.49	6.49	B	NAT	0	U	sm	VT	N	-	70	Close
B_011	6.53	6.53	B	NAT	0	U	ro	VT	N	-	40	Very Close
FR_013	6.71	6.71	FR	DI	0	-	-	-	-	-	180	Close
B_012	6.83	6.83	B	NAT	0	U	ro	O	Y	clay	120	Close
FR_014	6.95	6.95	FR	DI	0	-	-	-	-	-	120	Close
FR_015	7.00	7.00	FR	DI	0	-	-	-	-	-	50	Very Close
FR_016	7.00	7.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_002	7.00	7.05	NI	DI	0	-	-	-	-	possibly due to drilling	0	Extremely Close
FR_017	7.05	7.05	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_018	7.23	7.23	FR	DI	0	-	-	-	-	-	180	Close
I_001	7.27	7.27	I	NAT	0	-	-	-	-	-	40	Very Close
FR_019	7.37	7.37	FR	DI	0	-	-	-	-	-	100	Close
I_002	7.41	7.41	I	NAT	0	-	-	-	-	-	40	Very Close
FR_020	7.44	7.44	FR	DI	0	-	-	-	-	-	30	Very Close
FR_021	7.49	7.49	FR	DI	0	-	-	-	-	-	50	Very Close
FR_022	7.53	7.53	FR	DI	0	-	-	-	-	-	40	Very Close
B_013	7.58	7.58	B	NAT	0	P	sm	VT	N	-	50	Very Close
FR_023	7.67	7.67	FR	DI	5	-	-	-	-	-	90	Close
B_014	7.95	7.95	B	NAT	0	P	sm	VT	N	-	280	Medium
FR_024	8.05	8.05	FR	DI	0	-	-	-	-	-	100	Close
FR_025	8.14	8.14	FR	DI	0	-	-	-	-	-	90	Close
FR_026	8.50	8.50	FR	DI	0	-	-	-	-	-	360	Medium
FR_027	8.50	8.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_015	8.60	8.60	B	NAT	0	U	sm	O	Y	clay	100	Close
B_016	8.86	8.86	B	NAT	0	P	sm	T	Y	clay	260	Medium
B_017	8.90	8.90	B	NAT	0	P	sm	T	Y	clay	40	Very Close
B_018	8.96	8.96	B	NAT	0	P	sm	T	Y	clay	60	Close
FR_028	9.15	9.15	FR	DI	0	-	-	-	-	-	190	Close
B_019	9.36	9.36	B	NAT	0	P	sm	VT	N	-	210	Medium
FR_029	9.40	9.40	FR	DI	5	-	-	-	-	-	40	Very Close
FR_030	9.55	9.55	FR	DI	0	-	-	-	-	-	150	Close
NI_003	9.55	9.68	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_031	9.68	9.68	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_020	9.69	9.69	B	NAT	0	U	sm	T	Y	clay	10	Extremely Close
FR_032	9.92	9.92	FR	DI	0	-	-	-	-	-	230	Medium
FR_033	10.00	10.00	FR	DI	0	-	-	-	-	-	80	Close
FR_034	10.00	10.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_021	10.05	10.05	B	NAT	0	U	sm	O	Y	clay	50	Very Close
FR_035	10.14	10.14	FR	DI	0	-	-	-	-	-	90	Close
FR_036	10.18	10.18	FR	DI	0	-	-	-	-	-	40	Very Close
FR_037	10.19	10.19	FR	DI	0	-	-	-	-	-	10	Extremely Close
NI_004	10.19	10.21	NI	DI	0	-	-	-	-	possibly due to drilling	0	Extremely Close
FR_038	10.21	10.21	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_039	10.35	10.35	FR	DI	0	-	-	-	-	-	140	Close
FR_040	10.45	10.45	FR	DI	0	-	-	-	-	-	100	Close
FR_041	10.55	10.55	FR	DI	0	-	-	-	-	-	100	Close
B_022	10.60	10.60	B	NAT	0	P	sm	T	Y	clay	50	Very Close
FR_042	10.70	10.70	FR	DI	0	-	-	-	-	-	100	Close
FR_043	10.85	10.85	FR	DI	0	-	-	-	-	-	150	Close
FR_044	10.87	10.87	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_045	10.97	10.97	FR	DI	0	-	-	-	-	-	100	Close
B_023	11.13	11.13	B	NAT	0	P	sm	T	Y	clay	160	Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH01

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_046	11.22	11.22	FR	DI	0	-	-	-	-	-	90	Close
I_003	11.25	11.25	I	NAT	0	-	-	-	-	-	30	Very Close
FR_047	11.37	11.37	FR	DI	0	-	-	-	-	-	120	Close
FR 048	11.50	11.50	FR	DI	0	-	-	-	-	end of core run	130	Close
FR 049	11.50	11.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_024	11.60	11.61	B	NAT	10	U	ro	T	Y	grey clay	105	Close
NI_005	11.65	11.68	NI	NAT	0	-	-	-	-	-	45	Very Close
B_025	11.69	11.70	B	NAT	20	U	ro	T	Y	grey clay	15	Extremely Close
B_026	11.72	11.72	B	NAT	0	U	ro	O	Y	soft grey clay	25	Very Close
FR 050	11.76	11.76	FR	DI	0	-	-	-	-	-	40	Very Close
FR 051	11.86	11.86	FR	DI	0	-	-	-	-	-	100	Close
FR_052	11.97	11.97	FR	DI	0	-	-	-	-	-	110	Close
FR_053	12.02	12.02	FR	DI	0	-	-	-	-	-	50	Very Close
FR_054	12.07	12.07	FR	DI	0	-	-	-	-	-	50	Very Close
B_027	12.18	12.19	B	NAT	20	U	ro	VT	N	-	115	Close
FR 055	12.24	12.24	FR	DI	0	-	-	-	-	-	55	Very Close
FR 056	12.42	12.42	FR	DI	0	-	-	-	-	-	180	Close
FR_057	12.64	12.64	FR	DI	0	-	-	-	-	-	220	Medium
FR_058	12.73	12.73	FR	DI	0	-	-	-	-	-	90	Close
FR_059	12.84	12.84	FR	DI	0	-	-	-	-	-	110	Close
FR_060	12.87	12.87	FR	DI	0	-	-	-	-	-	30	Very Close
FR 061	13.00	13.00	FR	DI	0	-	-	-	-	-	130	Close
FR 062	13.00	13.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_063	13.10	13.10	FR	DI	0	-	-	-	-	-	100	Close
FR_064	13.24	13.24	FR	DI	0	-	-	-	-	-	140	Close
FR_065	13.32	13.32	FR	DI	0	-	-	-	-	-	80	Close
FR_066	13.48	13.48	FR	DI	0	-	-	-	-	-	160	Close
FR 067	13.58	13.58	FR	DI	0	-	-	-	-	-	100	Close
FR 068	13.68	13.68	FR	DI	0	-	-	-	-	-	100	Close
B_028	13.77	13.77	B	NAT	0	U	ro	O	Y	grey clay	90	Close
B_029	13.95	13.95	B	NAT	0	U	ro	O	Y	grey clay	180	Close
B_030	14.12	14.19	B	NAT	0	U	ro	MW	Y	infilled with medium to coarse gravel and clay	205	Medium
FR_069	14.30	14.30	FR	DI	0	-	-	-	-	-	145	Close
B 031	14.37	14.37	B	NAT	0	U	ro	O	Y	grey clay	70	Close
FR 070	14.44	14.44	FR	DI	0	-	-	-	-	-	70	Close
FR_071	14.50	14.50	FR	DI	0	-	-	-	-	-	60	Close
FR_072	14.50	14.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_073	14.58	14.58	FR	DI	0	-	-	-	-	-	80	Close
B_032	14.67	14.67	B	NAT	0	P	ro	O	Y	grey clay	90	Close
FR 074	14.71	14.71	FR	DI	0	-	-	-	-	-	40	Very Close
FR 075	14.99	14.99	FR	DI	0	-	-	-	-	-	280	Medium
B_033	15.10	15.10	B	NAT	0	U	ro	T	Y	grey clay	110	Close
FR_076	15.14	15.14	FR	DI	0	-	-	-	-	-	40	Very Close
B_034	15.35	15.39	B	NAT	0	U	ro	W	Y	soft grey clay	230	Medium
FR_077	15.56	15.56	FR	DI	0	-	-	-	-	-	190	Close
FR 078	15.89	15.89	FR	DI	0	-	-	-	-	-	330	Medium
FR 079	16.00	16.00	FR	DI	0	-	-	-	-	-	110	Close
FR_080	16.00	16.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_035	16.21	16.28	B	NAT	0	P	ro	W	Y	soft grey clay	245	Medium
B_036	16.39	16.47	B	NAT	0	P	ro	W	Y	soft grey clay	185	Close
B_037	16.51	16.51	B	NAT	0	P	ro	O	Y	gravel	80	Close
FR 081	16.57	16.57	FR	DI	0	-	-	-	-	-	60	Very Close
FR 082	16.62	16.62	FR	DI	0	-	-	-	-	-	-	-
B_038	16.69	16.69	B	NAT	0	U	ro	MW	Y	clay	70	Close
B_039	16.73	16.73	B	NAT	0	P	ro	O	Y	clay	40	Very Close
B_040	16.80	16.80	B	NAT	0	U	ro	VT	N	-	70	Close
FR_083	16.90	16.90	FR	DI	0	-	-	-	-	-	100	Close
FR 084	16.95	16.95	FR	DI	0	-	-	-	-	-	50	Very Close
B 041	17.13	17.13	B	NAT	0	P	ro	O	Y	clay	180	Close
FR_085	17.21	17.21	FR	DI	0	-	-	-	-	-	80	Close
B_042	17.38	17.39	B	NAT	20	U	ro	VT	N	clay	175	Close
B_043	17.46	17.47	B	NAT	20	U	ro	O	Y	clay	80	Close
FR_086	17.50	17.50	FR	DI	0	-	-	-	-	-	35	Very Close
FR 087	17.52	17.52	FR	DI	0	-	-	-	-	-	20	Extremely Close
B 044	17.64	17.64	B	NAT	0	U	ro	PO	Y	grey clay	120	Close
FR_088	17.76	17.76	FR	DI	0	-	-	-	-	-	120	Close
B_045	17.80	17.86	B	NAT	0	U	ro	W	Y	grey gravelly clay	70	Close
B_046	17.90	17.98	B	NAT	0	U	ro	W	Y	grey gravelly clay	110	Close
FR_089	18.24	18.24	FR	DI	0	-	-	-	-	-	300	Medium
J 001	18.42	18.45	J	NAT	30	U	ro	VT	N	-	195	Close
FR 090	18.57	18.57	FR	DI	0	-	-	-	-	-	135	Close
FR_091	18.65	18.65	FR	DI	0	-	-	-	-	-	80	Close
FR_092	18.74	18.74	FR	DI	0	-	-	-	-	-	90	Close
B_047	18.84	18.84	B	NAT	0	P	ro	O	Y	grey clay	100	Close
B_048	18.92	18.93	B	NAT	10	U	ro	O	Y	grey clay	85	Close

Notes:
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Number from 0° to 90°
with 5° increments

Roughness - interm.
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Roughness - small
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st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
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O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH01

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_093	19.00	19.00	FR	DI	0	-	-	-	-	-	75	Close
FR_094	19.00	19.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_095	19.30	19.30	FR	DI	0	-	-	-	-	-	300	Medium
FR_096	19.69	19.69	FR	DI	0	-	-	-	-	-	390	Medium
I_004	19.92	19.92	I	NAT	0	-	-	-	-	-	230	Medium
FR_097	20.00	20.00	FR	DI	0	-	-	-	-	-	80	Close
B_049	20.12	20.12	B	NAT	0	P	ro	W	Y	brown clay	120	Close
NI_006	20.12	20.19	NI	DI	0	-	-	-	-	-	0	Extremely Close
B_050	20.19	20.19	B	NAT	0	P	ro	W	N	-	0	Extremely Close
FR_098	20.50	20.50	FR	DI	0	-	-	-	-	-	310	Medium
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_001	0.35	0.35	B	NAT	0	S	ro	VT	N	-	0	Extremely Close
NI_001	0.35	0.47	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
B_002	0.47	0.47	B	NAT	0	P	ro	T	Y	silty sand	0	Extremely Close
FR_001	0.53	0.53	FR	DI	0	-	-	-	-	-	60	Close
NI_002	0.53	0.57	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
FR_002	0.57	0.57	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_003	0.69	0.69	FR	DI	0	-	-	-	-	-	120	Close
NI_003	0.69	0.75	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
B_003	0.75	0.75	B	NAT	0	S	sm	VT	N	-	0	Extremely Close
FR_004	0.89	0.89	FR	DI	0	-	-	-	-	-	140	Close
FR_005	0.97	0.97	FR	DI	0	-	-	-	-	-	80	Close
FR_006	1.00	1.00	FR	DI	0	-	-	-	-	-	30	Very Close
NI_004	1.00	1.37	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
FR_007	1.37	1.37	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_008	1.44	1.44	FR	DI	0	-	-	-	-	-	70	Close
FR_009	1.55	1.55	FR	DI	0	-	-	-	-	-	110	Close
NI_005	1.55	1.72	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
FR_010	1.72	1.72	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_001	1.72	2.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_011	2.00	2.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_006	2.00	2.20	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
B_004	2.20	2.20	B	NAT	0	U	sm	VT	N	-	0	Extremely Close
FR_012	2.30	2.30	FR	DI	0	-	-	-	-	-	100	Close
NR_002	2.30	3.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_013	3.00	3.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_007	3.00	3.05	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
B_005	3.05	3.05	B	NAT	0	S	ro	VT	N	-	0	Extremely Close
B_006	3.19	3.19	B	NAT	0	S	ro	-	-	-	140	Close
NI_008	3.19	3.40	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
FR_014	3.40	3.40	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_003	3.40	4.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_015	4.00	4.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_009	4.00	4.20	NI	DI	0	-	-	-	-	possibly drilling disturbed	0	Extremely Close
FR_016	4.20	4.20	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_004	4.20	4.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_017	4.50	4.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_010	4.50	4.65	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_007	4.65	4.65	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
B_008	4.70	4.70	B	NAT	0	P	ro	VT	N	-	50	Very Close
J_001	4.70	4.75	J	NAT	30	U	ro	VT	N	-	25	Very Close
B_009	4.81	4.81	B	NAT	0	U	ro	VT	N	-	85	Close
J_002	4.81	4.94	J	NAT	90	U	ro	VT	N	-	-	-
B_010	4.94	4.94	B	NAT	0	-	-	-	-	-	-	-
J_003	5.01	5.06	J	NAT	30	P	ro	VT	N	-	95	Close
FR_018	5.10	5.10	FR	DI	0	-	-	-	-	-	65	Close
FR_019	5.15	5.15	FR	DI	0	-	-	-	-	-	50	Very Close
NR_005	5.15	5.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_020	5.50	5.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_004	5.50	5.80	J	NAT	90	P	ro	VT	N	brownish staining	-	-
NI_011	5.50	5.57	NI	NAT	0	-	-	-	-	-	-	-
J_005	5.55	5.58	J	NAT	30	P	ro	VT	N	-	5	Extremely Close
J_006	5.60	5.85	J	NAT	80	U	ro	VT	N	-	160	Close
NI_012	5.67	5.92	NI	NAT	0	-	-	-	-	-	55	Very Close
FR_021	5.92	5.92	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_022	6.05	6.05	FR	DI	0	-	-	-	-	-	130	Close
NR_006	6.05	6.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_023	6.50	6.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_024	6.55	6.55	FR	DI	0	-	-	-	-	-	50	Very Close
NR_007	6.55	7.15	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NI_013	7.00	7.15	NI	NAT	0	-	-	-	-	-	150	Close
B_011	7.15	7.15	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_025	7.20	7.20	FR	DI	0	-	-	-	-	-	50	Very Close
FR_026	7.25	7.25	FR	DI	0	-	-	-	-	-	50	Very Close
NR_008	7.25	7.70	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_027	7.70	7.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_014	7.70	7.86	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_007	7.86	7.94	J	NAT	50	U	sm	VT	N	-	40	Very Close
J_008	7.91	8.06	J	NAT	60	S	sm	VT	N	-	85	Close
B_012	7.94	7.94	B	NAT	0	U	sm	VT	N	-	45	Very Close
B_013	8.00	8.00	B	NAT	0	U	sm	VT	N	-	60	Very Close
FR_028	8.10	8.10	FR	DI	0	-	-	-	-	-	100	Close
NR_009	8.10	8.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_029	8.50	8.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_009	8.50	8.55	J	NAT	60	P	sm	VT	N	-	25	Very Close
NI_015	8.50	8.55	NI	NAT	0	-	-	-	-	-	25	Very Close

Notes:
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Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

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Roughness - small
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Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
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MW : moderately wide (2.50 - 10)
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Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH02

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_030	8.55	8.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_031	8.62	8.62	FR	DI	0	-	-	-	-	-	70	Close
FR_032	8.70	8.70	FR	DI	0	-	-	-	-	-	80	Close
J_010	8.76	8.90	J	NAT	80	S	sm	VT	N	-	130	Close
FR_033	8.78	8.78	FR	DI	0	-	-	-	-	-	50	Very Close
FR_034	8.91	8.91	FR	DI	0	-	-	-	-	-	130	Close
J_011	8.97	9.01	J	NAT	50	U	sm	VT	N	-	80	Close
NR_010	9.05	9.20	NR	NAT	0	-	-	-	-	AZCL	60	Close
NR_011	9.20	9.70	NR	NAT	0	-	-	-	-	No recovery	0	Extremely Close
NR_012	9.70	10.20	NR	NAT	0	-	-	-	-	No recovery	0	Extremely Close
NR_013	10.20	11.20	NR	NAT	0	-	-	-	-	No recovery	0	Extremely Close
NI_016	11.20	11.40	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_014	11.25	11.25	B	NAT	0	U	ro	VT	N	-	150	Close
FR_035	11.40	11.40	FR	DI	0	-	-	-	-	-	150	Close
NR_014	11.40	11.70	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_036	11.70	11.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_037	11.78	11.78	FR	DI	0	-	-	-	-	-	80	Close
FR_038	11.84	11.84	FR	DI	0	-	-	-	-	-	60	Close
FR_039	11.93	11.93	FR	DI	0	-	-	-	-	-	90	Close
J_012	11.97	12.03	J	NAT	40	U	sm	VT	N	-	70	Close
J_013	12.00	12.09	J	NAT	60	S	sm	VT	N	-	45	Very Close
B_015	12.11	12.11	B	NAT	0	P	sm	VT	N	-	65	Close
B_016	12.23	12.23	B	NAT	0	S	sm	VT	N	-	120	Close
NI_017	12.30	12.39	NI	NAT	0	-	-	-	-	-	70	Close
J_014	12.30	12.37	J	NAT	90	S	sm	VT	N	-	-	-
J_015	12.33	12.37	J	NAT	60	S	sm	VT	N	-	-	-
J_016	12.34	12.45	J	NAT	70	S	sm	VT	N	-	45	Very Close
J_017	12.39	12.45	J	NAT	90	U	sm	VT	N	-	-	-
B_017	12.45	12.45	B	NAT	0	S	sm	VT	N	-	-	-
J_018	12.50	12.57	J	NAT	40	S	sm	VT	N	-	85	Close
B_018	12.60	12.60	B	NAT	0	U	sm	VT	N	-	65	Close
FR_040	12.70	12.70	FR	DI	0	-	-	-	-	-	100	Close
FR_041	12.78	12.78	FR	DI	0	-	-	-	-	-	80	Close
FR_042	13.00	13.00	FR	DI	0	-	-	-	-	-	220	Medium
J_019	13.11	13.26	J	NAT	70	U	sm	VT	N	-	185	Close
J_020	13.14	13.17	J	NAT	40	U	sm	VT	N	-	30	Very Close
J_021	13.22	13.28	J	NAT	40	U	sm	VT	N	-	95	Close
B_019	13.37	13.37	B	NAT	0	P	sm	T	Y	gravelly sandy clay	120	Close
B_020	13.43	13.43	B	NAT	0	P	sm	VT	N	-	60	Close
B_021	13.47	13.47	B	NAT	0	U	sm	T	Y	gravelly sandy clay	40	Very Close
FR_043	13.54	13.54	FR	DI	0	-	-	-	-	-	70	Close
FR_044	13.62	13.62	FR	DI	0	-	-	-	-	shoe destroyed	80	Close
FR_045	13.70	13.70	FR	DI	0	-	-	-	-	shoe destroyed	80	Close
FR_046	13.70	13.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_047	13.74	13.74	FR	DI	0	-	-	-	-	-	40	Very Close
FR_048	13.79	13.79	FR	DI	0	-	-	-	-	-	50	Very Close
J_022	13.82	13.84	J	NAT	10	U	sm	VT	N	-	40	Very Close
J_023	13.84	13.88	J	NAT	20	U	sm	VT	N	-	30	Very Close
J_024	13.85	13.86	J	NAT	20	U	sm	VT	N	-	5	Extremely Close
B_022	13.94	13.94	B	NAT	0	U	sm	VT	N	-	85	Close
FR_049	14.03	14.03	FR	DI	0	-	-	-	-	-	90	Close
FR_050	14.13	14.13	FR	DI	0	-	-	-	-	-	100	Close
J_025	14.13	14.20	J	NAT	50	S	sm	VT	N	-	-	-
NI_018	14.20	14.25	NI	NAT	0	-	-	-	-	-	35	Very Close
FR_051	14.25	14.25	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_023	14.31	14.31	B	NAT	0	U	sm	VT	N	-	60	Close
J_026	14.31	14.33	J	NAT	20	U	sm	VT	N	-	10	Extremely Close
NI_019	14.31	14.36	NI	NAT	0	-	-	-	-	-	10	Extremely Close
J_027	14.32	14.36	J	NAT	90	U	sm	VT	N	-	-	-
B_024	14.36	14.36	B	NAT	0	P	sm	VT	N	-	-	-
B_025	14.50	14.50	B	NAT	0	P	sm	VT	N	-	140	Close
B_026	14.65	14.65	B	NAT	0	p	sm	T	Y	gravelly sandy clay	150	Close
B_027	14.72	14.72	B	NAT	0	P	sm	T	Y	gravelly sandy clay	70	Close
B_028	14.79	14.79	B	NAT	0	P	sm	T	Y	gravelly sandy clay	70	Close
J_028	14.83	14.85	J	NAT	30	P	sm	T	Y	gravelly sandy clay	50	Very Close
NI_020	14.85	14.90	NI	NAT	0	-	-	-	-	destructured	10	Extremely Close
FR_052	15.00	15.00	FR	DI	0	-	-	-	-	-	100	Close
FR_053	15.00	15.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_029	15.01	15.10	J	NAT	10	P	ro	VT	N	-	55	Very Close
J_030	15.05	15.10	J	NAT	20	P	ro	VT	N	-	20	Extremely Close
J_031	15.15	15.22	J	NAT	50	U	ro	VT	N	-	110	Close
J_032	15.15	15.23	J	NAT	90	U	ro	VT	N	-	-	-
NI_021	15.18	15.23	NI	NAT	0	-	-	-	-	-	-	-
FR_054	15.29	15.29	FR	DI	0	-	-	-	-	-	60	Very Close
J_033	15.34	15.43	J	NAT	45	U	ro	VT	N	-	95	Close

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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH02

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_055	15.36	15.36	FR	DI	0	-	-	-	-	-	25	Very Close
FR_056	15.44	15.44	FR	DI	0	-	-	-	-	-	80	Close
J_034	15.48	15.56	J	NAT	90	P	ro	VT	N	-	-	-
J_035	15.48	15.60	J	NAT	60	P	ro	VT	N	-	-	-
NI_022	15.51	15.60	NI	NAT	0	-	-	-	-	-	30	Very Close
FR_057	15.72	15.72	FR	DI	0	-	-	-	-	-	120	Close
B_029	15.80	15.80	B	NAT	0	U	ro	VT	N	-	80	Close
FR_058	15.83	15.83	FR	DI	0	-	-	-	-	-	30	Very Close
J_036	15.92	15.92	J	NAT	0	S	ro	VT	N	-	90	Close
J_037	15.97	16.01	J	NAT	35	P	ro	VT	N	-	70	Close
J_038	15.99	16.09	J	NAT	90	P	ro	VT	N	-	-	-
FR_059	16.09	16.09	FR	DI	0	-	-	-	-	-	-	-
B_030	16.17	16.17	B	NAT	0	P	ro	VT	N	-	80	Close
NI_023	16.17	16.25	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
J_039	16.21	16.25	J	NAT	40	P	ro	VT	N	-	20	Extremely Close
FR_060	16.33	16.33	FR	DI	0	-	-	-	-	-	100	Close
NI_024	16.33	16.38	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
FR_061	16.38	16.38	FR	DI	0	-	-	-	-	shoe recovery	0	Extremely Close
FR_062	16.42	16.42	FR	DI	0	-	-	-	-	shoe recovery	40	Very Close
FR_063	16.48	16.48	FR	DI	0	-	-	-	-	shoe recovery	60	Very Close
FR_064	16.50	16.50	FR	DI	0	-	-	-	-	shoe recovery	20	Extremely Close
FR_065	16.50	16.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_040	16.53	16.57	J	NAT	20	U	ro	VT	N	-	50	Very Close
B_031	16.58	16.58	B	NAT	0	P	ro	VT	N	-	30	Very Close
B_032	16.72	16.72	B	NAT	0	U	ro	VT	N	-	140	Close
J_041	16.76	16.78	J	NAT	20	S	ro	VT	N	-	50	Very Close
NI_025	16.84	16.93	NI	NAT	0	-	-	-	-	-	70	Close
J_042	16.84	16.88	J	NAT	30	P	ro	VT	N	-	70	Close
J_043	16.85	16.93	J	NAT	60	U	ro	VT	N	-	30	Very Close
B_033	16.90	16.90	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B_034	16.94	16.94	B	NAT	0	U	ro	VT	N	-	40	Very Close
J_044	16.94	17.01	J	NAT	90	P	ro	VT	N	-	-	-
B_035	17.02	17.02	B	NAT	0	P	ro	VT	N	-	-	-
J_045	17.10	17.97	J	NAT	50	U	ro	VT	N	-	515	Medium
NI_026	17.14	17.66	NI	NAT	0	-	-	-	-	destructured	395	Medium
J_046	17.75	17.80	J	NAT	20	P	ro	VT	N	-	115	Close
J_047	17.75	17.80	J	NAT	20	P	ro	VT	N	-	0	Extremely Close
FR_066	17.87	17.87	FR	DI	0	-	-	-	-	shoe recovery	95	Close
FR_067	17.95	17.95	FR	DI	0	-	-	-	-	shoe recovery	80	Close
FR_068	18.00	18.00	FR	DI	0	-	-	-	-	shoe recovery	50	Very Close
B_036	18.14	18.14	B	NAT	0	U	ro	VT	N	-	140	Close
B_037	18.20	18.20	B	NAT	0	U	ro	VT	N	-	60	Very Close
J_048	18.26	18.27	J	NAT	30	U	ro	VT	N	-	65	Close
NI_027	18.38	18.38	NI	NAT	0	-	-	-	-	destructured	115	Close
B_038	18.60	18.60	B	NAT	0	U	ro	VT	N	-	220	Medium
B_039	18.66	18.66	B	NAT	0	P	ro	VT	N	-	60	Very Close
NI_028	18.66	18.66	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_040	19.12	19.12	B	NAT	0	U	ro	VT	N	-	460	Medium
B_041	19.19	19.19	B	NAT	0	S	ro	VT	N	-	70	Close
FR_069	19.27	19.27	FR	DI	0	-	-	-	-	-	80	Close
B_042	19.32	19.32	B	NAT	0	P	ro	VT	N	-	50	Very Close
FR_070	19.41	19.41	FR	DI	0	-	-	-	-	-	90	Close
FR_071	19.46	19.46	FR	DI	0	-	-	-	-	-	50	Very Close
FR_072	19.50	19.50	FR	DI	0	-	-	-	-	-	40	Very Close
NI_029	19.50	19.60	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_049	19.52	19.60	J	NAT	45	P	ro	VT	N	-	40	Very Close
J_050	19.52	19.60	J	NAT	45	P	ro	VT	N	-	0	Extremely Close
B_043	19.60	19.60	B	NAT	0	P	ro	VT	N	-	40	Very Close
B_044	19.67	19.67	B	NAT	0	P	ro	VT	N	-	70	Close
NI_030	19.67	19.74	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_045	19.74	19.74	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
B_046	19.78	19.78	B	NAT	0	U	ro	VT	N	-	40	Very Close
NI_031	19.78	19.88	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_047	19.88	19.88	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
B_048	19.93	19.93	B	NAT	0	P	ro	VT	N	-	50	Very Close
NI_032	19.93	20.00	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_051	19.93	20.05	J	NAT	90	P	ro	VT	N	-	-	-
J_052	19.93	20.06	J	NAT	60	P	ro	VT	N	-	-	-
B_049	20.00	20.00	B	NAT	0	P	ro	VT	N	-	5	Extremely Close
NI_033	20.00	20.60	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_050	20.60	20.60	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
J_053	20.62	20.69	J	NAT	80	U	ro	VT	N	-	55	Very Close
B_051	20.73	20.73	B	NAT	0	U	ro	VT	N	-	75	Close
J_054	20.73	20.82	J	NAT	45	-	-	-	-	-	45	Very Close
B_052	20.76	20.76	B	NAT	0	P	ro	VT	N	-	15	Extremely Close

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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH02

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_053	20.82	20.82	B	NAT	0	U	ro	VT	N	-	60	Very Close
NI_034	20.89	20.95	NI	NAT	0	-	-	-	-	-	70	Close
J_055	20.89	20.93	J	NAT	35	P	-	-	-	-	40	Very Close
J_056	20.91	20.94	J	NAT	90	U	-	-	-	-	-	-
J_057	20.93	20.96	J	NAT	35	P	-	-	-	-	-	-
FR_073	20.97	20.97	FR	DI	0	-	-	-	-	-	25	Very Close
FR_074	21.00	21.00	FR	DI	0	-	-	-	-	-	30	Very Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_001	0.15	0.15	B	NAT	0	P	ro	VT	N	Change of lithology following top gravel/cobble layer	0	Extremely Close
NI_001	0.15	0.17	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_002	0.17	0.17	B	NAT	0	P	ro	O	N	Presence of bioclasts	0	Extremely Close
B_003	0.23	0.23	B	NAT	0	P	ro	O	N	Shelly surface; stained orange	60	Close
NI_002	0.23	0.25	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_004	0.25	0.25	B	NAT	0	S	ro	O	Y	Silty matrix; stained orange	0	Extremely Close
B_005	0.36	0.36	B	NAT	0	P	ro	O	Y	Silty matrix; presence of gravel-sized bioclasts	110	Close
NI_003	0.36	0.51	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_006	0.51	0.51	B	NAT	0	P	ro	O	Y	Silty matrix	0	Extremely Close
B_007	0.57	0.57	B	NAT	0	P	ro	PO	N	Shelly surface; stained orange	60	Very Close
FR_001	0.57	0.59	FR	DI	0	-	-	-	-	-	10	Extremely Close
B_008	0.59	0.59	B	NAT	0	P	ro	PO	N	-	10	Extremely Close
B_009	0.62	0.62	B	NAT	0	P	ro	PO	N	-	30	Very Close
B_010	0.67	0.67	B	NAT	0	P	ro	O	Y	Silty matrix	50	Very Close
I_001	0.70	0.70	I	NAT	0	-	-	-	-	-	30	Very Close
FR_002	0.80	0.80	FR	DI	0	-	-	-	-	-	100	Close
NI_004	0.80	0.93	NI	DI	0	-	-	-	-	Possibly drilling induced (shoe recovery)	0	Extremely Close
FR_003	0.93	0.93	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_004	1.00	1.00	FR	DI	0	-	-	-	-	-	70	Close
FR_005	1.00	1.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_006	1.20	1.20	FR	DI	0	-	-	-	-	-	200	Close
B_011	1.49	1.49	B	NAT	0	S	ro	PO	Y	Change of layer; gravelly sandy silty matrix	290	Medium
NI_005	1.49	2.00	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_007	2.00	2.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH03-a

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_001	1.80	1.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_001	1.80	2.32	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_001	2.32	2.32	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B 002	2.43	2.44	B	NAT	10	S	ro	VT	N	-	115	Close
B 003	2.48	2.49	B	NAT	10	P	ro	VT	N	-	50	Very Close
NI_002	2.48	2.69	NI	NAT	0	-	-	-	-	-	5	Extremely Close
B_004	2.54	2.55	B	NAT	10	U	ro	VT	N	-	145	Close
J_001	2.60	2.67	J	NAT	45	S	ro	VT	N	-	90	Close
B_005	2.62	2.62	B	NAT	0	U	ro	VT	N	-	15	Extremely Close
B 006	2.67	2.67	B	NAT	0	S	ro	VT	N	-	50	Very Close
B 007	2.69	2.69	B	NAT	0	U	ro	VT	N	-	20	Very Close
NI_003	2.69	3.00	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_002	2.95	2.95	FR	DI	0	-	-	-	-	-	50	Very Close
FR_003	3.00	3.00	FR	DI	0	-	-	-	-	-	50	Very Close
NI_004	3.20	3.65	NI	NAT	0	-	-	-	-	Destructured	200	Medium
NR 001	3.65	4.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NR 002	4.00	4.10	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
B_008	4.10	4.17	B	NAT	0	U	ro	VT	N	-	35	Very Close
FR_004	4.10	4.10	FR	DI	0	-	-	-	-	-	35	Very Close
B_009	4.17	4.17	B	NAT	0	U	ro	VT	N	-	70	Close
NI_005	4.17	4.30	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B 010	4.30	4.40	B	NAT	0	U	ro	VT	N	-	50	Very Close
NI 006	4.47	4.95	NI	NAT	0	-	-	-	-	Destructured	120	Close
FR_005	4.96	4.96	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_006	5.00	5.00	FR	DI	0	-	-	-	-	-	40	Very Close
NI_007	5.00	5.05	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_007	5.05	5.05	FR	DI	0	-	-	-	-	-	0	Extremely Close
B 011	5.11	5.11	B	NAT	0	S	sm	VT	N	-	60	Close
B 012	5.14	5.14	B	NAT	0	S	sm	VT	N	-	30	Very Close
J_002	5.14	5.16	J	NAT	90	U	ro	VT	N	-	-	-
B_013	5.16	5.16	B	NAT	0	S	sm	VT	N	-	-	-
B_014	5.20	5.20	B	NAT	0	S	sm	VT	N	-	40	Very Close
B_015	5.30	5.30	B	NAT	0	S	sm	VT	N	-	100	Close
J 003	5.30	5.34	J	NAT	90	U	ro	VT	N	-	-	-
J 004	5.32	5.37	J	NAT	45	U	ro	VT	N	-	-	-
J_005	5.32	5.39	J	NAT	45	U	ro	VT	N	-	10	Extremely Close
B_016	5.45	5.45	B	NAT	0	U	ro	VT	N	-	95	Close
B_017	5.54	5.54	B	NAT	0	U	ro	VT	N	-	90	Close
NI_008	5.54	5.70	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
NR 003	5.70	6.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR 008	6.00	6.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_009	6.08	6.08	FR	DI	0	-	-	-	-	-	80	Close
B_018	6.20	6.20	B	NAT	0	P	sm	VT	N	-	120	Close
B_019	6.23	6.23	B	NAT	0	P	sm	VT	N	-	30	Very Close
J_006	6.24	6.26	J	NAT	20	U	sm	VT	N	-	20	Extremely Close
B 020	6.32	6.32	B	NAT	0	U	sm	VT	N	-	70	Close
B 021	6.40	6.42	B	NAT	20	U	sm	VT	N	-	90	Close
NI_009	6.40	6.89	NI	NAT	0	-	-	-	-	Destructured	10	Extremely Close
B_022	6.89	6.89	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_010	7.00	7.00	FR	DI	0	-	-	-	-	-	110	Close
FR_011	7.00	7.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
J 007	7.00	7.10	J	NAT	60	U	ro	VT	N	-	50	Very Close
B 023	7.03	7.03	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
NI_010	7.05	8.25	NI	NAT	0	-	-	-	-	Destructured	20	Extremely Close
NR_004	8.25	8.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_012	15.20	15.20	FR	DI	0	-	-	-	-	-	6700	Very Wide
NI_011	15.20	15.30	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B 024	15.30	15.30	B	NAT	0	P	sm	VT	N	Change of layer	0	Extremely Close
FR 013	15.45	15.45	FR	DI	0	-	-	-	-	-	150	Close
FR_014	15.56	15.56	FR	DI	0	-	-	-	-	-	110	Close
B_025	15.71	15.71	B	NAT	0	P	ro	O	Y	Silty matrix; stained orange	150	Close
B_026	15.79	15.79	B	NAT	0	S	ro	O	N	-	80	Close
B_027	15.84	15.84	B	NAT	0	P	ro	T	N	Stained orange	50	Very Close
FR 015	16.00	16.00	FR	DI	0	-	-	-	-	-	160	Close
FR 016	16.00	16.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
I_001	16.00	16.05	I	NAT	20	-	-	-	-	-	25	Very Close
B_028	16.18	16.18	B	NAT	0	P	ro	T	N	-	155	Close
B_029	16.30	16.30	B	NAT	0	P	sm	T	Y	Silty matrix	120	Close
B_030	16.45	16.45	B	NAT	0	S	ro	O	Y	Silty sandy matrix	150	Close
NI 012	16.45	16.78	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B 031	16.78	16.78	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
FR_017	16.86	16.86	FR	DI	0	-	-	-	-	-	80	Close
FR_018	16.94	16.97	FR	DI	20	-	-	-	-	-	95	Close
FR_019	17.00	17.00	FR	DI	0	-	-	-	-	-	45	Very Close
FR_020	17.00	17.00	FR	DI	0	-	-	-	-	-	0	Extremely Close

Notes:
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Number from 0° to 90°
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Roughness - small
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ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
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W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH03

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_032	17.09	17.09	B	NAT	0	U	sm	MW	Y	Silty sandy gravelly matrix	90	Close
NI_013	17.09	17.12	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_033	17.12	17.12	B	NAT	0	U	sm	MW	Y	Silty sandy gravelly matrix	0	Extremely Close
B_034	17.25	17.25	B	NAT	0	S	ro	PO	N	Stained orange	130	Close
NI_014	17.25	17.30	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_035	17.30	17.30	B	NAT	0	P	sm	PO	Y	Silty matrix	0	Extremely Close
FR_021	17.44	17.47	FR	DI	0	-	-	-	-	-	155	Close
FR_022	17.58	17.58	FR	DI	0	-	-	-	-	-	125	Close
FR_023	17.70	17.70	FR	DI	0	-	-	-	-	-	120	Close
FR_024	17.80	17.80	FR	DI	0	-	-	-	-	-	100	Close
FR_025	18.00	18.00	FR	DI	0	-	-	-	-	-	200	Close
FR_026	18.00	18.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_015	18.00	18.03	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_036	18.03	18.03	B	NAT	0	P	sm	VT	N	-	0	Extremely Close
FR_027	18.14	18.14	FR	DI	0	-	-	-	-	-	110	Close
B_037	18.28	18.28	B	NAT	0	P	sm	T	N	Change of layer	140	Close
B_038	18.38	18.38	B	NAT	0	P	sm	VT	N	-	100	Close
B_039	18.44	18.44	B	NAT	0	U	sm	O	Y	Silty matrix plus fine gravel	60	Close
B_040	18.52	18.52	B	NAT	0	P	sm	O	Y	Silty matrix	80	Close
B_041	18.59	18.59	B	NAT	0	P	ro	PO	N	-	70	Close
B_042	18.68	18.68	B	NAT	0	P	sm	VT	N	-	90	Close
B_043	18.73	18.73	B	NAT	0	P	sm	PO	Y	Silty sandy fine to medium size gravels	50	Very Close
NI_016	18.73	18.78	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_044	18.78	18.78	B	NAT	0	P	sm	VT	N	-	0	Extremely Close
B_045	18.81	18.81	B	NAT	0	P	sm	VT	N	-	30	Very Close
B_046	18.85	18.85	B	NAT	0	P	sm	VT	N	-	40	Very Close
B_047	18.88	18.88	B	NAT	0	P	sm	O	Y	Silty sandy medium size gravels	30	Very Close
NI_017	18.88	18.93	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_048	18.98	18.98	B	NAT	0	P	sm	VT	N	-	50	Very Close
FR_028	19.00	19.00	FR	DI	0	-	-	-	-	-	20	Extremely Close
NR_005	19.00	19.10	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_029	19.10	19.10	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_049	19.22	19.22	B	NAT	0	S	ro	T	N	-	120	Close
J_008	19.22	19.27	J	NAT	90	U	ro	PO	N	Stained orange	-	-
I_002	19.26	19.26	I	NAT	0	-	-	-	-	-	-	-
B_050	19.32	19.37	B	NAT	30	S	ro	T	N	-	85	Close
FR_030	19.50	19.50	FR	DI	0	-	-	-	-	-	155	Close
FR_031	19.57	19.64	FR	DI	30	-	-	-	-	-	105	Close
FR_032	19.64	19.64	FR	DI	0	-	-	-	-	-	35	Very Close
FR_033	19.71	19.71	FR	DI	0	-	-	-	-	-	70	Close
B_051	19.73	19.77	B	NAT	20	P	sm	PO	Y	Silty matrix	40	Very Close
NI_018	19.84	19.93	NI	NAT	0	-	-	-	-	-	90	Close
B_052	19.87	19.87	B	NAT	0	P	sm	VT	N	-	60	Very Close
B_053	19.93	19.93	B	NAT	0	S	ro	T	Y	Fine sandy gravels	60	Very Close
B_054	20.00	20.00	B	NAT	0	P	ro	O	Y	Silty matrix and medium size gravels	70	Close
NI_019	20.00	20.04	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_034	20.00	20.00	FR	DI	0	-	-	-	-	-	40	Very Close
NR_006	20.00	20.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
B_055	20.04	20.04	B	NAT	0	P	ro	PO	Y	Silty matrix and medium size gravels	460	Medium
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_001	0.23	0.23	B	NAT	0	S	ro	VT	N	Reddish yellow stains	0	Extremely Close
B_002	0.26	0.26	B	NAT	0	S	ro	VT	N	-	30	Very Close
B_003	0.30	0.30	B	NAT	0	S	ro	VT	N	-	40	Very Close
B 004	0.36	0.36	B	NAT	0	S	ro	VT	N	-	-	-
B 005	0.44	0.44	B	NAT	0	S	ro	VT	N	Brownish yellow stains	140	Close
B_006	0.49	0.49	B	NAT	0	S	ro	VT	N	-	50	Very Close
NI_001	0.52	0.55	NI	NAT	0	-	-	-	-	Yellow stains	30	Very Close
B_007	0.61	0.61	B	NAT	0	U	ro	VT	N	-	60	Very Close
B_008	0.62	0.62	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
NI 002	0.62	0.70	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J 001	0.63	0.69	J	NAT	40	U	ro	VT	N	-	40	Very Close
J_002	0.67	0.70	J	NAT	20	U	ro	VT	N	-	25	Very Close
B_009	0.70	0.70	B	NAT	0	P	ro	VT	N	-	15	Extremely Close
B_010	0.75	0.75	B	NAT	0	P	ro	VT	N	Yellow stains	50	Very Close
NR_001	0.75	0.80	NR	DI	0	U	ro	VT	N	AZCL	0	Extremely Close
B 011	0.80	0.80	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B 012	0.85	0.85	B	NAT	0	U	ro	VT	N	-	50	Very Close
B_013	0.92	0.92	B	NAT	0	U	ro	VT	N	-	70	Close
B_014	0.95	0.95	B	NAT	0	P	ro	VT	N	-	30	Very Close
NI_003	0.95	1.10	NI	NAT	0	-	-	-	-	-	0	Extremely Close
NR_002	1.10	1.80	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NR 003	1.80	2.80	NR	NAT	0	-	-	-	-	No recovery	0	Extremely Close
NR 004	2.80	3.30	NR	NAT	0	-	-	-	-	No recovery	0	Extremely Close
NR_005	3.30	3.50	NR	NAT	0	-	-	-	-	No recovery	0	Extremely Close
FR_001	3.50	3.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_015	3.57	3.57	B	NAT	0	U	ro	VT	N	Brownish yellow (10YR 6/8) stains	70	Close
B_016	3.66	3.66	B	NAT	0	U	ro	VT	N	Brownish yellow (10YR 6/8) stains	90	Close
B 017	3.74	3.74	B	NAT	0	U	ro	VT	N	-	80	Close
J 003	3.74	3.79	J	NAT	90	U	ro	VT	N	Brownish yellow (10YR 6/8) stains	-	-
J_004	3.74	3.77	J	NAT	20	P	ro	VT	N	-	-	-
NI_004	3.80	3.90	NI	NAT	0	-	-	-	-	Destructed CLAY with thin laminated ywllowish red (5YR 5/8) silt	-	-
B_018	3.90	3.90	B	NAT	0	P	ro	VT	N	-	145	Close
B_019	3.95	4.00	B	NAT	20	P	ro	VT	N	Brownish yellow (10YR 6/8) stains	75	Close
B 020	4.00	4.00	B	NAT	0	U	ro	VT	N	-	25	Very Close
B 021	4.05	4.05	B	NAT	0	U	ro	VT	N	-	50	Very Close
J_005	4.06	4.18	J	NAT	50	U	ro	VT	N	-	-	-
B_022	4.24	4.24	B	NAT	0	P	ro	VT	N	-	190	Close
B_023	4.28	4.28	B	NAT	0	P	ro	VT	N	-	40	Very Close
B_024	4.37	4.37	B	NAT	0	P	ro	VT	N	-	90	Close
J 006	4.37	4.51	J	NAT	90	U	ro	VT	N	-	-	-
NI 005	4.42	4.45	NI	NAT	0	-	-	-	-	-	-	-
B_025	4.45	4.45	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_026	4.51	4.51	B	NAT	0	P	ro	VT	N	-	60	Very Close
FR_002	4.55	4.55	FR	DI	0	-	-	-	-	-	40	Very Close
NR_006	4.55	5.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
B 027	5.00	5.00	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
NI 006	5.04	5.07	NI	NAT	0	U	ro	VT	N	-	40	Very Close
B_028	5.07	5.07	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_029	5.09	5.09	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
B_030	5.15	5.15	B	NAT	0	P	ro	VT	N	-	60	Close
J_007	5.15	5.29	J	NAT	90	U	ro	VT	N	-	-	-
B 031	5.21	5.21	B	NAT	0	U	ro	VT	N	-	-	-
B 032	5.30	5.30	B	NAT	0	P	ro	VT	N	-	90	Close
B_033	5.36	5.36	B	NAT	0	U	ro	VT	N	-	60	Close
B_034	5.38	5.38	B	NAT	0	P	ro	VT	N	-	20	Extremely Close
B_035	5.44	5.44	B	NAT	0	P	ro	VT	N	-	60	Close
B_036	5.53	5.53	B	NAT	0	P	ro	VT	N	-	90	Close
B 037	5.62	5.62	B	NAT	0	P	ro	VT	N	-	90	Close
J 008	5.63	5.70	J	NAT	70	U	ro	VT	N	-	45	Very Close
FR_003	5.70	5.70	FR	DI	0	-	-	-	-	-	35	Very Close
NR_007	5.70	6.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_004	6.00	6.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_005	6.05	6.05	FR	DI	0	-	-	-	-	-	50	Very Close
B 038	6.15	6.15	B	NAT	0	U	ro	VT	N	-	100	Close
J 009	6.15	6.20	J	NAT	0	U	ro	VT	N	-	25	Very Close
NI_007	6.15	6.20	NI	NAT	0	-	-	-	-	-	25	Very Close
B_039	6.20	6.20	B	NAT	0	S	ro	VT	N	-	0	Extremely Close
J_010	6.20	6.35	J	NAT	90	S	ro	VT	N	-	-	-
J_011	6.20	6.22	J	NAT	40	S	ro	VT	N	-	-	-
J 012	6.23	6.23	J	NAT	0	S	ro	VT	N	-	20	Very Close
J 013	6.26	6.26	J	NAT	0	S	ro	VT	N	-	30	Very Close
J_014	6.29	6.30	J	NAT	10	S	ro	VT	N	-	35	Very Close
J_015	6.31	6.31	J	NAT	0	S	ro	VT	N	-	15	Extremely Close
J_016	6.31	6.33	J	NAT	20	S	ro	VT	N	-	10	Extremely Close
B_040	6.35	6.35	B	NAT	0	S	ro	VT	N	-	30	Very Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
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J : joint
NI : non intact
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\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH04

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
J_017	6.35	6.47	J	NAT	90	S	ro	VT	N	-	-	-
B_041	6.44	6.44	B	NAT	0	P	ro	VT	N	-	-	-
FR_006	6.55	6.55	FR	DI	0	-	-	-	-	-	110	Close
J_018	6.60	6.64	J	NAT	10	U	ro	VT	N	-	70	Close
J_019	6.63	6.65	J	NAT	50	U	ro	VT	N	-	20	Very Close
B_042	6.65	6.65	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B_043	6.80	6.80	B	NAT	0	U	ro	VT	N	-	150	Close
FR_007	6.85	6.85	FR	DI	0	-	-	-	-	-	50	Very Close
NR_008	6.85	7.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_008	7.00	7.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_020	7.07	7.25	J	NAT	65	-	-	-	-	-	160	Close
FR_009	7.10	7.10	FR	DI	0	-	-	-	-	-	60	Close
B_044	7.28	7.28	B	NAT	0	P	ro	VT	N	-	180	Close
B_045	7.42	7.42	B	NAT	0	P	ro	VT	N	-	140	Close
B_046	7.51	7.51	B	NAT	0	P	ro	VT	N	-	90	Close
J_021	7.51	7.82	J	NAT	90	U	ro	VT	N	-	-	-
NI_008	7.60	7.74	NI	NAT	0	-	-	-	-	-	-	-
B_047	7.70	7.70	B	NAT	0	U	-	-	-	-	40	Very Close
B_048	7.74	7.74	B	NAT	0	P	ro	O	Y	clay	40	Very Close
J_022	7.78	7.81	J	NAT	20	U	ro	VT	N	-	55	Very Close
B_049	7.90	7.90	B	NAT	0	U	sm	O	Y	clay	105	Close
J_023	7.90	7.99	J	NAT	60	U	ro	VT	N	-	45	Very Close
J_024	7.92	7.99	J	NAT	35	U	ro	VT	N	-	10	Extremely Close
J_025	7.94	7.97	J	NAT	20	U	ro	VT	N	-	0	Extremely Close
FR_010	8.05	8.05	FR	DI	0	-	-	-	-	-	95	Close
NR_009	8.05	8.20	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_011	8.20	8.20	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_050	8.32	8.32	B	NAT	0	P	ro	VT	N	-	120	Close
B_051	8.41	8.41	B	NAT	0	P	ro	VT	N	-	90	Close
B_052	8.56	8.56	B	NAT	0	P	ro	VT	N	-	150	Close
FR_012	8.69	8.69	FR	DI	0	-	-	-	-	-	130	Close
B_053	8.75	8.75	B	NAT	0	P	ro	VT	N	-	60	Close
B_054	8.79	8.79	B	NAT	0	P	ro	VT	N	-	40	Very Close
B_055	8.92	8.92	B	NAT	0	P	ro	VT	N	-	130	Close
B_056	9.04	9.04	B	NAT	0	U	ro	VT	N	-	120	Close
J_026	9.04	9.12	J	NAT	80	U	ro	VT	N	-	40	Very Close
NI_009	9.12	9.20	NI	NAT	0	-	-	-	-	destructured	40	Very Close
B_057	9.20	9.20	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_013	9.28	9.28	FR	DI	0	-	-	-	-	-	80	Close
FR_014	9.30	9.30	FR	DI	0	-	-	-	-	-	20	Very Close
NR_010	9.30	9.70	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_015	9.70	9.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_016	9.80	9.80	FR	DI	0	-	-	-	-	-	100	Close
FR_017	9.90	9.90	FR	DI	0	-	-	-	-	-	100	Close
FR_018	10.02	10.02	FR	DI	0	-	-	-	-	-	120	Close
B_058	10.15	10.15	B	NAT	0	U	ro	PO	N	-	130	Close
B_059	10.22	10.22	B	NAT	0	S	ro	T	N	-	70	Close
B_060	10.28	10.28	B	NAT	0	U	ro	PO	N	-	60	Very Close
FR_019	10.38	10.38	FR	DI	0	-	-	-	-	-	100	Close
FR_020	10.49	10.49	FR	DI	0	-	-	-	-	-	110	Close
B_061	10.59	10.59	B	NAT	0	P	ro	T	N	stained orange; stained pink	100	Close
FR_021	10.68	10.68	FR	DI	0	-	-	-	-	-	90	Close
FR_022	10.76	10.76	FR	DI	0	-	-	-	-	-	80	Close
FR_023	10.85	10.85	FR	DI	0	-	-	-	-	-	90	Close
NI_010	10.85	11.01	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
NI_011	11.01	11.15	NI	NAT	0	-	-	-	-	destructured	90	Close
NR_011	11.15	11.20	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_024	11.20	11.20	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_025	11.33	11.33	FR	DI	0	-	-	-	-	-	130	Close
I_001	11.33	11.44	I	NAT	60	-	-	-	-	possibly drilling induced	55	Very Close
FR_026	11.44	11.44	FR	DI	0	-	-	-	-	-	55	Very Close
I_002	11.44	11.55	I	NAT	60	-	-	-	-	possibly drilling induced	55	Very Close
B_062	11.55	11.55	B	NAT	0	S	ro	T	N	-	55	Very Close
B_063	11.64	11.64	B	NAT	0	S	ro	PO	N	-	90	Close
B_064	11.72	11.72	B	NAT	0	P	ro	T	N	-	80	Close
B_065	11.84	11.84	B	NAT	0	S	ro	O	N	stained orange	120	Close
B_066	11.93	11.93	B	NAT	0	S	ro	MW	N	-	90	Close
B_067	12.03	12.03	B	NAT	0	S	ro	O	N	-	100	Close
FR_027	12.11	12.11	FR	DI	0	-	-	-	-	-	80	Close
FR_028	12.15	12.15	FR	DI	0	-	-	-	-	-	40	Very Close
B_068	12.23	12.23	B	NAT	0	U	ro	T	N	stained orange	80	Close
FR_029	12.37	12.37	FR	DI	0	-	-	-	-	-	140	Close
B_069	12.47	12.47	B	NAT	0	P	ro	T	N	-	100	Close
FR_030	12.57	12.57	FR	DI	0	-	-	-	-	-	100	Close
FR_031	12.63	12.63	FR	DI	0	-	-	-	-	-	60	Close

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Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH04

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_032	12.70	12.70	FR	DI	0	-	-	-	-	-	70	Close
FR_033	12.70	12.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_034	12.86	12.86	FR	DI	0	-	-	-	-	-	160	Close
FR_035	12.96	12.96	FR	DI	0	-	-	-	-	-	100	Close
B_070	13.07	13.07	B	NAT	0	P	ro	T	N	-	110	Close
B_071	13.12	13.12	B	NAT	0	P	ro	VT	N	-	50	Very Close
J_027	13.12	13.26	J	NAT	70	P	ro	O	N	-	70	Close
B_072	13.18	13.18	B	NAT	0	S	ro	O	Y	fine sandy gravel	10	Extremely Close
B_073	13.26	13.26	B	NAT	0	U	ro	O	Y	fine sandy gravel	80	Close
NI_012	13.26	13.58	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_074	13.67	13.68	B	NAT	10	U	ro	PO	N	stained orange; stained pink	95	Close
B_075	13.68	13.68	B	NAT	0	S	ro	T	N	-	5	Extremely Close
B_076	13.69	13.70	B	NAT	10	P	ro	PO	Y	fine sandy gravel; stained orange	15	Extremely Close
B_077	13.82	13.82	B	NAT	0	U	ro	O	N	stained pink	125	Close
FR_036	13.93	13.93	FR	DI	0	-	-	-	-	shoe recovery	110	Close
FR_037	14.10	14.10	FR	DI	0	-	-	-	-	shoe recovery	170	Close
NR_012	14.10	14.20	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_038	14.20	14.20	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_039	14.25	14.25	FR	DI	0	-	-	-	-	-	50	Very Close
NI_013	14.25	14.65	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_078	14.65	14.65	B	NAT	0	S	ro	T	Y	sandy silt	0	Extremely Close
NI_014	14.65	14.70	NI	DI	0	-	-	-	-	destructured, possibly drilling induced	0	Extremely Close
B_079	14.70	14.70	B	NAT	0	P	ro	PO	Y	silty sand	0	Extremely Close
FR_040	14.80	14.81	FR	DI	10	-	-	-	-	-	105	Close
FR_041	14.89	14.90	FR	DI	10	-	-	-	-	-	90	Close
FR_042	14.98	14.98	FR	DI	0	-	-	-	-	-	85	Close
FR_043	15.07	15.07	FR	DI	0	-	-	-	-	-	90	Close
FR_044	15.15	15.15	FR	DI	0	-	-	-	-	-	80	Close
NR_013	15.15	15.70	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_045	15.70	15.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_015	15.70	15.75	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_046	15.75	15.75	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_080	15.80	15.80	B	NAT	0	P	ro	PO	Y	silty sand	50	Very Close
B_081	15.87	15.87	B	NAT	0	U	ro	T	N	stained pink	70	Close
B_082	15.93	15.93	B	NAT	0	U	ro	T	Y	silty sand	60	Close
FR_047	16.01	16.01	FR	DI	0	-	-	-	-	-	80	Close
FR_048	16.13	16.13	FR	DI	0	-	-	-	-	-	120	Close
FR_049	16.23	16.23	FR	DI	0	-	-	-	-	-	100	Close
B_083	16.33	16.35	B	NAT	20	S	ro	T	N	-	110	Close
B_084	16.45	16.46	B	NAT	10	P	ro	PO	Y	fine sandy gravel; stained orange	115	Close
FR_050	16.60	16.60	FR	DI	0	-	-	-	-	-	145	Close
FR_051	16.67	16.67	FR	DI	0	-	-	-	-	-	70	Close
FR_052	16.70	16.70	FR	DI	0	-	-	-	-	-	30	Very Close
FR_053	16.75	16.75	FR	DI	0	-	-	-	-	-	50	Very Close
FR_054	16.80	16.81	FR	DI	10	-	-	-	-	-	55	Very Close
B_085	16.91	16.91	B	NAT	0	P	ro	PO	N	-	105	Close
NI_016	16.91	16.94	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_055	16.94	16.94	FR	DI	0	-	-	-	-	shoe recovery	0	Extremely Close
FR_056	17.00	17.00	FR	DI	0	-	-	-	-	shoe recovery	60	Very Close
NR_014	17.00	17.20	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_057	17.20	17.20	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_017	17.20	17.24	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_086	17.24	17.24	B	NAT	0	U	ro	PO	Y	sandy silt	0	Extremely Close
FR_058	17.32	17.32	FR	DI	0	-	-	-	-	-	80	Close
NI_018	17.32	17.39	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_059	17.39	17.39	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_060	17.44	17.44	FR	DI	0	-	-	-	-	-	50	Very Close
B_087	17.52	17.52	B	NAT	0	P	ro	PO	Y	silty sand	80	Close
NI_019	17.52	17.57	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_088	17.57	17.57	B	NAT	0	P	ro	T	N	-	0	Extremely Close
B_089	17.67	17.67	B	NAT	0	S	ro	PO	Y	fine sandy gravel	100	Close
B_090	17.74	17.76	B	NAT	20	S	ro	PO	Y	fine sandy gravel; stained orange	80	Close
NI_020	17.74	17.78	NI	DI	0	-	-	-	-	possibly drilling induced	10	Extremely Close
FR_061	17.77	17.78	FR	DI	10	-	-	-	-	-	5	Extremely Close
J_028	17.78	17.88	J	NAT	80	P	ro	-	-	-	55	Very Close
B_091	17.89	17.93	B	NAT	0	P	ro	MW	Y	fine to coarse sandy gravel	80	Close
J_029	18.02	18.07	J	NAT	70	P	ro	-	-	-	135	Close
B_092	18.07	18.07	B	NAT	0	P	ro	O	N	-	25	Very Close
B_093	18.13	18.13	B	NAT	0	S	ro	PO	N	-	60	Very Close
B_094	18.21	18.24	B	NAT	0	P	ro	MW	Y	medium sandy gravel	95	Close
FR_062	18.33	18.33	FR	DI	0	-	-	-	-	-	105	Close
FR_063	18.48	18.48	FR	DI	0	-	-	-	-	-	150	Close
FR_064	18.55	18.55	FR	DI	0	-	-	-	-	-	70	Close
NR_015	18.60	18.60	NR	DI	0	-	-	-	-	-	50	Very Close
NR_016	18.60	18.70	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close

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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH04

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_065	18.70	18.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_021	18.70	18.97	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_066	18.97	18.97	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_030	18.97	19.16	J	NAT	80	-	-	-	-	stained orange	95	Close
FR_067	19.16	19.16	FR	DI	0	-	-	-	-	-	95	Close
J_031	19.16	19.29	J	NAT	90	-	-	-	-	-	-	-
FR_068	19.29	19.29	FR	DI	0	-	-	-	-	-	-	-
FR_069	19.33	19.33	FR	DI	0	-	-	-	-	-	40	Very Close
B_095	19.42	19.43	B	NAT	10	P	ro	PO	Y	fine sandy gravel	95	Close
B_096	19.50	19.54	B	NAT	0	P	ro	MW	Y	fine to coarse sandy gravel	95	Close
J_032	19.54	19.76	J	NAT	80	-	-	-	-	stained orange; stained pink	130	Close
B_097	19.62	19.62	B	NAT	0	P	ro	T	N	-	30	Very Close
B_098	19.64	19.64	B	NAT	0	U	ro	PO	N	-	20	Extremely Close
FR_070	19.76	19.76	FR	DI	0	-	-	-	-	shoe recovery	120	Close
J_033	19.76	19.81	J	NAT	90	-	-	T	-	-	-	-
FR_071	20.00	20.00	FR	DI	0	-	-	-	-	shoe recovery	-	-
NR_017	20.00	20.20	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_001	1.50	1.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_001	1.56	1.56	B	NAT	0	P	ro	VT	N	-	60	Close
B_002	1.62	1.62	B	NAT	0	P	ro	VT	N	-	60	Close
J_001	1.65	1.66	J	NAT	15	P	ro	VT	N	-	-	-
J_002	1.66	1.67	J	NAT	15	P	ro	VT	N	-	45	Very Close
J_003	1.72	1.73	J	NAT	20	P	ro	VT	N	-	60	Close
J_004	1.72	1.77	J	NAT	90	P	ro	VT	N	-	-	-
J_005	1.77	1.80	J	NAT	20	P	ro	VT	N	-	-	-
J_006	1.79	1.83	J	NAT	40	U	ro	VT	N	-	25	Very Close
J_007	1.83	1.85	J	NAT	20	P	ro	VT	N	-	30	Very Close
B_003	1.86	1.86	B	NAT	0	U	ro	VT	N	-	20	Very Close
B_004	1.90	1.90	B	NAT	0	U	ro	VT	N	-	40	Very Close
J_008	1.91	1.93	J	NAT	20	U	ro	VT	N	-	20	Very Close
J_009	1.93	1.96	J	NAT	20	U	ro	VT	N	-	25	Very Close
J_010	1.98	2.00	J	NAT	20	P	ro	VT	N	-	45	Very Close
J_011	2.00	2.02	J	NAT	20	U	ro	VT	N	-	20	Extremely Close
J_012	2.03	2.04	J	NAT	20	U	ro	VT	N	-	25	Very Close
J_013	2.04	2.06	J	NAT	20	U	ro	VT	N	-	15	Extremely Close
B_005	2.11	2.11	B	NAT	0	U	ro	VT	N	-	60	Close
J_014	2.15	2.18	J	NAT	30	U	ro	VT	N	-	55	Very Close
J_015	2.19	2.22	J	NAT	15	S	ro	VT	N	-	40	Very Close
J_016	2.22	2.24	J	NAT	15	S	ro	VT	N	-	25	Very Close
B_006	2.26	2.26	B	NAT	0	U	ro	VT	N	-	30	Very Close
J_017	2.30	2.33	J	NAT	0	U	ro	VT	N	-	55	Very Close
FR_002	2.35	2.35	FR	DI	0	-	-	-	-	-	35	Very Close
NR_001	2.35	2.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_003	4.00	4.00	FR	DI	0	-	-	-	-	-	1500	Wide
B_007	4.03	4.16	B	NAT	20	P	ro	VT	N	-	95	Close
B_008	4.05	4.05	B	NAT	0	P	ro	VT	N	-	45	Very Close
B_009	4.09	4.10	B	NAT	10	U	ro	VT	N	-	45	Very Close
B_010	4.18	4.19	B	NAT	10	U	ro	VT	N	-	-	-
B_011	4.21	4.21	B	NAT	0	U	ro	VT	N	-	115	Close
J_018	4.21	4.27	J	NAT	50	U	ro	VT	N	-	30	Very Close
B_012	4.28	4.28	B	NAT	0	S	ro	VT	N	-	40	Very Close
B_013	4.29	4.29	B	NAT	0	S	ro	VT	N	-	10	Extremely Close
B_014	4.33	4.33	B	NAT	0	P	ro	VT	N	-	-	-
J_019	4.39	4.40	J	NAT	10	P	ro	VT	N	-	105	Close
J_020	4.40	4.41	J	NAT	0	P	ro	VT	N	-	10	Extremely Close
B_015	4.43	4.43	B	NAT	0	P	ro	VT	N	-	25	Very Close
B_016	4.47	4.47	B	NAT	0	P	ro	VT	N	-	40	Very Close
J_021	4.47	4.54	J	NAT	70	S	ro	VT	N	-	35	Very Close
J_022	4.51	4.51	J	NAT	0	S	ro	VT	N	-	5	Extremely Close
J_023	4.52	4.52	J	NAT	0	S	ro	VT	N	-	10	Extremely Close
B_017	4.54	4.54	B	NAT	0	P	ro	VT	N	-	20	Very Close
B_018	4.59	4.60	B	NAT	10	U	ro	VT	N	-	55	Very Close
B_019	4.59	4.60	B	NAT	10	U	ro	VT	N	-	0	Extremely Close
B_020	4.67	4.69	B	NAT	10	U	ro	VT	N	-	85	Close
J_024	4.71	4.72	J	NAT	20	U	ro	VT	N	-	35	Very Close
B_021	4.71	4.73	B	NAT	10	U	ro	VT	N	-	5	Extremely Close
B_022	4.76	4.79	B	NAT	20	S	ro	VT	N	-	55	Very Close
FR_004	4.83	4.83	FR	DI	0	-	-	-	-	shoe recovery	55	Very Close
FR_005	4.84	4.84	FR	DI	0	-	-	-	-	shoe recovery	10	Extremely Close
FR_006	4.85	4.85	FR	DI	0	-	-	-	-	shoe recovery	10	Extremely Close
FR_007	4.90	4.90	FR	DI	0	-	-	-	-	shoe recovery	50	Very Close
NR_002	4.90	4.94	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_008	6.60	6.60	FR	DI	0	-	-	-	-	-	1660	Wide
B_023	6.67	6.67	B	NAT	0	U	sm	T	Y	silty sand	70	Close
FR_009	6.72	6.72	FR	DI	0	-	-	-	-	-	50	Very Close
FR_010	6.80	6.80	FR	DI	0	-	-	-	-	-	80	Close
FR_011	6.86	6.86	FR	DI	0	-	-	-	-	-	60	Close
B_024	6.92	6.92	B	NAT	0	U	sm	T	N	-	60	Very Close
FR_012	7.00	7.00	FR	DI	0	-	-	-	-	-	80	Close
FR_013	7.10	7.10	FR	DI	0	-	-	-	-	-	100	Close
NR_003	7.10	7.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_014	7.50	7.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_001	7.50	8.00	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_025	8.00	8.00	B	NAT	0	P	sm	VT	N	-	0	Extremely Close
FR_015	8.05	8.05	FR	DI	0	-	-	-	-	-	50	Very Close
FR_016	8.30	8.30	FR	DI	0	-	-	-	-	-	250	Medium
FR_017	8.40	8.40	FR	DI	0	-	-	-	-	-	100	Close
FR_018	8.45	8.45	FR	DI	0	-	-	-	-	-	50	Very Close
FR_019	8.50	8.50	FR	DI	0	-	-	-	-	-	50	Very Close
FR_020	8.50	8.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_021	8.59	8.59	FR	DI	0	-	-	-	-	-	90	Close
FR_022	8.64	8.64	FR	DI	0	-	-	-	-	-	50	Very Close

Notes:
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J : joint
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\- : *no data*

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Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

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Roughness - small
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Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
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Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH07

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
NI_002	8.64	8.66	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_026	8.66	8.66	B	NAT	0	-	-	-	-	-	0	Extremely Close
FR_023	8.75	8.78	FR	DI	60	-	-	-	-	-	105	Close
FR_024	8.78	8.78	FR	DI	0	-	-	-	-	-	15	Extremely Close
B_027	8.92	8.92	B	NAT	0	U	ro	T	Y	silty sand	140	Close
B_028	8.94	8.94	B	NAT	0	U	sm	T	Y	silty sand	20	Extremely Close
NI_003	8.98	8.98	NI	DI	0	-	-	-	-	possibly drilling induced	40	Very Close
J_025	9.01	9.05	J	NAT	80	-	-	-	-	-	50	Very Close
FR_025	9.05	9.05	FR	DI	0	-	-	-	-	-	20	Extremely Close
B_029	9.15	9.15	B	NAT	0	U	ro	VT	N	-	100	Close
NI_004	9.15	9.18	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_030	9.18	9.18	B	NAT	0	U	sm	VT	N	-	0	Extremely Close
FR_026	9.24	9.24	FR	DI	0	-	-	-	-	-	60	Close
B_031	9.29	9.29	B	NAT	0	-	-	-	-	-	50	Very Close
FR_027	9.31	9.31	FR	DI	0	-	-	-	-	-	20	Very Close
NI_005	9.31	9.44	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_028	9.44	9.44	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_029	9.50	9.50	FR	DI	0	-	-	-	-	-	60	Close
FR_030	9.50	9.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_032	9.55	9.55	B	NAT	0	P	sm	T	Y	sandy silt	50	Very Close
NI_006	9.55	9.96	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_033	9.96	9.96	B	NAT	0	P	ro	T	N	-	0	Extremely Close
NI_007	9.96	10.16	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_034	10.16	10.16	B	NAT	0	U	sm	PO	Y	sandy silt	0	Extremely Close
B_035	10.23	10.23	B	NAT	0	U	ro	VT	N	-	70	Close
NI_008	10.23	10.35	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_036	10.35	10.35	B	NAT	0	U	ro	T	Y	silty sand	0	Extremely Close
FR_031	10.46	10.46	FR	DI	0	-	-	-	-	-	110	Close
FR_032	10.50	10.50	FR	DI	0	-	-	-	-	-	40	Very Close
FR_033	10.50	10.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_034	10.58	10.58	FR	DI	0	-	-	-	-	-	80	Close
FR_035	10.70	10.70	FR	DI	0	-	-	-	-	-	120	Close
J_026	10.70	10.77	J	NAT	60	P	ro	VT	N	-	35	Very Close
FR_036	10.77	10.77	FR	DI	0	-	-	-	-	-	35	Very Close
FR_037	10.80	10.80	FR	DI	0	-	-	-	-	-	30	Very Close
J_027	10.83	10.92	J	NAT	60	U	ro	VT	N	-	75	Close
B_037	10.92	10.92	B	NAT	0	U	sm	T	N	-	45	Very Close
B_038	11.00	11.00	B	NAT	0	U	ro	T	N	-	80	Close
B_039	11.07	11.07	B	NAT	0	U	sm	VT	N	-	70	Close
B_040	11.13	11.13	B	NAT	0	U	sm	VT	N	-	60	Close
FR_038	11.16	11.16	FR	DI	0	-	-	-	-	-	30	Very Close
FR_039	11.21	11.21	FR	DI	0	-	-	-	-	-	50	Very Close
B_041	11.30	11.30	B	NAT	0	P	sm	VT	N	-	90	Close
J_028	11.30	11.40	J	NAT	90	P	ro	VT	N	-	-	-
B_042	11.37	11.37	B	NAT	0	P	sm	VT	N	-	-	-
B_043	11.39	11.39	B	NAT	0	P	sm	VT	N	-	20	Very Close
B_044	11.41	11.41	B	NAT	0	U	sm	VT	N	-	20	Extremely Close
J_029	11.41	11.48	J	NAT	70	U	sm	VT	N	-	35	Very Close
B_045	11.44	11.44	B	NAT	0	U	sm	VT	N	-	5	Extremely Close
FR_040	11.48	11.48	FR	DI	0	-	-	-	-	-	40	Very Close
B_046	11.50	11.50	B	NAT	0	-	-	-	-	-	20	Extremely Close
J_030	11.50	11.57	J	NAT	60	U	sm	VT	N	-	35	Very Close
B_047	11.57	11.57	B	NAT	0	-	-	-	-	-	35	Very Close
J_031	11.60	11.64	J	NAT	60	U	sm	VT	N	-	50	Very Close
FR_041	11.64	11.64	FR	DI	0	-	-	-	-	-	20	Extremely Close
NI_009	11.64	11.73	NI	DI	0	-	-	-	-	possibly drilling induced	90	Close
FR_042	11.73	11.73	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_043	11.78	11.78	FR	DI	0	-	-	-	-	-	50	Very Close
NI_010	11.78	11.84	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_044	11.84	11.84	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_045	11.90	11.90	FR	DI	0	-	-	-	-	-	60	Close
FR_046	11.90	12.00	FR	-	0	-	-	-	-	AZCL	50	Very Close
NI_011	12.00	12.03	NI	DI	0	-	-	-	-	possibly drilling induced	50	Very Close
FR_047	12.03	12.03	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_048	12.06	12.06	B	NAT	0	P	ro	VT	N	-	30	Very Close
NI_012	12.06	12.18	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_049	12.18	12.18	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_050	12.28	12.28	B	NAT	0	U	ro	T	N	-	100	Close
B_051	12.35	12.35	B	NAT	0	P	sm	MW	Y	sandy silt	70	Close
NI_013	12.35	13.00	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_052	13.00	13.00	B	NAT	0	U	sm	MW	Y	silty sand	0	Extremely Close
FR_048	13.07	13.07	FR	DI	0	-	-	-	-	-	70	Close
NI_014	13.07	13.09	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_049	13.09	13.09	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_050	13.16	13.19	FR	DI	20	-	-	-	-	-	85	Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

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VT : very tight (< 0.10)
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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH07

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_053	13.25	13.25	B	NAT	5	P	ro	W	N	-	75	Close
FR_051	13.33	13.33	FR	DI	0	-	-	-	-	-	80	Close
FR_052	13.40	13.40	FR	DI	0	-	-	-	-	-	70	Close
NI_015	13.40	13.43	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_053	13.43	13.43	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_054	13.50	13.50	FR	DI	0	-	-	-	-	-	70	Close
FR_055	13.50	13.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_054	13.57	13.57	B	NAT	0	S	sm	VT	N	-	70	Close
NI_016	13.57	13.65	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_056	13.65	13.65	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_032	13.65	13.72	J	NAT	80	S	ro	VT	N	-	35	Very Close
FR_057	13.72	13.72	FR	DI	0	-	-	-	-	-	35	Very Close
NI_017	13.72	13.78	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
B_055	13.78	13.78	B	NAT	0	-	-	-	-	-	0	Extremely Close
NI_018	13.78	14.07	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_056	14.07	14.07	B	NAT	0	-	-	-	-	-	0	Extremely Close
FR_058	14.13	14.13	FR	DI	0	-	-	-	-	-	60	Close
NI_019	14.13	14.24	NI	-	0	-	-	-	-	-	0	Extremely Close
B_057	14.24	14.24	B	NAT	0	U	sm	T	Y	silty sand	0	Extremely Close
B_058	14.36	14.36	B	NAT	0	S	sm	VT	N	-	120	Close
NI_020	14.36	14.50	NI	-	0	-	-	-	-	-	0	Extremely Close
B_059	14.50	14.50	B	NAT	0	S	ro	VT	N	-	0	Extremely Close
FR_059	14.63	14.63	FR	DI	0	-	-	-	-	-	130	Close
FR_060	14.67	14.67	FR	DI	0	-	-	-	-	-	40	Very Close
B_060	14.69	14.69	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
FR_061	14.72	14.72	FR	DI	0	-	-	-	-	-	30	Very Close
FR_062	14.77	14.77	FR	DI	0	-	-	-	-	-	50	Very Close
NR_004	14.80	15.00	NR	DI	0	-	-	-	-	AZCL	30	Very Close
FR_063	15.00	15.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_021	15.00	15.05	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_064	15.05	15.05	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_061	15.11	15.11	B	NAT	0	S	sm	T	Y	sand	60	Very Close
B_062	15.19	15.19	B	NAT	0	U	ro	VT	N	-	80	Close
NI_022	15.19	15.44	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_063	15.44	15.44	B	NAT	0	S	sm	VT	N	-	0	Extremely Close
B_064	15.50	15.52	B	NAT	20	S	sm	MW	Y	sandy silt	70	Close
FR_065	15.58	15.58	FR	DI	0	-	-	-	-	-	70	Close
B_065	15.66	15.66	B	NAT	0	S	ro	VT	N	-	80	Close
FR_066	15.80	15.80	FR	DI	0	-	-	-	-	-	140	Close
FR_067	15.91	15.91	FR	DI	0	-	-	-	-	-	110	Close
FR_068	15.98	15.98	FR	DI	0	-	-	-	-	-	70	Close
FR_069	16.03	16.03	FR	DI	0	-	-	-	-	-	50	Very Close
FR_070	16.09	16.09	FR	DI	0	-	-	-	-	-	60	Very Close
NI_023	16.09	16.10	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_071	16.10	16.10	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_005	16.10	16.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_072	16.50	16.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_073	16.56	16.56	FR	DI	0	-	-	-	-	-	60	Very Close
FR_074	16.60	16.60	FR	DI	0	-	-	-	-	-	40	Very Close
NI_024	16.60	16.64	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_075	16.64	16.64	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_066	16.69	16.69	B	NAT	0	P	sm	T	Y	silt	50	Very Close
FR_076	16.76	16.76	FR	DI	0	-	-	-	-	-	70	Close
NI_025	16.76	16.79	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_077	16.79	16.79	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_078	16.84	16.84	FR	DI	0	-	-	-	-	-	50	Very Close
FR_079	16.97	16.97	FR	DI	0	-	-	-	-	-	130	Close
FR_080	17.04	17.04	FR	DI	0	-	-	-	-	-	70	Close
B_067	17.10	17.10	B	NAT	0	P	ro	VT	N	-	60	Close
NI_026	17.10	17.36	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_068	17.36	17.36	B	NAT	0	P	sm	VT	N	-	0	Extremely Close
NI_027	17.36	17.50	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_081	17.50	17.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_082	17.59	17.59	FR	DI	0	-	-	-	-	-	90	Close
I_001	17.72	17.72	I	NAT	0	-	-	-	-	-	130	Close
FR_083	17.80	17.80	FR	DI	0	-	-	-	-	-	80	Close
FR_084	17.90	17.90	FR	DI	0	-	-	-	-	-	100	Close
NR_006	17.90	18.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_085	18.00	18.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_086	18.11	18.11	FR	DI	0	-	-	-	-	-	110	Close
NI_028	18.11	18.16	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_087	18.16	18.16	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_033	18.30	18.40	J	NAT	50	U	ro	VT	N	-	190	Close
B_069	18.35	18.35	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
J_034	18.36	18.51	J	NAT	50	U	ro	PO	N	intersecting	85	Close

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Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH07

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
NI_029	18.43	18.55	NI	-	0	-	-	-	-	-	5	Extremely Close
J_035	18.45	18.49	J	NAT	30	U	ro	VT	N	-	80	Close
J_036	18.46	18.66	J	NAT	90	U	ro	VT	N	-	-	-
J_037	18.49	18.83	J	NAT	90	U	ro	VT	N	-	-	-
J_038	18.67	18.88	J	NAT	70	U	ro	VT	N	-	-	-
J_039	18.68	18.84	J	NAT	70	U	ro	VT	N	-	15	Extremely Close
J_040	18.68	18.87	J	NAT	70	U	ro	VT	N	-	15	Extremely Close
J_041	18.85	18.90	J	NAT	40	U	ro	VT	N	-	100	Close
FR_088	18.93	18.93	FR	DI	0	-	-	-	-	-	55	Very Close
J_042	19.01	19.06	J	NAT	30	U	ro	VT	N	-	105	Close
J_043	19.05	19.09	J	NAT	50	U	ro	VT	N	-	35	Very Close
B_070	19.08	19.08	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
J_044	19.19	19.21	J	NAT	20	U	ro	O	N	-	120	Close
FR_089	19.23	19.23	FR	DI	0	-	-	-	-	-	30	Very Close
FR_090	19.40	19.40	FR	DI	0	-	-	-	-	-	170	Close
NR_007	19.40	19.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_091	19.50	19.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_030	19.50	19.75	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_092	19.75	19.75	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_071	19.81	19.81	B	NAT	0	U	ro	VT	N	-	60	Very Close
FR_093	19.86	19.86	FR	DI	0	-	-	-	-	-	50	Very Close
NI_031	19.86	19.96	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_094	19.96	19.96	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_095	20.01	20.01	FR	DI	0	-	-	-	-	-	50	Very Close
NI_032	20.01	20.07	NI	DI	0	-	-	-	-	possibly drilling induced	0	Extremely Close
FR_096	20.07	20.07	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_097	20.25	20.25	FR	DI	0	-	-	-	-	-	180	Close
FR_098	20.32	20.32	FR	DI	0	-	-	-	-	-	70	Close
NR_008	20.32	20.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
NR_001	0.00	0.05	NR	DI	0	-	-	-	-	AZCL top, possibly drilling induced	0	-
FR_001	0.05	0.05	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_001	0.10	0.10	B	NAT	0	S	ro	VT	N	-	50	Very Close
FR_002	0.17	0.17	FR	DI	0	-	-	-	-	-	70	Close
FR_003	0.35	0.35	FR	DI	0	-	-	-	-	-	180	Close
FR_004	0.52	0.52	FR	DI	0	-	-	-	-	-	170	Close
FR_005	0.67	0.67	FR	DI	0	-	-	-	-	-	145	Close
FR_006	0.75	0.78	FR	DI	10	-	-	-	-	-	100	Close
FR_007	1.00	1.00	FR	DI	0	-	-	-	-	-	235	Medium
FR_008	1.05	1.05	FR	DI	0	-	-	-	-	-	50	Very Close
B_002	1.07	1.09	B	NAT	10	S	ro	VT	N	-	30	Very Close
FR_009	1.20	1.25	FR	DI	20	-	-	-	-	-	145	Close
FR_010	1.35	1.35	FR	DI	0	-	-	-	-	-	125	Close
FR_011	1.47	1.47	FR	DI	0	-	-	-	-	-	120	Close
FR_012	1.58	1.58	FR	DI	0	-	-	-	-	-	110	Close
FR_013	1.69	1.69	FR	DI	0	-	-	-	-	-	110	Close
B_003	1.72	1.72	B	NAT	0	S	ro	VT	N	-	30	Very Close
J_001	1.72	2.00	J	NAT	90	S	ro	VT	N	-	-	-
FR_014	1.80	1.80	FR	DI	0	-	-	-	-	-	-	-
FR_015	1.90	1.90	FR	DI	0	-	-	-	-	-	100	Close
FR_016	2.00	2.00	FR	DI	0	-	-	-	-	-	100	Close
FR_017	2.00	2.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_018	2.07	2.07	FR	DI	0	-	-	-	-	-	70	Close
J_002	2.07	2.21	J	NAT	60	S	ro	VT	N	-	70	Close
FR_019	2.14	2.14	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_020	2.22	2.22	FR	DI	0	-	-	-	-	-	80	Close
FR_021	2.31	2.31	FR	DI	0	-	-	-	-	-	90	Close
FR_022	2.38	2.38	FR	DI	0	-	-	-	-	-	70	Close
FR_023	2.40	2.40	FR	DI	0	-	-	-	-	-	20	Very Close
B_004	2.52	2.52	B	NAT	0	S	ro	VT	N	-	120	Close
FR_024	2.59	2.60	FR	DI	10	-	-	-	-	-	75	Close
FR_025	2.75	2.75	FR	DI	0	-	-	-	-	-	155	Close
FR_026	2.86	2.90	FR	DI	30	-	-	-	-	-	130	Close
FR_027	3.00	3.00	FR	DI	0	-	-	-	-	-	120	Close
FR_028	3.05	3.05	FR	DI	0	-	-	-	-	-	50	Very Close
FR_029	3.12	3.12	FR	DI	0	-	-	-	-	-	70	Close
B_005	3.25	3.25	B	NAT	0	P	ro	T	N	-	130	Close
NI_001	3.25	3.50	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_006	3.50	3.50	B	NAT	0	S	ro	T	N	-	0	Extremely Close
B_007	3.52	3.52	B	NAT	0	P	ro	VT	N	-	20	Very Close
NI_002	3.52	3.55	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_030	3.55	3.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_031	3.64	3.64	FR	DI	0	-	-	-	-	-	90	Close
FR_032	3.82	3.82	FR	DI	0	-	-	-	-	-	180	Close
FR_033	3.91	3.91	FR	DI	0	-	-	-	-	-	90	Close
FR_034	4.10	4.10	FR	DI	0	-	-	-	-	-	190	Close
FR_035	4.15	4.15	FR	DI	0	-	-	-	-	-	50	Very Close
I_001	4.21	4.32	I	NAT	80	S	ro	VT	N	-	115	Close
B_008	4.35	4.35	B	NAT	0	P	ro	T	N	-	85	Close
NI_003	4.35	4.50	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
FR_036	4.50	4.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_037	4.57	4.57	FR	DI	0	-	-	-	-	-	70	Close
FR_038	4.65	4.65	FR	DI	0	-	-	-	-	-	80	Close
FR_039	4.73	4.73	FR	DI	0	-	-	-	-	-	80	Close
FR_040	4.77	4.77	FR	DI	0	-	-	-	-	-	40	Very Close
NI_004	4.77	4.84	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_041	4.84	4.84	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_042	4.92	4.92	FR	DI	0	-	-	-	-	-	80	Close
NI_005	4.92	4.99	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_043	4.99	4.99	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_044	5.04	5.04	FR	DI	0	-	-	-	-	-	50	Very Close
FR_045	5.15	5.15	FR	DI	0	-	-	-	-	-	110	Close
FR_046	5.20	5.20	FR	DI	0	-	-	-	-	-	50	Very Close
NR_002	5.20	5.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_047	5.50	5.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_048	5.60	5.60	FR	DI	0	-	-	-	-	-	100	Close
NI_006	5.60	5.85	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_009	5.85	5.85	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
NI_007	5.85	6.02	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
J_003	5.96	6.09	J	NAT	70	U	ro	VT	N	-	5	Extremely Close
FR_049	6.22	6.22	FR	DI	0	-	-	-	-	-	195	Close
FR_050	6.26	6.26	FR	DI	0	-	-	-	-	-	40	Very Close
B_010	6.32	6.32	B	NAT	0	P	ro	O	Y	silt	60	Close
FR_051	6.40	6.40	FR	DI	0	-	-	-	-	-	80	Close
NR_003	6.40	6.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH08

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_052	6.50	6.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_053	6.55	6.55	FR	DI	0	-	-	-	-	-	50	Very Close
FR_054	6.58	6.60	FR	DI	20	-	-	-	-	-	40	Very Close
FR 055	6.60	6.60	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR 056	6.60	6.61	FR	DI	20	-	-	-	-	-	5	Extremely Close
B_011	6.72	6.72	B	NAT	0	U	ro	VT	N	-	115	Close
NI_008	6.72	7.22	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_012	6.90	6.90	B	NAT	0	U	ro	VT	N	-	320	Medium
B_013	6.97	6.97	B	NAT	0	S	ro	VT	N	-	70	Close
B 014	7.10	7.10	B	NAT	0	U	ro	VT	N	-	130	Close
B 015	7.22	7.22	B	NAT	0	S	ro	VT	N	-	120	Close
FR_057	7.34	7.34	FR	DI	0	-	-	-	-	-	120	Close
FR_058	7.41	7.41	FR	DI	0	-	-	-	-	-	70	Close
FR_059	7.47	7.47	FR	DI	0	-	-	-	-	-	60	Very Close
FR_060	7.50	7.50	FR	DI	0	-	-	-	-	-	30	Very Close
FR 061	7.65	7.65	FR	DI	0	-	-	-	-	-	150	Close
NI 009	7.65	7.68	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_062	7.68	7.68	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_063	7.78	7.80	FR	DI	10	-	-	-	-	-	110	Close
FR_064	7.88	7.88	FR	DI	0	-	-	-	-	-	90	Close
J_004	7.98	8.22	J	NAT	70	P	ro	VT	N	-	220	Medium
FR 065	8.00	8.00	FR	DI	0	-	-	-	-	-	100	Close
FR 066	8.07	8.07	FR	DI	0	-	-	-	-	-	70	Close
FR_067	8.22	8.22	FR	DI	0	-	-	-	-	-	150	Close
FR_068	8.32	8.32	FR	DI	0	-	-	-	-	-	100	Close
FR_069	8.40	8.40	FR	DI	0	-	-	-	-	-	80	Close
NR_004	8.40	8.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR 070	8.50	8.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR 071	8.65	8.66	FR	DI	10	-	-	-	-	-	155	Close
FR_072	8.75	8.75	FR	DI	0	-	-	-	-	-	95	Close
FR_073	8.84	8.84	FR	DI	0	-	-	-	-	-	90	Close
NI_010	8.92	8.93	NI	DI	0	-	-	-	-	-	80	Close
FR_074	8.97	8.97	FR	DI	0	-	-	-	-	-	40	Very Close
B 016	9.03	9.05	B	NAT	0	U	ro	O	Y	silt	70	Close
B 017	9.12	9.12	B	NAT	0	U	ro	MW	Y	silt	80	Close
B_018	9.18	9.18	B	NAT	0	U	ro	O	Y	silt	60	Close
B_019	9.23	9.23	B	NAT	0	U	ro	O	Y	silt	50	Very Close
B_020	9.24	9.24	B	NAT	0	U	ro	O	Y	silt	10	Extremely Close
FR_075	9.31	9.31	FR	DI	0	-	-	-	-	-	70	Close
FR 076	9.45	9.45	FR	DI	0	-	-	-	-	-	140	Close
FR 077	9.50	9.50	FR	DI	0	-	-	-	-	-	50	Very Close
J_005	9.64	9.67	J	NAT	60	U	ro	VT	N	-	155	Close
FR_078	9.67	9.67	FR	DI	0	-	-	-	-	-	15	Extremely Close
J_006	9.67	9.77	J	NAT	60	U	ro	VT	N	-	50	Very Close
J_007	9.71	9.76	J	NAT	20	U	ro	VT	N	-	15	Extremely Close
FR 079	9.85	9.85	FR	DI	0	-	-	-	-	-	115	Close
FR 080	9.92	9.92	FR	DI	0	-	-	-	-	-	70	Close
FR_081	10.02	10.02	FR	DI	0	-	-	-	-	-	100	Close
FR_082	10.21	10.21	FR	DI	0	-	-	-	-	-	190	Close
FR_083	10.32	10.32	FR	DI	0	-	-	-	-	-	110	Close
FR_084	10.44	10.44	FR	DI	0	-	-	-	-	-	120	Close
FR 085	10.55	10.55	FR	DI	0	-	-	-	-	-	110	Close
FR 086	10.70	10.70	FR	DI	0	-	-	-	-	-	90	Close
FR_087	10.83	10.83	FR	DI	0	-	-	-	-	-	130	Close
FR_088	10.93	10.93	FR	DI	0	-	-	-	-	-	100	Close
FR_089	11.00	11.00	FR	DI	0	-	-	-	-	-	70	Close
NI_011	11.00	11.04	NI	NAT	60	U	ro	VT	N	-	0	Extremely Close
FR 090	11.11	11.11	FR	DI	0	-	-	-	-	-	70	Close
NI 012	11.11	11.49	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_091	11.49	11.49	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_092	11.54	11.54	FR	DI	0	-	-	-	-	-	50	Very Close
B_021	11.63	11.63	B	NAT	0	S	ro	VT	N	-	90	Close
FR_093	11.72	11.72	FR	DI	0	-	-	-	-	-	90	Close
NI 013	11.72	11.91	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B 022	11.91	11.91	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_094	12.01	12.01	FR	DI	0	-	-	-	-	-	100	Close
B_023	12.20	12.20	B	NAT	0	U	ro	VT	N	-	190	Close
NI_014	12.20	12.25	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_024	12.35	12.35	B	NAT	0	U	ro	VT	N	-	100	Close
NR 005	12.35	12.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR 095	12.59	12.59	FR	DI	0	-	-	-	-	-	90	Close
FR_096	12.64	12.64	FR	DI	0	-	-	-	-	-	50	Very Close
NI_015	12.64	12.81	NI	DI	0	-	-	-	-	-	0	Extremely Close
J_008	12.75	12.84	J	NAT	70	P	ro	VT	N	-	15	Extremely Close
J_009	12.84	12.88	J	NAT	70	P	ro	VT	N	-	65	Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type

BF	: bedding fracture
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-	: *no data*

Discontinuity state

NAT	: natural
DI	: drilling induced

Dipping
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Number from 0° to 90°
with 5° increments

Roughness - interm.

S	: Stepped
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Roughness - small

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Aperture (mm)

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T	: tight (0.10 - 0.25)
PO	: partially open (0.25 - 0.50)
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EW	: extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH08

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_097	12.87	12.87	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_098	12.95	12.95	FR	DI	0	-	-	-	-	-	80	Close
FR_099	13.05	13.05	FR	DI	0	-	-	-	-	-	100	Close
J_010	13.05	13.13	J	NAT	50	P	ro	VT	N	-	40	Very Close
J_011	13.07	13.11	J	NAT	30	U	ro	VT	N	-	0	Extremely Close
FR_100	13.21	13.21	FR	DI	0	-	-	-	-	-	120	Close
J_012	13.27	13.55	J	NAT	80	P	ro	VT	N	-	200	Close
FR_101	13.32	13.32	FR	DI	0	-	-	-	-	-	90	Close
J_013	13.39	13.43	J	NAT	40	P	ro	VT	N	-	90	Close
FR_102	13.51	13.51	FR	DI	0	-	-	-	-	-	100	Close
NI_016	13.57	13.60	NI	NAT	0	-	-	-	-	-	60	Close
FR_103	13.65	13.65	FR	DI	0	-	-	-	-	-	50	Very Close
FR_104	13.77	13.77	FR	DI	0	-	-	-	-	-	120	Close
NI_017	13.77	13.85	NI	NAT	0	-	-	-	-	-	0	Extremely Close
NR_006	13.85	14.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
B_025	14.00	14.00	B	NAT	0	U	ro	VT	N	reddish brown spot - 3 cm diameter	0	Extremely Close
B_026	14.05	14.05	B	NAT	0	U	ro	VT	N	reddish brown spot + fossils	50	Very Close
FR_105	14.09	14.09	FR	DI	0	-	-	-	-	broke on big fossil (5 cm diameter coral)	40	Very Close
B_027	14.14	14.14	B	NAT	0	U	ro	VT	N	greenish gray staining with reddish brown dots	50	Very Close
FR_106	14.31	14.31	FR	DI	0	-	-	-	-	broke on few fossils (took picture) - discoloring - is it natural frac	170	Close
FR_107	14.43	14.43	FR	DI	0	-	-	-	-	-	120	Close
FR_108	14.47	14.47	FR	DI	0	-	-	-	-	-	40	Very Close
FR_109	14.57	14.57	FR	DI	0	-	-	-	-	-	100	Close
FR_110	14.65	14.65	FR	DI	0	-	-	-	-	-	80	Close
FR_111	14.72	14.72	FR	DI	0	-	-	-	-	-	70	Close
FR_112	14.80	14.80	FR	DI	0	-	-	-	-	-	80	Close
FR_113	14.86	14.86	FR	DI	0	-	-	-	-	-	60	Very Close
J_014	14.99	15.09	J	NAT	65	U	ro	VT	N	-	180	Close
NI_018	15.02	15.09	NI	NAT	0	-	-	-	-	-	20	Extremely Close
J_015	15.03	15.08	J	NAT	35	U	ro	VT	N	-	35	Very Close
J_016	15.10	15.16	J	NAT	90	U	ro	VT	N	reddish bvrown to black staining	-	-
FR_114	15.16	15.16	FR	DI	0	-	-	-	-	-	-	-
FR_115	15.22	15.22	FR	DI	0	-	-	-	-	-	60	Close
NI_019	15.22	15.31	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_116	15.31	15.31	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_117	15.35	15.35	FR	DI	0	-	-	-	-	-	40	Very Close
NR_007	15.35	15.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_118	15.50	15.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_119	15.56	15.56	FR	DI	0	-	-	-	-	-	60	Close
B_028	15.64	15.64	B	NAT	0	U	ro	O	Y	clay	80	Close
FR_120	15.67	15.67	FR	DI	0	-	-	-	-	-	30	Very Close
B_029	15.74	15.74	B	NAT	0	U	ro	O	Y	clay	70	Close
B_030	15.82	15.82	B	NAT	0	U	ro	MW	Y	clay	80	Close
J_017	15.86	15.90	J	NAT	10	U	ro	-	-	-	60	Very Close
J_018	15.87	16.04	J	NAT	80	U	ro	-	-	-	75	Close
J_019	16.04	16.20	J	NAT	80	U	ro	-	-	-	165	Close
FR_121	16.18	16.18	FR	DI	0	-	-	-	-	-	60	Close
J_020	16.18	16.23	J	NAT	90	U	ro	VT	N	-	-	-
NI_020	16.23	16.38	NI	NAT	0	-	-	-	-	-	-	-
FR_122	16.38	16.38	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_123	16.50	16.50	FR	DI	0	-	-	-	-	-	120	Close
J_021	16.50	16.58	J	NAT	50	U	ro	VT	N	-	40	Very Close
J_022	16.50	16.61	J	NAT	90	U	ro	VT	N	-	-	-
B_031	16.61	16.61	B	NAT	0	U	ro	VT	N	-	-	-
NI_021	16.61	16.68	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_023	16.68	16.80	J	NAT	45	U	ro	VT	N	-	60	Close
FR_124	16.80	16.80	FR	DI	0	-	-	-	-	-	60	Very Close
I_002	16.83	16.83	I	NAT	0	U	ro	VT	N	-	30	Very Close
FR_125	16.87	16.87	FR	DI	0	-	-	-	-	-	40	Very Close
NI_022	16.87	17.00	NI	DI	0	-	-	-	-	cutting shoe stuff	0	Extremely Close
FR_126	17.00	17.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_023	17.00	17.20	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_024	17.00	17.20	J	NAT	75	S	ro	VT	N	-	100	Close
B_032	17.04	17.04	B	NAT	0	S	ro	VT	N	-	60	Close
B_033	17.12	17.12	B	NAT	0	S	ro	VT	N	-	80	Close
FR_127	17.15	17.15	FR	DI	0	-	-	-	-	-	30	Very Close
FR_128	17.23	17.23	FR	DI	0	-	-	-	-	-	80	Close
B_034	17.29	17.29	B	NAT	0	U	ro	T	Y	c	60	Very Close
FR_129	17.33	17.33	FR	DI	0	-	-	-	-	-	40	Very Close
NI_024	17.37	17.73	NI	NAT	0	-	-	-	-	destructured	40	Very Close
J_025	17.73	17.91	J	NAT	80	S	sm	VT	N	-	90	Close
B_035	17.82	17.83	B	NAT	10	S	sm	VT	N	-	5	Extremely Close
FR_130	17.92	17.92	FR	DI	0	-	-	-	-	-	95	Close
FR_131	18.02	18.02	FR	DI	0	-	-	-	-	-	100	Close
J_026	18.02	18.11	J	NAT	75	S	ro	VT	N	-	45	Very Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH08

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_132	18.11	18.11	FR	DI	0	-	-	-	-	-	45	Very Close
NR_008	18.11	18.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_133	18.50	18.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_134	18.61	18.61	FR	DI	0	-	-	-	-	-	110	Close
FR_135	18.73	18.73	FR	DI	0	-	-	-	-	-	120	Close
FR_136	18.77	18.77	FR	DI	0	-	-	-	-	-	40	Very Close
FR_137	18.89	18.89	FR	DI	0	-	-	-	-	-	120	Close
FR_138	18.91	18.91	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_139	19.04	19.04	FR	DI	0	-	-	-	-	-	130	Close
B_036	19.10	19.10	B	NAT	0	P	sm	T	Y	clay	60	Close
B_037	19.11	19.11	B	NAT	0	P	sm	T	Y	clay	10	Extremely Close
J_027	19.11	19.14	J	NAT	40	U	sm	VT	N	-	15	Extremely Close
J_028	19.11	19.14	J	NAT	80	U	sm	VT	N	-	0	Extremely Close
FR_140	19.24	19.24	FR	DI	0	-	-	-	-	-	115	Close
FR_141	19.30	19.30	FR	DI	0	-	-	-	-	-	60	Close
FR_142	19.36	19.36	FR	DI	0	-	-	-	-	-	60	Very Close
NR_009	19.40	19.50	NR	DI	0	-	-	-	-	AZCL	40	Very Close
FR_143	19.50	19.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_144	19.55	19.55	FR	DI	0	-	-	-	-	-	50	Very Close
NI_025	19.55	19.62	NI	DI	0	-	-	-	-	-	0	Extremely Close
J_029	19.60	19.90	J	NAT	80	U	ro	VT	N	-	130	Close
FR_145	19.71	19.71	FR	DI	0	-	-	-	-	-	40	Very Close
B_038	19.85	19.85	B	NAT	0	U	ro	VT	N	-	140	Close
FR_146	19.92	19.92	FR	DI	0	-	-	-	-	-	70	Close
FR_147	20.00	20.00	FR	DI	0	-	-	-	-	-	80	Close
FR_148	20.04	20.04	FR	DI	0	-	-	-	-	-	40	Very Close
FR_149	20.10	20.10	FR	DI	0	-	-	-	-	-	60	Close
FR_150	20.15	20.15	FR	DI	0	-	-	-	-	-	50	Very Close
FR_151	20.22	20.22	FR	DI	0	-	-	-	-	-	70	Close
FR_152	20.31	20.31	FR	DI	0	-	-	-	-	-	90	Close
FR_153	20.39	20.39	FR	DI	0	-	-	-	-	-	80	Close
FR_154	20.42	20.42	FR	DI	0	-	-	-	-	-	30	Very Close
FR_155	20.45	20.45	FR	DI	0	-	-	-	-	-	30	Very Close
NR_010	20.45	20.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
NI_001	1.20	1.80	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_001	1.80	1.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_002	1.80	1.92	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_002	1.92	1.92	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_001	1.92	2.00	J	NAT	60	S	ro	VT	N	-	40	Very Close
FR_003	2.00	2.00	FR	DI	0	-	-	-	-	-	40	Very Close
NR_001	2.00	2.50	NR	DI	0	-	-	-	-	No recovery	0	Extremely Close
FR_004	2.50	2.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
I_001	2.50	2.65	I	NAT	70	S	ro	T	N	-	75	Close
FR_005	2.55	2.55	FR	DI	0	-	-	-	-	-	25	Very Close
FR_006	2.65	2.65	FR	DI	0	-	-	-	-	-	100	Close
NI_003	2.65	3.20	NI	DI	0	-	-	-	-	-	0	Extremely Close
NR_002	3.20	3.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_007	5.00	5.00	FR	DI	0	P	ro	-	-	-	1500	Wide
J_002	5.05	5.12	J	NAT	60	U	ro	VT	N	-	85	Close
J_003	5.10	5.14	J	NAT	30	U	ro	VT	N	-	35	Very Close
FR_008	5.24	5.24	FR	DI	0	S	ro	VT	N	-	120	Close
FR_009	5.37	5.37	FR	DI	0	U	ro	VT	N	-	130	Close
FR_010	5.37	5.41	FR	DI	90	U	ro	VT	N	-	-	-
FR_011	5.41	5.41	FR	DI	0	U	ro	VT	N	-	-	-
FR_012	5.47	5.49	FR	DI	20	U	ro	VT	N	-	70	Close
J_004	5.51	5.58	J	NAT	60	U	ro	VT	N	-	65	Close
J_005	5.55	5.57	J	NAT	20	U	ro	VT	N	-	15	Extremely Close
FR_013	5.61	5.61	FR	DI	0	U	ro	VT	N	-	50	Very Close
FR_014	5.69	5.69	FR	DI	0	U	ro	VT	N	-	80	Close
FR_015	5.73	5.73	FR	DI	0	U	ro	VT	N	-	40	Very Close
J_006	5.75	5.78	J	NAT	40	S	ro	VT	N	-	35	Very Close
FR_016	5.82	5.82	FR	DI	0	U	ro	VT	N	-	55	Very Close
FR_017	5.95	5.95	FR	DI	0	P	ro	VT	N	-	130	Close
NR_003	5.95	6.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_018	7.50	7.50	FR	DI	0	P	ro	VT	N	-	1500	Wide
FR_019	7.57	7.57	FR	DI	0	P	ro	VT	N	-	70	Close
FR_020	7.60	7.60	FR	DI	0	P	ro	VT	N	-	30	Very Close
NI_004	7.60	8.30	NI	DI	0	-	-	-	-	destructured, probably drilling induced	0	Extremely Close
FR_021	10.00	10.00	FR	DI	0	P	ro	VT	N	-	1700	Wide
FR_022	10.08	10.08	FR	DI	0	U	ro	VT	N	-	80	Close
FR_023	10.16	10.16	FR	DI	0	U	ro	VT	N	-	80	Close
J_007	10.16	10.22	J	NAT	90	U	ro	VT	N	-	-	-
J_008	10.16	10.22	J	NAT	90	U	ro	VT	N	-	-	-
FR_024	10.22	10.22	FR	DI	0	U	ro	VT	N	-	-	-
J_009	10.56	10.59	J	NAT	40	S	ro	VT	N	-	355	Medium
FR_025	10.61	10.61	FR	DI	0	U	ro	VT	N	-	35	Very Close
J_010	10.61	10.79	J	NAT	75	S	ro	VT	N	-	90	Close
FR_026	10.72	10.72	FR	DI	0	S	ro	VT	N	-	20	Very Close
J_011	10.83	10.88	J	NAT	40	S	ro	VT	N	-	135	Close
FR_027	10.90	10.90	FR	DI	0	P	ro	-	-	-	45	Very Close
NR_004	10.90	11.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_028	12.50	12.50	FR	DI	0	P	ro	VT	N	-	1500	Wide
J_012	12.55	12.60	J	NAT	45	S	ro	VT	N	-	75	Close
FR_029	12.66	12.66	FR	DI	0	U	ro	VT	N	-	85	Close
J_013	12.68	12.75	J	NAT	75	U	ro	VT	N	-	55	Very Close
J_014	12.79	12.84	J	NAT	70	S	ro	VT	N	-	100	Close
FR_030	12.97	12.97	FR	DI	0	S	ro	VT	N	-	155	Close
FR_031	13.06	13.06	FR	DI	0	S	ro	VT	N	-	90	Close
FR_032	13.10	13.12	FR	DI	10	S	ro	VT	N	-	50	Very Close
FR_033	13.12	13.13	FR	DI	10	S	ro	VT	N	-	15	Extremely Close
B_001	13.16	13.16	B	NAT	0	U	ro	VT	N	-	35	Very Close
FR_034	13.29	13.29	FR	DI	0	S	ro	VT	N	-	130	Close
FR_035	13.31	13.31	FR	DI	0	S	ro	VT	N	-	20	Very Close
FR_036	13.35	13.35	FR	DI	0	S	ro	-	-	-	40	Very Close
NR_005	13.35	13.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_037	15.00	15.00	FR	DI	0	U	ro	VT	N	-	1500	Wide
B_002	15.09	15.09	B	NAT	0	U	ro	VT	N	-	90	Close
NI_005	15.09	15.32	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_003	15.32	15.32	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
NI_006	15.32	15.56	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_004	15.56	15.56	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
J_015	15.56	15.59	J	NAT	30	U	ro	VT	N	-	15	Extremely Close
FR_038	15.65	15.65	FR	DI	0	-	-	-	-	-	75	Close
FR_039	15.70	15.70	FR	DI	0	-	-	-	-	-	50	Very Close
NR_006	15.70	16.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NI_007	16.50	16.70	NI	NAT	0	-	-	-	-	destructured	500	Medium
FR_040	16.77	16.79	FR	DI	30	U	ro	VT	N	-	80	Close
FR_041	16.79	16.82	FR	DI	30	U	ro	VT	N	-	25	Very Close
NI_008	16.90	17.50	NI	NAT	0	-	-	-	-	destructured	95	Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH10

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_042	19.00	19.00	FR	DI	0	U	ro	VT	N	-	1500	Wide
NI_009	19.00	19.75	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_005	19.75	19.75	B	NAT	0	S	ro	VT	N	change of lithology	0	Extremely Close
B_006	19.88	19.90	B	NAT	10	S	ro	VT	N	-	140	Close
B_007	19.95	19.95	B	NAT	0	S	ro	VT	N	change of lithology	60	Very Close
NI_010	19.95	20.00	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
FR_043	20.00	20.00	FR	DI	0	U	ro	VT	N	-	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_001	0.15	0.15	B	NAT	0	P	ro	VT	N	Change of lithology from COBBLE to CALCARENITE	0	Extremely Close
NI_001	0.15	0.30	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_001	0.30	0.30	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_002	0.35	0.35	FR	DI	0	-	-	-	-	-	50	Very Close
NI_002	0.35	0.60	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_003	0.60	0.60	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_004	0.70	0.70	FR	DI	0	-	-	-	-	-	100	Close
FR_005	0.73	0.73	FR	DI	0	-	-	-	-	-	30	Very Close
NI_003	0.73	0.80	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_006	0.80	0.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_007	0.85	0.85	FR	DI	0	-	-	-	-	-	50	Very Close
FR_008	0.88	0.88	FR	DI	0	-	-	-	-	-	30	Very Close
FR_009	0.92	0.92	FR	DI	0	-	-	-	-	-	40	Very Close
FR_010	0.95	0.95	FR	DI	0	-	-	-	-	-	30	Very Close
FR_011	1.00	1.00	FR	DI	0	-	-	-	-	-	50	Very Close
FR_012	1.00	1.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_004	1.00	1.40	NI	DI	0	-	-	-	-	-	0	Extremely Close
NR_001	1.40	2.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NR_002	2.00	2.40	NR	DI	0	-	-	-	-	AZCL, disturbed by CPT 02	0	Extremely Close
FR_013	2.40	2.40	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_005	2.40	2.80	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_002	2.80	2.80	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
FR_014	2.93	2.93	FR	DI	0	-	-	-	-	-	130	Close
FR_015	2.96	2.96	FR	DI	0	-	-	-	-	-	30	Very Close
I_001	3.02	3.02	I	NAT	0	-	-	-	-	-	60	Close
I_002	3.06	3.06	I	NAT	0	-	-	-	-	-	40	Very Close
FR_016	3.20	3.20	FR	DI	0	-	-	-	-	-	140	Close
FR_017	3.25	3.25	FR	DI	0	-	-	-	-	-	50	Very Close
FR_018	3.31	3.34	FR	DI	30	-	-	-	-	-	75	Close
FR_019	3.34	3.34	FR	DI	0	-	-	-	-	-	15	Extremely Close
FR_020	3.40	3.40	FR	DI	0	-	-	-	-	-	60	Close
FR_021	3.44	3.44	FR	DI	0	-	-	-	-	-	40	Very Close
FR_022	3.50	3.50	FR	DI	0	-	-	-	-	-	60	Close
NR_003	3.50	3.60	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_023	3.60	3.60	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_001	3.66	3.71	J	NAT	10	U	ro	VT	N	-	85	Close
FR_024	3.76	3.76	FR	DI	0	-	-	-	-	-	75	Close
FR_025	3.80	3.80	FR	DI	0	-	-	-	-	-	40	Very Close
FR_026	3.80	3.92	FR	DI	0	-	-	-	-	-	60	Close
FR_027	3.92	3.92	FR	DI	0	-	-	-	-	-	60	Close
FR_028	3.96	3.96	FR	DI	0	-	-	-	-	-	40	Very Close
FR_029	3.96	3.98	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_030	3.98	3.98	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_031	4.02	4.02	FR	DI	0	-	-	-	-	-	40	Very Close
FR_032	4.09	4.13	FR	DI	30	-	-	-	-	-	90	Close
FR_033	4.17	4.17	FR	DI	0	-	-	-	-	-	60	Close
FR_034	4.27	4.27	FR	DI	0	-	-	-	-	-	100	Close
FR_035	4.48	4.48	FR	DI	0	-	-	-	-	-	210	Medium
FR_036	4.58	4.58	FR	DI	0	-	-	-	-	-	100	Close
FR_037	4.64	4.64	FR	DI	0	-	-	-	-	-	60	Very Close
FR_038	4.72	4.72	FR	DI	0	-	-	-	-	-	80	Close
FR_039	4.74	4.74	FR	DI	0	-	-	-	-	-	20	Very Close
NI_006	4.74	4.77	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_040	4.77	4.77	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_003	4.79	4.79	B	NAT	0	S	ro	VT	N	-	20	Very Close
FR_041	4.89	4.89	FR	DI	0	-	-	-	-	-	100	Close
NI_007	4.89	4.95	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_042	4.95	4.95	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_043	5.00	5.00	FR	DI	0	-	-	-	-	-	50	Very Close
NI_008	5.00	5.15	NI	DI	0	-	-	-	-	-	0	Extremely Close
B_004	5.15	5.15	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_044	5.20	5.21	FR	DI	20	-	-	-	-	-	55	Very Close
FR_045	5.25	5.26	FR	DI	20	-	-	-	-	-	50	Very Close
FR_046	5.27	5.29	FR	DI	20	-	-	-	-	-	25	Very Close
FR_047	5.32	5.32	FR	DI	0	-	-	-	-	-	40	Very Close
FR_048	5.35	5.35	FR	DI	0	-	-	-	-	-	30	Very Close
B_005	5.41	5.43	B	NAT	20	P	sm	T	Y	Light grey material	70	Close
NI_009	5.41	5.55	NI	NAT	0	-	-	-	-	-	10	Extremely Close
FR_049	5.55	5.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_050	5.59	5.59	FR	DI	0	-	-	-	-	-	40	Very Close
I_003	5.70	5.72	I	NAT	10	-	-	-	-	-	120	Close
FR_051	5.73	5.73	FR	DI	0	-	-	-	-	-	20	Very Close
FR_052	5.89	5.89	FR	DI	0	-	-	-	-	-	160	Close
NI_010	5.89	6.11	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_006	6.11	6.11	B	NAT	0	P	sm	VT	N	-	0	Extremely Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
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J : joint
NI : non intact
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\- : *no data*

Discontinuity state
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Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
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VW : very wide (100 -1000)
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Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH11

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_053	6.19	6.19	FR	DI	0	-	-	-	-	-	80	Close
J_002	6.26	6.28	J	NAT	10	P	ro	T	N	Stained orange	80	Close
J_003	6.34	6.36	J	NAT	30	S	ro	VT	N	-	80	Close
FR 054	6.36	6.38	FR	DI	10	-	-	-	-	-	20	Very Close
B 007	6.47	6.47	B	NAT	0	S	ro	VT	N	Stained orange	100	Close
FR_055	6.50	6.50	FR	DI	0	-	-	-	-	-	30	Very Close
NI_011	6.65	6.80	NI	DI	0	-	-	-	-	-	150	Close
FR_056	6.80	6.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_057	6.82	6.86	FR	DI	20	-	-	-	-	-	40	Very Close
FR 058	6.90	6.90	FR	DI	0	-	-	-	-	-	60	Close
FR 059	6.99	6.99	FR	DI	0	-	-	-	-	-	90	Close
FR_060	7.04	7.04	FR	DI	0	-	-	-	-	-	50	Very Close
FR_061	7.09	7.09	FR	DI	0	-	-	-	-	-	50	Very Close
J_004	7.13	7.17	J	NAT	30	P	ro	VT	N	-	60	Close
FR_062	7.30	7.30	FR	DI	0	-	-	-	-	-	150	Close
NI 012	7.34	7.36	NI	DI	0	-	-	-	-	-	40	Very Close
J 005	7.49	7.49	J	NAT	0	U	ro	VT	N	-	130	Close
FR_063	7.57	7.57	FR	DI	0	-	-	-	-	-	80	Close
FR_064	7.67	7.69	FR	DI	0	-	-	-	-	-	110	Close
FR_065	7.79	7.79	FR	DI	0	-	-	-	-	-	110	Close
FR_066	7.89	7.89	FR	DI	0	-	-	-	-	-	100	Close
FR 067	7.92	7.92	FR	DI	0	-	-	-	-	-	30	Very Close
FR 068	8.00	8.00	FR	DI	0	-	-	-	-	-	80	Close
FR_069	8.06	8.06	FR	DI	0	-	-	-	-	-	60	Close
FR_070	8.16	8.16	FR	DI	0	-	-	-	-	-	100	Close
NI_013	8.28	8.31	NI	DI	0	-	-	-	-	-	120	Close
I_004	8.35	8.36	I	NAT	10	S	ro	T	N	-	45	Very Close
I 005	8.42	8.42	I	NAT	0	S	ro	T	N	-	65	Close
FR 071	8.53	8.57	FR	DI	20	-	-	-	-	-	130	Close
FR_072	8.67	8.67	FR	DI	0	-	-	-	-	-	120	Close
FR_073	8.71	8.75	FR	DI	20	-	-	-	-	-	60	Close
B_008	8.97	8.97	B	NAT	0	U	ro	T	N	-	240	Medium
FR_074	9.14	9.16	FR	DI	10	-	-	-	-	-	180	Close
FR 075	9.16	9.20	FR	DI	30	-	-	-	-	-	30	Very Close
FR 076	9.29	9.29	FR	DI	0	-	-	-	-	-	110	Close
FR_077	9.34	9.34	FR	DI	0	-	-	-	-	-	50	Very Close
FR_078	9.46	9.46	FR	DI	0	-	-	-	-	-	120	Close
FR_079	9.50	9.50	FR	DI	0	-	-	-	-	-	40	Very Close
FR_080	9.57	9.57	FR	DI	0	-	-	-	-	-	70	Close
FR 081	9.67	9.67	FR	DI	0	-	-	-	-	-	100	Close
FR 082	9.76	9.76	FR	DI	0	-	-	-	-	-	90	Close
FR_083	9.84	9.84	FR	DI	0	-	-	-	-	-	80	Close
FR_084	9.87	9.87	FR	DI	0	-	-	-	-	-	30	Very Close
B_009	9.94	9.94	B	NAT	0	P	ro	T	N	-	70	Close
B_010	10.00	10.02	B	NAT	10	S	ro	PO	N	-	70	Close
B 011	10.07	10.07	B	NAT	0	S	ro	-	-	-	60	Close
FR 085	10.17	10.17	FR	DI	0	P	ro	VT	-	-	100	Close
NI_014	10.24	10.28	NI	DI	0	-	-	-	-	-	70	Close
FR_086	10.33	10.33	FR	DI	0	-	-	-	-	-	50	Very Close
FR_087	10.39	10.39	FR	DI	0	-	-	-	-	-	60	Close
FR_088	10.43	10.43	FR	DI	0	-	-	-	-	-	40	Very Close
FR 089	10.52	10.52	FR	DI	0	-	-	-	-	-	90	Close
FR 090	10.60	10.60	FR	DI	0	-	-	-	-	-	80	Close
NR_004	10.60	11.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
B_012	11.20	11.20	B	NAT	0	P	ro	VT	N	change of lithology	200	Close
FR_091	11.39	11.39	FR	DI	0	-	-	-	-	-	190	Close
FR_092	11.52	11.55	FR	DI	20	-	-	-	-	-	147	Close
FR 093	11.59	11.59	FR	DI	0	-	-	-	-	-	53	Very Close
FR 094	11.64	11.64	FR	DI	0	-	-	-	-	-	50	Very Close
B_013	11.72	11.74	B	NAT	10	P	ro	VT	N	-	90	Close
FR_095	11.79	11.81	FR	DI	20	S	-	-	-	-	70	Close
FR_096	11.90	11.90	FR	DI	0	-	-	-	-	-	100	Close
FR_097	12.00	12.00	FR	DI	0	-	-	-	-	-	100	Close
FR 098	12.06	12.06	FR	DI	0	-	-	-	-	-	60	Close
FR 099	12.19	12.21	FR	DI	10	-	-	-	-	-	140	Close
FR_100	12.28	12.30	FR	DI	20	-	-	-	-	-	90	Close
FR_101	12.29	12.31	FR	DI	20	-	-	-	-	-	10	Extremely Close
FR_102	12.36	12.36	FR	DI	0	-	-	-	-	-	60	Very Close
NI_015	12.36	12.48	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR 103	12.48	12.48	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR 104	12.69	12.69	FR	DI	0	-	-	-	-	-	210	Medium
FR_105	12.75	12.75	FR	DI	0	-	-	-	-	-	60	Close
FR_106	13.00	13.00	FR	DI	0	-	-	-	-	-	250	Medium
FR_107	13.20	13.22	FR	DI	10	-	-	-	-	-	210	Medium
FR_108	13.49	13.50	FR	DI	10	-	-	-	-	-	285	Medium

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type

BF	: bedding fracture
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J	: joint
NI	: non intact
NR	: no recovery
-	: *no data*

Discontinuity state

NAT	: natural
DI	: drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.

S	: Stepped
U	: Undulating
P	: Planar

Roughness - small

sm	: smooth
ro	: rough
st	: striated

Aperture (mm)

VT	: very tight (< 0.10)
T	: tight (0.10 - 0.25)
PO	: partially open (0.25 - 0.50)
O	: open (0.50 - 2.50)
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Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH11

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_109	13.72	13.72	FR	DI	0	-	-	-	-	-	225	Medium
B_014	13.76	13.76	B	NAT	0	P	ro	VT	N	-	40	Very Close
NI_016	13.76	14.20	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_110	14.30	14.30	FR	DI	0	-	-	-	-	-	100	Close
NR_005	14.30	14.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_111	14.50	14.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_112	14.57	14.57	FR	DI	0	-	-	-	-	-	70	Close
B_015	14.61	14.61	B	NAT	0	P	ro	VT	N	-	40	Very Close
NI_017	14.61	15.21	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_016	15.21	15.21	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
NI_018	15.30	15.32	NI	DI	0	-	-	-	-	-	90	Close
FR_113	15.41	15.46	FR	DI	20	-	-	-	-	-	115	Close
FR_114	15.50	15.50	FR	DI	0	-	-	-	-	-	65	Close
FR_115	15.57	15.57	FR	DI	0	-	-	-	-	-	70	Close
FR_116	15.63	15.63	FR	DI	0	-	-	-	-	-	60	Close
FR_117	15.68	15.68	FR	DI	0	-	-	-	-	-	50	Very Close
FR_118	15.80	15.83	FR	DI	10	-	-	-	-	-	135	Close
FR_119	15.90	15.90	FR	DI	0	-	-	-	-	-	85	Close
FR_120	16.19	16.19	FR	DI	0	-	-	-	-	-	290	Medium
FR_121	16.29	16.29	FR	DI	0	-	-	-	-	-	100	Close
FR_122	16.34	16.36	FR	DI	10	-	-	-	-	-	60	Close
NI_019	16.41	16.44	NI	DI	0	-	-	-	-	-	60	Very Close
FR_123	16.51	16.51	FR	DI	0	-	-	-	-	-	70	Close
NI_020	16.51	16.57	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_124	16.57	16.57	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_125	16.58	16.61	FR	DI	10	-	-	-	-	-	25	Very Close
FR_126	16.70	16.70	FR	DI	0	-	-	-	-	-	105	Close
NR_006	16.70	16.80	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_127	16.80	16.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_021	16.84	16.89	NI	DI	0	-	-	-	-	-	40	Very Close
FR_128	17.02	17.02	FR	DI	0	-	-	-	-	-	130	Close
FR_129	17.10	17.10	FR	DI	0	-	-	-	-	-	80	Close
FR_130	17.17	17.17	FR	DI	0	-	-	-	-	-	70	Close
FR_131	17.24	17.24	FR	DI	0	-	-	-	-	-	70	Close
FR_132	17.30	17.30	FR	DI	0	-	-	-	-	-	60	Close
NI_022	17.35	17.40	NI	DI	0	-	-	-	-	-	50	Very Close
FR_133	17.46	17.49	FR	DI	20	-	-	-	-	-	75	Close
FR_134	17.50	17.53	FR	DI	20	-	-	-	-	-	40	Very Close
FR_135	17.54	17.56	FR	DI	20	-	-	-	-	-	35	Very Close
FR_136	17.60	17.61	FR	DI	10	-	-	-	-	-	55	Very Close
FR_137	17.66	17.69	FR	DI	20	-	-	-	-	-	70	Close
FR_138	17.78	17.82	FR	DI	20	-	-	-	-	-	125	Close
FR_139	17.81	17.83	FR	DI	20	-	-	-	-	-	20	Extremely Close
FR_140	17.96	17.96	FR	DI	0	-	-	-	-	-	140	Close
FR_141	18.06	18.06	FR	DI	0	-	-	-	-	-	100	Close
FR_142	18.14	18.14	FR	DI	0	-	-	-	-	-	80	Close
FR_143	18.22	18.22	FR	DI	0	-	-	-	-	-	80	Close
FR_144	18.30	18.30	FR	DI	0	-	-	-	-	-	80	Close
NI_023	18.30	18.34	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_145	18.34	18.34	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_146	18.43	18.43	FR	DI	0	-	-	-	-	-	90	Close
FR_147	18.46	18.46	FR	DI	0	-	-	-	-	-	30	Very Close
FR_148	18.70	18.70	FR	DI	0	-	-	-	-	-	240	Medium
FR_149	18.77	18.77	FR	DI	0	-	-	-	-	-	70	Close
FR_150	18.86	18.86	FR	DI	0	-	-	-	-	-	90	Close
FR_151	18.92	18.92	FR	DI	0	-	-	-	-	-	60	Close
B_017	18.97	18.97	B	NAT	0	P	ro	VT	N	Change of granulometry grain size	50	Very Close
NI_024	18.97	19.22	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_152	19.22	19.22	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_153	19.37	19.37	FR	DI	0	-	-	-	-	-	150	Close
NR_007	19.37	19.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_154	19.50	19.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_155	19.55	19.55	FR	DI	0	-	-	-	-	-	50	Very Close
B_018	19.63	19.63	B	NAT	0	S	ro	VT	N	-	80	Close
NI_025	19.63	19.95	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_156	19.93	19.93	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_157	19.95	19.95	FR	DI	0	-	-	-	-	-	20	Extremely Close
J_006	19.95	19.99	J	NAT	50	S	ro	T	Y	clay	20	Extremely Close
NI_026	19.99	20.04	NI	NAT	0	-	-	-	-	-	20	Extremely Close
FR_158	20.04	20.04	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_027	20.17	20.26	NI	NAT	0	-	-	-	-	-	130	Close
FR_159	20.26	20.26	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_160	20.33	20.33	FR	DI	0	-	-	-	-	-	70	Close
FR_161	20.43	20.43	FR	DI	0	-	-	-	-	-	100	Close
FR_162	20.50	20.50	FR	DI	0	-	-	-	-	-	70	Close

Notes:
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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH11

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_001	1.00	1.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_002	1.03	1.05	FR	DI	0	-	-	-	-	-	40	Very Close
FR_003	1.05	1.07	FR	DI	0	-	-	-	-	-	20	Very Close
FR_004	1.07	1.07	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_005	1.10	1.10	FR	DI	0	-	-	-	-	-	30	Very Close
NR_001	1.10	2.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_006	3.00	3.00	FR	DI	0	-	-	-	-	-	1000	Wide
J_001	3.08	3.11	J	NAT	40	U	sm	VT	N	-	95	Close
FR_007	3.13	3.13	FR	DI	0	-	-	-	-	-	35	Very Close
J_002	3.13	3.16	J	NAT	30	U	sm	VT	N	-	15	Extremely Close
B_001	3.20	3.22	B	NAT	0	U	sm	T	Y	gravelly CLAY	65	Close
FR_008	3.30	3.30	FR	DI	0	-	-	-	-	-	90	Close
B_002	3.37	3.38	B	NAT	20	U	sm	T	Y	GRAVEL	75	Close
B_003	3.39	3.42	B	NAT	20	U	sm	T	Y	GRAVEL	30	Very Close
FR_009	3.48	3.48	FR	DI	0	-	-	-	-	-	75	Close
B_004	3.52	3.52	B	NAT	0	P	sm	T	Y	sandy CLAY	40	Very Close
B_005	3.56	3.56	B	NAT	0	P	sm	T	Y	sandy CLAY	40	Very Close
NI_001	3.60	3.65	NI	NAT	0	-	-	-	Y	gravelly CLAY	40	Very Close
B_006	3.68	3.68	B	NAT	0	P	sm	O	Y	sandy CLAY	30	Very Close
J_003	3.68	3.70	J	NAT	50	U	sm	T	N	-	10	Extremely Close
B_007	3.70	3.70	B	NAT	0	P	sm	O	N	-	10	Extremely Close
FR_010	3.74	3.74	FR	DI	0	-	-	-	-	-	40	Very Close
FR_011	3.78	3.78	FR	DI	0	-	-	-	-	-	40	Very Close
FR_012	3.80	3.80	FR	DI	0	-	-	-	-	-	20	Very Close
NR_002	3.80	4.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_013	4.00	4.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_008	4.09	4.09	B	NAT	0	U	ro	VT	N	-	90	Close
NI_002	4.09	4.25	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_009	4.25	4.25	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_014	4.29	4.29	FR	DI	0	-	-	-	-	-	40	Very Close
FR_015	4.34	4.34	FR	DI	0	-	-	-	-	-	50	Very Close
FR_016	4.42	4.42	FR	DI	0	-	-	-	-	-	80	Close
FR_017	4.47	4.47	FR	DI	0	-	-	-	-	-	50	Very Close
FR_018	4.52	4.52	FR	DI	0	-	-	-	-	-	50	Very Close
FR_019	4.58	4.58	FR	DI	0	-	-	-	-	-	60	Close
FR_020	4.62	4.62	FR	DI	0	-	-	-	-	-	40	Very Close
FR_021	4.79	4.79	FR	DI	0	-	-	-	-	-	170	Close
FR_022	4.80	4.80	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_023	4.85	4.85	FR	DI	0	-	-	-	-	-	50	Very Close
NR_003	4.85	5.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_024	5.00	5.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_010	5.06	5.06	B	NAT	0	P	ro	VT	N	-	60	Very Close
NI_003	5.06	5.18	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_004	5.12	5.18	J	NAT	90	P	ro	VT	N	-	-	-
FR_025	5.15	5.15	FR	DI	0	-	-	-	-	-	-	-
B_011	5.18	5.18	B	NAT	0	U	ro	VT	N	-	30	Very Close
NI_004	5.18	5.65	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_012	5.65	5.65	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_026	5.75	5.75	FR	DI	0	-	-	-	-	-	100	Close
FR_027	5.82	5.82	FR	DI	0	-	-	-	-	-	70	Close
FR_028	5.85	5.85	FR	DI	0	-	-	-	-	-	30	Very Close
FR_029	5.97	5.97	FR	DI	0	-	-	-	-	-	120	Close
FR_030	6.00	6.00	FR	DI	0	-	-	-	-	-	30	Very Close
NI_005	6.00	6.05	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_031	6.05	6.05	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_032	6.10	6.10	FR	DI	0	-	-	-	-	-	50	Very Close
FR_033	6.18	6.18	FR	DI	0	-	-	-	-	-	80	Close
FR_034	6.25	6.25	FR	DI	0	-	-	-	-	-	70	Close
FR_035	6.28	6.28	FR	DI	0	-	-	-	-	-	30	Very Close
NI_006	6.28	6.34	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_036	6.34	6.34	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_037	6.35	6.35	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_038	6.37	6.37	FR	DI	0	-	-	-	-	-	20	Very Close
NI_007	6.37	6.53	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_039	6.53	6.53	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_040	6.63	6.63	FR	DI	0	-	-	-	-	-	100	Close
NI_008	6.63	6.65	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_041	6.65	6.65	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_042	6.75	6.75	FR	DI	0	-	-	-	-	-	100	Close
NR_004	6.75	7.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NR_005	7.00	8.00	NR	DI	0	-	-	-	-	No recovery	0	Extremely Close
FR_043	8.00	8.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_013	8.02	8.02	B	NAT	0	P	sm	VT	N	-	20	Extremely Close
NI_009	8.02	8.25	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_014	8.25	8.25	B	NAT	0	P	sm	MW	N	-	0	Extremely Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type

BF	: bedding fracture
C	: cleavage
F	: fault
FR	: induced fracture
I	: incipient
J	: joint
NI	: non intact
NR	: no recovery
-	: *no data*

Discontinuity state

NAT	: natural
DI	: drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.

S	: Stepped
U	: Undulating
P	: Planar

Roughness - small

sm	: smooth
ro	: rough
st	: striated

Aperture (mm)

VT	: very tight (< 0.10)
T	: tight (0.10 - 0.25)
PO	: partially open (0.25 - 0.50)
O	: open (0.50 - 2.50)
MW	: moderately wide (2.50 - 10)
W	: wide (10 - 100)
VW	: very wide (100 -1000)
EW	: extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH12

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_015	8.30	8.30	B	NAT	0	U	sm	W	N	-	50	Very Close
B_016	8.36	8.36	B	NAT	0	U	sm	W	Y	sandy silt	60	Very Close
B_017	8.40	8.40	B	NAT	0	U	sm	W	Y	sandy sillt	40	Very Close
NI_010	8.46	8.54	NI	NAT	0	-	-	-	-	-	60	Close
FR_044	8.54	8.54	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_018	8.58	8.58	B	NAT	0	U	sm	VT	N	-	40	Very Close
NI_011	8.58	8.63	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_045	8.63	8.63	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_046	8.68	8.68	FR	DI	0	-	-	-	-	-	50	Very Close
FR_047	8.78	8.78	FR	DI	0	-	-	-	-	-	100	Close
FR_048	8.84	8.84	FR	DI	0	-	-	-	-	-	60	Close
FR_049	8.89	8.89	FR	DI	0	-	-	-	-	-	50	Very Close
FR_050	9.00	9.00	FR	DI	0	-	-	-	-	-	110	Close
FR_051	9.00	9.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_052	9.10	9.10	FR	DI	0	-	-	-	-	-	100	Close
NI_012	9.10	9.50	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_019	9.50	9.50	B	NAT	0	U	ro	T	Y	silty sand	0	Extremely Close
FR_053	9.55	9.55	FR	DI	0	-	-	-	-	-	50	Very Close
FR_054	9.65	9.65	FR	DI	0	-	-	-	-	-	100	Close
FR_055	9.72	9.72	FR	DI	0	-	-	-	-	-	70	Close
FR_056	9.77	9.77	FR	DI	0	-	-	-	-	-	50	Very Close
FR_057	9.79	9.79	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_058	9.82	9.82	FR	DI	0	-	-	-	-	-	30	Very Close
NI_013	9.82	9.87	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_059	9.87	9.87	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_060	9.94	9.94	FR	DI	0	-	-	-	-	-	70	Close
FR_061	10.00	10.00	FR	DI	0	-	-	-	-	-	60	Close
NI_014	10.00	10.04	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_062	10.04	10.04	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_063	10.09	10.09	FR	DI	0	-	-	-	-	-	50	Very Close
FR_064	10.15	10.15	FR	DI	0	-	-	-	-	-	60	Close
B_020	10.23	10.23	B	NAT	0	U	ro	VT	N	-	80	Close
B_021	10.23	10.40	B	NAT	0	U	ro	O	Y	silty sand	85	Close
FR_065	10.50	10.50	FR	DI	0	-	-	-	-	-	185	Close
NI_015	10.50	10.55	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_066	10.55	10.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_067	10.65	10.65	FR	DI	0	-	-	-	-	-	100	Close
FR_068	10.69	10.69	FR	DI	0	-	-	-	-	-	40	Very Close
FR_069	10.73	10.73	FR	DI	0	-	-	-	-	-	40	Very Close
FR_070	10.77	10.77	FR	DI	0	-	-	-	-	-	40	Very Close
NI_016	10.77	11.03	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_022	11.03	11.03	B	NAT	0	U	ro	VT	N	Silty sand	0	Extremely Close
FR_071	11.07	11.08	FR	DI	10	-	-	-	-	-	45	Very Close
FR_072	11.18	11.18	FR	DI	0	-	-	-	-	-	105	Close
FR_073	11.34	11.34	FR	DI	0	-	-	-	-	-	160	Close
FR_074	11.47	11.47	FR	DI	0	-	-	-	-	-	130	Close
NI_017	11.47	11.50	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_075	11.58	11.58	FR	DI	0	-	-	-	-	-	80	Close
J_005	11.58	11.65	J	NAT	70	U	ro	T	N	-	35	Very Close
B_023	11.65	11.65	B	NAT	0	-	-	VT	N	-	35	Very Close
B_024	11.69	11.69	B	NAT	0	-	-	-	-	-	40	Very Close
B_025	11.75	11.75	B	NAT	0	U	ro	T	N	-	60	Close
B_026	11.79	11.79	B	NAT	0	U	ro	MW	Y	Silty sand	90	Close
FR_076	11.84	11.84	FR	DI	0	-	-	-	-	-	50	Very Close
FR_077	11.89	11.89	FR	DI	0	-	-	-	-	-	50	Very Close
FR_078	12.00	12.00	FR	DI	0	-	-	-	-	End of core run	110	Close
FR_079	12.00	12.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_080	12.10	12.10	FR	DI	0	-	-	-	-	-	100	Close
FR_081	12.20	12.20	FR	DI	0	-	-	-	-	-	100	Close
FR_082	12.21	12.22	FR	DI	5	-	-	-	-	-	15	Extremely Close
B_027	12.25	12.26	B	NAT	10	U	ro	VT	N	-	40	Very Close
NI_018	12.25	12.55	NI	NAT	0	-	-	-	-	Destructured	5	Extremely Close
B_028	12.55	12.55	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_083	12.57	12.57	FR	DI	0	-	-	-	-	-	20	Extremely Close
B_029	12.64	12.64	B	NAT	0	U	st	VT	N	-	70	Close
NI_019	12.64	12.74	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_084	12.74	12.74	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_085	12.87	12.87	FR	DI	0	-	-	-	-	-	130	Close
FR_086	12.99	12.99	FR	DI	0	-	-	-	-	-	120	Close
FR_087	13.06	13.06	FR	DI	0	-	-	-	-	-	70	Close
FR_088	13.15	13.15	FR	DI	0	-	-	-	-	-	90	Close
FR_089	13.40	13.40	FR	DI	0	-	-	-	-	-	250	Medium
NR_006	13.40	13.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_090	13.50	13.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_020	13.50	13.55	NI	NAT	0	-	-	-	-	-	0	Extremely Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH12

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_091	13.55	13.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_092	13.55	13.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_093	13.61	13.61	FR	DI	0	-	-	-	-	-	60	Very Close
FR_094	13.70	13.70	FR	DI	0	-	-	-	-	-	90	Close
FR_095	13.85	13.85	FR	DI	0	-	-	-	-	-	150	Close
FR_096	13.96	13.96	FR	DI	0	-	-	-	-	-	110	Close
FR_097	14.10	14.10	FR	DI	0	-	-	-	-	-	140	Close
FR_098	14.17	14.20	FR	DI	10	-	-	-	-	-	85	Close
FR_099	14.26	14.29	FR	DI	10	-	-	-	-	-	90	Close
FR_100	14.37	14.37	FR	DI	0	-	-	-	-	-	95	Close
FR_101	14.45	14.45	FR	DI	0	-	-	-	-	-	80	Close
NR_007	14.45	14.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_102	14.50	14.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_030	14.63	14.63	B	NAT	0	S	sm	PO	N	-	130	Close
FR_103	14.70	14.70	FR	DI	0	-	-	-	-	-	70	Close
B_031	14.75	14.75	B	NAT	0	S	sm	O	Y	Silty sand	50	Very Close
B_032	14.80	14.80	B	NAT	0	U	sm	T	Y	Silty sand	50	Very Close
B_033	14.85	14.85	B	NAT	0	U	ro	VT	N	-	50	Very Close
B_034	14.88	14.88	B	NAT	0	U	ro	VT	N	-	30	Very Close
B_035	14.92	14.92	B	NAT	0	U	ro	O	N	-	40	Very Close
NI_021	14.92	14.97	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_036	14.97	14.97	B	NAT	0	U	ro	O	N	-	0	Extremely Close
FR_104	15.03	15.03	FR	DI	0	-	-	-	-	-	60	Very Close
FR_105	15.05	15.05	FR	DI	0	-	-	-	-	-	20	Very Close
NI_022	15.05	15.10	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_106	15.10	15.10	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_107	15.17	15.17	FR	DI	0	-	-	-	-	-	70	Close
FR_108	15.20	15.20	FR	DI	0	-	-	-	-	-	30	Very Close
FR_109	15.30	15.30	FR	DI	0	-	-	-	-	-	100	Close
FR_110	15.37	15.37	FR	DI	0	-	-	-	-	-	70	Close
FR_111	15.40	15.40	FR	DI	0	-	-	-	-	-	30	Very Close
NR_008	15.40	15.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_112	15.50	15.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_037	15.55	15.55	B	NAT	0	S	sm	T	Y	sandy silt	50	Very Close
FR_113	15.60	15.60	FR	DI	0	-	-	-	-	-	50	Very Close
FR_114	15.70	15.70	FR	DI	0	-	-	-	-	-	100	Close
NI_023	15.70	15.78	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_115	15.78	15.78	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_116	15.83	15.83	FR	DI	0	-	-	-	-	-	50	Very Close
NI_024	15.83	15.85	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_117	15.85	15.85	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_118	15.96	15.96	FR	DI	0	-	-	-	-	-	110	Close
FR_119	16.05	16.05	FR	DI	0	-	-	-	-	-	90	Close
FR_120	16.12	16.12	FR	DI	0	-	-	-	-	-	70	Close
FR_121	16.25	16.25	FR	DI	0	-	-	-	-	-	130	Close
FR_122	16.34	16.34	FR	DI	0	-	-	-	-	-	90	Close
FR_123	16.40	16.40	FR	DI	0	-	-	-	-	-	60	Very Close
FR_124	16.50	16.50	FR	DI	0	-	-	-	-	-	100	Close
FR_125	16.56	16.56	FR	DI	0	-	-	-	-	-	60	Very Close
FR_126	16.60	16.60	FR	DI	0	-	-	-	-	-	40	Very Close
NR_009	16.60	17.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_127	17.00	17.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_128	17.10	17.10	FR	DI	0	-	-	-	-	-	100	Close
FR_129	17.22	17.22	FR	DI	0	-	-	-	-	-	120	Close
FR_130	17.27	17.27	FR	DI	0	-	-	-	-	-	50	Very Close
NI_025	17.27	17.30	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_131	17.30	17.30	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_132	17.33	17.33	FR	DI	0	-	-	-	-	-	30	Very Close
I_001	17.33	17.40	I	NAT	50	-	-	-	-	-	35	Very Close
FR_133	17.40	17.40	FR	DI	0	-	-	-	-	-	35	Very Close
B_038	17.50	17.50	B	NAT	0	U	sm	VT	N	-	100	Close
FR_134	17.63	17.63	FR	DI	0	-	-	-	-	-	130	Close
FR_135	17.75	17.75	FR	DI	0	-	-	-	-	-	120	Close
FR_136	17.83	17.85	FR	DI	5	-	-	-	-	-	90	Close
FR_137	17.85	17.85	FR	DI	0	-	-	-	-	-	10	Extremely Close
FR_138	17.90	17.90	FR	DI	0	-	-	-	-	-	50	Very Close
NR_010	17.90	18.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_139	18.00	18.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_140	18.20	18.20	FR	DI	0	-	-	-	-	-	200	Close
NI_026	18.20	18.50	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_039	18.50	18.50	B	NAT	0	U	sm	VT	N	-	0	Extremely Close
FR_141	18.80	18.80	FR	DI	0	-	-	-	-	-	300	Medium
FR_142	18.92	18.92	FR	DI	0	-	-	-	-	-	120	Close
FR_143	19.00	19.00	FR	DI	0	-	-	-	-	-	80	Close
FR_144	19.00	19.00	FR	DI	0	-	-	-	-	-	0	Extremely Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH12

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_145	19.06	19.06	FR	DI	0	-	-	-	-	-	60	Very Close
J_006	19.20	19.30	J	NAT	50	P	sm	VT	N	-	190	Close
FR_146	19.35	19.35	FR	DI	0	-	-	-	-	-	100	Close
FR_147	19.43	19.43	FR	DI	0	-	-	-	-	-	80	Close
FR_148	19.52	19.52	FR	DI	0	-	-	-	-	-	90	Close
FR_149	19.55	19.55	FR	DI	0	-	-	-	-	-	30	Very Close
FR_150	19.60	19.60	FR	DI	0	-	-	-	-	-	50	Very Close
NI_027	19.60	19.65	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_151	19.65	19.65	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_152	19.70	19.70	FR	DI	0	-	-	-	-	-	50	Very Close
NI_028	19.70	19.76	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_153	19.76	19.76	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_154	19.85	19.85	FR	DI	0	-	-	-	-	-	90	Close
FR_155	19.96	19.97	FR	DI	10	-	-	-	-	-	115	Close
B_040	20.05	20.05	B	NAT	0	U	sm	VT	N	-	85	Close
NI_029	20.05	20.25	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_041	20.25	20.25	B	NAT	0	U	sm	VT	N	-	0	Extremely Close
I_002	20.35	20.35	I	NAT	0	U	sm	-	-	-	100	Close
I_003	20.38	20.38	I	NAT	0	U	sm	-	-	-	30	Very Close
FR_156	20.42	20.42	FR	DI	0	-	-	-	-	-	40	Very Close
NI_030	20.42	20.45	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_157	20.45	20.45	FR	DI	0	-	-	-	-	-	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
NI_001	1.00	1.10	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
NR_001	1.10	2.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NI_002	2.00	2.02	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
FR_001	2.02	2.02	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_002	2.05	2.05	FR	DI	0	-	-	-	-	-	30	Very Close
NI_003	2.05	2.10	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
FR_003	2.10	2.10	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_001	2.11	2.11	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
NI_004	2.11	2.30	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_002	2.30	2.30	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
NI_005	2.30	2.55	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_001	2.30	2.41	J	NAT	55	U	ro	VT	N	-	195	Close
J_002	2.33	2.41	J	NAT	90	U	ro	VT	N	-	-	-
J_003	2.37	2.45	J	NAT	55	U	ro	VT	N	-	-	-
J_004	2.41	2.47	J	NAT	45	U	ro	VT	N	-	30	Very Close
FR_004	2.55	2.55	FR	DI	0	-	-	-	-	-	110	Close
NR_002	2.55	3.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_005	3.00	3.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_003	3.03	3.03	B	NAT	0	U	ro	VT	N	-	30	Very Close
NI_006	3.03	3.35	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_005	3.07	3.21	J	NAT	80	S	ro	VT	N	-	210	Medium
J_006	3.12	3.23	J	NAT	70	S	ro	VT	N	-	35	Very Close
J_007	3.17	3.19	J	NAT	20	S	ro	VT	N	-	5	Extremely Close
J_008	3.20	3.25	J	NAT	30	S	ro	VT	N	-	45	Very Close
J_009	3.24	3.28	J	NAT	30	S	ro	VT	N	-	35	Very Close
J_010	3.28	3.31	J	NAT	30	S	ro	VT	N	-	35	Very Close
NI_007	3.35	3.48	NI	NAT	0	-	-	-	-	Destructured	55	Very Close
FR_006	3.48	3.61	FR	DI	0	-	-	-	-	-	65	Close
FR_007	3.61	3.65	FR	DI	0	-	-	-	-	Manual handling fracture	85	Close
NR_003	3.65	4.00	NR	DI	0	-	-	-	-	AZCL	20	Very Close
FR_008	5.50	6.28	FR	DI	0	-	-	-	-	Reworked	1890	Wide
B_004	6.28	6.28	B	NAT	0	S	ro	T	N	-	390	Medium
FR_009	6.33	6.33	FR	DI	0	-	-	-	-	-	50	Very Close
FR_010	6.39	6.39	FR	DI	0	-	-	-	-	-	60	Very Close
NR_004	6.39	6.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NR_005	8.00	8.07	NR	DI	0	-	-	-	-	No recovery	1500	Wide
FR_011	8.00	8.00	FR	DI	0	-	-	-	-	-	70	Close
B_005	8.05	8.07	B	NAT	10	S	sm	PO	Y	Brown oxidation	60	Close
B_006	8.11	8.11	B	NAT	0	U	sm	O	N	-	50	Very Close
B_007	8.21	8.21	B	NAT	0	P	sm	T	Y	Silty matrix	100	Close
NI_008	8.21	8.23	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_008	8.23	8.23	B	NAT	0	S	ro	PO	Y	Silty matrix	0	Extremely Close
FR_012	8.28	8.28	FR	DI	0	-	-	-	-	-	50	Very Close
B_009	8.37	8.37	B	NAT	0	P	ro	PO	N	-	90	Close
J_011	8.37	8.42	J	NAT	80	S	ro	T	N	-	25	Very Close
B_010	8.42	8.42	B	NAT	0	P	ro	T	N	-	25	Very Close
I_001	8.57	8.57	I	NAT	0	-	-	-	-	-	150	Close
B_011	8.67	8.67	B	NAT	0	S	ro	T	Y	Silty matrix	100	Close
B_012	8.79	8.79	B	NAT	0	S	ro	VT	N	-	120	Close
J_012	8.79	8.83	J	NAT	80	P	ro	T	N	-	20	Extremely Close
FR_013	8.83	8.83	FR	DI	0	-	-	-	-	-	20	Very Close
NI_009	8.83	9.00	NI	DI	0	-	-	-	-	Possibly due to drilling (recovered in shoe)	0	Extremely Close
FR_014	9.00	9.00	FR	DI	0	-	-	-	-	End of core run	0	Extremely Close
B_013	9.09	9.09	B	NAT	0	S	ro	T	Y	Silty matrix	90	Close
NI_010	9.09	9.15	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_014	9.15	9.15	B	NAT	0	S	ro	T	Y	Brown oxidation	0	Extremely Close
B_015	9.23	9.23	B	NAT	0	U	ro	PO	N	-	80	Close
B_016	9.34	9.34	B	NAT	0	S	ro	O	Y	Silty matrix	110	Close
B_017	9.42	9.42	B	NAT	0	P	sm	T	Y	Silty matrix	80	Close
NI_011	9.42	9.59	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
B_018	9.59	9.59	B	NAT	0	S	ro	PO	Y	Silty matrix	0	Extremely Close
FR_015	9.65	9.65	FR	DI	0	-	-	-	-	-	60	Close
NR_006	9.65	10.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_016	10.00	10.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_017	10.10	10.10	FR	DI	0	-	-	-	-	-	100	Close
B_019	10.20	10.20	B	NAT	0	P	ro	VT	N	-	100	Close
I_002	10.22	10.22	I	NAT	0	P	ro	VT	N	-	20	Very Close
B_020	10.27	10.27	B	NAT	0	P	ro	VT	N	-	50	Very Close
NI_012	10.27	10.31	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_021	10.31	10.31	B	NAT	0	P	sm	T	Y	Silty matrix	0	Extremely Close
B_022	10.40	10.40	B	NAT	0	P	sm	T	Y	Silty matrix	90	Close
NI_013	10.40	10.75	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_018	10.75	10.75	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_007	10.75	11.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_019	13.50	13.50	FR	DI	0	-	-	-	-	-	2500	Very Wide

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH13

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_020	13.53	13.53	FR	DI	0	-	-	-	-	-	30	Very Close
I_003	13.65	13.65	I	NAT	0	P	ro	VT	N	-	120	Close
I_004	13.83	13.83	I	NAT	0	P	ro	VT	N	-	180	Close
I 005	13.93	13.93	I	NAT	0	P	ro	VT	N	-	100	Close
I 006	13.98	13.98	I	NAT	0	P	ro	VT	N	-	50	Very Close
FR_021	14.15	14.15	FR	DI	0	-	-	-	-	Shoe recovery	170	Close
FR_022	14.20	14.20	FR	DI	0	-	-	-	-	-	50	Very Close
NR_008	16.00	16.07	NR	DI	0	-	-	-	-	No recovery	1800	Wide
FR_023	16.05	16.05	FR	DI	0	-	-	-	-	-	20	Extremely Close
B 023	16.12	16.13	B	NAT	10	P	ro	VT	N	Stained orange	75	Close
B 024	16.28	16.28	B	NAT	0	P	ro	VT	N	Stained orange	155	Close
B_025	16.35	16.35	B	NAT	0	S	ro	VT	N	Stained orange	70	Close
B_026	16.43	16.45	B	NAT	20	S	ro	VT	N	Stained orange	90	Close
FR_024	16.61	16.61	FR	DI	0	-	-	-	-	-	170	Close
FR_025	16.70	16.70	FR	DI	0	-	-	-	-	-	90	Close
FR 026	16.76	16.76	FR	DI	0	-	-	-	-	-	60	Close
FR 027	16.93	16.93	FR	DI	0	-	-	-	-	-	170	Close
FR_028	17.00	17.00	FR	DI	0	-	-	-	-	-	70	Close
NR_009	17.00	17.05	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_029	17.00	17.00	FR	DI	0	-	-	-	-	-	50	Very Close
FR_030	17.10	17.10	FR	DI	0	-	-	-	-	-	100	Close
B 027	17.19	17.19	B	NAT	0	P	ro	T	Y	Silty Matrix	90	Close
B 028	17.27	17.27	B	NAT	0	S	ro	VT	N	-	80	Close
NI_014	17.27	17.32	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_029	17.32	17.32	B	NAT	0	P	ro	T	Y	Silty Matrix	0	Extremely Close
FR_031	17.39	17.39	FR	DI	0	-	-	-	-	-	70	Close
B_030	17.47	17.47	B	NAT	0	U	ro	PO	N	-	80	Close
B 031	17.58	17.58	B	NAT	0	U	ro	T	N	-	110	Close
B 032	17.70	17.70	B	NAT	0	P	sm	PO	Y	Stained orange + silty matrix	120	Close
B_033	17.79	17.79	B	NAT	0	P	ro	PO	Y	Silty sandy matrix	90	Close
B_034	17.85	17.85	B	NAT	0	P	sm	PO	Y	Silty sandy matrix / Change of weathering state	60	Close
NI_015	17.85	18.00	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
FR_032	18.00	18.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR 010	18.00	18.28	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR 033	18.28	18.28	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_034	18.43	18.43	FR	DI	0	-	-	-	-	-	150	Close
FR_035	18.50	18.50	FR	DI	0	-	-	-	-	-	70	Close
FR_036	18.50	18.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_016	18.50	18.52	NI	DI	0	-	-	-	-	Possibly drilling induced	0	Extremely Close
FR 037	18.52	18.52	FR	DI	0	-	-	-	-	-	0	Extremely Close
B 035	18.56	18.56	B	NAT	0	-	-	-	-	Change of weathering state	40	Very Close
NI_017	18.56	18.90	NI	NAT	0	-	-	-	-	Destructured	0	Extremely Close
NR_011	18.90	19.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_038	20.50	20.50	FR	DI	0	-	-	-	-	-	1500	Wide
NI_018	20.50	20.55	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B 036	20.51	20.51	B	NAT	0	U	ro	VT	N	-	40	Very Close
B 037	20.55	20.55	B	NAT	0	U	ro	VT	N	-	40	Very Close
FR_039	20.61	20.61	FR	DI	0	-	-	-	-	-	60	Very Close
B_038	20.63	20.63	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
NI_019	20.65	20.67	NI	NAT	0	-	-	-	-	-	20	Extremely Close
B_039	20.69	20.69	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
B 040	20.93	20.93	B	NAT	0	U	ro	VT	N	-	240	Medium
NI 020	20.96	20.98	NI	NAT	0	-	-	-	-	-	-	-
B_041	21.01	21.01	B	NAT	0	U	ro	VT	N	-	30	Very Close
B_042	21.02	21.02	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B_043	21.03	21.03	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B_044	21.04	21.04	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B 045	21.05	21.05	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B 046	21.06	21.06	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
B_047	21.07	21.07	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
FR_040	21.09	21.09	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_041	21.10	21.10	FR	DI	0	-	-	-	-	-	10	Extremely Close
NR_012	21.10	21.15	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

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Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
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Roughness - small
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Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
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Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH13

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
NR_001	0.00	0.35	NR	DI	0	-	-	-	-	AZCL	0	-
NI_001	0.35	0.60	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
NR_002	0.65	1.00	NR	DI	0	-	-	-	-	AZCL	50	Very Close
FR_001	1.00	1.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_002	1.08	1.12	NI	NAT	0	-	-	-	-	-	80	Close
B_001	1.12	1.14	B	NAT	0	U	ro	O	Y	sandy clay	10	Extremely Close
FR_002	1.20	1.20	FR	DI	0	-	-	-	-	-	70	Close
J_001	1.29	1.37	J	NAT	70	U	ro	VT	N	-	130	Close
J_002	1.32	1.37	J	NAT	0	U	ro	VT	N	-	15	Extremely Close
NI_003	1.37	1.50	NI	NAT	0	-	-	-	-	-	25	Very Close
FR_003	1.50	1.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_003	1.50	1.57	J	NAT	50	S	sm	VT	N	-	35	Very Close
J_004	1.54	1.65	J	NAT	90	S	ro	VT	N	-	-	-
J_005	1.60	1.95	J	NAT	80	U	sm	VT	N	-	-	-
J_006	1.67	1.68	J	NAT	10	S	sm	VT	N	-	100	Close
J_007	1.69	1.72	J	NAT	10	S	sm	VT	N	-	30	Very Close
NI_004	1.76	1.82	NI	NAT	0	-	-	-	-	-	55	Very Close
J_008	1.85	1.96	J	NAT	70	S	ro	VT	N	-	85	Close
NI_005	1.88	1.96	NI	NAT	0	-	-	-	-	-	25	Very Close
B_002	1.97	1.97	B	NAT	0	U	sm	T	Y	matrix clayey sand	10	Extremely Close
J_009	2.08	2.11	J	NAT	20	S	ro	VT	N	-	125	Close
NI_006	2.08	2.12	NI	NAT	0	-	-	-	-	-	15	Extremely Close
J_010	2.08	2.15	J	NAT	50	S	sm	VT	N	-	5	Extremely Close
J_011	2.17	2.24	J	NAT	50	U	sm	T	Y	reddish brown stain on fracture with fossils	90	Close
J_012	2.18	2.24	J	NAT	50	U	sm	T	Y	reddish brown stain	5	Extremely Close
NI_007	2.19	2.24	NI	NAT	0	-	-	-	-	-	20	Very Close
B_003	2.24	2.24	B	NAT	0	U	sm	T	Y	clayey gravelly sand	0	Extremely Close
NI_008	2.25	2.45	NI	NAT	0	-	-	-	-	destructured	10	Extremely Close
FR_004	2.45	2.45	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_003	2.45	2.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NR_004	2.50	3.00	NR	DI	0	-	-	-	-	No recovery	0	Extremely Close
FR_005	3.00	3.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_009	3.00	3.10	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_013	3.00	3.07	J	NAT	50	S	sm	T	Y	gravelly sandy clay matrix	65	Close
J_014	3.04	3.10	J	NAT	50	S	sm	T	Y	gravelly sandy clay matrix	35	Very Close
B_004	3.10	3.10	B	NAT	0	S	sm	T	Y	gravelly sandy clay matrix	30	Very Close
NI_010	3.10	3.65	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
J_015	3.54	3.61	J	NAT	50	U	ro	T	Y	silty sand	75	Close
J_016	3.57	3.70	J	NAT	90	S	sm	VT	N	-	-	-
J_017	3.62	3.72	J	NAT	50	S	sm	VT	N	-	-	-
NI_011	3.69	3.85	NI	NAT	0	-	-	-	-	-	20	Very Close
J_018	3.73	3.85	J	NAT	50	U	sm	VT	N	-	60	Close
J_019	3.77	3.79	J	NAT	30	U	sm	VT	N	-	10	Extremely Close
FR_006	3.85	3.85	FR	DI	0	-	-	-	-	-	70	Close
NR_005	3.85	4.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_007	4.00	4.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_005	4.05	4.05	B	NAT	0	U	sm	VT	N	-	50	Very Close
B_006	4.10	4.10	B	NAT	0	P	sm	VT	N	-	50	Very Close
B_007	4.10	4.10	B	NAT	0	P	sm	VT	N	-	0	Extremely Close
FR_008	4.13	4.19	FR	DI	0	-	-	-	-	-	60	Close
FR_009	4.32	4.32	FR	DI	0	-	-	-	-	-	160	Close
FR_010	4.50	4.50	FR	DI	0	-	-	-	-	End of core run	180	Close
FR_011	4.50	4.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_008	4.64	4.64	B	NAT	0	U	sm	VT	N	reddish yellow stain	140	Close
B_009	4.67	4.67	B	NAT	0	S	sm	VT	N	-	30	Very Close
J_020	4.67	4.73	J	NAT	50	S	sm	VT	N	-	30	Very Close
J_021	4.68	4.72	J	NAT	40	S	sm	VT	N	-	0	Extremely Close
J_022	4.68	4.73	J	NAT	90	S	sm	VT	N	-	-	-
J_023	4.70	4.73	J	NAT	60	S	sm	VT	N	-	-	-
B_010	4.73	4.73	B	NAT	0	U	sm	VT	N	-	15	Extremely Close
B_011	4.77	4.77	B	NAT	0	U	sm	VT	N	-	40	Very Close
B_012	5.13	5.13	B	NAT	0	S	sm	VT	N	reddish yellow stain	360	Medium
J_024	5.13	5.18	J	NAT	90	S	sm	VT	N	-	-	-
J_025	5.15	5.20	J	NAT	10	U	sm	VT	N	-	-	-
J_026	5.16	5.19	J	NAT	20	U	sm	VT	N	-	0	Extremely Close
B_013	5.40	5.40	B	NAT	0	S	sm	VT	N	reddish yellow stain with fossils and a shell	225	Medium
FR_012	5.50	5.50	FR	DI	0	-	-	-	-	-	100	Close
FR_013	5.50	5.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_012	5.50	5.57	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
B_014	5.57	5.57	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_015	5.62	5.62	B	NAT	0	U	ro	O	Y	clay	50	Very Close
B_016	5.69	5.69	B	NAT	0	U	ro	MW	Y	clay	70	Close
B_017	5.75	5.75	B	NAT	0	S	ro	VT	N	-	60	Very Close
J_027	5.75	5.95	J	NAT	90	U	ro	VT	N	-	-	-
B_018	5.79	5.79	B	NAT	0	U	ro	VT	N	-	-	-

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
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J : joint
NI : non intact
NR : no recovery
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Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH15

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_019	5.89	5.89	B	NAT	0	S	ro	VT	N	-	100	Close
J_028	5.89	6.25	J	NAT	90	U	ro	VT	N	-	-	-
B_020	5.96	5.96	B	NAT	0	P	ro	VT	N	-	-	-
NI_013	5.96	6.25	NI	NAT	0	0	-	-	-	destructured	0	Extremely Close
B_021	5.99	5.99	B	NAT	0	U	ro	VT	N	-	260	Medium
B_022	6.15	6.15	B	NAT	0	P	ro	VT	N	-	160	Close
J_029	6.25	6.32	J	NAT	65	U	ro	VT	N	-	135	Close
J_030	6.32	6.34	J	NAT	20	U	ro	VT	N	-	45	Very Close
J_031	6.32	6.43	J	NAT	60	U	ro	VT	N	-	45	Very Close
J_032	6.35	6.38	J	NAT	20	P	ro	VT	N	-	10	Extremely Close
J_033	6.36	6.55	J	NAT	90	U	ro	VT	N	-	-	-
J_034	6.37	6.40	J	NAT	20	P	ro	VT	N	-	-	-
B_023	6.55	6.55	B	NAT	0	P	-	-	-	-	165	Close
J_035	6.55	6.66	J	NAT	90	P	ro	VT	N	-	-	-
J_036	6.60	6.63	J	NAT	20	U	ro	VT	N	-	-	-
NI_014	6.62	6.66	NI	NAT	0	-	-	-	-	-	5	Extremely Close
B_024	6.66	6.66	B	NAT	0	-	-	-	-	-	0	Extremely Close
B_025	6.80	6.80	B	NAT	0	-	-	-	-	-	140	Close
FR_014	6.85	6.85	FR	DI	0	-	-	-	-	-	50	Very Close
FR_015	6.90	6.90	FR	DI	0	-	-	-	-	-	50	Very Close
NR_006	6.90	7.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_016	7.00	7.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_037	7.00	7.25	J	NAT	90	U	ro	VT	N	-	-	-
B_026	7.05	7.05	B	NAT	0	U	ro	VT	N	-	-	-
J_038	7.15	7.17	J	NAT	20	U	ro	VT	N	-	110	Close
B_027	7.25	7.25	B	NAT	0	U	ro	VT	N	-	90	Close
FR_017	7.50	7.50	FR	DI	0	-	-	-	-	-	250	Medium
B_028	7.67	7.67	B	NAT	0	-	-	-	-	-	170	Close
J_039	7.67	7.72	J	NAT	50	U	ro	VT	N	-	25	Very Close
NI_015	7.67	7.72	NI	NAT	0	-	-	-	-	-	25	Very Close
B_029	7.72	7.72	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
J_040	7.72	7.83	J	NAT	60	U	ro	VT	N	-	55	Very Close
B_030	7.76	7.76	B	NAT	0	P	-	-	-	-	15	Extremely Close
J_041	7.82	7.97	J	NAT	60	U	ro	VT	N	-	135	Close
NI_016	7.92	8.10	NI	NAT	0	-	-	-	-	destructured	25	Very Close
J_042	8.03	8.20	J	NAT	90	U	ro	VT	N	-	-	-
J_043	8.10	8.13	J	NAT	20	U	ro	VT	N	-	-	-
B_031	8.20	8.20	B	NAT	0	U	ro	VT	N	-	85	Close
B_032	8.27	8.27	B	NAT	0	U	ro	VT	N	-	70	Close
FR_018	8.36	8.36	FR	DI	0	-	-	-	-	-	90	Close
FR_019	8.50	8.50	FR	DI	0	-	-	-	-	-	140	Close
FR_020	8.50	8.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_021	8.62	8.62	FR	DI	0	-	-	-	-	-	120	Close
B_033	8.70	8.70	B	NAT	0	P	ro	VT	N	-	80	Close
NI_017	8.70	8.78	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_044	8.70	8.78	J	NAT	90	P	ro	VT	N	-	-	-
J_045	8.70	8.78	J	NAT	70	P	ro	VT	N	-	-	-
J_046	8.70	8.81	J	NAT	60	P	ro	VT	N	-	15	Extremely Close
J_047	8.73	8.75	J	NAT	20	P	ro	VT	N	-	15	Extremely Close
B_034	8.93	8.93	B	NAT	0	U	ro	VT	N	-	190	Close
B_035	9.02	9.02	B	NAT	0	P	ro	VT	N	-	90	Close
NI_018	9.02	9.08	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_048	9.02	9.08	J	NAT	90	P	ro	VT	N	-	-	-
J_049	9.03	9.08	J	NAT	40	P	ro	VT	N	-	-	-
J_050	9.03	9.08	J	NAT	70	U	ro	VT	N	-	0	Extremely Close
J_051	9.14	9.25	J	NAT	60	U	ro	VT	N	-	140	Close
NI_019	9.17	9.39	NI	NAT	0	-	-	-	-	-	25	Very Close
J_052	9.20	9.37	J	NAT	60	P	ro	VT	N	-	105	Close
B_036	9.39	9.39	B	NAT	0	-	-	-	-	-	105	Close
NI_020	9.39	10.00	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
FR_022	10.00	10.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_021	10.00	10.12	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
NI_022	10.12	10.20	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_053	10.12	10.20	J	NAT	50	P	ro	VT	N	-	40	Very Close
J_054	10.17	10.21	J	NAT	40	P	ro	VT	N	-	30	Very Close
J_055	10.21	10.32	J	NAT	90	P	ro	VT	N	-	-	-
B_037	10.32	10.32	B	NAT	0	P	ro	-	-	-	-	-
B_038	10.37	10.37	B	NAT	0	U	ro	MW	Y	gravelly clay	50	Very Close
J_056	10.37	10.45	J	NAT	70	U	ro	VT	N	-	40	Very Close
B_039	10.53	10.53	B	NAT	0	P	-	-	-	-	120	Close
J_057	10.56	10.60	J	NAT	40	U	ro	VT	N	-	50	Very Close
NI_023	10.56	10.70	NI	NAT	0	-	-	-	-	-	20	Extremely Close
J_058	10.57	10.60	J	NAT	40	U	ro	VT	N	-	115	Close
J_059	10.61	10.67	J	NAT	50	U	ro	VT	N	-	55	Very Close
J_060	10.65	10.70	J	NAT	50	U	ro	VT	N	-	35	Very Close

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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH15

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_023	10.70	10.70	FR	DI	0	-	-	-	-	-	25	Very Close
FR_024	10.75	10.75	FR	DI	0	-	-	-	-	-	50	Very Close
NR_007	10.75	11.00	NR	DI	90	-	-	-	-	AZCL	-	-
FR_025	11.00	11.00	FR	DI	0	-	-	-	-	-	-	-
J_061	11.00	11.13	J	NAT	90	U	ro	VT	N	-	-	-
B_040	11.06	11.06	B	NAT	0	U	ro	VT	N	-	-	-
B_041	11.12	11.12	B	NAT	0	P	ro	VT	N	-	60	Very Close
J_062	11.25	11.33	J	NAT	50	U	ro	VT	N	-	170	Close
J_063	11.26	11.39	J	NAT	55	U	ro	VT	N	-	35	Very Close
J_064	11.31	11.35	J	NAT	30	U	ro	VT	N	-	5	Extremely Close
J_065	11.37	11.46	J	NAT	60	U	ro	VT	N	-	85	Close
J_066	11.41	11.50	J	NAT	40	U	ro	VT	N	-	40	Very Close
FR_026	11.65	11.65	FR	DI	0	-	-	-	-	-	195	Close
FR_027	11.80	11.80	FR	DI	0	-	-	-	-	-	150	Close
NR_008	11.80	12.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_028	12.00	12.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_042	12.11	12.11	B	NAT	0	S	ro	VT	N	-	110	Close
B_043	12.20	12.20	B	NAT	0	S	ro	VT	N	-	90	Close
B_044	12.28	12.28	B	NAT	0	S	ro	VT	N	-	80	Close
B_045	12.33	12.33	B	NAT	0	S	ro	VT	N	-	50	Very Close
FR_029	12.36	12.36	FR	DI	0	-	-	-	-	-	30	Very Close
B_046	12.53	12.53	B	NAT	0	S	sm	VT	N	-	170	Close
B_047	12.58	12.58	B	NAT	0	S	sm	VT	N	-	50	Very Close
B_048	12.64	12.64	B	NAT	0	U	ro	VT	N	-	60	Close
B_049	12.69	12.69	B	NAT	0	U	ro	VT	N	-	50	Very Close
B_050	12.74	12.74	B	NAT	0	U	sm	T	Y	sandy clay	50	Very Close
B_051	12.83	12.83	B	NAT	0	P	sm	T	Y	sandy gravelly clay	90	Close
B_052	12.90	12.90	B	NAT	0	P	sm	T	Y	sandy gravelly clay	70	Close
J_067	12.90	12.96	J	NAT	90	U	sm	T	Y	sandy clay	-	-
B_053	12.96	12.96	B	NAT	0	P	sm	T	Y	sandy clay	-	-
J_068	12.98	13.05	J	NAT	50	U	sm	T	Y	matrix sandy clay	55	Very Close
J_069	12.98	13.05	J	NAT	50	U	sm	T	Y	matrix sandy clay	0	Extremely Close
NI_024	12.99	13.05	NI	NAT	0	-	-	-	-	-	25	Very Close
B_054	13.12	13.12	B	NAT	0	P	sm	T	Y	sandy gravelly clay	70	Close
B_055	13.17	13.17	B	NAT	0	P	sm	T	Y	sandy clay	50	Very Close
B_056	13.23	13.23	B	NAT	0	P	sm	T	Y	sandy clay	60	Close
B_057	13.33	13.33	B	NAT	0	P	sm	T	Y	sandy clay	100	Close
B_058	13.40	13.40	B	NAT	0	P	sm	T	Y	sandy clay	70	Close
FR_030	13.50	13.50	FR	DI	0	-	-	-	-	-	100	Close
FR_031	15.00	15.00	FR	DI	0	-	-	-	-	-	1500	Wide
NI_025	15.00	15.60	NI	NAT	0	-	-	-	-	destructured	0	Extremely Close
J_070	15.69	15.74	J	NAT	20	U	sm	VT	N	-	115	Close
FR_032	15.82	15.82	FR	DI	0	-	-	-	-	-	105	Close
FR_033	15.89	15.89	FR	DI	0	-	-	-	-	-	70	Close
FR_034	16.00	16.00	FR	DI	0	-	-	-	-	-	110	Close
FR_035	16.00	16.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_036	16.07	16.07	FR	DI	0	-	-	-	-	-	70	Close
FR_037	16.19	16.19	FR	DI	0	-	-	-	-	-	120	Close
FR_038	16.28	16.28	FR	DI	0	-	-	-	-	-	90	Close
NI_026	16.28	16.31	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_039	16.31	16.31	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_040	16.38	16.38	FR	DI	0	-	-	-	-	-	70	Close
FR_041	16.46	16.46	FR	DI	0	-	-	-	-	-	80	Close
NI_027	16.46	16.53	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_042	16.53	16.53	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_043	16.67	16.67	FR	DI	0	-	-	-	-	-	140	Close
FR_044	16.87	16.87	FR	DI	0	-	-	-	-	-	200	Close
FR_045	17.00	17.00	FR	DI	0	-	-	-	-	-	130	Close
FR_046	17.12	17.12	FR	DI	0	-	-	-	-	-	120	Close
FR_047	17.20	17.20	FR	DI	0	-	-	-	-	-	80	Close
FR_048	17.35	17.35	FR	DI	0	-	-	-	-	-	150	Close
FR_049	17.41	17.41	FR	DI	0	-	-	-	-	-	60	Very Close
FR_050	17.50	17.50	FR	DI	0	-	-	-	-	-	90	Close
FR_051	17.50	17.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_052	17.61	17.61	FR	DI	0	-	-	-	-	-	110	Close
FR_053	17.67	17.67	FR	DI	0	-	-	-	-	-	60	Close
FR_054	17.70	17.70	FR	DI	0	-	-	-	-	-	30	Very Close
FR_055	17.78	17.78	FR	DI	0	-	-	-	-	-	80	Close
B_059	17.91	17.91	B	NAT	0	P	ro	VT	N	-	130	Close
FR_056	17.97	17.97	FR	DI	0	-	-	-	-	-	60	Very Close
FR_057	18.08	18.08	FR	DI	0	-	-	-	-	-	110	Close
FR_058	18.20	18.20	FR	DI	0	-	-	-	-	-	120	Close
FR_059	18.30	18.30	FR	DI	0	-	-	-	-	-	100	Close
FR_060	18.45	18.45	FR	DI	0	-	-	-	-	-	150	Close
FR_061	18.61	18.61	FR	DI	0	-	-	-	-	-	160	Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH15

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_062	18.70	18.70	FR	DI	0	-	-	-	-	-	90	Close
FR_063	18.70	18.70	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_064	18.75	18.75	FR	DI	0	-	-	-	-	-	50	Very Close
FR_065	18.86	18.86	FR	DI	0	-	-	-	-	-	110	Close
NI_028	18.86	18.93	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_066	18.93	18.93	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_067	18.94	18.94	FR	DI	0	-	-	-	-	-	10	Extremely Close
NI_029	18.94	19.03	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_068	19.03	19.03	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_069	19.05	19.05	FR	DI	0	-	-	-	-	-	20	Extremely Close
NI_030	19.05	19.16	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_070	19.16	19.16	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_071	19.20	19.20	FR	DI	0	-	-	-	-	-	40	Very Close
NR_009	19.20	20.20	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_001	0.00	0.00	B	NAT	0	P	ro	T	N	top surface layer covered in algae	0	-
B_002	0.10	0.10	B	NAT	0	P	sm	T	N	stained orange	100	Close
NI_001	0.10	0.42	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_003	0.42	0.42	B	NAT	0	P	sm	PO	Y	change of lithology; sandy silty matrix	0	Extremely Close
B_004	0.46	0.46	B	NAT	0	P	sm	T	Y	fine gravels; stained orange	40	Very Close
NI_002	0.46	0.55	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_005	0.55	0.55	B	NAT	0	P	ro	O	N	stained orange	0	Extremely Close
B_006	0.65	0.65	B	NAT	0	P	sm	PO	N	-	100	Close
NI_003	0.65	0.75	NI	DI	0	-	-	-	-	possibly drilling induced (shoe recovery)	0	Extremely Close
FR_001	0.75	0.75	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_001	0.75	1.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_002	1.00	1.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_007	1.09	1.09	B	NAT	0	P	ro	O	N	-	90	Close
NI_004	1.09	1.37	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_008	1.37	1.39	B	NAT	0	P	sm	O	Y	sandy clay	10	Extremely Close
B_009	1.51	1.52	B	NAT	10	P	ro	T	Y	fine sand	135	Close
NI_005	1.51	1.74	NI	NAT	0	-	-	-	-	-	5	Extremely Close
B_010	1.74	1.74	B	NAT	0	P	sm	T	Y	sandy clay; change of layer	0	Extremely Close
NI_006	1.74	1.80	NI	DI	0	-	-	-	-	possibly drilling induced; shoe recovery	0	Extremely Close
FR_003	1.80	1.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_002	1.80	2.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_004	2.00	2.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_011	2.11	2.15	B	NAT	10	S	sm	T	Y	sandy clay	130	Close
NI_007	2.11	2.23	NI	NAT	0	-	-	-	-	(accentuated by drilling, interbedded)	20	Very Close
B_012	2.23	2.23	B	NAT	0	U	ro	T	Y	sandy clay	0	Extremely Close
B_013	2.27	2.27	B	NAT	0	U	ro	T	Y	sandy clay	40	Very Close
NI_008	2.27	2.37	NI	NAT	0	-	-	-	-	accentuated by drilling	0	Extremely Close
B_014	2.37	2.37	B	NAT	0	U	ro	T	Y	sandy clay	0	Extremely Close
B_015	2.40	2.40	B	NAT	0	U	ro	PO	Y	sandy clay	30	Very Close
B_016	2.42	2.42	B	NAT	0	U	ro	O	Y	sandy clay	20	Very Close
NI_009	2.42	2.55	NI	DI	0	-	-	-	-	possibly drilling induced; shoe recovery	0	Extremely Close
FR_005	2.55	2.55	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_003	2.55	3.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_006	3.00	3.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_007	3.03	3.03	FR	DI	0	-	-	-	-	-	30	Very Close
NI_010	3.03	3.26	NI	DI	0	-	-	-	-	possible subvertical fracture	0	Extremely Close
FR_008	3.28	3.28	FR	DI	0	-	-	-	-	-	20	Very Close
B_017	3.31	3.31	B	NAT	0	U	ro	VT	N	-	30	Very Close
B_018	3.33	3.33	B	NAT	0	U	ro	VT	N	-	20	Very Close
FR_009	3.36	3.36	FR	DI	0	-	-	-	-	-	30	Very Close
FR_010	3.40	3.40	FR	DI	0	-	-	-	-	-	40	Very Close
B_019	3.44	3.44	B	NAT	0	U	ro	VT	N	-	40	Very Close
B_020	3.47	3.47	B	NAT	0	P	ro	VT	N	-	30	Very Close
B_021	3.50	3.50	B	NAT	0	U	ro	PO	Y	grey silt	30	Very Close
FR_011	3.55	3.55	FR	DI	0	-	-	-	-	-	50	Very Close
FR_012	3.58	3.58	FR	DI	0	-	-	-	-	-	30	Very Close
B_022	3.63	3.63	B	NAT	0	U	ro	VT	N	-	50	Very Close
FR_013	3.66	3.66	FR	DI	0	-	-	-	-	-	30	Very Close
FR_014	3.71	3.71	FR	DI	0	-	-	-	-	-	50	Very Close
B_023	3.79	3.79	B	NAT	0	U	ro	T	Y	grey silt	80	Close
FR_015	3.83	3.83	FR	DI	0	-	-	-	-	-	40	Very Close
B_024	3.88	3.88	B	NAT	0	-	-	-	-	-	50	Very Close
J_001	3.94	3.99	J	NAT	90	P	ro	VT	N	-	-	-
FR_016	4.00	4.00	FR	DI	0	-	-	-	-	-	-	-
FR_017	4.00	4.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_011	4.00	4.40	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
B_025	4.40	4.40	B	NAT	0	P	sm	PO	Y	Sandy silty matrix	0	Extremely Close
B_026	4.46	4.46	B	NAT	0	U	ro	O	N	Stained dark grey	60	Very Close
B_027	4.54	4.54	B	NAT	0	S	ro	PO	N	Stained dark grey and occasional fine to medium-sized bioclast	80	Close
NI_012	4.54	4.80	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
FR_018	4.80	4.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_004	4.80	5.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_019	5.00	5.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_028	5.05	5.06	B	NAT	10	S	ro	O	N	Stained grey	55	Very Close
FR_020	5.10	5.10	FR	DI	0	-	-	-	-	-	45	Very Close
NR_005	5.10	6.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_021	6.00	6.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_013	6.00	6.35	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
B_029	6.35	6.35	B	NAT	0	S	ro	O	Y	Silty sand	0	Extremely Close
FR_022	6.42	6.42	FR	DI	0	-	-	-	-	-	70	Close
FR_023	6.50	6.50	FR	DI	0	-	-	-	-	-	80	Close
NR_006	6.50	7.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_024	7.00	7.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_030	7.01	7.01	B	NAT	0	P	sm	O	Y	sandy silty matrix	10	Extremely Close
B_031	7.05	7.05	B	NAT	0	P	ro	PO	N	-	40	Very Close

Notes:
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Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH17

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_032	7.08	7.08	B	NAT	0	U	ro	O	N	-	30	Very Close
B_033	7.11	7.11	B	NAT	0	S	ro	PO	N	-	30	Very Close
B_034	7.14	7.14	B	NAT	0	P	ro	T	N	fine to medium gravel-sized bioclasts	30	Very Close
NI_014	7.14	7.22	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_035	7.22	7.22	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
B_036	7.26	7.26	B	NAT	0	P	ro	T	N	-	40	Very Close
NI_015	7.26	7.33	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_037	7.33	7.33	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
B_038	7.37	7.37	B	NAT	0	P	ro	T	N	-	40	Very Close
B_039	7.42	7.43	B	NAT	10	P	ro	VT	N	-	55	Very Close
NI_016	7.42	7.57	NI	NAT	0	-	-	-	-	Destructed	5	Extremely Close
NI_017	7.57	7.60	NI	DI	0	-	-	-	-	Drilling (shoe)	0	Extremely Close
FR_025	7.60	7.60	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_007	7.60	8.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_026	8.00	8.05	FR	DI	0	-	-	-	-	CPT disturbed	25	Very Close
NI_018	8.05	8.20	NI	NAT	0	-	-	-	-	Destructed	25	Very Close
FR_027	8.20	8.20	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_019	8.20	8.60	NI	NAT	0	-	-	-	-	Destructed	0	Extremely Close
B_040	8.57	8.60	B	NAT	10	P	ro	PO	Y	Silty sandy fine gravels	15	Extremely Close
B_041	8.68	8.68	B	NAT	0	P	ro	VT	N	Stained grey	95	Close
FR_028	8.85	8.85	FR	DI	0	-	-	-	-	-	170	Close
FR_029	8.89	8.89	FR	DI	0	-	-	-	-	-	40	Very Close
NI_020	8.89	8.91	NI	DI	0	-	-	-	-	Drilling (shoe)	0	Extremely Close
FR_030	8.91	8.91	FR	DI	0	-	-	-	-	Drilling (shoe)	0	Extremely Close
FR_031	8.96	8.96	FR	DI	0	-	-	-	-	Drilling (shoe)	50	Very Close
NI_021	8.96	9.00	NI	DI	0	-	-	-	-	Drilling (shoe)	0	Extremely Close
FR_032	9.00	9.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_033	9.07	9.07	FR	DI	0	-	-	-	-	-	70	Close
J_002	9.07	9.32	J	NAT	90	P	ro	O	Y	fine to medium gravels	-	-
J_003	9.07	9.26	J	NAT	80	P	ro	O	N	-	-	-
B_042	9.17	9.17	B	NAT	0	P	ro	T	N	-	5	Extremely Close
B_043	9.21	9.21	B	NAT	0	P	ro	T	N	-	40	Very Close
B_044	9.21	9.23	B	NAT	10	P	ro	T	N	-	10	Extremely Close
B_045	9.26	9.26	B	NAT	0	P	ro	T	N	-	40	Very Close
I_001	9.32	9.32	I	NAT	0	-	-	-	-	-	60	Close
B_046	9.36	9.36	B	NAT	0	P	ro	PO	Y	Fine gravels	40	Very Close
B_047	9.44	9.47	B	NAT	0	P	sm	MW	Y	Silty sandy fine to coarse gravels - Change of of weathering	95	Close
NI_022	9.47	10.00	NI	NAT	0	-	-	-	-	Destructed	15	Extremely Close
FR_034	10.00	10.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_023	10.00	10.10	NI	NAT	0	-	-	-	-	Destructed	0	Extremely Close
I_002	10.10	10.10	I	NAT	0	-	-	-	-	-	0	Extremely Close
FR_035	10.22	10.22	FR	DI	0	-	-	-	-	Shoe recovery	120	Close
FR_036	10.30	10.30	FR	DI	0	-	-	-	-	Shoe recovery	80	Close
FR_037	10.30	10.30	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_048	10.34	10.34	B	NAT	0	P	sm	PO	Y	Sandy silty matrix	40	Very Close
B_049	10.40	10.40	B	NAT	0	P	sm	VT	N	-	60	Close
B_050	10.46	10.46	B	NAT	0	P	ro	O	Y	Sandy silty matrix	60	Close
B_051	10.52	10.52	B	NAT	0	P	ro	PO	Y	Sandy silty matrix	60	Very Close
B_052	10.59	10.64	B	NAT	10	P	sm	MW	Y	Silty sandy clasts	95	Close
B_053	10.75	10.75	B	NAT	0	P	ro	VT	N	-	135	Close
B_054	10.80	10.80	B	NAT	0	P	ro	VT	N	-	50	Very Close
B_055	11.05	11.05	B	NAT	0	P	ro	T	N	-	250	Medium
FR_038	11.06	11.10	FR	DI	20	-	-	-	-	-	-	-
B_056	11.10	11.10	B	NAT	0	P	ro	T	N	-	20	Extremely Close
B_057	11.15	11.15	B	NAT	0	P	ro	O	N	-	50	Very Close
FR_039	11.20	11.20	FR	DI	0	-	-	-	-	-	50	Very Close
NI_024	11.20	11.24	NI	DI	0	-	-	-	-	Possibly due to drilling	0	Extremely Close
B_058	11.24	11.24	B	NAT	0	P	sm	T	N	-	0	Extremely Close
B_059	11.35	11.36	B	NAT	10	S	ro	PO	Y	Silty sandy matrix	115	Close
B_060	11.38	11.38	B	NAT	0	U	ro	VT	N	-	25	Very Close
B_061	11.46	11.46	B	NAT	0	P	ro	T	N	-	80	Close
FR_040	11.50	11.50	FR	DI	0	-	-	-	-	-	40	Very Close
FR_041	11.50	11.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
I_003	11.53	11.55	I	NAT	10	-	-	-	-	-	40	Very Close
FR_042	11.58	11.58	FR	DI	0	-	-	-	-	Shoe recovery (RC12)	40	Very Close
FR_043	11.67	11.67	FR	DI	0	-	-	-	-	Shoe recovery (RC12)	90	Close
B_062	11.75	11.75	B	NAT	0	P	sm	O	Y	Sandy silt	80	Close
B_063	11.83	11.83	B	NAT	0	P	sm	PO	Y	Sandy silt	80	Close
B_064	11.84	11.84	B	NAT	0	P	sm	PO	Y	Sandy silt	10	Extremely Close
B_065	11.86	11.88	B	NAT	0	P	sm	O	Y	Sandy silt + fine clasts	30	Very Close
B_066	11.93	11.93	B	NAT	0	P	sm	O	Y	Sandy silt	60	Very Close
B_067	11.96	11.96	B	NAT	0	P	sm	O	Y	Sandy silt	30	Very Close
B_068	12.00	12.00	B	NAT	0	P	sm	O	Y	Sandy silt	40	Very Close
B_069	12.05	12.05	B	NAT	0	P	sm	PO	Y	Sandy silt	50	Very Close
B_070	12.06	12.06	B	NAT	0	P	sm	T	Y	Sandy silt	10	Extremely Close

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DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH17

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B_071	12.06	12.06	B	NAT	0	P	sm	T	Y	Sandy silt	0	Extremely Close
B_072	12.11	12.11	B	NAT	0	P	sm	PO	Y	Sandy silt	50	Very Close
B_073	12.13	12.13	B	NAT	0	P	sm	T	Y	Sandy silt	20	Very Close
B_074	12.14	12.16	B	NAT	0	P	ro	O	Y	Sandy silt + fine to medium clasts	20	Extremely Close
B_075	12.22	12.22	B	NAT	0	P	ro	VT	N	-	70	Close
B_076	12.40	12.40	B	NAT	0	P	ro	VT	N	-	180	Close
B_077	12.44	12.44	B	NAT	0	P	ro	T	N	-	40	Very Close
NI_025	12.44	12.50	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_078	12.50	12.50	B	NAT	0	P	ro	T	N	-	0	Extremely Close
B_079	12.56	12.56	B	NAT	0	P	ro	T	N	-	60	Close
B_080	12.70	12.70	B	NAT	0	P	ro	T	N	-	140	Close
NI_026	12.70	12.74	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_081	12.81	12.81	B	NAT	0	P	sm	T	Y	Sandy silt	70	Close
B_082	12.85	12.85	B	NAT	0	P	ro	O	Y	Sandy silt fine to medium clasts	40	Very Close
I_004	12.85	12.93	I	NAT	60	-	-	-	-	-	40	Very Close
B_083	12.93	12.93	B	NAT	0	P	ro	O	Y	Fine to medium clasts	40	Very Close
FR_044	13.00	13.00	FR	DI	0	-	-	-	-	-	70	Close
FR_045	13.00	13.00	FR	DI	0	-	-	-	-	Drilling (shoe RC13)	0	Extremely Close
FR_046	13.10	13.10	FR	DI	0	-	-	-	-	Drilling (shoe RC13)	100	Close
FR_047	13.15	13.15	FR	DI	0	-	-	-	-	Drilling (shoe RC13)	50	Very Close
B_084	13.20	13.20	B	NAT	0	P	ro	VT	N	-	50	Very Close
B_085	13.25	13.25	B	NAT	0	S	ro	T	N	-	50	Very Close
NI_027	13.25	13.47	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_048	13.47	13.47	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_049	13.50	13.53	FR	DI	20	-	-	-	-	-	45	Very Close
NI_028	13.50	13.64	NI	DI	0	-	-	-	-	-	15	Extremely Close
B_086	13.64	13.64	B	NAT	0	P	sm	PO	Y	Silty sandy + fine clasts matrix	0	Extremely Close
B_087	13.70	13.70	B	NAT	0	U	ro	PO	N	-	60	Very Close
NI_029	13.70	13.80	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_050	13.80	13.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_051	13.97	13.97	FR	DI	0	-	-	-	-	-	170	Close
FR_052	14.05	14.05	FR	DI	0	-	-	-	-	-	80	Close
FR_053	14.15	14.15	FR	DI	0	-	-	-	-	-	100	Close
NI_030	14.15	14.21	NI	DI	0	-	-	-	-	-	0	Extremely Close
B_088	14.21	14.21	B	NAT	0	U	ro	PO	N	-	0	Extremely Close
FR_054	14.42	14.42	FR	DI	0	-	-	-	-	Drilling (shoe)	210	Medium
FR_055	14.50	14.50	FR	DI	0	-	-	-	-	Drilling (shoe)	80	Close
B_089	14.52	14.52	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
B_090	14.56	14.56	B	NAT	0	U	ro	VT	N	-	40	Very Close
B_091	14.60	14.60	B	NAT	0	U	ro	VT	N	-	40	Very Close
B_092	14.64	14.64	B	NAT	0	U	ro	VT	N	-	40	Very Close
NI_031	14.64	15.35	NI	NAT	0	-	-	-	-	Destructed	0	Extremely Close
B_093	15.35	15.35	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
FR_056	15.45	15.45	FR	DI	0	-	-	-	-	-	100	Close
FR_057	15.50	15.50	FR	DI	0	-	-	-	-	-	50	Very Close
NI_032	15.50	15.54	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_094	15.54	15.54	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_095	15.59	15.59	B	NAT	0	U	ro	VT	N	-	50	Very Close
NI_033	15.59	15.63	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_096	15.63	15.63	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_097	15.65	15.65	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
NI_034	15.65	15.70	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_098	15.70	15.70	B	NAT	0	U	ro	VT	N	-	0	Extremely Close
B_099	15.77	15.77	B	NAT	0	U	ro	VT	N	-	70	Close
B_100	15.82	15.82	B	NAT	0	U	ro	VT	N	-	50	Very Close
B_101	15.82	15.87	B	NAT	0	U	ro	VT	N	-	25	Very Close
B_102	15.87	15.87	B	NAT	0	U	ro	VT	N	-	25	Very Close
B_103	15.99	15.99	B	NAT	0	U	ro	VT	N	-	120	Close
B_104	16.02	16.02	B	NAT	0	U	ro	VT	N	-	30	Very Close
J_004	16.03	16.07	J	NAT	40	U	ro	VT	N	-	30	Very Close
J_005	16.09	16.14	J	NAT	45	U	ro	VT	N	-	65	Close
J_006	16.09	16.14	J	NAT	45	U	ro	VT	N	-	0	Extremely Close
B_105	16.25	16.25	B	NAT	0	U	ro	VT	N	-	135	Close
B_106	16.34	16.34	B	NAT	0	U	ro	VT	N	-	90	Close
B_107	16.40	16.40	B	NAT	0	U	ro	VT	N	-	60	Very Close
B_108	16.42	16.42	B	NAT	0	U	ro	VT	N	-	20	Very Close
FR_058	16.45	16.45	FR	DI	-	-	-	-	-	Drilling shoe and parts from next run	30	Very Close
FR_059	16.45	16.50	FR	DI	-	-	-	-	-	Drilling shoe and parts from next run	25	Very Close
FR_060	16.50	16.50	FR	DI	-	-	-	-	-	Drilling shoe and parts from next run	25	Very Close
FR_061	16.60	16.60	FR	DI	-	-	-	-	-	Drilling shoe and parts from next run	100	Close
NR_008	16.60	17.00	NR	DI	-	-	-	-	-	AZCL	0	Extremely Close
FR_062	17.00	17.00	FR	DI	-	-	-	-	-	-	0	Extremely Close
B_109	17.06	17.06	B	NAT	0	U	ro	VT	N	-	60	Very Close
B_110	17.15	17.15	B	NAT	0	U	ro	VT	N	-	90	Close
B_111	17.24	17.24	B	NAT	0	U	ro	VT	N	-	90	Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH17

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_063	17.34	17.34	FR	DI	-	-	-	-	-	-	100	Close
B_112	17.46	17.46	B	NAT	0	S	ro	VT	N	-	120	Close
B_113	17.52	17.52	B	NAT	0	U	ro	VT	N	-	60	Very Close
B_114	17.60	17.60	B	NAT	0	S	ro	VT	N	-	80	Close
B_115	17.65	17.65	B	NAT	0	U	ro	MW	Y	sandy CLAY	50	Very Close
B_116	17.70	17.70	B	NAT	0	U	ro	VT	N	-	50	Very Close
NI_035	17.70	18.00	NI	NAT	0	-	-	-	-	Destructed	0	Extremely Close
FR_064	18.00	18.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_065	18.00	18.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_117	18.04	18.04	B	NAT	0	P	sm	VT	N	-	40	Very Close
B_118	18.08	18.08	B	NAT	0	P	sm	VT	N	-	40	Very Close
B_119	18.09	18.09	B	NAT	0	P	sm	VT	N	-	10	Extremely Close
B_120	18.12	18.12	B	NAT	0	P	sm	VT	N	-	30	Very Close
B_121	18.19	18.19	B	NAT	0	U	sm	VT	N	-	70	Close
B_122	18.24	18.24	B	NAT	0	P	sm	VT	N	-	50	Very Close
B_123	18.29	18.29	B	NAT	0	P	sm	MW	Y	Slightly sandy gravelly silty CLAY	50	Very Close
B_124	18.38	18.38	B	NAT	0	P	sm	O	Y	Slightly sandy silty CLAY	90	Close
B_125	18.49	18.49	B	NAT	0	U	sm	VT	N	-	110	Close
B_126	18.58	18.58	B	NAT	0	P	sm	VT	N	-	90	Close
NI_036	18.58	18.62	NI	NAT	0	-	-	-	-	-	0	Extremely Close
B_127	18.62	18.62	B	NAT	0	U	sm	VT	N	-	0	Extremely Close
FR_066	18.81	18.81	FR	DI	0	-	-	-	-	-	190	Close
FR_067	19.00	19.00	FR	DI	0	-	-	-	-	-	190	Close
FR_068	19.00	19.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_128	19.12	19.12	B	NAT	0	S	ro	VT	N	-	120	Close
B_129	19.20	19.20	B	NAT	0	S	sm	VT	N	-	80	Close
J_007	19.39	19.46	J	NAT	50	U	sm	VT	N	-	225	Medium
NI_037	19.40	19.46	NI	NAT	0	-	-	-	-	-	25	Very Close
J_008	19.40	19.46	J	NAT	20	U	sm	VT	N	-	30	Very Close
FR_069	19.50	19.50	FR	DI	0	-	-	-	-	-	70	Close
B_130	19.55	19.55	B	NAT	0	P	sm	VT	N	-	50	Very Close
NI_038	19.67	19.72	NI	NAT	0	-	-	-	-	-	120	Close
NI_039	19.76	19.84	NI	NAT	0	-	-	-	-	-	40	Very Close
B_131	19.87	19.87	B	NAT	0	U	sm	VT	N	-	30	Very Close
B_132	19.94	19.94	B	NAT	0	U	sm	VT	N	-	70	Close
B_133	20.02	20.02	B	NAT	0	P	sm	VT	N	-	80	Close
J_009	20.02	20.17	J	NAT	90	S	ro	VT	N	-	-	-
J_010	20.02	20.17	J	NAT	90	S	ro	VT	N	-	-	-
B_134	20.17	20.17	B	NAT	0	U	ro	VT	N	-	-	-
B_135	20.26	20.26	B	NAT	0	S	sm	VT	N	-	90	Close
B_136	20.30	20.30	B	NAT	0	S	sm	VT	N	-	40	Very Close
FR_070	20.39	20.39	FR	DI	0	-	-	-	-	-	90	Close
NI_040	20.39	20.44	NI	NAT	0	-	-	-	-	-	0	Extremely Close
FR_071	20.44	20.44	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_072	20.50	20.50	FR	DI	0	-	-	-	-	-	60	Very Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
B_001	0.76	0.76	B	NAT	0	U	ro	VT	N	Change of lithology from gravel to calcarenite	0	Extremely Close
J_001	0.80	0.85	J	NAT	40	U	ro	PO	Y	Infilled with calcite? (transparent/greyish material)	65	Close
NI_001	0.85	0.93	NI	DI	0	-	-	-	-	-	25	Very Close
FR_001	1.00	1.00	FR	DI	0	-	-	-	-	-	70	Close
FR_002	1.00	1.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_003	1.05	1.05	FR	DI	0	-	-	-	-	-	50	Very Close
NR_001	1.05	2.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_004	4.50	4.50	FR	DI	0	-	-	-	-	-	2500	Very Wide
B_002	4.53	4.53	B	NAT	0	P	ro	VT	N	-	30	Very Close
NI_002	4.55	4.60	NI	DI	0	-	-	-	-	-	20	Extremely Close
FR_005	4.60	4.60	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_006	4.65	4.65	FR	DI	0	-	-	-	-	-	50	Very Close
FR_007	4.68	4.68	FR	DI	0	-	-	-	-	-	30	Very Close
FR_008	4.70	4.70	FR	DI	0	-	-	-	-	-	20	Very Close
NI_003	4.70	4.75	NI	DI	0	-	-	-	-	-	0	Extremely Close
NI_004	4.75	5.08	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_009	5.08	5.08	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_002	5.15	5.20	J	NAT	40	U	ro	PO	Y	Sandy silt	95	Close
FR_010	5.18	5.20	FR	DI	20	-	-	-	-	-	15	Extremely Close
NI_005	5.19	5.50	NI	DI	0	-	-	-	-	-	0	Extremely Close
NI_006	5.50	5.60	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_011	5.60	5.60	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_012	5.65	5.65	FR	DI	0	-	-	-	-	-	50	Very Close
NI_007	5.65	5.80	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_013	5.80	5.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_008	5.80	6.08	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_014	6.08	6.08	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_009	6.08	6.10	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_015	6.10	6.10	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_002	6.10	6.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_016	6.50	6.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_017	6.55	6.55	FR	DI	0	-	-	-	-	-	50	Very Close
NI_010	6.55	6.58	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_018	6.58	6.58	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_019	6.64	6.64	FR	DI	0	-	-	-	-	-	60	Very Close
FR_020	6.70	6.70	FR	DI	0	-	-	-	-	-	60	Close
NI_011	6.70	6.80	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_021	6.80	6.80	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_022	6.87	6.87	FR	DI	0	-	-	-	-	-	70	Close
FR_023	6.97	6.97	FR	DI	0	-	-	-	-	-	100	Close
NI_012	6.97	7.00	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_024	7.00	7.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
NR_003	7.00	7.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_025	7.50	7.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_026	7.53	7.53	FR	DI	0	-	-	-	-	-	30	Very Close
FR_027	7.56	7.56	FR	DI	0	-	-	-	-	-	30	Very Close
FR_028	7.58	7.58	FR	DI	0	-	-	-	-	-	20	Very Close
FR_029	7.62	7.62	FR	DI	0	-	-	-	-	-	40	Very Close
FR_030	7.66	7.68	FR	DI	5	-	-	-	-	-	50	Very Close
FR_031	7.70	7.71	FR	DI	10	-	-	-	-	-	35	Very Close
FR_032	7.70	7.71	FR	DI	10	-	-	-	-	-	0	Extremely Close
FR_033	7.81	7.81	FR	DI	0	-	-	-	-	-	105	Close
FR_034	7.87	7.89	FR	DI	20	-	-	-	-	-	70	Close
B_003	8.02	8.05	B	NAT	20	S	ro	VT	N	-	155	Close
J_003	8.08	8.15	J	NAT	50	U	ro	VT	N	Reddish brown stain	80	Close
FR_035	8.15	8.15	FR	DI	0	-	-	-	-	-	35	Very Close
NI_013	8.15	8.50	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_036	8.50	8.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_004	8.50	8.60	J	NAT	90	U	ro	VT	N	Reddish brown stain	-	-
FR_037	8.50	8.50	FR	DI	0	-	-	-	-	-	-	-
FR_038	8.53	8.53	FR	DI	0	-	-	-	-	-	30	Very Close
FR_039	8.60	8.60	FR	DI	0	-	-	-	-	-	70	Close
NI_014	8.60	8.63	NI	DI	0	-	-	-	-	-	0	Extremely Close
NI_015	8.69	8.76	NI	DI	0	-	-	-	-	-	60	Very Close
FR_040	8.76	8.76	FR	DI	0	-	-	-	-	-	0	Extremely Close
FR_041	8.80	8.80	FR	DI	0	-	-	-	-	-	40	Very Close
FR_042	8.87	8.87	FR	DI	0	-	-	-	-	-	70	Close
NI_016	8.87	9.23	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_043	9.23	9.25	FR	DI	15	-	-	-	-	-	10	Extremely Close
FR_044	9.35	9.35	FR	DI	0	-	-	-	-	-	110	Close
NR_004	9.35	9.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_045	9.50	9.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
NI_017	9.50	9.55	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_046	9.64	9.64	FR	DI	0	-	-	-	-	-	90	Close
FR_047	9.69	9.69	FR	DI	0	-	-	-	-	-	50	Very Close

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH19

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_048	9.78	9.78	FR	DI	0	-	-	-	-	-	90	Close
FR_049	9.90	9.90	FR	DI	0	-	-	-	-	-	120	Close
FR_050	9.96	9.96	FR	DI	0	-	-	-	-	-	60	Close
NI_018	9.96	10.23	NI	DI	0	-	-	-	-	-	0	Extremely Close
FR_051	10.23	10.23	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_005	10.23	10.35	J	NAT	80	U	ro	VT	N	Reddish brown stain	60	Very Close
J_006	10.23	10.40	J	NAT	80	U	ro	VT	N	Reddish brown stain	25	Very Close
FR_052	10.40	10.40	FR	DI	0	-	-	-	-	-	85	Close
NR_005	10.40	11.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_053	11.00	11.00	FR	DI	0	-	-	-	-	-	0	Extremely Close
J_007	11.06	11.06	J	NAT	0	U	ro	VT	N	-	60	Close
FR_054	11.08	11.08	FR	DI	0	-	-	-	-	-	20	Extremely Close
J_008	11.08	11.13	J	NAT	50	S	ro	T	Y	Stained reddish brown to black	25	Very Close
NI_019	11.08	11.24	NI	NAT	0	-	-	-	-	-	25	Very Close
J_009	11.08	11.24	J	NAT	90	U	ro	VT	N	-	-	-
FR_055	11.30	11.30	FR	DI	0	-	-	-	-	-	-	-
NI_020	11.30	11.44	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_010	11.30	11.44	J	NAT	90	S	ro	VT	N	Reddish brown stain	-	-
B_004	11.59	11.59	B	NAT	0	U	ro	VT	N	-	-	-
FR_056	11.70	11.70	FR	DI	0	-	-	-	-	-	110	Close
FR_057	11.72	11.72	FR	DI	0	-	-	-	-	-	20	Very Close
B_005	11.86	11.86	B	NAT	0	U	ro	VT	N	-	140	Close
B_006	11.92	11.92	B	NAT	0	U	ro	VT	N	-	60	Close
B_007	11.98	11.98	B	NAT	0	U	ro	VT	N	-	60	Close
FR_058	12.00	12.00	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_059	12.05	12.05	FR	DI	0	-	-	-	-	-	50	Very Close
NI_021	12.05	12.14	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_011	12.05	12.14	J	NAT	90	U	ro	VT	N	Reddish brown stain	-	-
J_012	12.05	12.14	J	NAT	90	U	ro	VT	N	Reddish brown stain	-	-
FR_060	12.14	12.14	FR	DI	0	-	-	-	-	-	-	-
FR_061	12.25	12.25	FR	DI	0	-	-	-	-	-	110	Close
FR_062	12.31	12.31	FR	DI	0	-	-	-	-	-	60	Close
FR_063	12.38	12.38	FR	DI	0	-	-	-	-	-	70	Close
NI_022	12.38	12.49	NI	DI	0	-	-	-	-	-	0	Extremely Close
J_013	12.38	12.49	J	NAT	90	U	ro	VT	N	-	-	-
J_014	12.38	12.59	J	NAT	90	U	ro	VT	N	-	-	-
B_008	12.59	12.59	B	NAT	0	U	ro	VT	N	Reddish brown stain	-	-
FR_064	12.67	12.67	FR	DI	0	-	-	-	-	-	80	Close
B_009	12.72	12.73	B	NAT	10	P	ro	VT	N	-	55	Very Close
FR_065	12.74	13.00	FR	DI	0	-	-	-	-	-	145	Close
J_015	12.74	13.00	J	NAT	90	U	ro	VT	N	-	-	-
J_016	12.74	13.00	J	NAT	80	U	ro	VT	N	-	-	-
NI_023	13.00	13.31	NI	NAT	0	-	-	-	-	-	130	Close
J_017	13.00	13.31	J	NAT	90	U	ro	VT	N	-	-	-
J_018	13.00	13.31	J	NAT	80	U	ro	VT	N	-	-	-
J_019	13.28	13.33	J	NAT	30	U	ro	VT	N	Reddish brown stain	150	Close
NI_024	13.35	13.51	NI	NAT	0	-	-	-	-	-	45	Very Close
J_020	13.35	13.51	J	NAT	90	U	ro	VT	N	-	-	-
J_021	13.35	13.51	J	NAT	90	U	ro	VT	N	-	-	-
J_022	13.37	13.45	J	NAT	60	U	ro	VT	N	-	-	-
B_010	13.51	13.51	B	NAT	0	U	ro	VT	N	Reddish brown stain	100	Close
NI_025	13.58	13.80	NI	NAT	0	-	-	-	-	-	70	Close
J_023	13.58	13.80	J	NAT	90	P	ro	VT	N	Reddish brown stain	90	Close
J_024	13.58	13.80	J	NAT	90	U	ro	VT	N	-	-	-
FR_066	13.80	13.80	FR	DI	0	-	-	-	-	-	-	-
NR_006	13.80	14.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_067	14.50	14.50	FR	DI	0	-	-	-	-	-	0	Extremely Close
B_011	14.60	14.60	B	NAT	0	P	ro	VT	N	-	100	Close
B_012	14.64	14.67	B	NAT	0	P	ro	MW	Y	3 mm silt	55	Very Close
B_013	14.72	14.73	B	NAT	0	p	ro	O	Y	1 mm silt	70	Close
J_025	14.73	14.80	J	NAT	80	P	ro	VT	N	-	40	Very Close
J_026	14.73	14.80	J	NAT	80	P	ro	VT	N	-	0	Extremely Close
B_014	14.75	14.75	B	NAT	0	U	ro	VT	N	-	15	Extremely Close
J_027	14.87	14.89	J	NAT	30	P	ro	VT	N	-	130	Close
FR_068	14.91	14.91	FR	DI	0	U	ro	VT	N	-	30	Very Close
NI_026	14.95	15.00	NI	NAT	0	-	-	-	-	-	40	Very Close
B_015	15.05	15.06	B	NAT	10	U	ro	VT	N	-	55	Very Close
J_028	15.05	15.10	J	NAT	90	P	ro	VT	N	-	-	-
FR_069	15.15	15.15	FR	DI	0	U	ro	VT	N	-	-	-
FR_070	15.21	15.23	FR	DI	10	U	ro	VT	N	-	70	Close
FR_071	15.30	15.30	FR	DI	0	S	ro	VT	N	-	80	Close
NR_007	15.30	15.50	NR	DI	0	-	-	-	-	-	0	Extremely Close
NI_027	15.50	15.62	NI	NAT	0	-	-	-	-	-	0	Extremely Close
J_029	15.53	15.61	J	NAT	90	P	ro	VT	N	Reddish brown stain	-	-
J_030	15.59	15.63	J	NAT	30	P	ro	VT	N	Reddish brown stain	-	-

Notes:
Discontinuity log in accordance with ISO 14689:2017 and BS 5930:2015+A1 :2020

Discontinuity type
BF : bedding fracture
C : cleavage
F : fault
FR : induced fracture
I : incipient
J : joint
NI : non intact
NR : no recovery
\- : *no data*

Discontinuity state
NAT : natural
DI : drilling induced

Dipping
Inclination from horizontal.
Number from 0° to 90°
with 5° increments

Roughness - interm.
S : Stepped
U : Undulating
P : Planar

Roughness - small
sm : smooth
ro : rough
st : striated

Aperture (mm)
VT : very tight (< 0.10)
T : tight (0.10 - 0.25)
PO : partially open (0.25 - 0.50)
O : open (0.50 - 2.50)
MW : moderately wide (2.50 - 10)
W : wide (10 - 100)
VW : very wide (100 -1000)
EW : extremely wide (> 1000)

Spacing (mm)
Extremely close (< 20)
Very close (20 - 60)
Close (60 - 200)
Medium (200 - 600)
Wide (600 - 2000)
Very wide (> 2000)

DISCONTINUITY LOG - COMPLETE RECORD
BNO-OWF-BH19

Discon. ID	Depth from [m]	Depth to [m]	Type	State	Dip [°]	Roughness Interm	Roughness Small	Aperture	Infilling [Y/N]	Infill notes and Remarks	Discon. spacing [mm]	Terms
FR_072	15.66	15.66	FR	DI	0	-	-	-	-	-	50	Very Close
B_016	15.67	15.70	B	NAT	20	U	ro	VT	N	-	25	Very Close
FR_073	15.72	15.72	FR	DI	0	-	-	-	-	-	35	Very Close
B_017	15.73	15.74	B	NAT	20	U	ro	VT	N	-	15	Extremely Close
FR_074	15.77	15.77	FR	DI	0	-	-	-	-	-	35	Very Close
B_018	15.78	15.78	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
FR_075	15.82	15.90	FR	DI	0	-	-	-	-	-	80	Close
B_019	15.84	15.86	B	NAT	20	U	ro	VT	N	-	10	Extremely Close
B_020	15.92	15.92	B	NAT	0	U	ro	VT	N	-	70	Close
B_021	15.94	15.94	B	NAT	0	U	ro	VT	N	-	20	Extremely Close
J_031	15.96	16.08	J	NAT	90	P	ro	VT	N	Reddish brown stain	-	-
FR_076	15.97	15.97	FR	DI	0	-	-	-	-	-	-	-
FR_077	16.00	16.00	FR	DI	0	-	-	-	-	-	30	Very Close
B_022	16.03	16.03	B	NAT	0	U	ro	VT	N	-	30	Very Close
B_023	16.04	16.04	B	NAT	0	U	ro	VT	N	-	10	Extremely Close
FR_078	16.09	16.09	FR	DI	0	-	-	-	-	-	50	Very Close
FR_079	16.12	16.12	FR	DI	0	-	-	-	-	-	30	Very Close
B_024	16.16	16.16	B	NAT	0	U	ro	VT	N	-	40	Very Close
FR_080	16.18	16.18	FR	DI	0	-	-	-	-	-	20	Extremely Close
FR_081	16.22	16.22	FR	DI	0	-	-	-	-	-	40	Very Close
FR_082	16.24	16.25	FR	DI	10	-	-	-	-	-	25	Very Close
B_025	16.32	16.32	B	NAT	0	U	ro	VT	N	-	75	Close
B_026	16.35	16.36	B	NAT	10	U	ro	VT	N	-	35	Very Close
FR_083	16.42	16.42	FR	DI	0	-	-	-	-	-	65	Close
NI_028	16.50	16.59	NI	NAT	0	-	-	-	-	-	80	Close
B_027	16.59	16.59	B	NAT	0	P	ro	VT	N	-	0	Extremely Close
J_032	16.65	16.68	J	NAT	30	U	ro	VT	N	Reddish brown stain	75	Close
B_028	16.74	16.74	B	NAT	0	P	ro	VT	N	Reddish brown stain	75	Close
B_029	16.76	16.78	B	NAT	30	P	ro	VT	N	-	30	Very Close
NI_029	16.80	17.20	NI	NAT	0	-	-	-	-	Destructed rock	30	Very Close
B_030	17.22	17.25	B	NAT	30	U	ro	VT	N	-	35	Very Close
B_031	17.26	17.28	B	NAT	20	U	ro	VT	N	-	35	Very Close
B_032	17.36	17.36	B	NAT	0	P	ro	VT	N	-	90	Close
B_033	17.44	17.44	B	NAT	0	P	ro	VT	N	-	80	Close
FR_084	17.55	17.55	FR	DI	0	-	-	-	-	-	110	Close
NR_008	17.55	18.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
FR_085	18.00	18.07	FR	DI	0	-	-	-	-	-	35	Very Close
FR_086	18.07	18.14	FR	DI	0	-	-	-	-	-	70	Close
FR_087	18.14	18.15	FR	DI	0	-	-	-	-	-	40	Very Close
B_034	18.15	18.30	B	NAT	0	-	-	-	-	-	80	Close
J_033	18.30	18.82	J	NAT	40	U	ro	VT	N	Reddish brown stain	335	Medium
J_034	18.82	18.86	J	NAT	30	U	ro	VT	N	Reddish brown stain	280	Medium
J_035	18.86	18.92	J	NAT	30	U	ro	VT	N	Reddish brown stain	50	Very Close
NI_030	18.92	18.95	NI	NAT	0	-	-	-	-	-	30	Very Close
NR_009	18.95	19.00	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
NI_031	19.00	19.17	NI	NAT	0	-	-	-	-	-	0	Extremely Close
NI_032	19.17	20.25	NI	NAT	0	-	-	-	-	Destructed	0	Extremely Close
NR_010	20.25	20.50	NR	DI	0	-	-	-	-	AZCL	0	Extremely Close
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

3. In Situ Test Data

Title	Plate No.
Pre-fieldwork Cone Calibration Certificates	3.1 to 3.45
Cone Penetration Tests	
Measured (q_c, f_s and u) and Derived Parameters (q_n, q_t, B_q, f_t, R_f, R_{ft})	3.46 to 3.60
Normalised (Q_{tn}, Q_t and F_r) and Classification Parameters (I_c, I_{SBT}, γ, S_u, D_r)	3.61 to 3.75
Cone Zero Loads and Accuracy Class	3.76 to 3.89

Calibration Certificate

Applicant	**Fugro Netherlands Marine B.V.**
	Prismastraat 4
	2631 RT, Nootdorp
	The Netherlands

Certificate Number
FCN25038130

Instrument	**Cone Penetrometer**		
Manufacturer	Fugro		
Type	CP10-CF80PB10-P1E1M1-V1		
Serial Number	1706-2584	Electronics	8389
Node Type	7001	Hardware Version	5.01
Software Version	8.01		

Calibration method The instrument was calibrated according to Fugro procedures using a comparison technique against a reference standard.

Environmental Conditions

Ambient air temperature during calibration	20.5 ± 3 °C
Temperature change during calibration	< 1 °C
Atmospheric pressure during calibration	1000 ± 100 mbar

Result The condition of the cone penetrometer meets the requirements of ISO 22476-1:2012 Section 4.1 through 4.7. The calibration results are reported on the next page(s).

The calibration results indicate that the cone penetrometer meets the requirements for use in Application Class 1 as defined in ISO 22476-1:2012 Section 5.2.

Uncertainty The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides a confidence level of approximately 95%. The standard uncertainty has been determined in accordance with EA-4/02.

Traceability The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA (Raad voor Accreditatie).

Calibration date 27-Jun-2025

Calibrate before 27-Dec-2025

Calibrated Sensor	Manufacturer / Type	Calibrated Range	Maximum Rating	Procedure
Cone [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Cone+Fric. [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Pore 2 [Pressure]	Keller PA-8/100bar (8467.8)	0 to 10 MPa	15 MPa	EUAF-FNLM- CAL-PR-004

	Before adjustment		After adjustment		Drift	
Calibrated Sensor	Sensitivity	Zero Load	Sensitivity	Zero Load	Sensitivity	Zero Load
Cone [Force]	25.2 µV/V/kN	15.1 µV/V	25.3 µV/V/kN	14.7 µV/V	0.21 %	-0.02 %
Cone+Fric. [Force]	25.1 µV/V/kN	405 µV/V	25.1 µV/V/kN	425 µV/V	0.22 %	0.97 %
Pore 2 [Pressure]	3.34 mV/V/MPa	1.45 mV/V	3.34 mV/V/MPa	1.37 mV/V	-0.02 %	-0.26 %

Nootdorp, 30-Jun-2025

Ruud Schrijvers
Deputy Manager Transducer Workshop

This certificate is issued provided that neither Fugro nor the Raad voor Accreditatie assumes any liability.

The Raad voor Accreditatie is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) for the mutual recognition of calibration certificates.

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Cone Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2584
Electronics	8389
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Cone [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

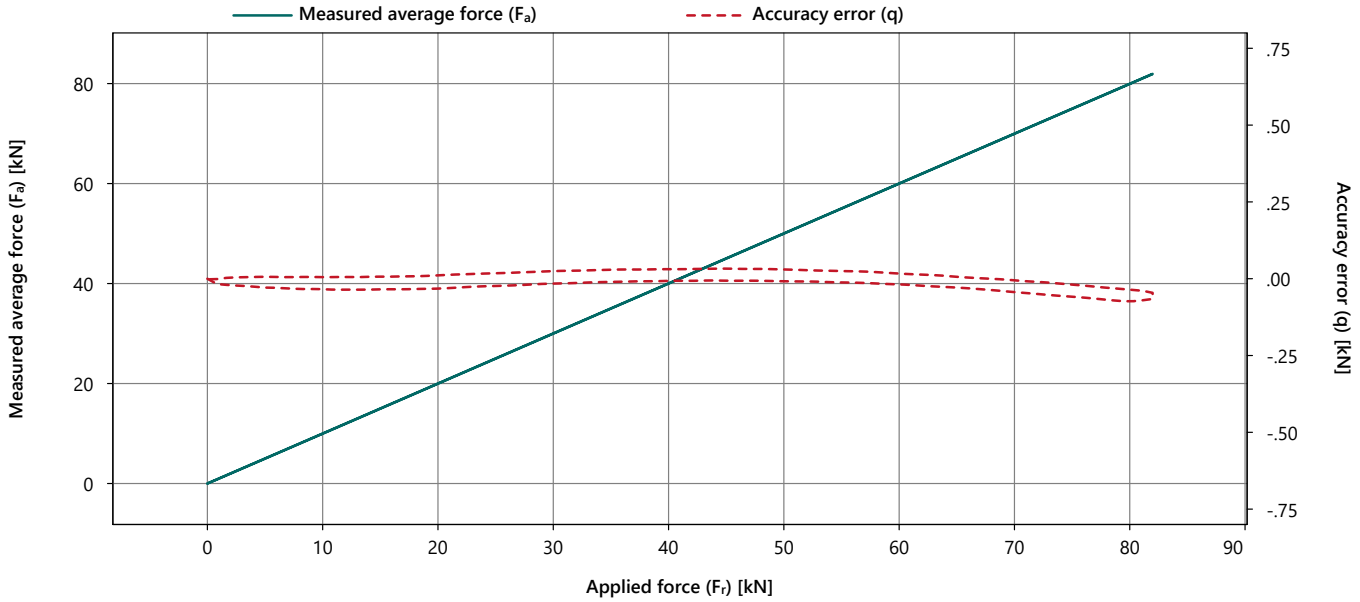
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0002
Expanded Uncertainty	0.0029 · F_r + 0.0070 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 13:25:40
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25038130

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.074
Max repeatability error (b)	[kN]	0.018
Max reversibility error (v)	[kN]	0.041
Zero load error (F_{c0})	[kN]	0.002
Zero load offset (F_0)	[kN]	-0.003
Resolution	[kN]	$3.69 \cdot 10^{-5}$
Noise RMS	[kN]	0.000



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	-0.001	0.001	0.001	0.000	0.000	0.002		0.016
16.000	15.966	15.965	15.966	15.966	-0.034	0.001	0.041	0.082
32.000	31.988	31.987	31.983	31.986	-0.014	0.005	0.040	0.113
48.000	47.997	47.992	47.991	47.993	-0.007	0.006	0.039	0.157
64.000	63.980	63.973	63.966	63.973	-0.027	0.014	0.036	0.203
80.000	79.935	79.926	79.917	79.926	-0.074	0.018		0.246
64.000	64.011	64.008	64.009	64.009	0.009	0.002	0.036	0.202
48.000	48.034	48.031	48.030	48.032	0.032	0.004	0.039	0.157
32.000	32.030	32.026	32.022	32.026	0.026	0.008	0.040	0.113
16.000	16.007	16.007	16.006	16.007	0.007	0.001	0.041	0.082
0.000	-0.002	-0.002	-0.002	-0.002	-0.002	0.001		0.016

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Cone+Fric. Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2584
Electronics	8389
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Cone+Fric. [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

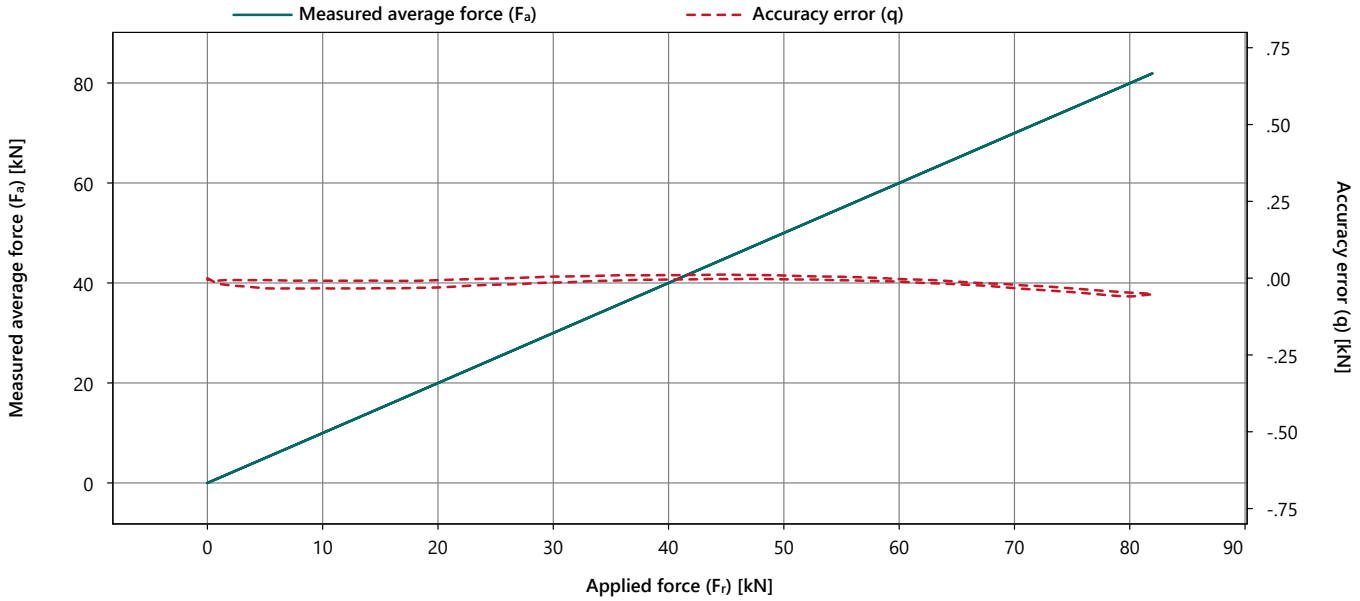
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0002
Expanded Uncertainty	0.0029 · F_r + 0.0070 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 13:25:40
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25038130

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.060
Max repeatability error (b)	[kN]	0.017
Max reversibility error (v)	[kN]	0.024
Zero load error (F_{c0})	[kN]	0.005
Zero load offset (F_0)	[kN]	0.005
Resolution	[kN]	$3.71 \cdot 10^{-5}$
Noise RMS	[kN]	0.000
Tip-Sleeve Interaction %	[%]	0.046



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.000	0.001	-0.001	0.000	0.000	0.002		0.016
16.000	15.971	15.966	15.964	15.967	-0.033	0.007	0.024	0.063
32.000	31.994	31.988	31.981	31.988	-0.012	0.013	0.018	0.106
48.000	48.005	47.996	47.991	47.997	-0.003	0.013	0.013	0.152
64.000	63.990	63.982	63.974	63.982	-0.018	0.016	0.010	0.199
80.000	79.946	79.939	79.933	79.940	-0.060	0.013		0.246
64.000	64.000	63.991	63.983	63.991	-0.009	0.017	0.010	0.199
48.000	48.018	48.009	48.003	48.010	0.010	0.014	0.013	0.152
32.000	32.014	32.005	31.999	32.006	0.006	0.015	0.018	0.106
16.000	15.994	15.991	15.988	15.991	-0.009	0.006	0.024	0.063
0.000	-0.004	-0.006	-0.005	-0.005	-0.005	0.002		0.016

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Pore 2 Calibration Result [Pressure]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2584
Electronics	8389
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Pore 2 [Pressure]
Manufacturer	Keller PA-8/100bar (8467.8)
Calibrated Range	0 to 10 MPa
Maximum Rating	15 MPa

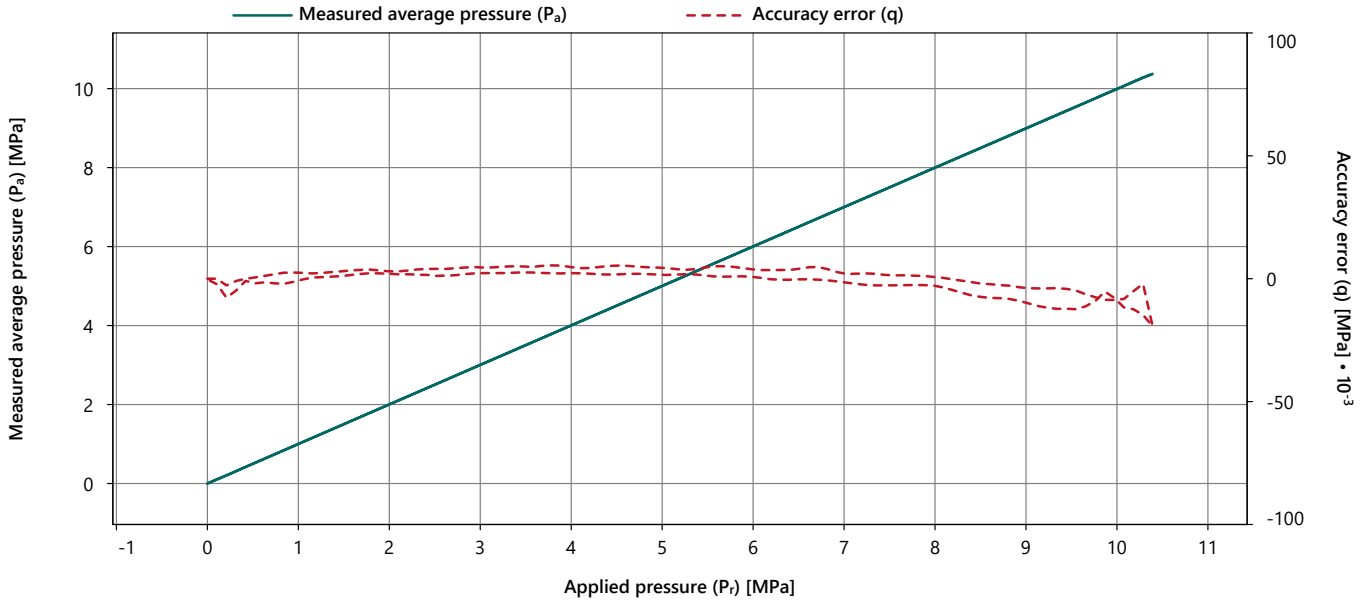
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Calibration Details	
Calibration Date	27 Jun 2025 14:49:09
Procedure	EUAF-FNLM- CAL-PR-004
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25038130

Characteristics	Unit	Value
Max accuracy error (q)	[MPa]	0.009
Max repeatability error (b)	[MPa]	0.003
Max reversibility error (v)	[MPa]	0.004
Zero load error (P_{c0})	[MPa]	0.000
Zero load offset (P_0)	[MPa]	-0.029
Resolution	[MPa]	$2.23 \cdot 10^{-6}$
Noise RMS	[MPa]	0.000



Applied pressure (P_r)	Measured pressure 1 ($P_{a,1}$)	Measured pressure 2 ($P_{a,2}$)	Measured pressure 3 ($P_{a,3}$)	Measured average pressure (P_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.003
2.000	2.004	2.003	2.002	2.003	0.003	0.001	-0.001	0.004
4.000	4.006	4.003	4.005	4.005	0.005	0.003	-0.002	0.007
6.000	6.002	6.005	6.004	6.004	0.004	0.003	-0.003	0.007
8.000	8.001	8.001	8.000	8.001	0.001	0.001	-0.004	0.007
10.000	9.990	9.993	9.991	9.991	-0.009	0.003		0.007
8.000	7.996	7.999	7.996	7.997	-0.003	0.003	-0.004	0.008
6.000	6.001	6.000	6.001	6.001	0.001	0.001	-0.003	0.006
4.000	4.001	4.003	4.002	4.002	0.002	0.002	-0.002	0.006
2.000	2.003	2.001	2.002	2.002	0.002	0.002	-0.001	0.004
0.000	0.000	0.000	-0.001	0.000	0.000	0.002		0.003

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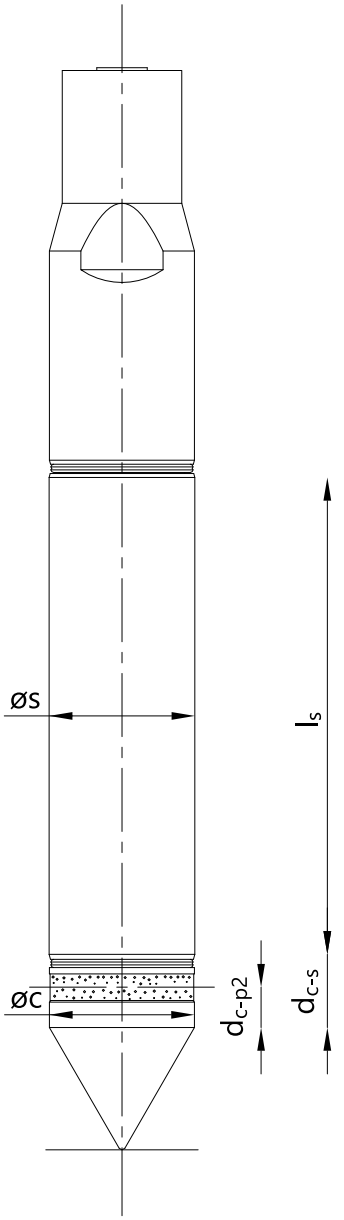
Typical Dimensions

Instrument

Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1M1-V1
Serial Number	1706-2584

Appendix Applicable to Certificate Number FCN25038130



Typical Dimensions

A_c	Cross-sectional projected area of the cone	0.001 m^2
A_s	Surface area of the friction sleeve	0.015 m^2
af	Cone net area ratio	0.75
bf	Friction sleeve net area ratio	0
øc	Diameter of the cylindrical part of the cone	35.8 mm
øs	Diameter of the friction sleeve	36.1 mm
l_s	Length of the friction sleeve	132.7 mm
d_{c-s}	Cone - friction sleeve distance	13.5 mm
d_{c-p2}	Cone - pore 2 distance	5 mm

Diagram is not to scale

Cone Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2584
Electronics	8389
Node Type	7001
Hardware Version	5.01
Software Version	8.01

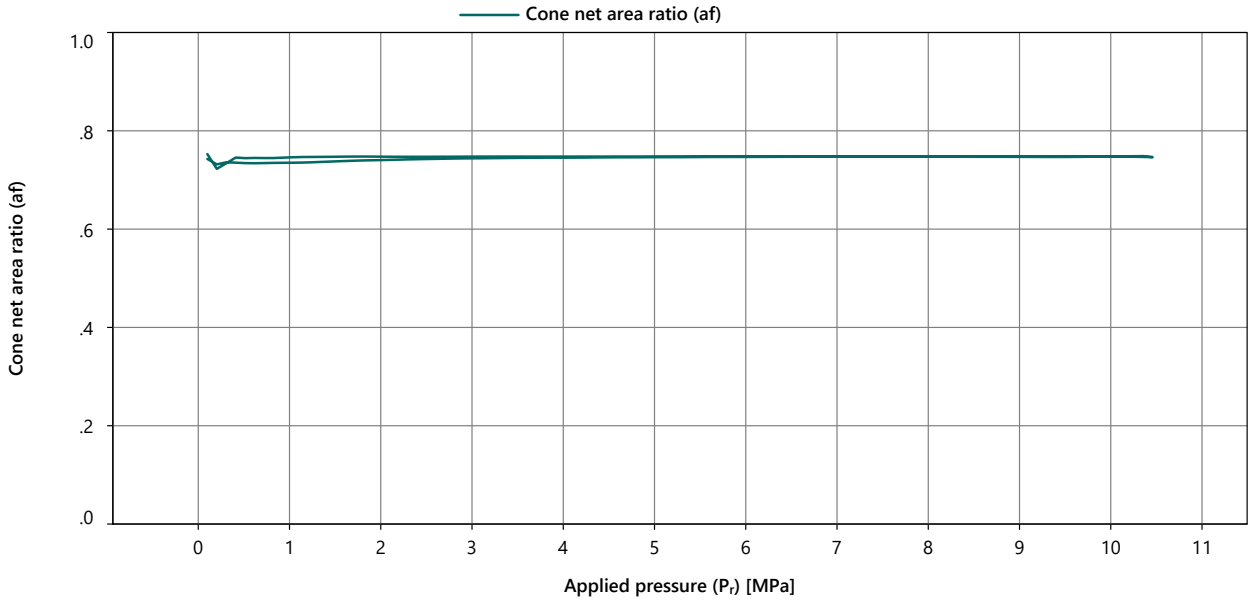
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 14:49:09
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25038130

Characteristics	Unit	Value
Cone net area ratio (af)	[-]	0.75

The cone net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured cone net area ratio 1 (af,1)	Measured cone net area ratio 2 (af,2)	Measured cone net area ratio 3 (af,3)	Measured average cone net area ratio (af)
2.000	0.741	0.740	0.740	0.740
4.000	0.746	0.745	0.745	0.745
6.000	0.747	0.747	0.747	0.747
8.000	0.748	0.748	0.748	0.748
10.000	0.748	0.748	0.748	0.748
8.000	0.748	0.748	0.747	0.748
6.000	0.748	0.748	0.748	0.748
4.000	0.747	0.748	0.747	0.748
2.000	0.748	0.747	0.747	0.747

Friction Sleeve Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2584
Electronics	8389
Node Type	7001
Hardware Version	5.01
Software Version	8.01

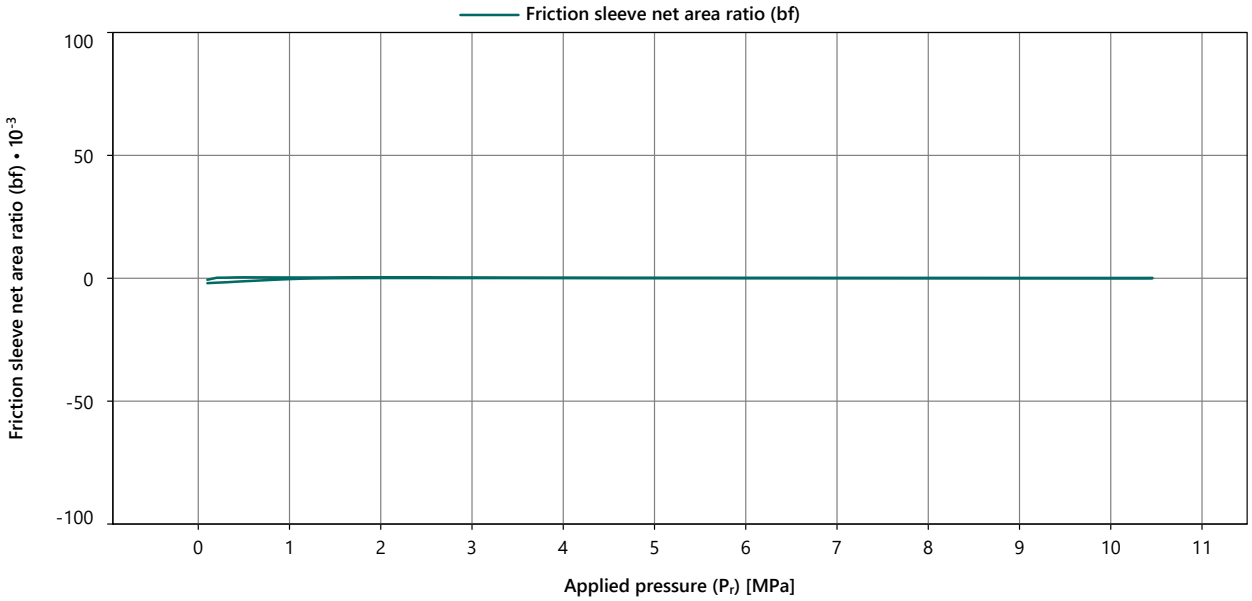
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 14:49:09
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25038130

Characteristics	Unit	Value
Friction sleeve net area ratio (bf)	[-]	0.00007

The friction sleeve net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured friction sleeve net area ratio (bf) 1 (bf,1)	Measured friction sleeve net area ratio (bf) 2 (bf,2)	Measured friction sleeve net area ratio (bf) 3 (bf,3)	Measured average Friction sleeve net area ratio (bf)
2.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
10.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000

Symbols, Definitions and References

Appendix Applicable to Certificate Number FCN25038130

Symbols and Definitions (general)

af	Cone net area ratio, defined as the factor between the applied pressure to the instrument and the indicated cone resistance.
af,x	Measured cone net area ratio at measurement x.
b	Repeatability error, defined as the maximum difference between the measurements of the instrument at the applied value.
bf	Friction sleeve net area ratio, defined as the factor between the applied pressure to the instrument and the indicated sleeve friction.
bf,x	The measured friction sleeve net area ratio at measurement x.
Noise RMS	Signal noise, defined as the quadratic mean when the sensor is not subjected to load.
q	Accuracy error, defined as the difference between the average indicated value by the instrument and the applied value.
Resolution	Smallest change in a quantity being measured that causes a perceptible change in the corresponding indication.
U	The stated uncertainty is that of the average indicated quantity, and includes the entire calibration method, including the reference and calibrated sensor, but excludes the difference between average indicated value by the instrument and the applied value.
v	Reversibility error, defined as the difference between the average indicated value by the instrument at a certain applied value when it was increased and when it was decreased.

Symbols and Definitions (quantity specific: Q may be substituted for F or P, as appropriate)

Q_0	Zero load offset, instrument output where the specified measured quantity value is zero.
Q_a	Average indicated quantity value by the instrument.
$Q_{a,x}$	Quantity value indicated by the instrument at measurement x.
Q_{c0}	Zero load error, defined as the difference between the average indicated value by the instrument before and after the load cycle has been applied.
Q_r	Applied reference quantity value.
Qw	Applied reference quantity value.

Appendix Applicable to Certificate Number FCN25038130

Quantities

F	Force
P	Pressure

References

International Organization for Standardization, 2012. *ISO 22476-1:2012 Geotechnical investigation and testing, Field testing, Electrical cone and piezocone penetration test.* Geneva: ISO.

European Co-operation For Accreditation, 2022. *Evaluation of the uncertainty of measurement in calibration.* European Co-operation For Accreditation, Publication; EA-4/02 M:2022.

Calibration Certificate

Applicant	**Fugro Netherlands Marine B.V.**
	Prismastraat 4
	2631 RT, Nootdorp
	The Netherlands

CALIBRATION RvA K 167

Certificate Number
FCN25037912

Instrument	**Cone Penetrometer**		
Manufacturer	Fugro		
Type	CP10-CF80PB10-P1E1M1-V1		
Serial Number	1706-2672	Electronics	8444
Node Type	7001	Hardware Version	5.01
Software Version	8.01		

Calibration method The instrument was calibrated according to Fugro procedures using a comparison technique against a reference standard.

Environmental Conditions

Ambient air temperature during calibration	20.5 ± 3 °C
Temperature change during calibration	< 1 °C
Atmospheric pressure during calibration	1000 ± 100 mbar

Result The condition of the cone penetrometer meets the requirements of ISO 22476-1:2012 Section 4.1 through 4.7. The calibration results are reported on the next page(s).

The calibration results indicate that the cone penetrometer meets the requirements for use in Application Class 2 as defined in ISO 22476-1:2012 Section 5.2.

Uncertainty The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides a confidence level of approximately 95%. The standard uncertainty has been determined in accordance with EA-4/02.

Traceability The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA (Raad voor Accreditatie).

Calibration date 27-Jun-2025

Calibrate before 27-Dec-2025

Calibrated Sensor	Manufacturer / Type	Calibrated Range	Maximum Rating	Procedure
Cone [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Cone+Fric. [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Pore 2 [Pressure]	Keller PA-8/100bar (8467.8)	0 to 10 MPa	15 MPa	EUAF-FNLM- CAL-PR-004

	Before adjustment		After adjustment		Drift	
Calibrated Sensor	Sensitivity	Zero Load	Sensitivity	Zero Load	Sensitivity	Zero Load
Cone [Force]	25.1 µV/V/kN	9.15 µV/V	25.1 µV/V/kN	15.2 µV/V	-0.26 %	0.30 %
Cone+Fric. [Force]	25.0 µV/V/kN	17.4 µV/V	25.1 µV/V/kN	24.2 µV/V	0.17 %	0.34 %
Pore 2 [Pressure]	3.08 mV/V/MPa	1.46 mV/V	3.07 mV/V/MPa	1.48 mV/V	-0.14 %	0.05 %

Nootdorp, 30-Jun-2025

Ruud Schrijvers
Deputy Manager Transducer Workshop

This certificate is issued provided that neither Fugro nor the Raad voor Accreditatie assumes any liability.

The Raad voor Accreditatie is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) for the mutual recognition of calibration certificates.

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Cone Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2672
Electronics	8444
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Cone [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

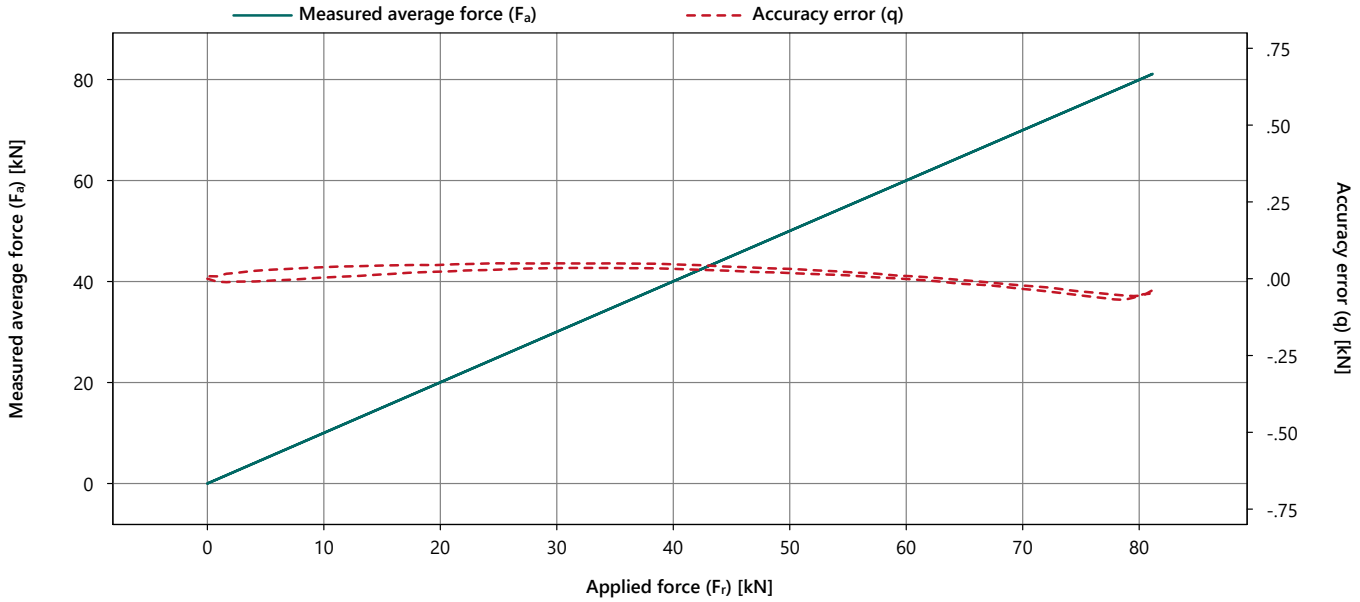
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0003
Expanded Uncertainty	0.0025 · F_r + 0.0094 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 11:48:56
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

RvA CALIBRATION K 167

Certificate Number FCN25037912

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.056
Max repeatability error (b)	[kN]	0.017
Max reversibility error (v)	[kN]	0.028
Zero load error (F_{c0})	[kN]	0.008
Zero load offset (F_0)	[kN]	0.006
Resolution	[kN]	$3.72 \cdot 10^{-5}$
Noise RMS	[kN]	0.000



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.011	-0.006	-0.005	0.000	0.000	0.017		0.040
16.000	16.016	16.017	16.015	16.016	0.016	0.002	0.028	0.064
32.000	32.036	32.037	32.033	32.035	0.035	0.004	0.015	0.096
48.000	48.021	48.021	48.021	48.021	0.021	0.000	0.013	0.136
64.000	63.984	63.986	63.988	63.986	-0.014	0.005	0.012	0.176
80.000	79.949	79.937	79.947	79.944	-0.056	0.012		0.216
64.000	63.997	63.997	64.000	63.998	-0.002	0.004	0.012	0.176
48.000	48.035	48.032	48.036	48.034	0.034	0.003	0.013	0.136
32.000	32.050	32.049	32.050	32.050	0.050	0.001	0.015	0.096
16.000	16.042	16.044	16.045	16.044	0.044	0.003	0.028	0.064
0.000	0.009	0.009	0.007	0.008	0.008	0.002		0.016

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Cone+Fric. Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2672
Electronics	8444
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Cone+Fric. [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

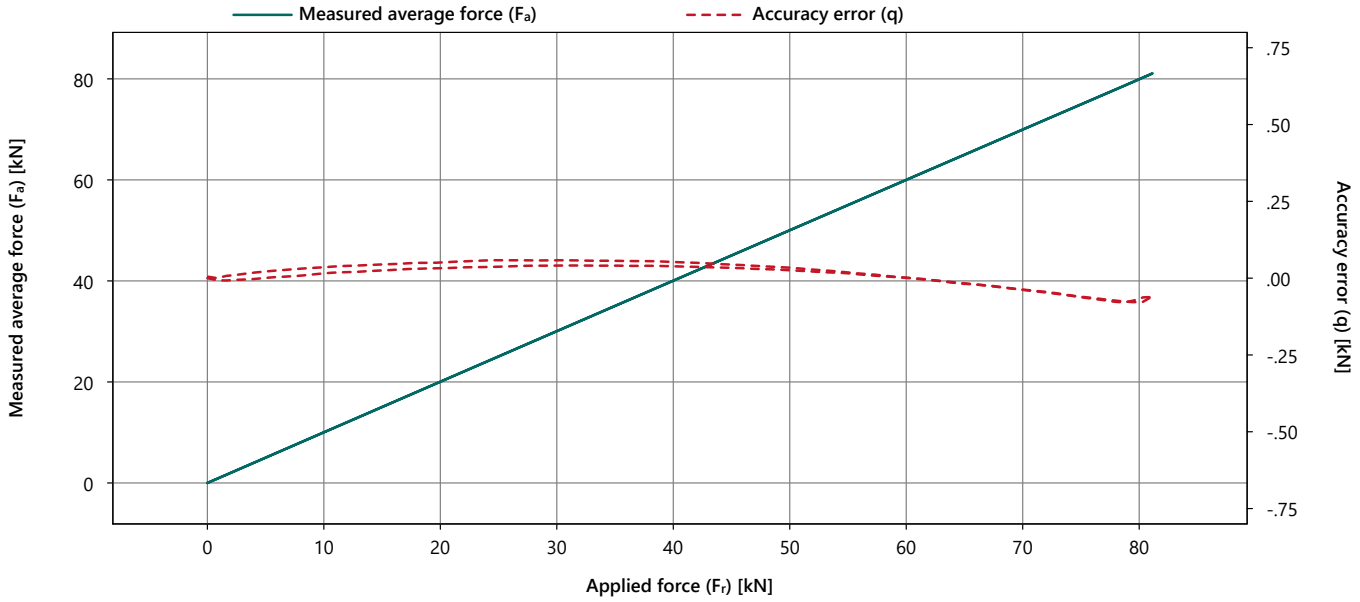
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0003
Expanded Uncertainty	0.0025 · F_r + 0.0094 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 11:48:56
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25037912

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.067
Max repeatability error (b)	[kN]	0.018
Max reversibility error (v)	[kN]	0.019
Zero load error (F_{c0})	[kN]	0.005
Zero load offset (F_0)	[kN]	0.016
Resolution	[kN]	$3.72 \cdot 10^{-5}$
Noise RMS	[kN]	0.000
Tip-Sleeve Interaction %	[%]	0.057



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.012	-0.006	-0.006	0.000	0.000	0.018		0.039
16.000	16.029	16.027	16.025	16.027	0.027	0.004	0.019	0.056
32.000	32.043	32.042	32.039	32.041	0.041	0.004	0.016	0.096
48.000	48.030	48.029	48.029	48.029	0.029	0.001	0.009	0.136
64.000	63.983	63.985	63.988	63.985	-0.015	0.004	0.002	0.176
80.000	79.939	79.924	79.935	79.933	-0.067	0.015		0.216
64.000	63.987	63.985	63.989	63.987	-0.013	0.003	0.002	0.176
48.000	48.041	48.035	48.038	48.038	0.038	0.006	0.009	0.136
32.000	32.060	32.056	32.057	32.058	0.058	0.004	0.016	0.096
16.000	16.047	16.045	16.046	16.046	0.046	0.003	0.019	0.056
0.000	0.007	0.005	0.003	0.005	0.005	0.004		0.016

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Pore 2 Calibration Result [Pressure]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2672
Electronics	8444
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Pore 2 [Pressure]
Manufacturer	Keller PA-8/100bar (8467.8)
Calibrated Range	0 to 10 MPa
Maximum Rating	15 MPa

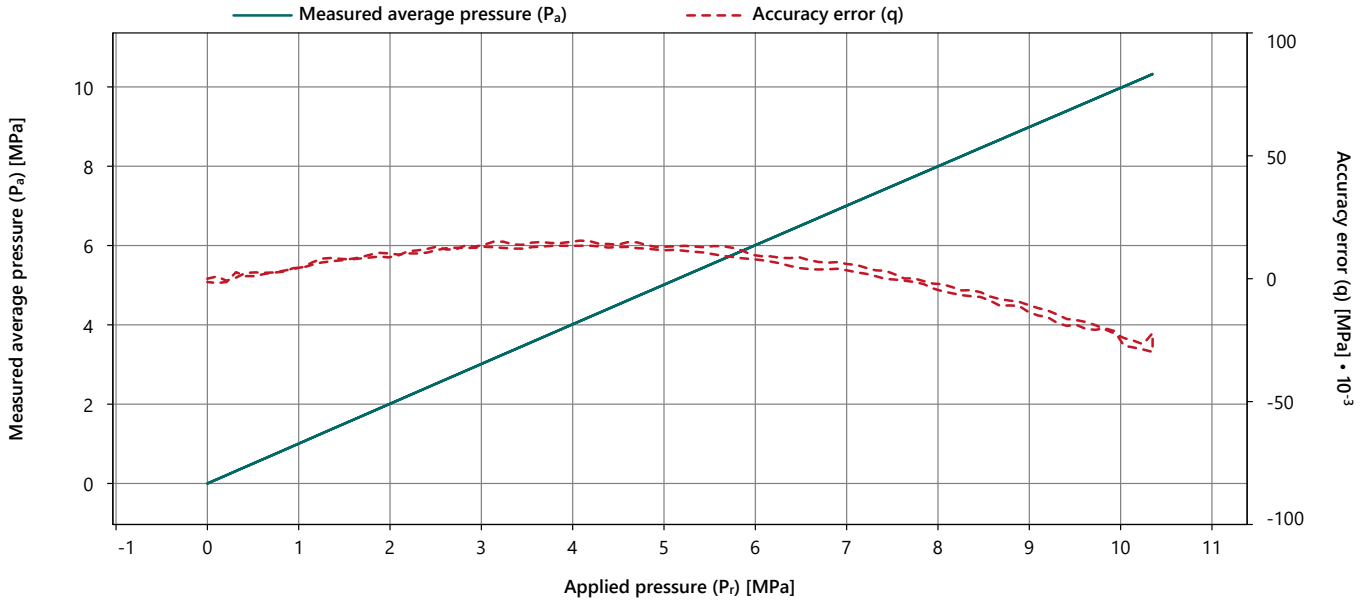
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Calibration Details	
Calibration Date	27 Jun 2025 12:57:31
Procedure	EUAF-FNLM- CAL-PR-004
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25037912

Characteristics	Unit	Value
Max accuracy error (q)	[MPa]	0.023
Max repeatability error (b)	[MPa]	0.003
Max reversibility error (v)	[MPa]	0.003
Zero load error (P_{c0})	[MPa]	0.001
Zero load offset (P_0)	[MPa]	-0.002
Resolution	[MPa]	$2.42 \cdot 10^{-6}$
Noise RMS	[MPa]	0.000



Applied pressure (P_r)	Measured pressure 1 ($P_{a,1}$)	Measured pressure 2 ($P_{a,2}$)	Measured pressure 3 ($P_{a,3}$)	Measured average pressure (P_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.003
2.000	2.009	2.008	2.009	2.009	0.009	0.001	0.002	0.004
4.000	4.016	4.014	4.015	4.015	0.015	0.002	-0.002	0.005
6.000	6.010	6.009	6.009	6.009	0.009	0.001	-0.001	0.005
8.000	7.998	7.997	7.999	7.998	-0.002	0.002	-0.003	0.007
10.000	9.976	9.977	9.977	9.977	-0.023	0.000		0.006
8.000	7.995	7.996	7.995	7.995	-0.005	0.001	-0.003	0.006
6.000	6.008	6.008	6.008	6.008	0.008	0.000	-0.001	0.005
4.000	4.012	4.014	4.014	4.013	0.013	0.003	-0.002	0.006
2.000	2.009	2.011	2.011	2.010	0.010	0.003	0.002	0.006
0.000	-0.001	-0.001	-0.002	-0.001	-0.001	0.000		0.003

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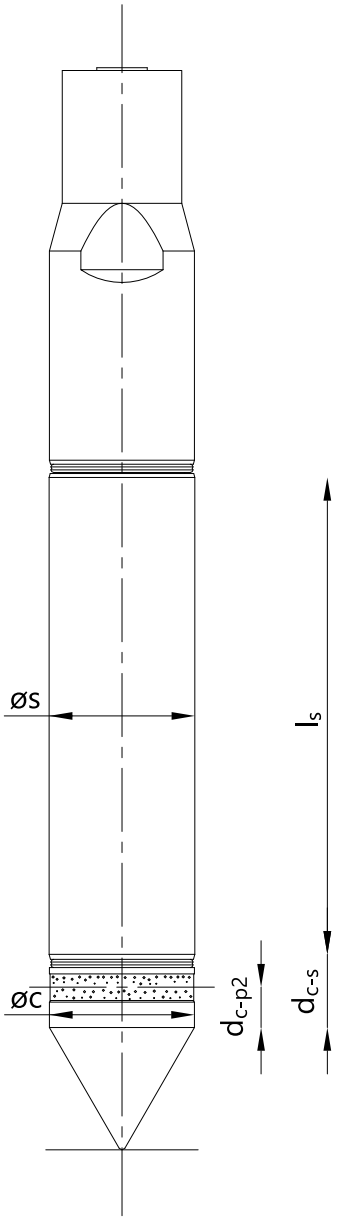
Typical Dimensions

Instrument

Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1M1-V1
Serial Number	1706-2672

Appendix Applicable to Certificate Number FCN25037912



Typical Dimensions

A_c	Cross-sectional projected area of the cone	0.001 m^2
A_s	Surface area of the friction sleeve	0.015 m^2
af	Cone net area ratio	0.75
bf	Friction sleeve net area ratio	0
øc	Diameter of the cylindrical part of the cone	35.8 mm
øs	Diameter of the friction sleeve	36.1 mm
l_s	Length of the friction sleeve	132.7 mm
d_{c-s}	Cone - friction sleeve distance	13.5 mm
d_{c-p2}	Cone - pore 2 distance	5 mm

Diagram is not to scale

Cone Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2672
Electronics	8444
Node Type	7001
Hardware Version	5.01
Software Version	8.01

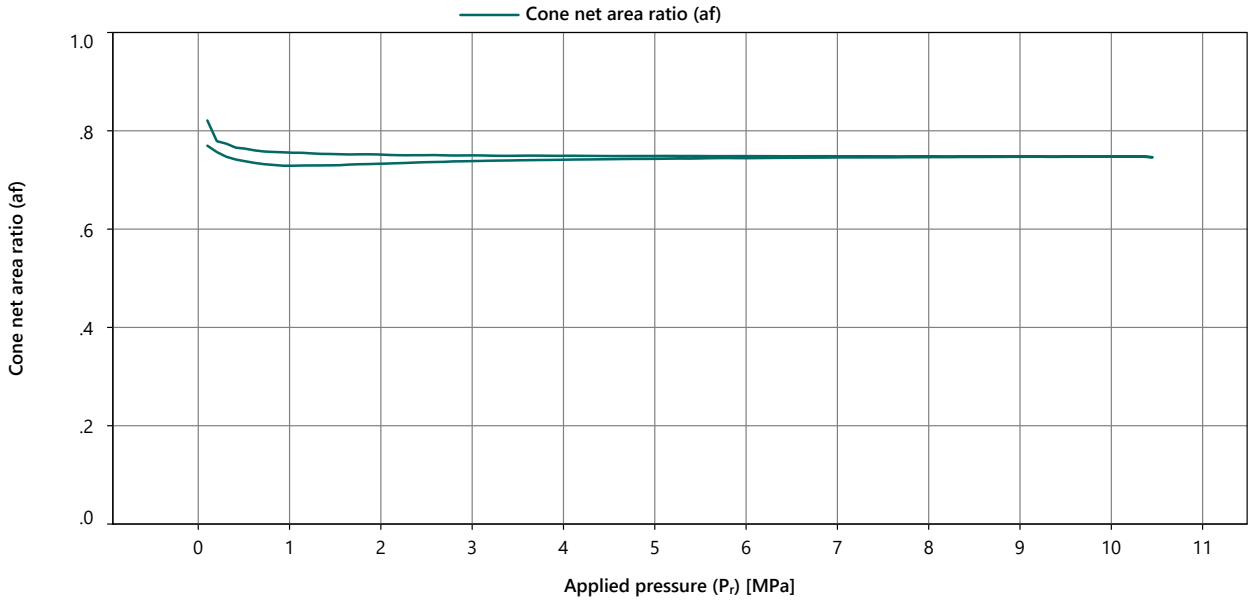
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 12:57:31
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25037912

Characteristics	Unit	Value
Cone net area ratio (af)	[-]	0.75

The cone net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured cone net area ratio 1 (af,1)	Measured cone net area ratio 2 (af,2)	Measured cone net area ratio 3 (af,3)	Measured average cone net area ratio (af)
2.000	0.733	0.733	0.733	0.733
4.000	0.741	0.741	0.741	0.741
6.000	0.744	0.744	0.744	0.744
8.000	0.746	0.746	0.747	0.746
10.000	0.747	0.748	0.748	0.747
8.000	0.748	0.748	0.748	0.748
6.000	0.748	0.749	0.748	0.749
4.000	0.749	0.749	0.749	0.749
2.000	0.751	0.752	0.752	0.752

Friction Sleeve Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2672
Electronics	8444
Node Type	7001
Hardware Version	5.01
Software Version	8.01

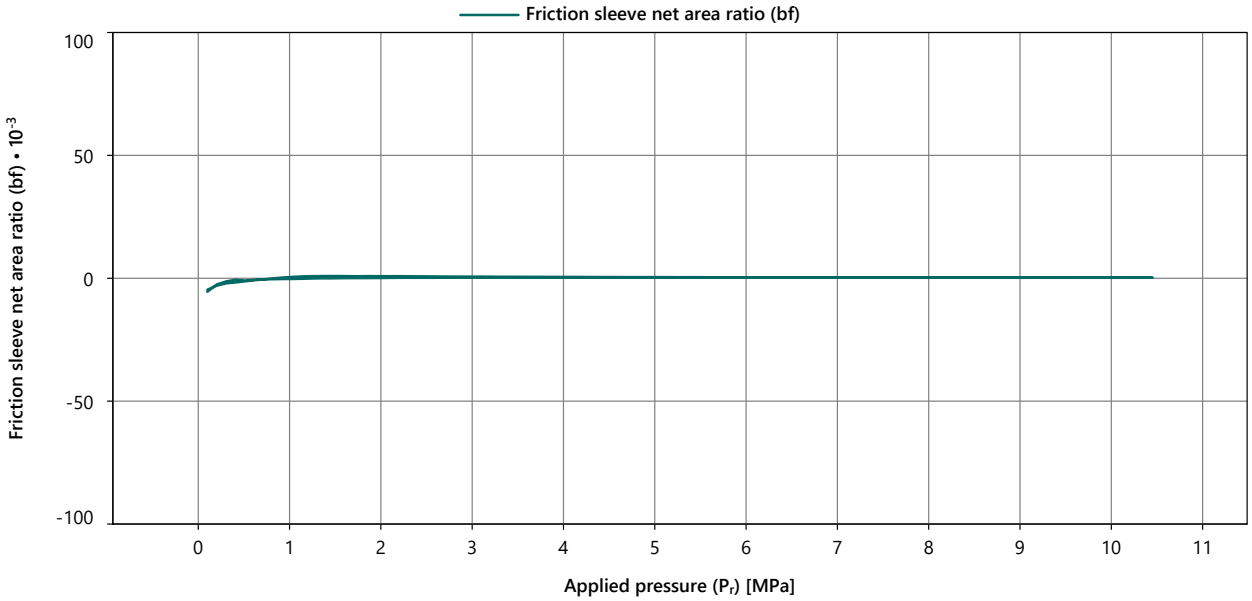
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 12:57:31
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25037912

Characteristics	Unit	Value
Friction sleeve net area ratio (bf)	[-]	0.00022

The friction sleeve net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured friction sleeve net area ratio (bf) 1 (bf,1)	Measured friction sleeve net area ratio (bf) 2 (bf,2)	Measured friction sleeve net area ratio (bf) 3 (bf,3)	Measured average Friction sleeve net area ratio (bf)
2.000	0.001	0.001	0.001	0.001
4.000	0.001	0.001	0.001	0.001
6.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
10.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000

Symbols, Definitions and References

Appendix Applicable to Certificate Number FCN25037912

Symbols and Definitions (general)

af	Cone net area ratio, defined as the factor between the applied pressure to the instrument and the indicated cone resistance.
af,x	Measured cone net area ratio at measurement x.
b	Repeatability error, defined as the maximum difference between the measurements of the instrument at the applied value.
bf	Friction sleeve net area ratio, defined as the factor between the applied pressure to the instrument and the indicated sleeve friction.
bf,x	The measured friction sleeve net area ratio at measurement x.
Noise RMS	Signal noise, defined as the quadratic mean when the sensor is not subjected to load.
q	Accuracy error, defined as the difference between the average indicated value by the instrument and the applied value.
Resolution	Smallest change in a quantity being measured that causes a perceptible change in the corresponding indication.
U	The stated uncertainty is that of the average indicated quantity, and includes the entire calibration method, including the reference and calibrated sensor, but excludes the difference between average indicated value by the instrument and the applied value.
v	Reversibility error, defined as the difference between the average indicated value by the instrument at a certain applied value when it was increased and when it was decreased.

Symbols and Definitions (quantity specific: Q may be substituted for F or P, as appropriate)

Q_0	Zero load offset, instrument output where the specified measured quantity value is zero.
Q_a	Average indicated quantity value by the instrument.
$Q_{a,x}$	Quantity value indicated by the instrument at measurement x.
Q_{c0}	Zero load error, defined as the difference between the average indicated value by the instrument before and after the load cycle has been applied.
Q_r	Applied reference quantity value.
Qw	Applied reference quantity value.

Appendix Applicable to Certificate Number FCN25037912

Quantities

F	Force
P	Pressure

References

International Organization for Standardization, 2012. *ISO 22476-1:2012 Geotechnical investigation and testing, Field testing, Electrical cone and piezocone penetration test.* Geneva: ISO.

European Co-operation For Accreditation, 2022. *Evaluation of the uncertainty of measurement in calibration.* European Co-operation For Accreditation, Publication; EA-4/02 M:2022.

Calibration Certificate

Applicant	**Fugro Netherlands Marine B.V.**
	Prismastraat 4
	2631 RT, Nootdorp
	The Netherlands

Certificate Number
FCN25037932

Instrument	**Cone Penetrometer**		
Manufacturer	Fugro		
Type	CP10-CF80PB10-P1E1M1-V1		
Serial Number	1706-2834	Electronics	271
Node Type	7001	Hardware Version	5.01
Software Version	8.01		

Calibration method The instrument was calibrated according to Fugro procedures using a comparison technique against a reference standard.

Environmental Conditions

Ambient air temperature during calibration	20.5 ± 3 °C
Temperature change during calibration	< 1 °C
Atmospheric pressure during calibration	1000 ± 100 mbar

Result The condition of the cone penetrometer meets the requirements of ISO 22476-1:2012 Section 4.1 through 4.7. The calibration results are reported on the next page(s).

The calibration results indicate that the cone penetrometer meets the requirements for use in Application Class 2 as defined in ISO 22476-1:2012 Section 5.2.

Uncertainty The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides a confidence level of approximately 95%. The standard uncertainty has been determined in accordance with EA-4/02.

Traceability Fugro reference standards are periodically recertified and are traceable to the International System of Units (SI). Fugro's calibration system meets or exceeds the requirements of ISO 9001:2008, ISO 10012:2003 and ISO/IEC 17025:2017.

Calibration date 27-Jun-2025

Calibrate before 27-Dec-2025

Calibrated Sensor	Manufacturer / Type	Calibrated Range	Maximum Rating	Procedure
Cone [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Cone+Fric. [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Pore 2 [Pressure]	Keller PA-8/100bar (8467.8)	0 to 10 MPa	15 MPa	EUAF-FNLM- CAL-PR-004

	Before adjustment		After adjustment		Drift	
Calibrated Sensor	Sensitivity	Zero Load	Sensitivity	Zero Load	Sensitivity	Zero Load
Cone [Force]	25.4 µV/V/kN	2.62 µV/V	25.4 µV/V/kN	13.8 µV/V	-0.04 %	0.55 %
Cone+Fric. [Force]	25.3 µV/V/kN	20.2 µV/V	25.3 µV/V/kN	42.2 µV/V	-0.07 %	1.08 %
Pore 2 [Pressure]	2.97 mV/V/MPa	-1.27 mV/V	2.97 mV/V/MPa	-1.19 mV/V	-0.03 %	0.24 %

Nootdorp, 30-Jun-2025

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Ruud Schrijvers
Deputy Manager Transducer Workshop

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Cone Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2834
Electronics	271
Node Type	7001
Hardware Version	5.01
Software Version	8.01

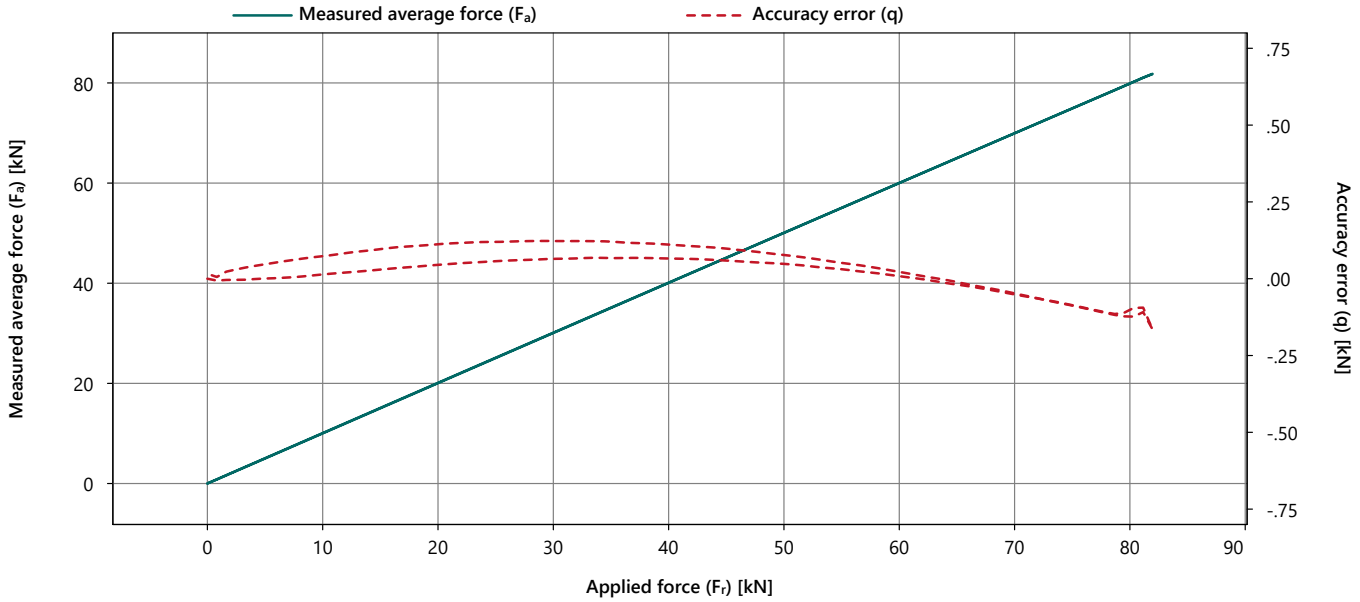
Sensor	
Channel	Cone [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0003
Expanded Uncertainty	$0.0025 \cdot F_r + 0.0094$ [kN]

Calibration Details	
Calibration Date	27 Jun 2025 13:47:00
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Certificate Number
FCN25037932

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.122
Max repeatability error (b)	[kN]	0.008
Max reversibility error (v)	[kN]	0.068
Zero load error (F_{c0})	[kN]	0.016
Zero load offset (F_0)	[kN]	0.005
Resolution	[kN]	$3.67 \cdot 10^{-5}$
Noise RMS	[kN]	0.001



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.000	0.000	0.000	0.000	0.000	0.001		0.035
16.000	16.032	16.034	16.034	16.033	0.033	0.002	0.068	0.135
32.000	32.066	32.067	32.065	32.066	0.066	0.002	0.056	0.121
48.000	48.052	48.053	48.052	48.052	0.052	0.002	0.034	0.140
64.000	63.987	63.986	63.986	63.986	-0.014	0.001	0.010	0.176
80.000	79.894	79.900	79.902	79.899	-0.101	0.008		0.216
64.000	63.998	63.994	63.998	63.996	-0.004	0.003	0.010	0.176
48.000	48.086	48.088	48.084	48.086	0.086	0.003	0.034	0.140
32.000	32.123	32.124	32.121	32.122	0.122	0.002	0.056	0.121
16.000	16.102	16.101	16.100	16.101	0.101	0.002	0.068	0.135
0.000	0.016	0.017	0.016	0.016	0.016	0.001		0.035

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Cone+Fric. Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2834
Electronics	271
Node Type	7001
Hardware Version	5.01
Software Version	8.01

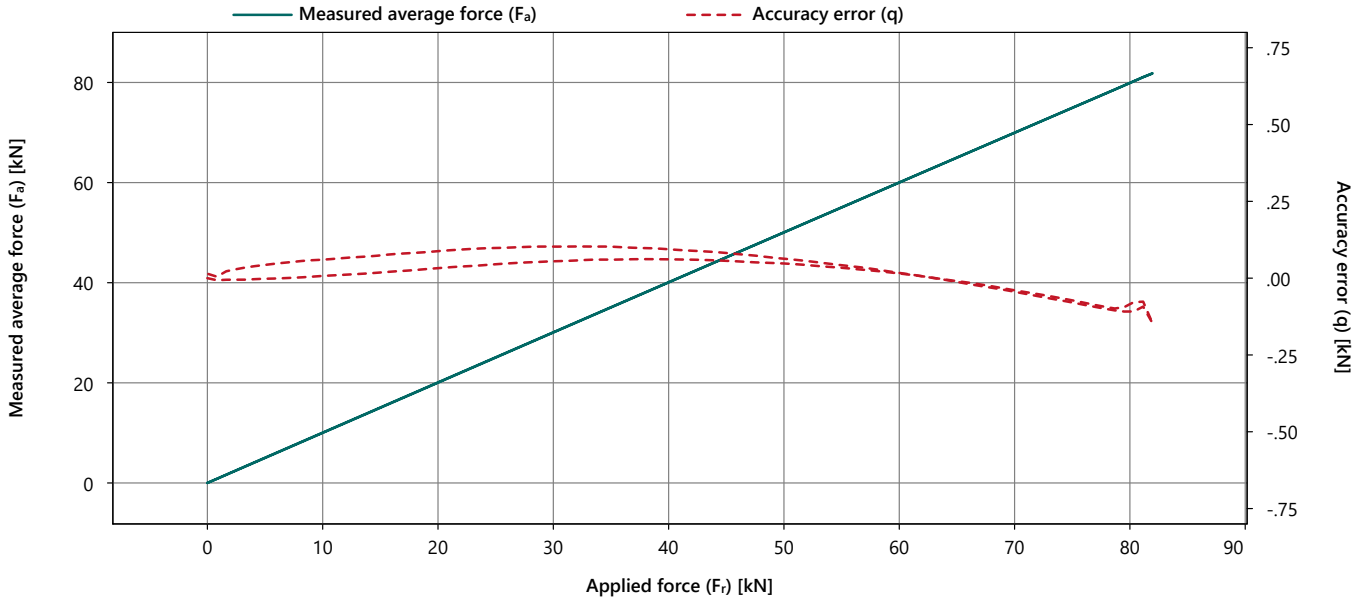
Sensor	
Channel	Cone+Fric. [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0003
Expanded Uncertainty	0.0025 · F_r + 0.0094 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 13:47:00
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Certificate Number
FCN25037932

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.103
Max repeatability error (b)	[kN]	0.009
Max reversibility error (v)	[kN]	0.056
Zero load error (F_{c0})	[kN]	0.015
Zero load offset (F_0)	[kN]	0.009
Resolution	[kN]	$3.68 \cdot 10^{-5}$
Noise RMS	[kN]	0.001
Tip-Sleeve Interaction %	[%]	0.010



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.001	0.000	-0.001	0.000	0.000	0.002		0.032
16.000	16.021	16.022	16.021	16.021	0.021	0.001	0.056	0.111
32.000	32.058	32.058	32.057	32.058	0.058	0.001	0.045	0.110
48.000	48.051	48.051	48.050	48.051	0.051	0.002	0.021	0.136
64.000	63.995	63.996	63.995	63.995	-0.005	0.001	-0.001	0.176
80.000	79.910	79.917	79.919	79.915	-0.085	0.009		0.216
64.000	63.995	63.992	63.996	63.994	-0.006	0.004	-0.001	0.176
48.000	48.070	48.073	48.071	48.071	0.071	0.003	0.021	0.136
32.000	32.102	32.105	32.103	32.103	0.103	0.003	0.045	0.110
16.000	16.078	16.079	16.077	16.078	0.078	0.002	0.056	0.111
0.000	0.015	0.015	0.014	0.015	0.015	0.002		0.032

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Pore 2 Calibration Result [Pressure]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2834
Electronics	271
Node Type	7001
Hardware Version	5.01
Software Version	8.01

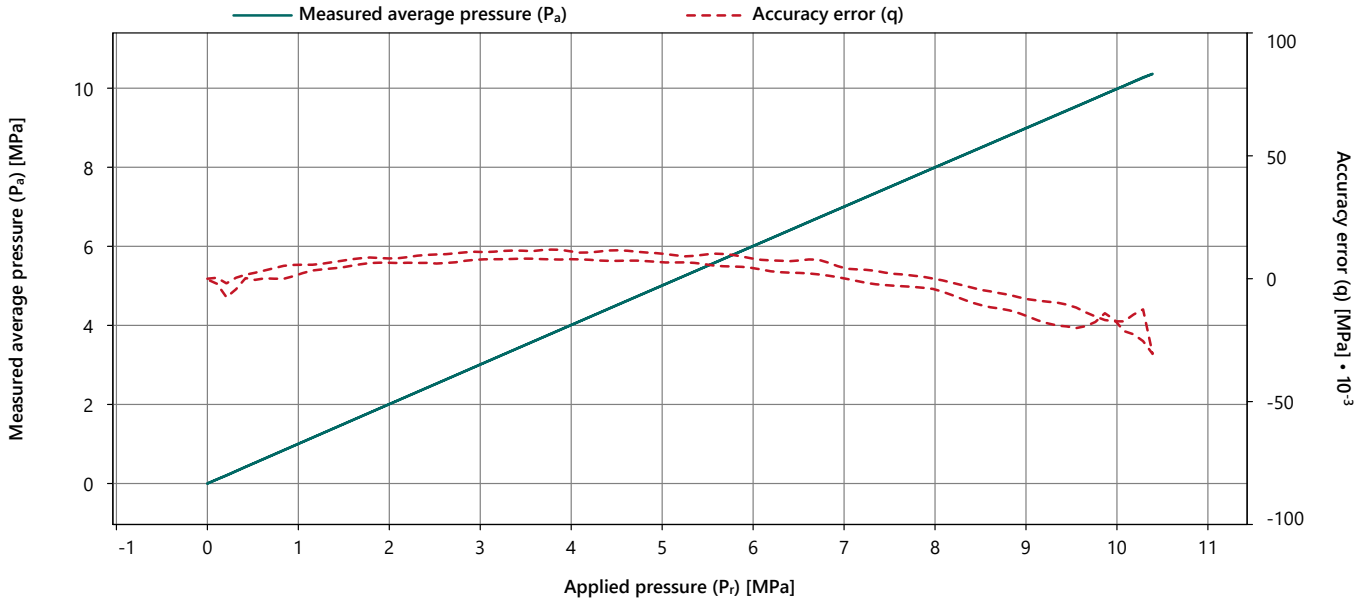
Sensor	
Channel	Pore 2 [Pressure]
Manufacturer	Keller PA-8/100bar (8467.8)
Calibrated Range	0 to 10 MPa
Maximum Rating	15 MPa

Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Calibration Details	
Calibration Date	27 Jun 2025 14:48:49
Procedure	EUAF-FNLM- CAL-PR-004
Software Version	5.1.5.58158

Certificate Number
FCN25037932

Characteristics	Unit	Value
Max accuracy error (q)	[MPa]	0.017
Max repeatability error (b)	[MPa]	0.003
Max reversibility error (v)	[MPa]	0.004
Zero load error (P_{c0})	[MPa]	0.000
Zero load offset (P_0)	[MPa]	-0.030
Resolution	[MPa]	$2.51 \cdot 10^{-6}$
Noise RMS	[MPa]	0.000



Applied pressure (P_r)	Measured pressure 1 ($P_{a,1}$)	Measured pressure 2 ($P_{a,2}$)	Measured pressure 3 ($P_{a,3}$)	Measured average pressure (P_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.003
2.000	2.009	2.008	2.008	2.008	0.008	0.001	-0.002	0.004
4.000	4.013	4.009	4.011	4.011	0.011	0.003	-0.003	0.007
6.000	6.007	6.010	6.008	6.008	0.008	0.003	-0.004	0.008
8.000	8.000	8.000	7.999	8.000	0.000	0.001	-0.004	0.008
10.000	9.981	9.985	9.982	9.983	-0.017	0.003		0.007
8.000	7.995	7.998	7.994	7.996	-0.004	0.003	-0.004	0.009
6.000	6.005	6.004	6.004	6.004	0.004	0.001	-0.004	0.008
4.000	4.007	4.009	4.008	4.008	0.008	0.002	-0.003	0.007
2.000	2.007	2.006	2.006	2.006	0.006	0.002	-0.002	0.004
0.000	0.000	0.000	-0.001	0.000	0.000	0.002		0.004

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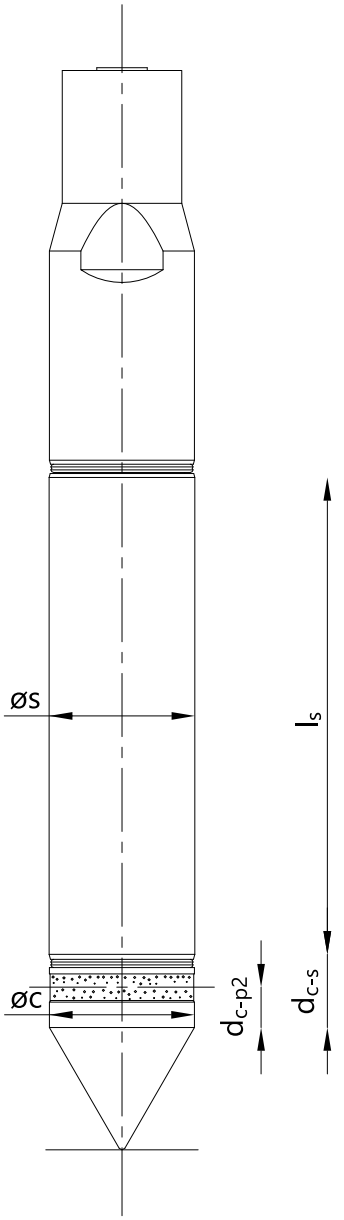
Typical Dimensions

Instrument

Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1M1-V1
Serial Number	1706-2834

Appendix Applicable to Certificate Number FCN25037932



Typical Dimensions

A_c	Cross-sectional projected area of the cone	0.001 m^2
A_s	Surface area of the friction sleeve	0.015 m^2
af	Cone net area ratio	0.75
bf	Friction sleeve net area ratio	0
øc	Diameter of the cylindrical part of the cone	35.8 mm
øs	Diameter of the friction sleeve	36.1 mm
l_s	Length of the friction sleeve	132.7 mm
d_{c-s}	Cone - friction sleeve distance	13.5 mm
d_{c-p2}	Cone - pore 2 distance	5 mm

Diagram is not to scale

Cone Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2834
Electronics	271
Node Type	7001
Hardware Version	5.01
Software Version	8.01

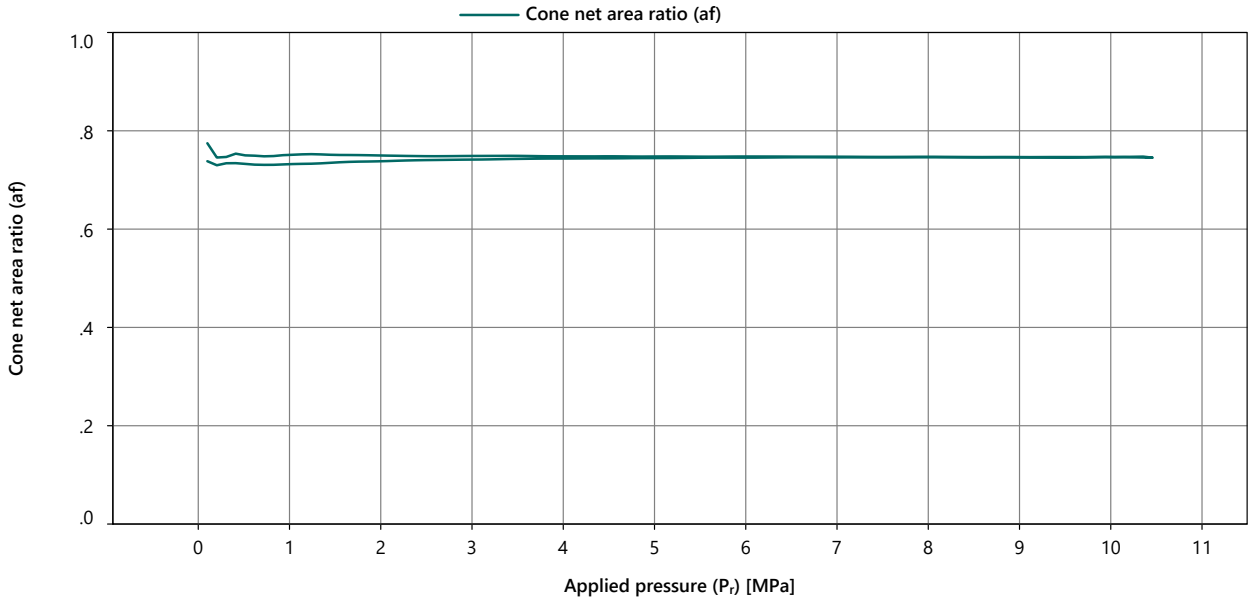
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 14:48:49
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25037932

Characteristics	Unit	Value
Cone net area ratio (af)	[-]	0.75

The cone net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured cone net area ratio 1 (af,1)	Measured cone net area ratio 2 (af,2)	Measured cone net area ratio 3 (af,3)	Measured average cone net area ratio (af)
2.000	0.739	0.738	0.737	0.738
4.000	0.744	0.743	0.744	0.744
6.000	0.745	0.746	0.746	0.745
8.000	0.747	0.747	0.746	0.747
10.000	0.747	0.747	0.747	0.747
8.000	0.747	0.747	0.747	0.747
6.000	0.748	0.748	0.748	0.748
4.000	0.748	0.748	0.748	0.748
2.000	0.751	0.749	0.750	0.750

Friction Sleeve Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2834
Electronics	271
Node Type	7001
Hardware Version	5.01
Software Version	8.01

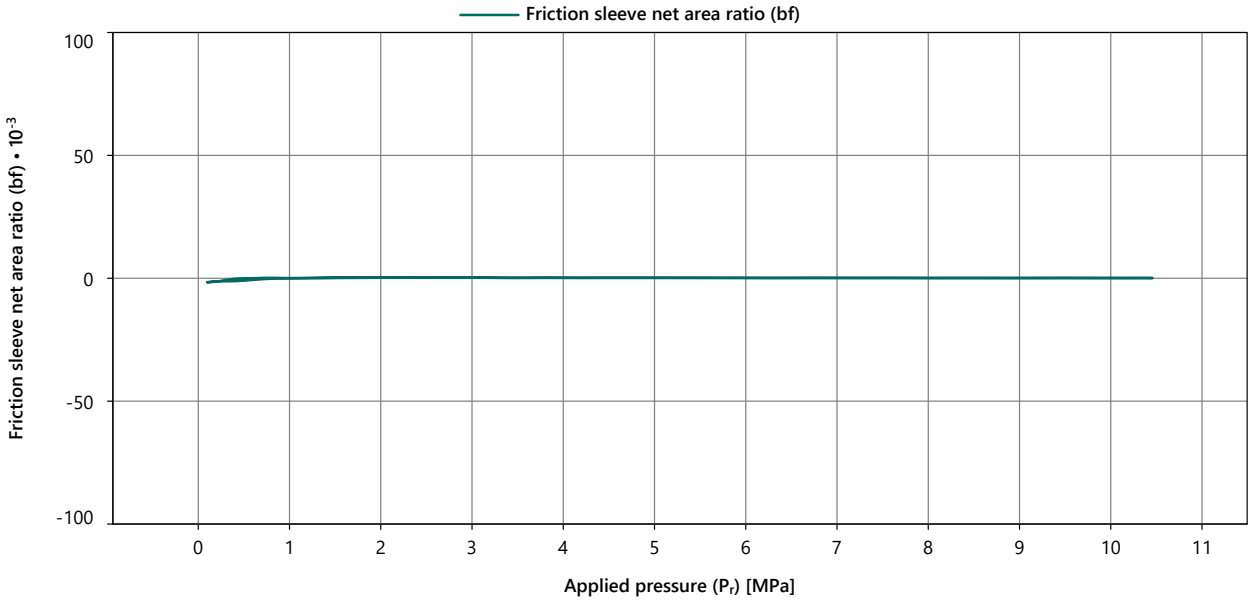
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 14:48:49
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25037932

Characteristics	Unit	Value
Friction sleeve net area ratio (bf)	[-]	0.00009

The friction sleeve net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured friction sleeve net area ratio (bf) 1 (bf,1)	Measured friction sleeve net area ratio (bf) 2 (bf,2)	Measured friction sleeve net area ratio (bf) 3 (bf,3)	Measured average Friction sleeve net area ratio (bf)
2.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
10.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000

Symbols, Definitions and References

Appendix Applicable to Certificate Number FCN25037932

Symbols and Definitions (general)

af	Cone net area ratio, defined as the factor between the applied pressure to the instrument and the indicated cone resistance.
af,x	Measured cone net area ratio at measurement x.
b	Repeatability error, defined as the maximum difference between the measurements of the instrument at the applied value.
bf	Friction sleeve net area ratio, defined as the factor between the applied pressure to the instrument and the indicated sleeve friction.
bf,x	The measured friction sleeve net area ratio at measurement x.
Noise RMS	Signal noise, defined as the quadratic mean when the sensor is not subjected to load.
q	Accuracy error, defined as the difference between the average indicated value by the instrument and the applied value.
Resolution	Smallest change in a quantity being measured that causes a perceptible change in the corresponding indication.
U	The stated uncertainty is that of the average indicated quantity, and includes the entire calibration method, including the reference and calibrated sensor, but excludes the difference between average indicated value by the instrument and the applied value.
v	Reversibility error, defined as the difference between the average indicated value by the instrument at a certain applied value when it was increased and when it was decreased.

Symbols and Definitions (quantity specific: Q may be substituted for F or P, as appropriate)

Q_0	Zero load offset, instrument output where the specified measured quantity value is zero.
Q_a	Average indicated quantity value by the instrument.
$Q_{a,x}$	Quantity value indicated by the instrument at measurement x.
Q_{c0}	Zero load error, defined as the difference between the average indicated value by the instrument before and after the load cycle has been applied.
Q_r	Applied reference quantity value.
Qw	Applied reference quantity value.

Appendix Applicable to Certificate Number FCN25037932

Quantities

F	Force
P	Pressure

References

International Organization for Standardization, 2012. *ISO 22476-1:2012 Geotechnical investigation and testing, Field testing, Electrical cone and piezocone penetration test.* Geneva: ISO.

European Co-operation For Accreditation, 2022. *Evaluation of the uncertainty of measurement in calibration.* European Co-operation For Accreditation, Publication; EA-4/02 M:2022.

International Organization for Standardization, 2017. *ISO 17025:2017 General requirements for the competence of testing and calibration laboratories.* Geneva: ISO.

International Organization for Standardization, 2003. *ISO 10012:2003 Measurement management systems - requirements for measurement processes and measuring equipment.* Geneva: ISO.

International Organization for Standardization, 2008. *ISO 9001:2008 Quality management systems - Requirements.* Geneva: ISO.

Calibration Certificate

Applicant	**Fugro Netherlands Marine B.V.**
	Prismastraat 4
	2631 RT, Nootdorp
	The Netherlands

Certificate Number
FCN25037700

Instrument	**Cone Penetrometer**		
Manufacturer	Fugro		
Type	CP10-CF80PB10-P1E1M1-V1		
Serial Number	1706-2851	Electronics	7316
Node Type	7001	Hardware Version	5.01
Software Version	8.01		

Calibration method The instrument was calibrated according to Fugro procedures using a comparison technique against a reference standard.

Environmental Conditions

Ambient air temperature during calibration	20.5 ± 3 °C
Temperature change during calibration	< 1 °C
Atmospheric pressure during calibration	1000 ± 100 mbar

Result The condition of the cone penetrometer meets the requirements of ISO 22476-1:2012 Section 4.1 through 4.7. The calibration results are reported on the next page(s).

The calibration results indicate that the cone penetrometer meets the requirements for use in Application Class 1 as defined in ISO 22476-1:2012 Section 5.2.

Uncertainty The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides a confidence level of approximately 95%. The standard uncertainty has been determined in accordance with EA-4/02.

Traceability The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA (Raad voor Accreditatie).

Calibration date 27-Jun-2025

Calibrate before 27-Dec-2025

Calibrated Sensor	Manufacturer / Type	Calibrated Range	Maximum Rating	Procedure
Cone [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Cone+Fric. [Force]	Fugro load cell	0 to 80 kN	100 kN	EUAF-FNLM- CAL-PR-003
Pore 2 [Pressure]	Keller PA-8/100bar (8467.8)	0 to 10 MPa	15 MPa	EUAF-FNLM- CAL-PR-004

	Before adjustment		After adjustment		Drift	
Calibrated Sensor	Sensitivity	Zero Load	Sensitivity	Zero Load	Sensitivity	Zero Load
Cone [Force]	25.4 µV/V/kN	1.53 µV/V	25.4 µV/V/kN	4.71 µV/V	-0.01 %	0.16 %
Cone+Fric. [Force]	25.4 µV/V/kN	3.32 µV/V	25.4 µV/V/kN	54.7 µV/V	0.01 %	2.53 %
Pore 2 [Pressure]	2.98 mV/V/MPa	1.42 mV/V	2.98 mV/V/MPa	1.43 mV/V	-0.02 %	0.05 %

Nootdorp, 30-Jun-2025

Ruud Schrijvers
Deputy Manager Transducer Workshop

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Cone Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2851
Electronics	7316
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Cone [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

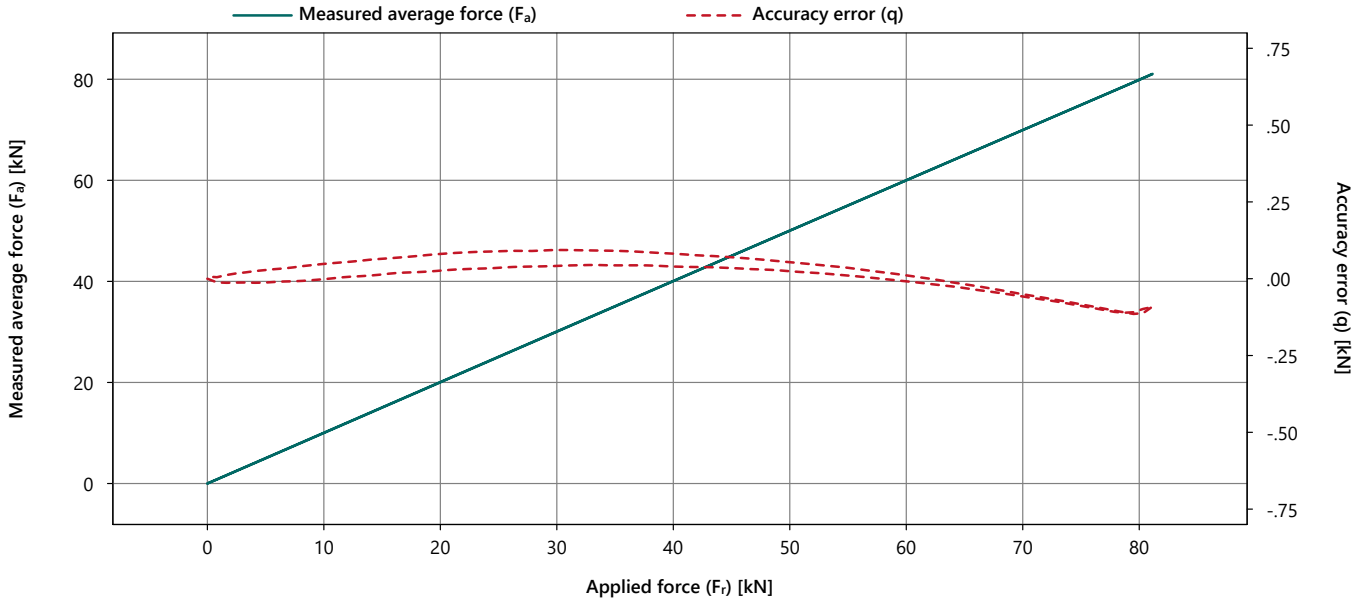
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0003
Expanded Uncertainty	0.0025 · F_r + 0.0094 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 11:42:02
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25037700

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.103
Max repeatability error (b)	[kN]	0.065
Max reversibility error (v)	[kN]	0.050
Zero load error (F_{c0})	[kN]	0.007
Zero load offset (F_0)	[kN]	-0.011
Resolution	[kN]	$3.66 \cdot 10^{-5}$
Noise RMS	[kN]	0.001



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.009	-0.004	-0.005	0.000	0.000	0.014		0.030
16.000	15.999	16.023	16.032	16.018	0.018	0.034	0.050	0.101
32.000	32.017	32.051	32.063	32.044	0.044	0.046	0.049	0.126
48.000	47.996	48.038	48.054	48.029	0.029	0.058	0.031	0.155
64.000	63.938	63.983	64.003	63.975	-0.025	0.065	0.013	0.191
80.000	79.866	79.902	79.921	79.897	-0.103	0.055		0.225
64.000	63.950	64.000	64.013	63.988	-0.012	0.062	0.013	0.190
48.000	48.025	48.073	48.085	48.061	0.061	0.060	0.031	0.156
32.000	32.060	32.102	32.116	32.093	0.093	0.056	0.049	0.134
16.000	16.047	16.074	16.081	16.068	0.068	0.034	0.050	0.101
0.000	0.009	0.007	0.006	0.007	0.007	0.002		0.016

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Cone+Fric. Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2851
Electronics	7316
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Cone+Fric. [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	100 kN

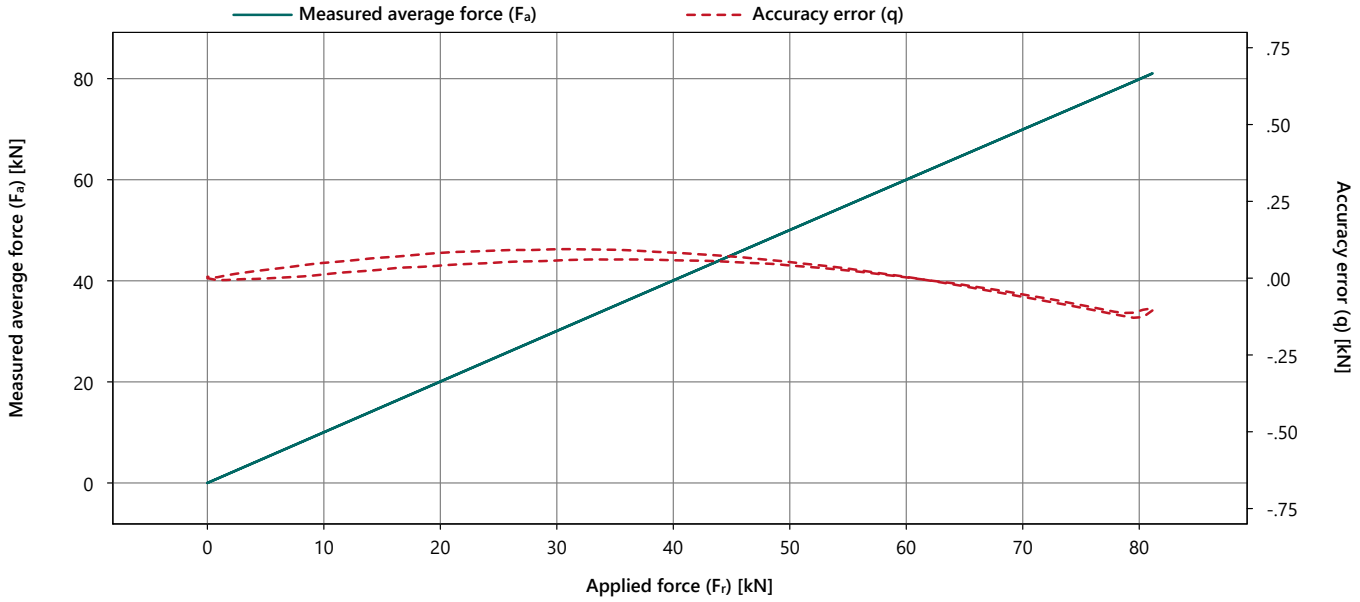
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0003
Expanded Uncertainty	0.0025 · F_r + 0.0094 [kN]

Calibration Details	
Calibration Date	27 Jun 2025 11:42:02
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25037700

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.107
Max repeatability error (b)	[kN]	0.014
Max reversibility error (v)	[kN]	0.037
Zero load error (F_{c0})	[kN]	0.004
Zero load offset (F_0)	[kN]	-0.014
Resolution	[kN]	$3.67 \cdot 10^{-5}$
Noise RMS	[kN]	0.000
Tip-Sleeve Interaction %	[%]	0.103



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.009	-0.004	-0.005	0.000	0.000	0.014		0.028
16.000	16.032	16.032	16.034	16.032	0.032	0.002	0.037	0.075
32.000	32.058	32.061	32.061	32.060	0.060	0.003	0.034	0.100
48.000	48.044	48.048	48.050	48.047	0.047	0.006	0.013	0.136
64.000	63.979	63.983	63.987	63.983	-0.017	0.008	-0.004	0.176
80.000	79.898	79.889	79.891	79.893	-0.107	0.009		0.216
64.000	63.977	63.983	63.979	63.980	-0.020	0.006	-0.004	0.176
48.000	48.056	48.063	48.060	48.060	0.060	0.007	0.013	0.136
32.000	32.090	32.096	32.096	32.094	0.094	0.007	0.034	0.100
16.000	16.068	16.071	16.070	16.070	0.070	0.002	0.037	0.075
0.000	0.007	0.004	0.003	0.004	0.004	0.004		0.016

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Pore 2 Calibration Result [Pressure]

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2851
Electronics	7316
Node Type	7001
Hardware Version	5.01
Software Version	8.01

Sensor	
Channel	Pore 2 [Pressure]
Manufacturer	Keller PA-8/100bar (8467.8)
Calibrated Range	0 to 10 MPa
Maximum Rating	15 MPa

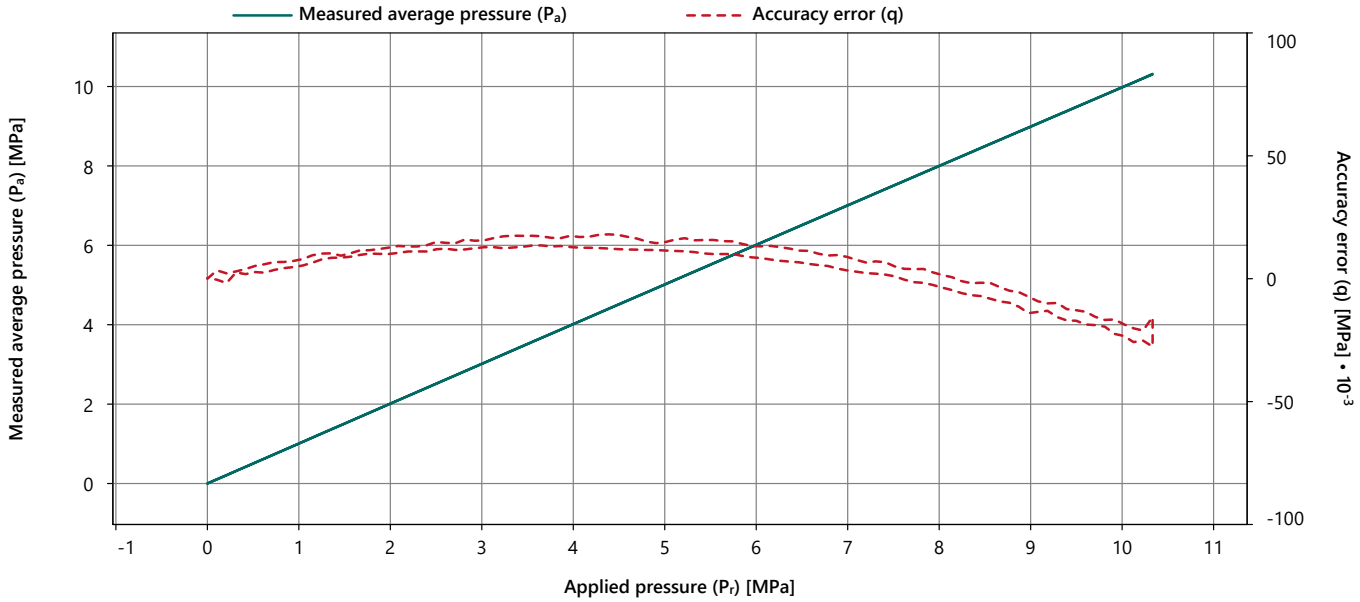
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Calibration Details	
Calibration Date	27 Jun 2025 11:54:04
Procedure	EUAF-FNLM- CAL-PR-004
Software Version	5.1.5.58158

CALIBRATION RvA K 167

Certificate Number FCN25037700

Characteristics	Unit	Value
Max accuracy error (q)	[MPa]	0.018
Max repeatability error (b)	[MPa]	0.003
Max reversibility error (v)	[MPa]	0.005
Zero load error (P_{c0})	[MPa]	0.000
Zero load offset (P_0)	[MPa]	0.001
Resolution	[MPa]	2.5 · 10^{-6}
Noise RMS	[MPa]	0.000



Applied pressure (P_r)	Measured pressure 1 ($P_{a,1}$)	Measured pressure 2 ($P_{a,2}$)	Measured pressure 3 ($P_{a,3}$)	Measured average pressure (P_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
0.000	0.000	-0.001	0.001	0.000	0.000	0.001		0.003
2.000	2.013	2.012	2.014	2.013	0.013	0.002	-0.003	0.006
4.000	4.018	4.017	4.017	4.017	0.017	0.001	-0.005	0.009
6.000	6.014	6.012	6.013	6.013	0.013	0.002	-0.005	0.009
8.000	8.000	8.002	8.003	8.002	0.002	0.003	-0.005	0.010
10.000	9.981	9.982	9.983	9.982	-0.018	0.002		0.006
8.000	7.995	7.998	7.998	7.997	-0.003	0.002	-0.005	0.010
6.000	6.007	6.009	6.009	6.009	0.009	0.002	-0.005	0.009
4.000	4.011	4.013	4.014	4.013	0.013	0.003	-0.005	0.010
2.000	2.010	2.011	2.009	2.010	0.010	0.001	-0.003	0.006
0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.003

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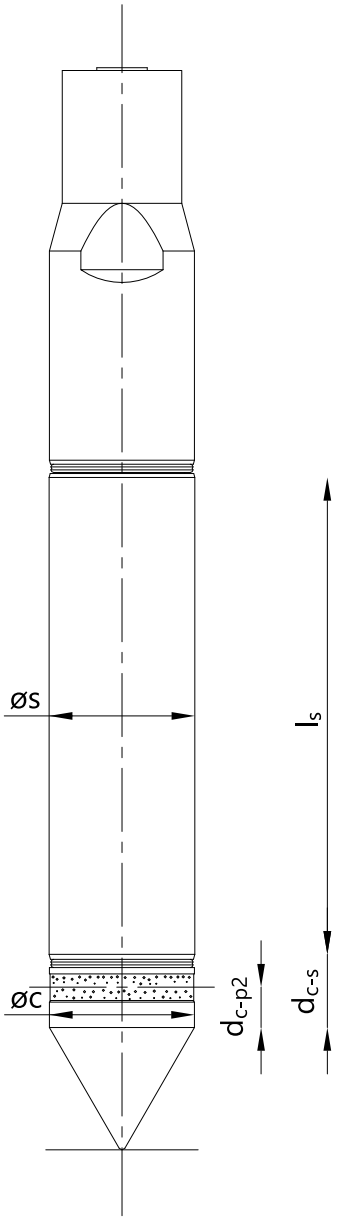
Typical Dimensions

Instrument

Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1M1-V1
Serial Number	1706-2851

Appendix Applicable to Certificate Number FCN25037700



Typical Dimensions

A_c	Cross-sectional projected area of the cone	0.001 m^2
A_s	Surface area of the friction sleeve	0.015 m^2
af	Cone net area ratio	0.75
bf	Friction sleeve net area ratio	0
øc	Diameter of the cylindrical part of the cone	35.8 mm
øs	Diameter of the friction sleeve	36.1 mm
l_s	Length of the friction sleeve	132.7 mm
d_{c-s}	Cone - friction sleeve distance	13.5 mm
d_{c-p2}	Cone - pore 2 distance	5 mm

Diagram is not to scale

Cone Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2851
Electronics	7316
Node Type	7001
Hardware Version	5.01
Software Version	8.01

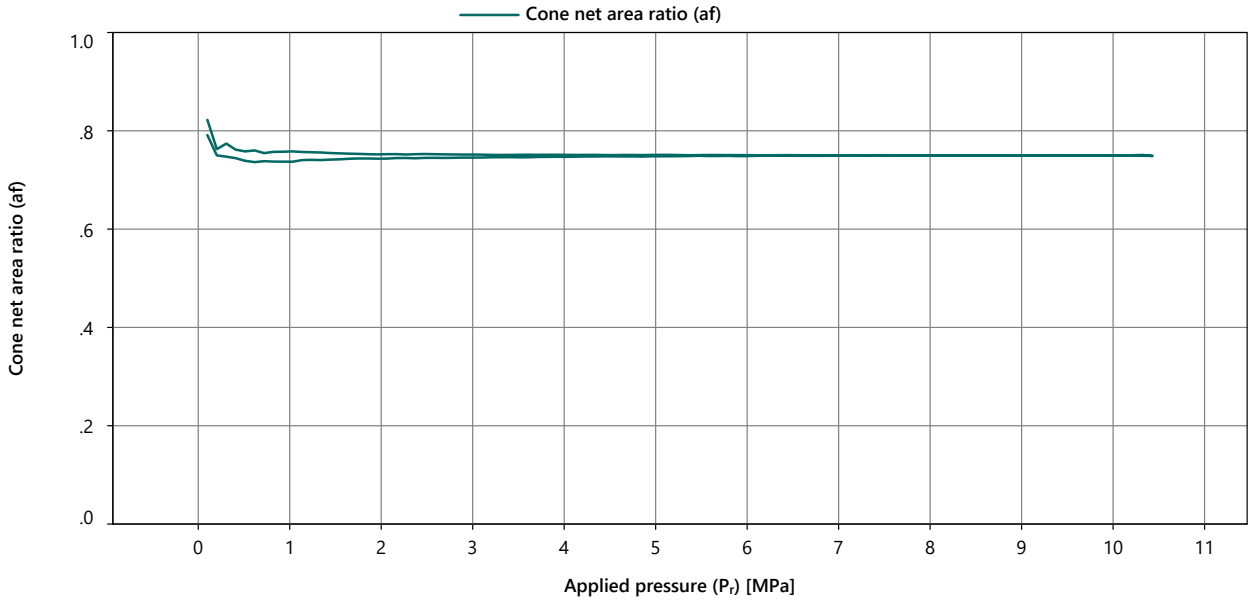
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 11:54:04
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25037700

Characteristics	Unit	Value
Cone net area ratio (af)	[-]	0.75

The cone net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured cone net area ratio 1 (af,1)	Measured cone net area ratio 2 (af,2)	Measured cone net area ratio 3 (af,3)	Measured average cone net area ratio (af)
2.000	0.744	0.743	0.744	0.743
4.000	0.748	0.747	0.747	0.747
6.000	0.748	0.749	0.749	0.749
8.000	0.749	0.749	0.750	0.750
10.000	0.750	0.750	0.751	0.750
8.000	0.749	0.750	0.750	0.750
6.000	0.750	0.750	0.751	0.750
4.000	0.750	0.751	0.752	0.751
2.000	0.751	0.752	0.753	0.752

Friction Sleeve Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP10-CF80PB10-P1E1 M1-V1
Serial Number	1706-2851
Electronics	7316
Node Type	7001
Hardware Version	5.01
Software Version	8.01

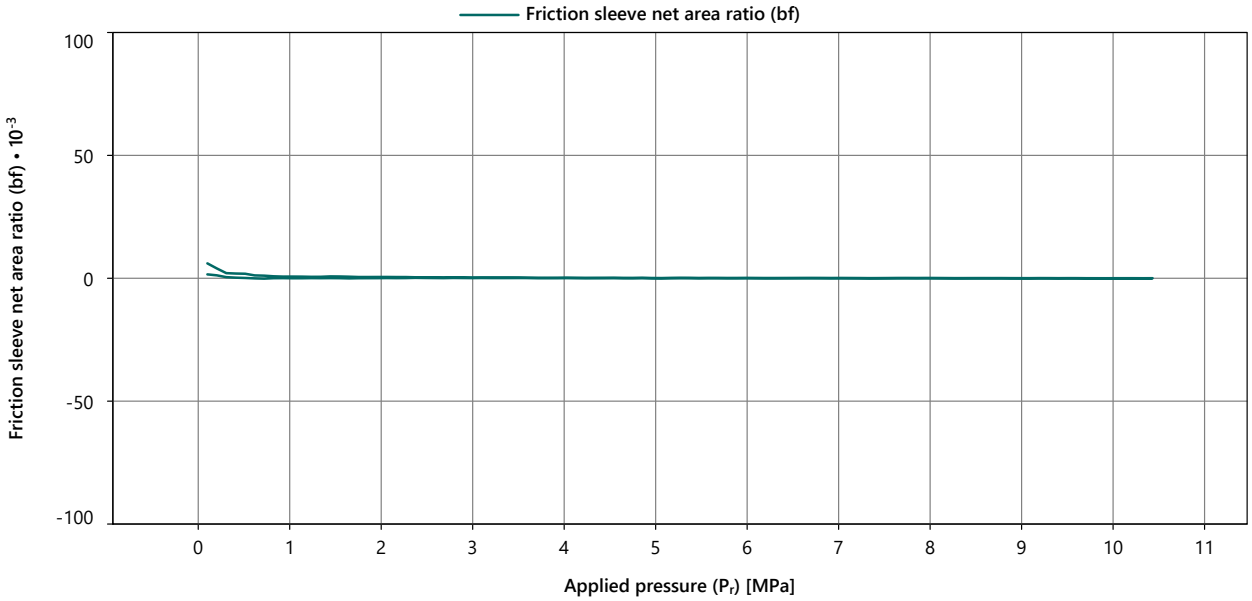
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	27 Jun 2025 11:54:04
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.1.5.58158

Appendix Applicable to Certificate Number FCN25037700

Characteristics	Unit	Value
Friction sleeve net area ratio (bf)	[-]	0.00002

The friction sleeve net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured friction sleeve net area ratio (bf) 1 (bf,1)	Measured friction sleeve net area ratio (bf) 2 (bf,2)	Measured friction sleeve net area ratio (bf) 3 (bf,3)	Measured average Friction sleeve net area ratio (bf)
2.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
10.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
2.000	0.000	0.001	0.001	0.001

Symbols, Definitions and References

Appendix Applicable to Certificate Number FCN25037700

Symbols and Definitions (general)

af	Cone net area ratio, defined as the factor between the applied pressure to the instrument and the indicated cone resistance.
af,x	Measured cone net area ratio at measurement x.
b	Repeatability error, defined as the maximum difference between the measurements of the instrument at the applied value.
bf	Friction sleeve net area ratio, defined as the factor between the applied pressure to the instrument and the indicated sleeve friction.
bf,x	The measured friction sleeve net area ratio at measurement x.
Noise RMS	Signal noise, defined as the quadratic mean when the sensor is not subjected to load.
q	Accuracy error, defined as the difference between the average indicated value by the instrument and the applied value.
Resolution	Smallest change in a quantity being measured that causes a perceptible change in the corresponding indication.
U	The stated uncertainty is that of the average indicated quantity, and includes the entire calibration method, including the reference and calibrated sensor, but excludes the difference between average indicated value by the instrument and the applied value.
v	Reversibility error, defined as the difference between the average indicated value by the instrument at a certain applied value when it was increased and when it was decreased.

Symbols and Definitions (quantity specific: Q may be substituted for F or P, as appropriate)

Q_0	Zero load offset, instrument output where the specified measured quantity value is zero.
Q_a	Average indicated quantity value by the instrument.
$Q_{a,x}$	Quantity value indicated by the instrument at measurement x.
Q_{c0}	Zero load error, defined as the difference between the average indicated value by the instrument before and after the load cycle has been applied.
Q_r	Applied reference quantity value.
Qw	Applied reference quantity value.

Appendix Applicable to Certificate Number FCN25037700

Quantities

F	Force
P	Pressure

References

International Organization for Standardization, 2012. *ISO 22476-1:2012 Geotechnical investigation and testing, Field testing, Electrical cone and piezocone penetration test.* Geneva: ISO.

European Co-operation For Accreditation, 2022. *Evaluation of the uncertainty of measurement in calibration.* European Co-operation For Accreditation, Publication; EA-4/02 M:2022.

Calibration Certificate

Applicant	Fugro Netherlands Marine B.V.
	Prismastraat 4
	2631 RT, Nootdorp
	The Netherlands

Instrument	Cone Penetrometer		
Manufacturer	Fugro		
Type	CP5-CF80PB10-P1E1M2-V1		
Serial Number	1703-0085	Electronics	10079
Node Type	7001	Hardware Version	6.00
Software Version	8.01		

CALIBRATION RvA K 167

Certificate Number
FCN25038250

Calibration method The instrument was calibrated according to Fugro procedures using a comparison technique against a reference standard.

Environmental Conditions

Ambient air temperature during calibration	20.5 ± 3 °C
Temperature change during calibration	< 1 °C
Atmospheric pressure during calibration	1000 ± 100 mbar

Result The condition of the cone penetrometer meets the requirements of ISO 22476-1:2012 Section 4.1 through 4.7. The calibration results are reported on the next page(s).

Uncertainty The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides a confidence level of approximately 95%. The standard uncertainty has been determined in accordance with EA-4/02.

Traceability The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA (Raad voor Accreditatie).

Calibration date 07-Jul-2025

Calibrate before 07-Jan-2026

Calibrated Sensor	Manufacturer / Type	Calibrated Range	Maximum Rating	Procedure
Cone [Force]	Fugro load cell	0 to 80 kN	80 kN	EUAF-FNLM- CAL-PR-003
Cone+Fric. [Force]	Fugro load cell	0 to 80 kN	80 kN	EUAF-FNLM- CAL-PR-003
Pore 2 [Pressure]	Keller PA-3L/100bar	0 to 10 MPa	20 MPa	EUAF-FNLM- CAL-PR-004

Nootdorp, 08-Jul-2025

Ruud Schrijvers
Deputy Manager Transducer Workshop

This certificate is issued provided that neither Fugro nor the Raad voor Accreditatie assumes any liability.

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Cone Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP5-CF80PB10-P1E1M 2-V1
Serial Number	1703-0085
Electronics	10079
Node Type	7001
Hardware Version	6.00
Software Version	8.01

Sensor	
Channel	Cone [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	80 kN

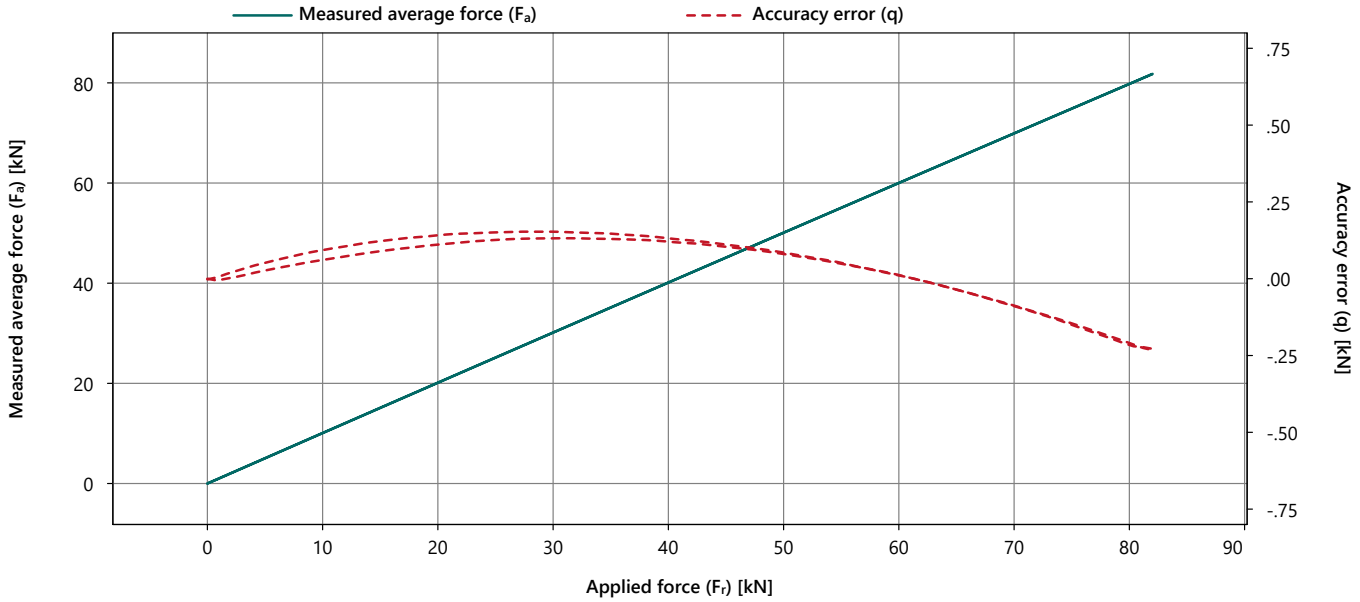
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0002
Expanded Uncertainty	$0.0029 \cdot F_r + 0.0070$ [kN]

Calibration Details	
Calibration Date	07 Jul 2025 12:34:39
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.2.0.58648

CALIBRATION RvA K 167

Certificate Number FCN25038250

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.217
Max repeatability error (b)	[kN]	0.004
Max reversibility error (v)	[kN]	0.032
Zero load error (F_{c0})	[kN]	0.002
Zero load offset (F_0)	[kN]	-0.037
Resolution	[kN]	$1.95 \cdot 10^{-5}$
Noise RMS	[kN]	0.000



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.001	-0.001	0.000	0.000	0.000	0.002		0.016
16.000	16.094	16.095	16.094	16.094	0.094	0.001	0.032	0.070
32.000	32.132	32.131	32.132	32.132	0.132	0.000	0.019	0.105
48.000	48.091	48.092	48.091	48.091	0.091	0.001	0.005	0.150
64.000	63.974	63.976	63.974	63.974	-0.026	0.002	0.000	0.197
80.000	79.781	79.784	79.785	79.783	-0.217	0.004		0.245
64.000	63.974	63.973	63.977	63.975	-0.025	0.003	0.000	0.197
48.000	48.095	48.097	48.098	48.097	0.097	0.002	0.005	0.150
32.000	32.149	32.150	32.152	32.150	0.150	0.003	0.019	0.105
16.000	16.125	16.126	16.129	16.127	0.127	0.003	0.032	0.070
0.000	-0.002	-0.003	-0.002	-0.002	-0.002	0.001		0.016

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Cone+Fric. Calibration Result [Force]

Instrument	
Manufacturer	Fugro
Type	CP5-CF80PB10-P1E1M 2-V1
Serial Number	1703-0085
Electronics	10079
Node Type	7001
Hardware Version	6.00
Software Version	8.01

Sensor	
Channel	Cone+Fric. [Force]
Manufacturer	Fugro load cell
Calibrated Range	0 to 80 kN
Maximum Rating	80 kN

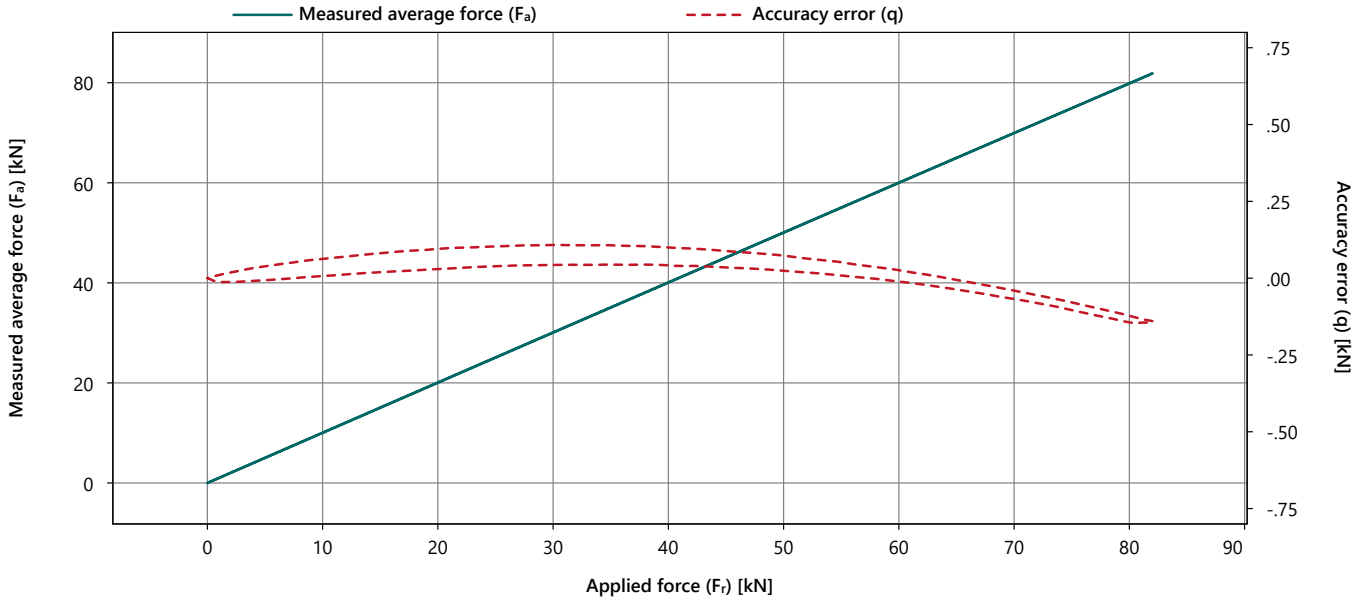
Reference	
Manufacturer	Zwick/Roell
Serial Number	6034-0002
Expanded Uncertainty	0.0029 · F_r + 0.0070 [kN]

Calibration Details	
Calibration Date	07 Jul 2025 12:34:39
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.2.0.58648

CALIBRATION RvA K 167

Certificate Number FCN25038250

Characteristics	Unit	Value
Max accuracy error (q)	[kN]	0.145
Max repeatability error (b)	[kN]	0.003
Max reversibility error (v)	[kN]	0.064
Zero load error (F_{c0})	[kN]	0.000
Zero load offset (F_0)	[kN]	-0.046
Resolution	[kN]	$3.33 \cdot 10^{-5}$
Noise RMS	[kN]	0.000
Tip-Sleeve Interaction %	[%]	0.064



Applied force (F_r)	Measured force 1 ($F_{a,1}$)	Measured force 2 ($F_{a,2}$)	Measured force 3 ($F_{a,3}$)	Measured average force (F_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
0.000	0.000	-0.001	0.002	0.000	0.000	0.003		0.016
16.000	16.021	16.022	16.022	16.022	0.022	0.001	0.063	0.129
32.000	32.043	32.043	32.044	32.044	0.044	0.001	0.064	0.134
48.000	48.029	48.030	48.030	48.029	0.029	0.002	0.051	0.161
64.000	63.968	63.970	63.969	63.969	-0.031	0.003	0.032	0.201
80.000	79.854	79.856	79.856	79.855	-0.145	0.002		0.245
64.000	64.002	64.000	64.001	64.001	0.001	0.001	0.032	0.201
48.000	48.080	48.081	48.079	48.080	0.080	0.001	0.051	0.161
32.000	32.108	32.108	32.106	32.107	0.107	0.002	0.064	0.134
16.000	16.085	16.085	16.083	16.085	0.085	0.002	0.063	0.130
0.000	0.000	0.001	0.000	0.000	0.000	0.001		0.016

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Pore 2 Calibration Result [Pressure]

Instrument	
Manufacturer	Fugro
Type	CP5-CF80PB10-P1E1M 2-V1
Serial Number	1703-0085
Electronics	10079
Node Type	7001
Hardware Version	6.00
Software Version	8.01

Sensor	
Channel	Pore 2 [Pressure]
Manufacturer	Keller PA-3L/100bar
Calibrated Range	0 to 10 MPa
Maximum Rating	20 MPa

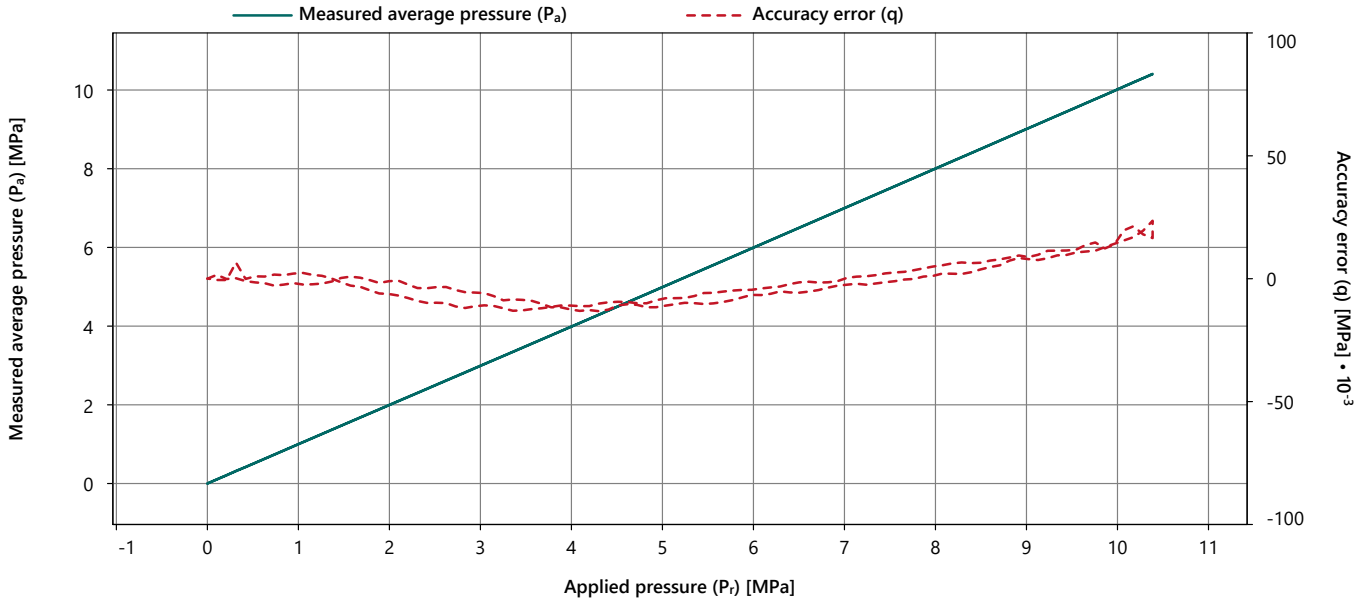
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Calibration Details	
Calibration Date	07 Jul 2025 12:51:03
Procedure	EUAF-FNLM- CAL-PR-004
Software Version	5.2.0.58648

CALIBRATION RvA K 167

Certificate Number FCN25038250

Characteristics	Unit	Value
Max accuracy error (q)	[MPa]	0.015
Max repeatability error (b)	[MPa]	0.003
Max reversibility error (v)	[MPa]	0.005
Zero load error (P_{c0})	[MPa]	0.000
Zero load offset (P_0)	[MPa]	-0.019
Resolution	[MPa]	$3.18 \cdot 10^{-6}$
Noise RMS	[MPa]	0.000



Applied pressure (P_r)	Measured pressure 1 ($P_{a,1}$)	Measured pressure 2 ($P_{a,2}$)	Measured pressure 3 ($P_{a,3}$)	Measured average pressure (P_a)	Accuracy error (q)	Repeatability error (b)	Reversibility error (v)	Expanded Uncertainty (U)
[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
0.000	0.000	0.000	-0.001	0.000	0.000	0.001		0.003
2.000	2.000	1.998	1.999	1.999	-0.001	0.002	-0.005	0.012
4.000	3.989	3.987	3.986	3.987	-0.013	0.003	0.002	0.007
6.000	5.994	5.993	5.994	5.993	-0.007	0.001	0.002	0.005
8.000	8.001	8.001	8.002	8.001	0.001	0.002	0.004	0.008
10.000	10.015	10.014	10.014	10.015	0.015	0.001		0.006
8.000	8.004	8.005	8.007	8.005	0.005	0.003	0.004	0.008
6.000	5.997	5.994	5.995	5.996	-0.004	0.003	0.002	0.006
4.000	3.988	3.989	3.990	3.989	-0.011	0.002	0.002	0.005
2.000	1.993	1.994	1.995	1.994	-0.006	0.001	-0.005	0.011
0.000	0.000	0.000	0.000	0.000	0.000	0.001		0.003

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Typical Dimensions

Instrument	
Manufacturer	Fugro
Type	CP5-CF80PB10-P1E1M2-V1
Serial Number	1703-0085

Appendix Applicable to Certificate Number FCN25038250

Typical Dimensions	
Cross-sectional projected area of the cone	0.00051 m^2
Surface area of the friction sleeve	0.0075 m^2
Cone net area ratio	0.75
Friction sleeve net area ratio	0
Diameter of the cylindrical part of the cone	25.4 mm
Diameter of the friction sleeve	25.5 mm
Length of the friction sleeve	93.6 mm
Cone - friction sleeve distance	8.8 mm
Cone - pore 2 distance	3.6 mm

Cone Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP5-CF80PB10-P1E1M 2-V1
Serial Number	1703-0085
Electronics	10079
Node Type	7001
Hardware Version	6.00
Software Version	8.01

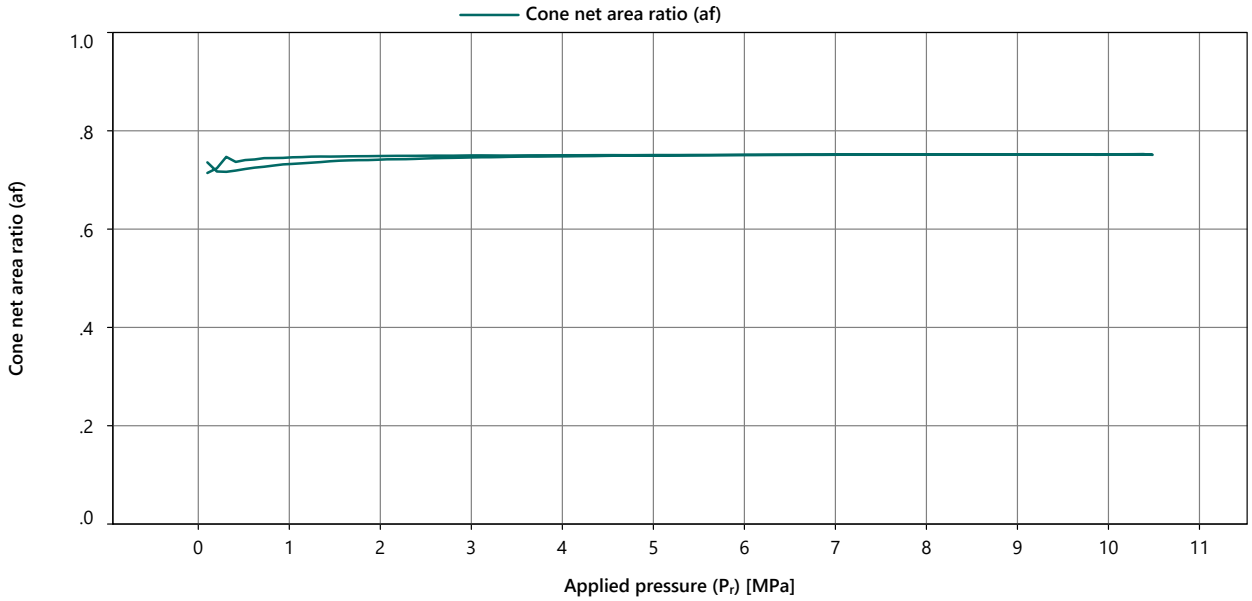
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	07 Jul 2025 12:51:03
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.2.0.58648

Appendix Applicable to Certificate Number FCN25038250

Characteristics	Unit	Value
Cone net area ratio (af)	[-]	0.75

The cone net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured cone net area ratio 1 (af,1)	Measured cone net area ratio 2 (af,2)	Measured cone net area ratio 3 (af,3)	Measured average cone net area ratio (af)
2.000	0.741	0.741	0.742	0.741
4.000	0.748	0.748	0.748	0.748
6.000	0.751	0.751	0.751	0.751
8.000	0.752	0.752	0.752	0.752
10.000	0.752	0.752	0.752	0.752
8.000	0.751	0.751	0.752	0.751
6.000	0.751	0.751	0.751	0.751
4.000	0.750	0.750	0.751	0.750
2.000	0.748	0.749	0.750	0.749

Friction Sleeve Net Area Ratio Result

Instrument	
Manufacturer	Fugro
Type	CP5-CF80PB10-P1E1M 2-V1
Serial Number	1703-0085
Electronics	10079
Node Type	7001
Hardware Version	6.00
Software Version	8.01

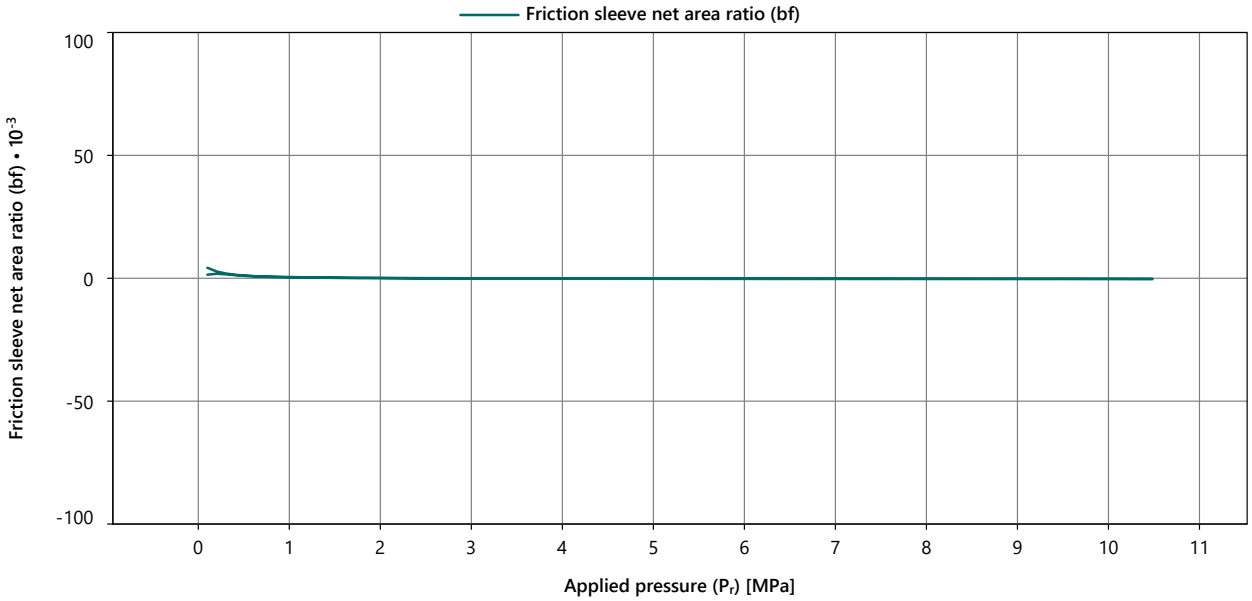
Reference	
Manufacturer	Keller PA-33X
Serial Number	3257-0002
Expanded Uncertainty	0.0003 · P_r + 0.0021 [MPa]

Measurement Details	
Measurement Date	07 Jul 2025 12:51:03
Procedure	EUAF-FNLM- CAL-PR-003
Software Version	5.2.0.58648

Appendix Applicable to Certificate Number FCN25038250

Characteristics	Unit	Value
Friction sleeve net area ratio (bf)	[-]	-0.00028

The friction sleeve net area ratio presented above is determined at the maximum applied pressure during the measurement.



Applied pressure (P_r) [MPa]	Measured friction sleeve net area ratio (bf) 1 (bf,1)	Measured friction sleeve net area ratio (bf) 2 (bf,2)	Measured friction sleeve net area ratio (bf) 3 (bf,3)	Measured average Friction sleeve net area ratio (bf)
2.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
10.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000

Symbols, Definitions and References

Appendix Applicable to Certificate Number FCN25038250

Symbols and Definitions (general)

af	Cone net area ratio, defined as the factor between the applied pressure to the instrument and the indicated cone resistance.
af,x	Measured cone net area ratio at measurement x.
b	Repeatability error, defined as the maximum difference between the measurements of the instrument at the applied value.
bf	Friction sleeve net area ratio, defined as the factor between the applied pressure to the instrument and the indicated sleeve friction.
bf,x	The measured friction sleeve net area ratio at measurement x.
Noise RMS	Signal noise, defined as the quadratic mean when the sensor is not subjected to load.
q	Accuracy error, defined as the difference between the average indicated value by the instrument and the applied value.
Resolution	Smallest change in a quantity being measured that causes a perceptible change in the corresponding indication.
U	The stated uncertainty is that of the average indicated quantity, and includes the entire calibration method, including the reference and calibrated sensor, but excludes the difference between average indicated value by the instrument and the applied value.
v	Reversibility error, defined as the difference between the average indicated value by the instrument at a certain applied value when it was increased and when it was decreased.

Symbols and Definitions (quantity specific: Q may be substituted for F or P, as appropriate)

Q_0	Zero load offset, instrument output where the specified measured quantity value is zero.
Q_a	Average indicated quantity value by the instrument.
$Q_{a,x}$	Quantity value indicated by the instrument at measurement x.
Q_{c0}	Zero load error, defined as the difference between the average indicated value by the instrument before and after the load cycle has been applied.
Q_r	Applied reference quantity value.
Qw	Applied reference quantity value.

Appendix Applicable to Certificate Number FCN25038250

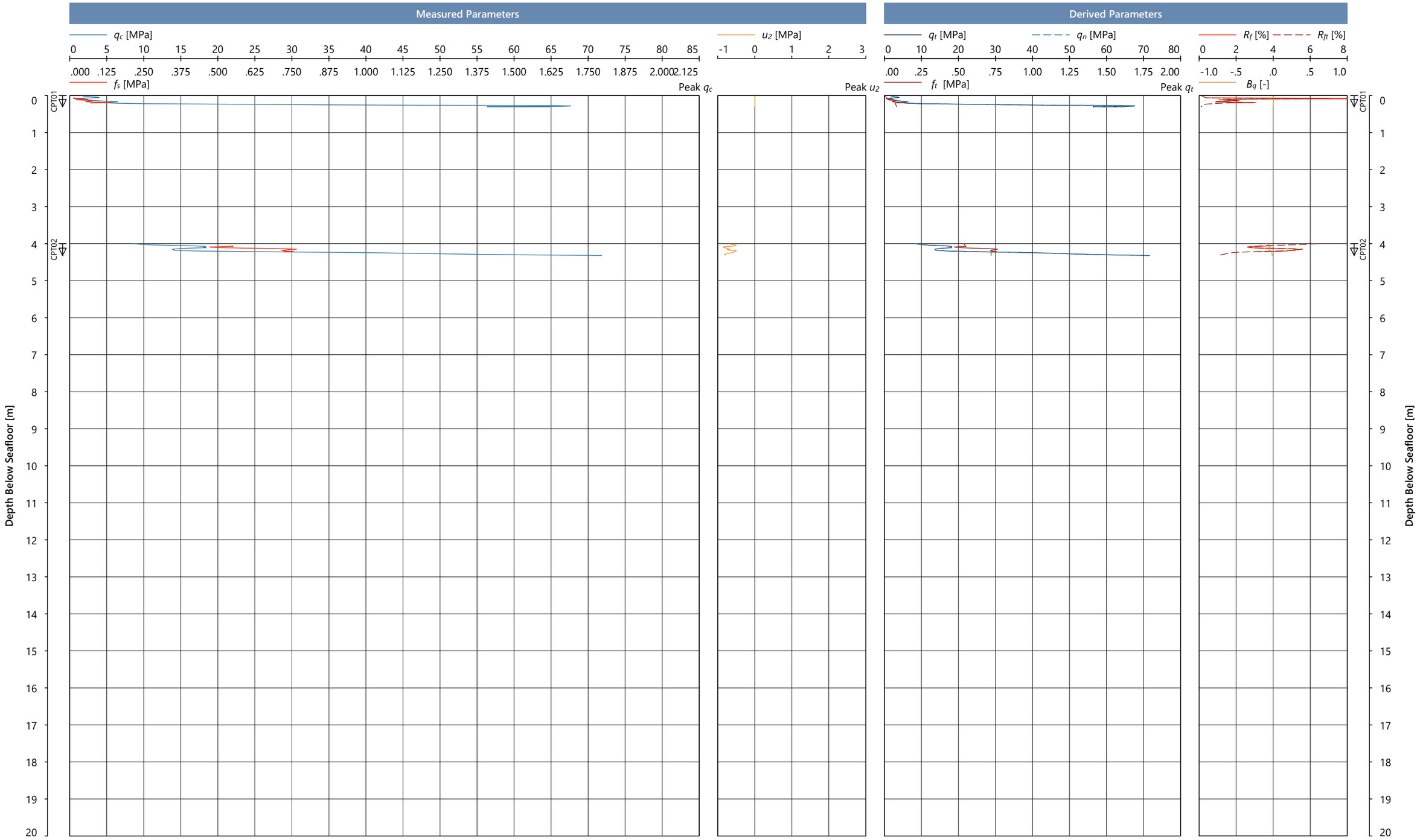
Quantities

F	Force
P	Pressure

References

International Organization for Standardization, 2012. *ISO 22476-1:2012 Geotechnical investigation and testing, Field testing, Electrical cone and piezocone penetration test.* Geneva: ISO.

European Co-operation For Accreditation, 2022. *Evaluation of the uncertainty of measurement in calibration.* European Co-operation For Accreditation, Publication; EA-4/02 M:2022.



Date of Testing : 19 August 2025
Location : BNO-OWF-BH01
Water Depth [m] : 85.4
Coordinates [m] : E 427075.8 N 5428214.4

Cone Penetration Test Results: Measured and Derived Parameters

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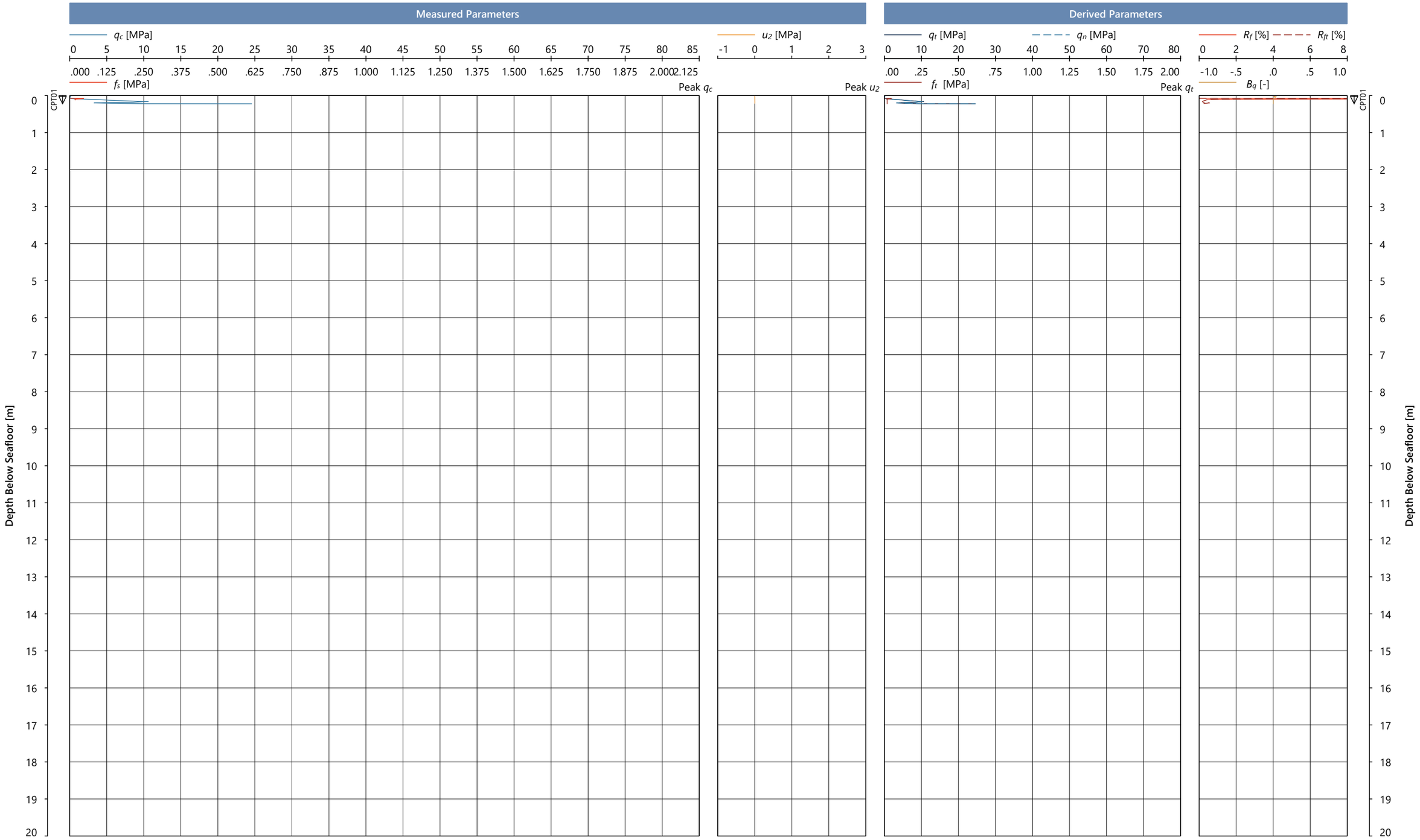

Date of Testing : 21 August 2025
Location : BNO-OWF-BH02
Water Depth [m] : 80.2
Coordinates [m] : E 437799.0 N 5426682.6

Cone Penetration Test Results: Measured and Derived Parameters

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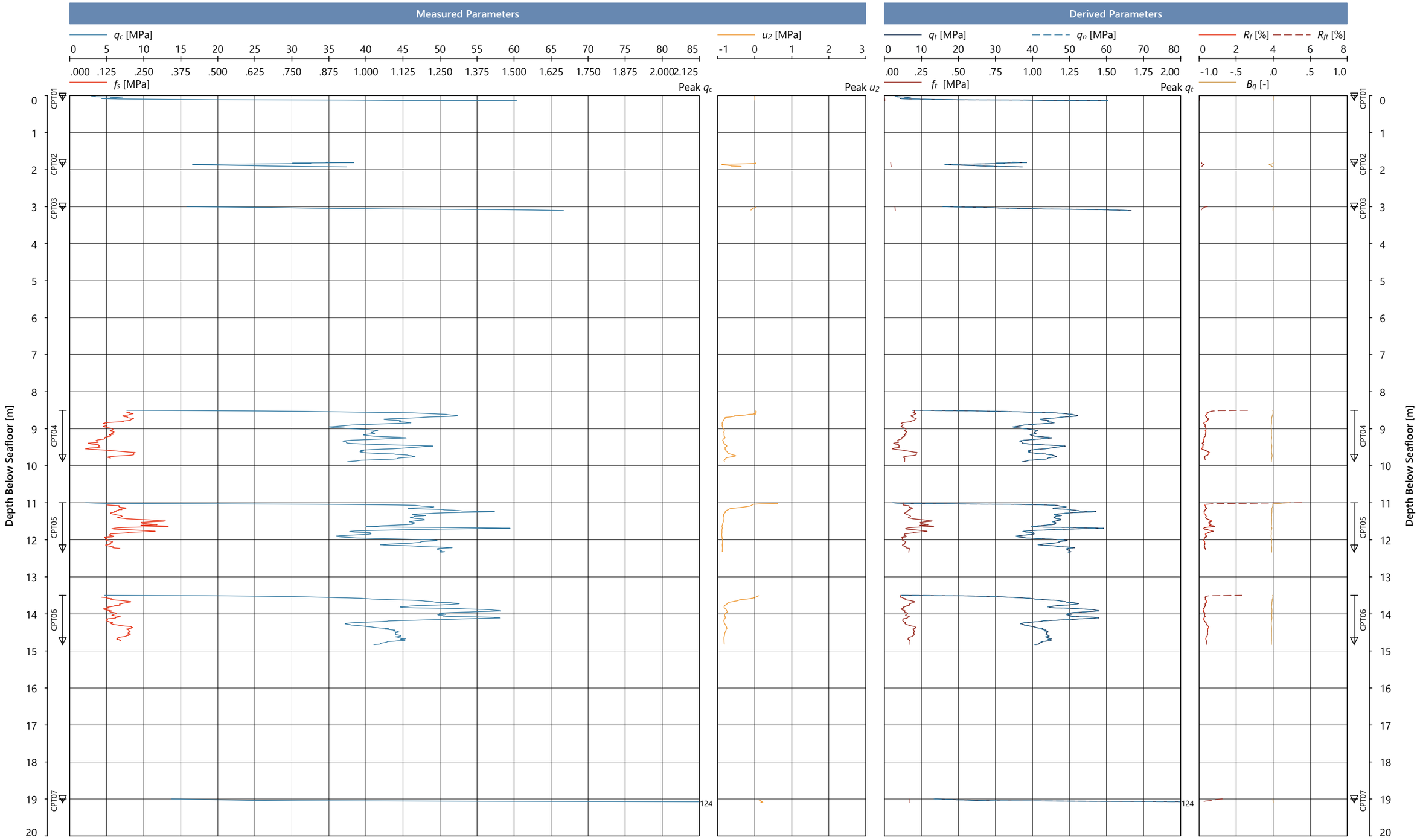

Date of Testing : 20 August 2025
Location : BNO-OWF-BH03
Water Depth [m] : 84.5
Coordinates [m] : E 431213.7 N 5432684.6

Cone Penetration Test Results: Measured and Derived Parameters

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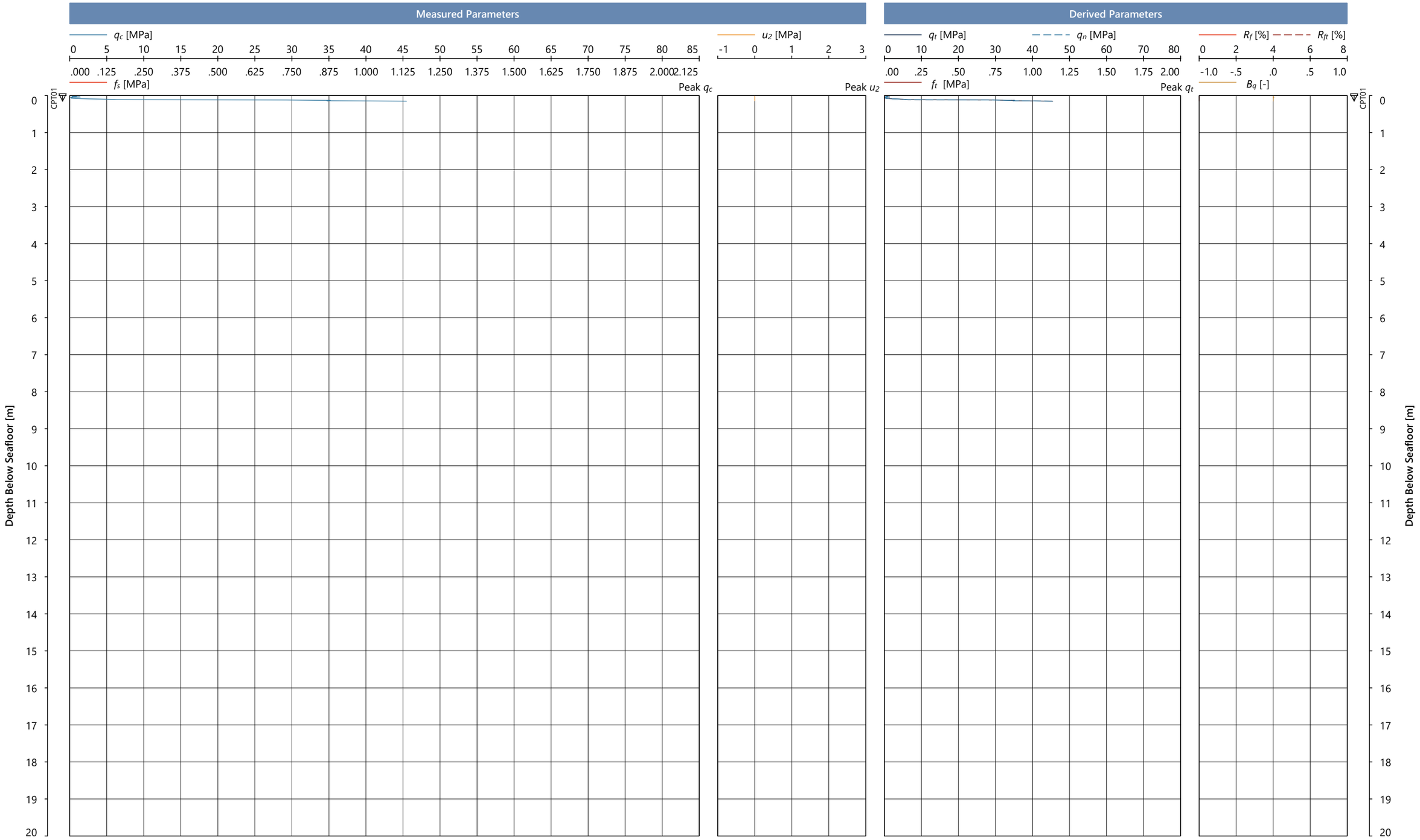
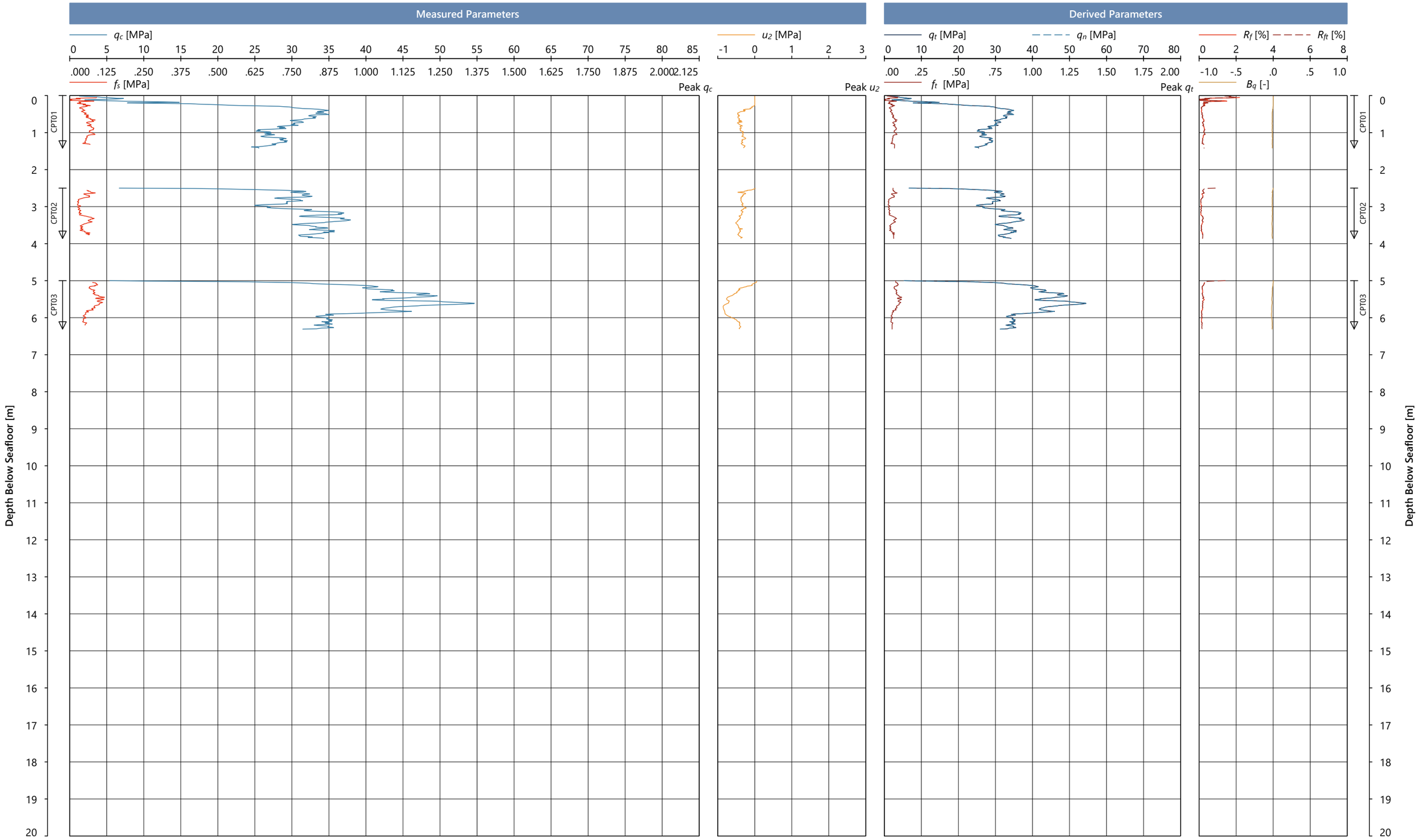


Date of Testing : 25 August 2025
Location : BNO-OWF-BH04
Water Depth [m] : 82.6
Coordinates [m] : E 426592.7 N 5418623.6

Cone Penetration Test Results: Measured and Derived Parameters



Date of Testing : 23 August 2025
Location : BNO-OWF-BH07
Water Depth [m] : 80.0
Coordinates [m] : E 434030.6 N 5417960.7

Cone Penetration Test Results: Measured and Derived Parameters

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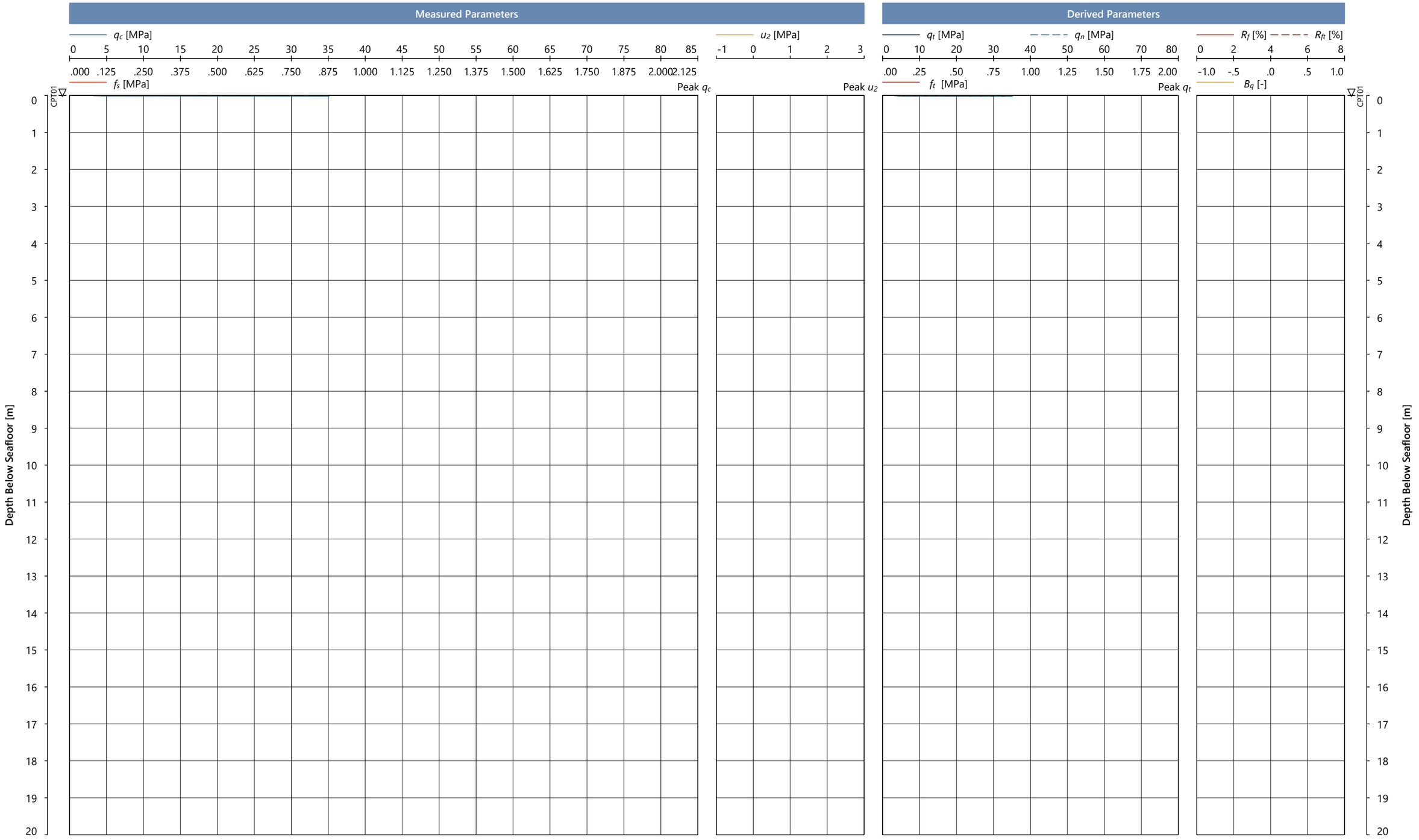
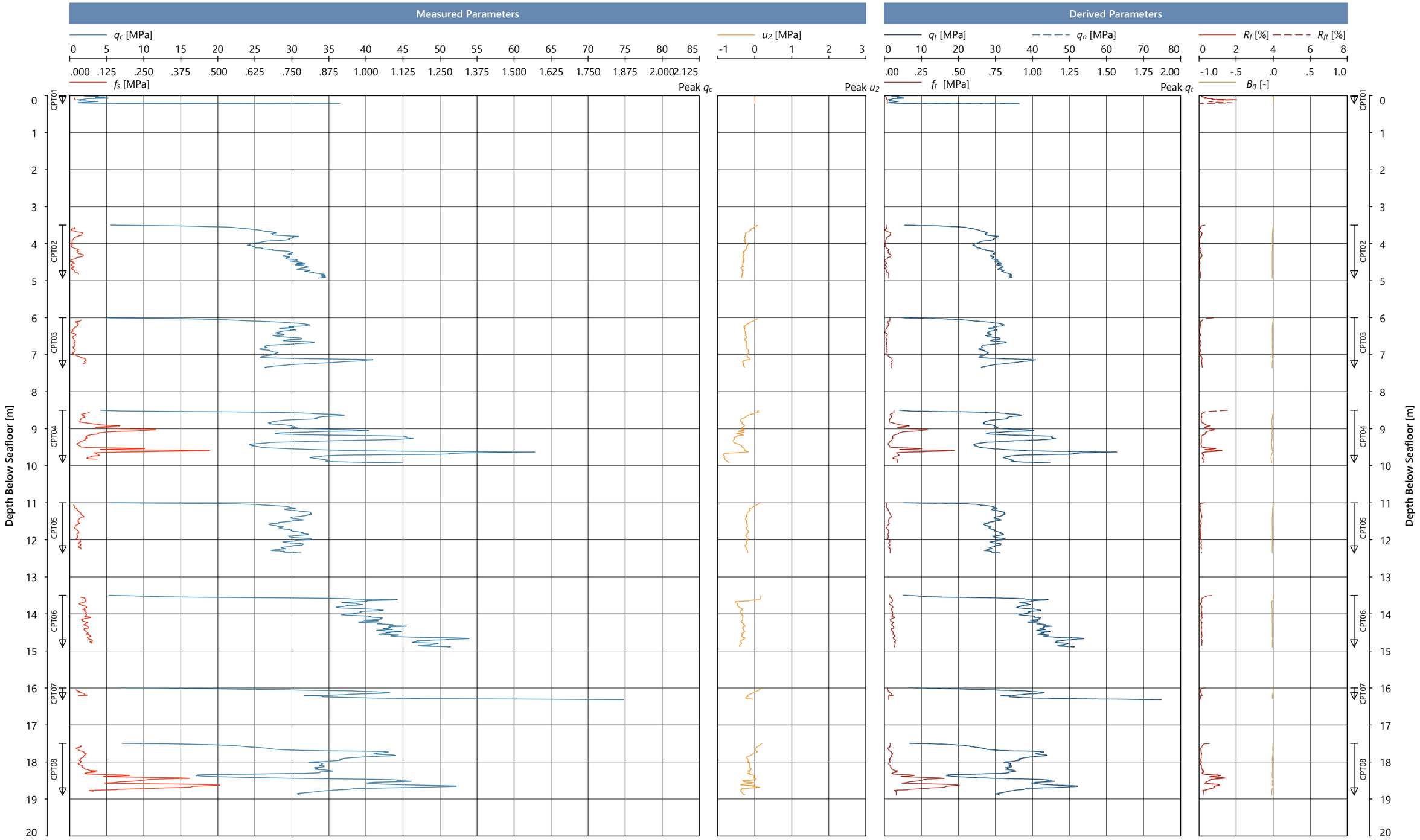


Date of Testing : 15 August 2025
Location : BNO-OWF-BH08
Water Depth [m] : 85.8
Coordinates [m] : E 414111.1 N 5413632.7

Cone Penetration Test Results: Measured and Derived Parameters



Date of Testing : 14 August 2025
Location : BNO-OWF-BH10
Water Depth [m] : 87.7
Coordinates [m] : E 411963.3 N 5415669.8

Cone Penetration Test Results: Measured and Derived Parameters

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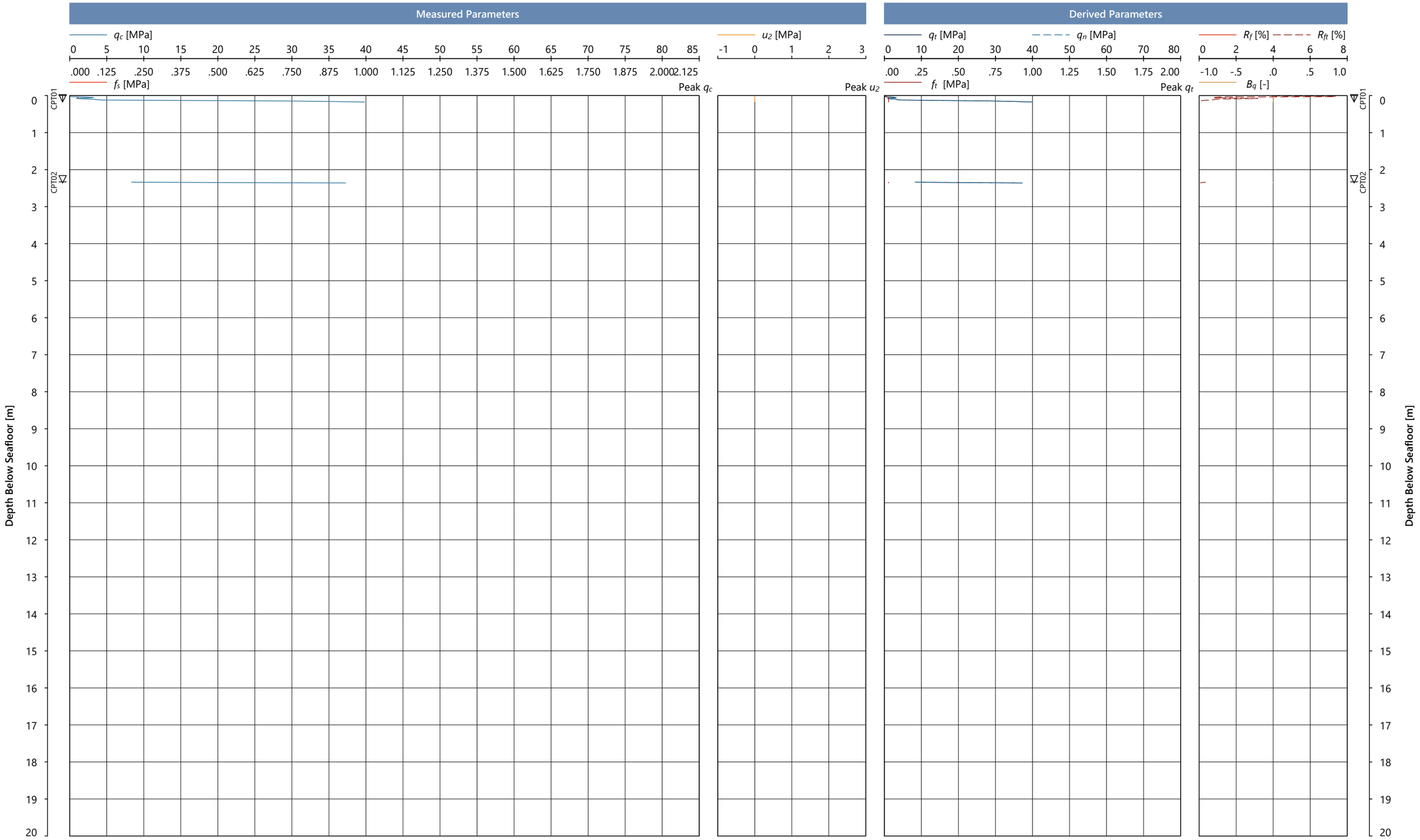

Date of Testing : 16 August 2025
Location : BNO-OWF-BH11
Water Depth [m] : 86.8
Coordinates [m] : E 416829.8 N 5421236.9

Cone Penetration Test Results: Measured and Derived Parameters

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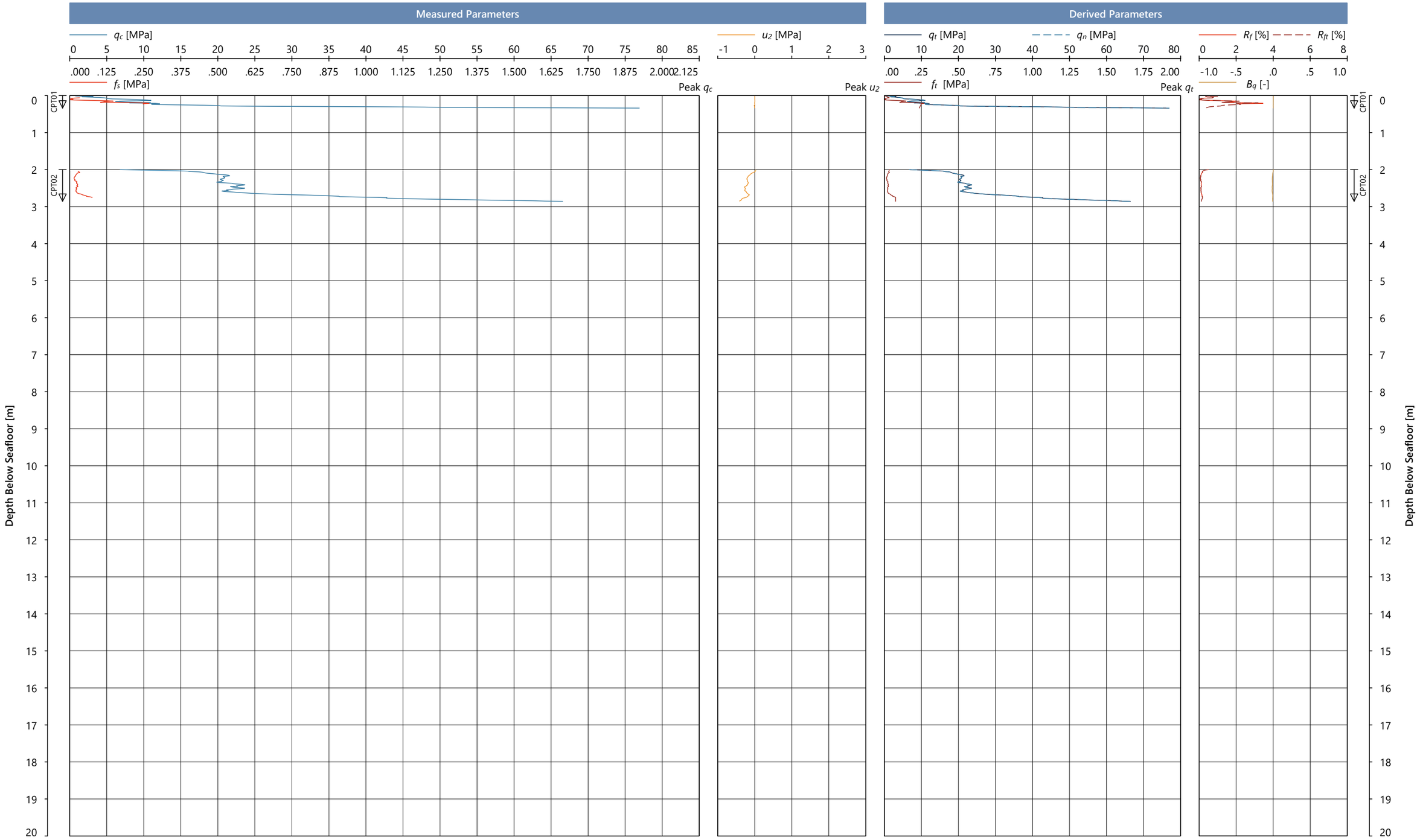

Date of Testing : 17 August 2025
Location : BNO-OWF-BH12
Water Depth [m] : 85.6
Coordinates [m] : E 421008.9 N 5423622.0

Cone Penetration Test Results: Measured and Derived Parameters

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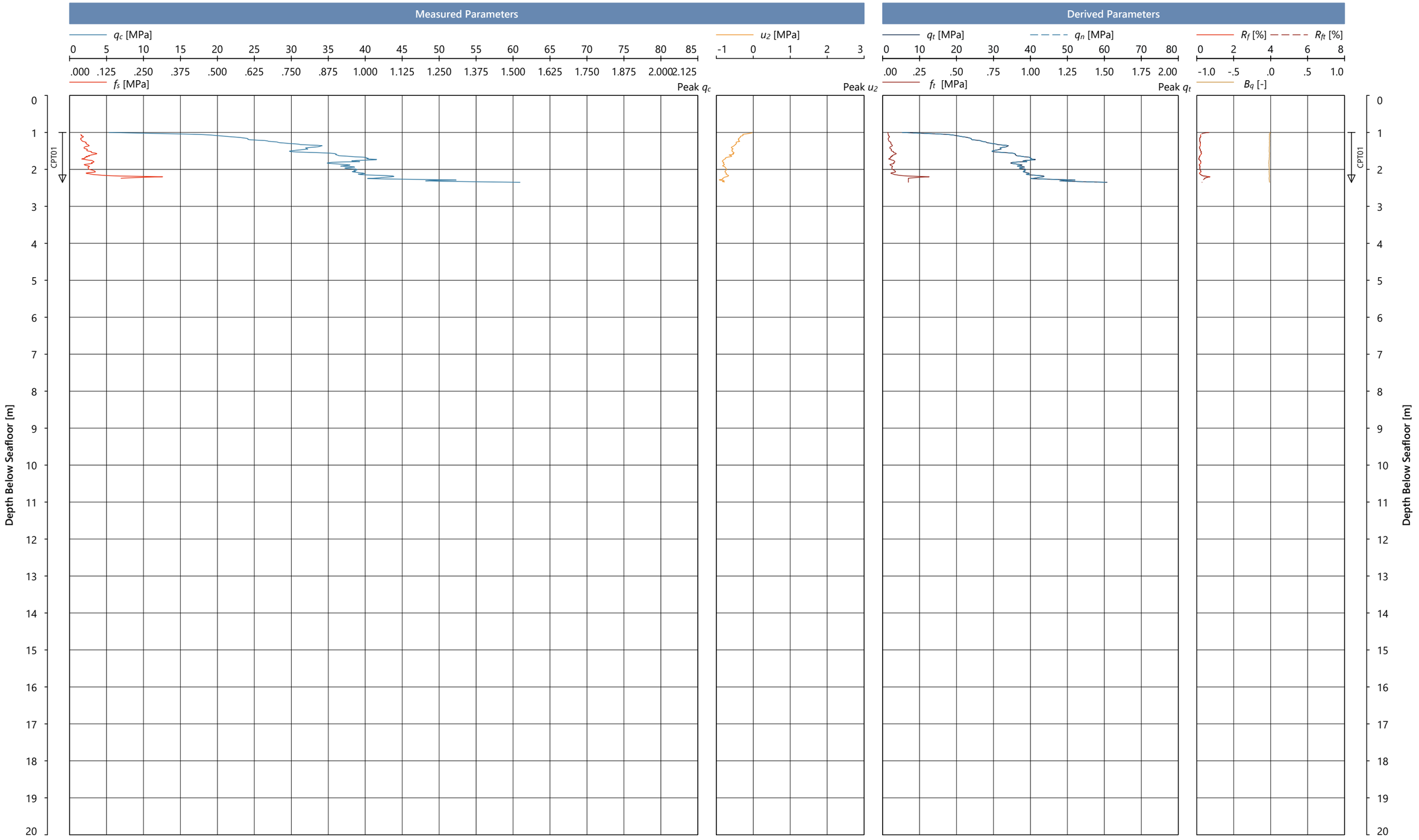
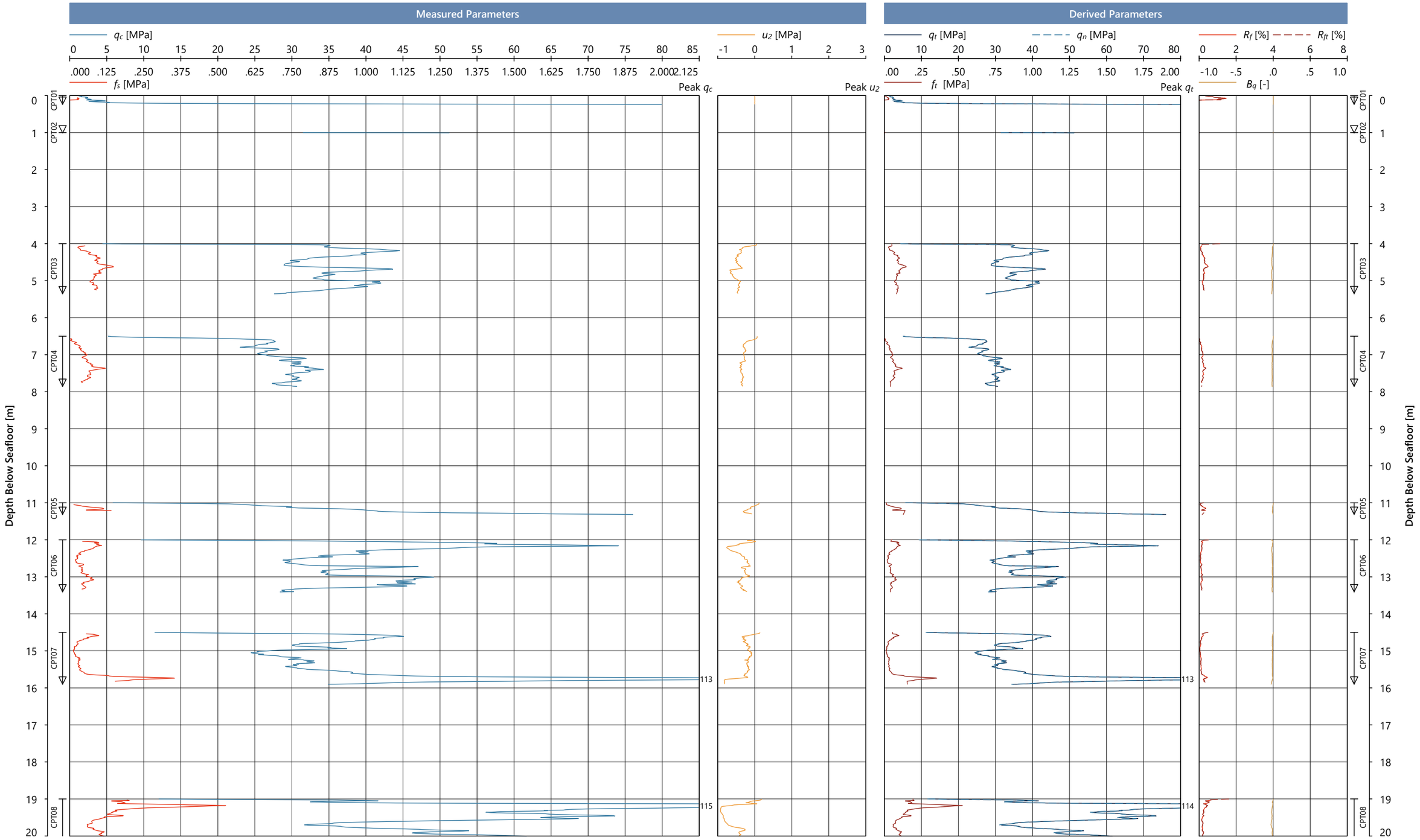


Date of Testing : 17 August 2025
Location : BNO-OWF-BH12-a
Water Depth [m] : 85.5
Coordinates [m] : E 421009.4 N 5423626.8

Cone Penetration Test Results: Measured and Derived Parameters



Date of Testing : 18 August 2025
Location : BNO-OWF-BH13
Water Depth [m] : 83.3
Coordinates [m] : E 426180.9 N 5425025.9

Cone Penetration Test Results: Measured and Derived Parameters

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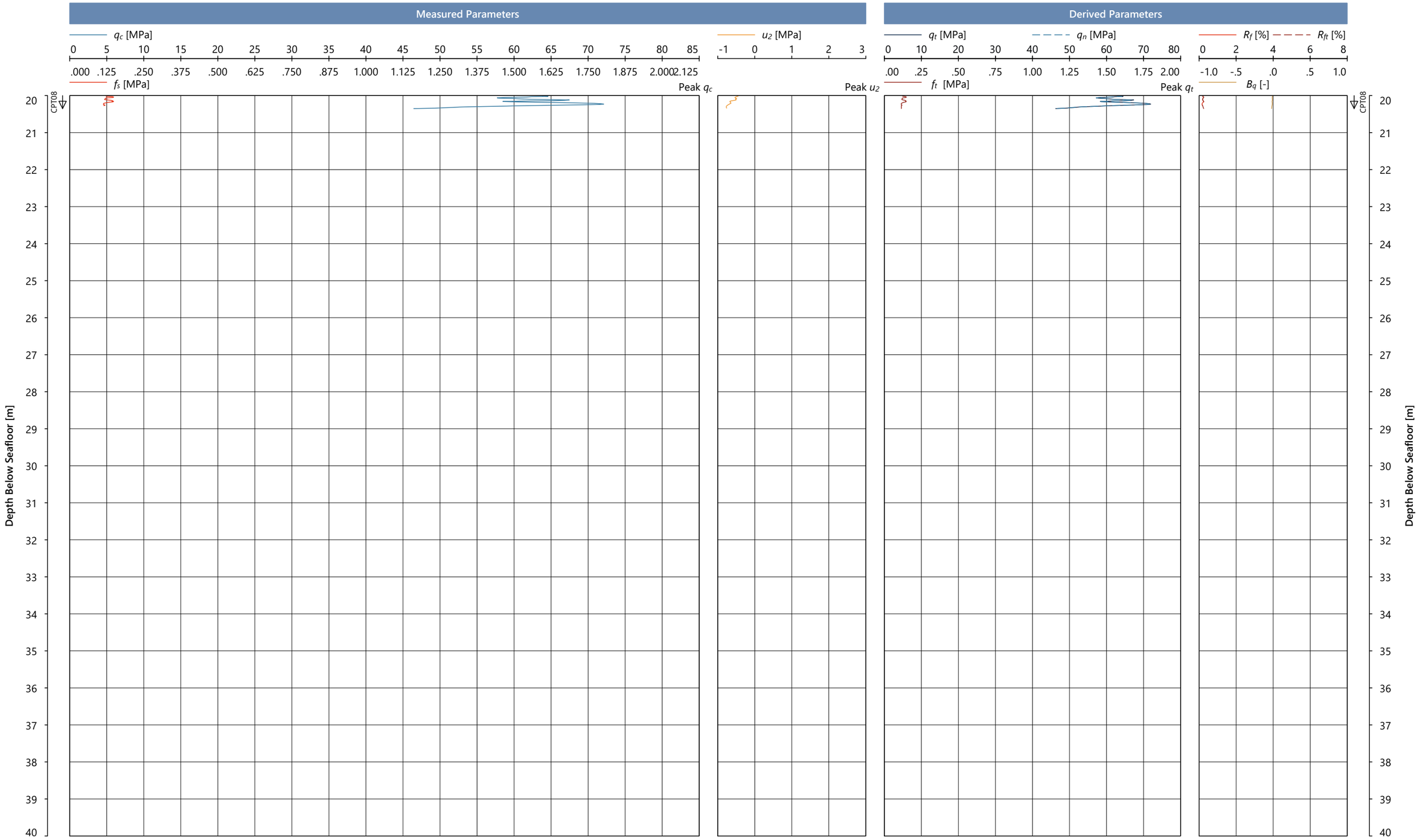

Date of Testing : 18 August 2025
Location : BNO-OWF-BH13
Water Depth [m] : 83.3
Coordinates [m] : E 426180.9 N 5425025.9

Cone Penetration Test Results: Measured and Derived Parameters

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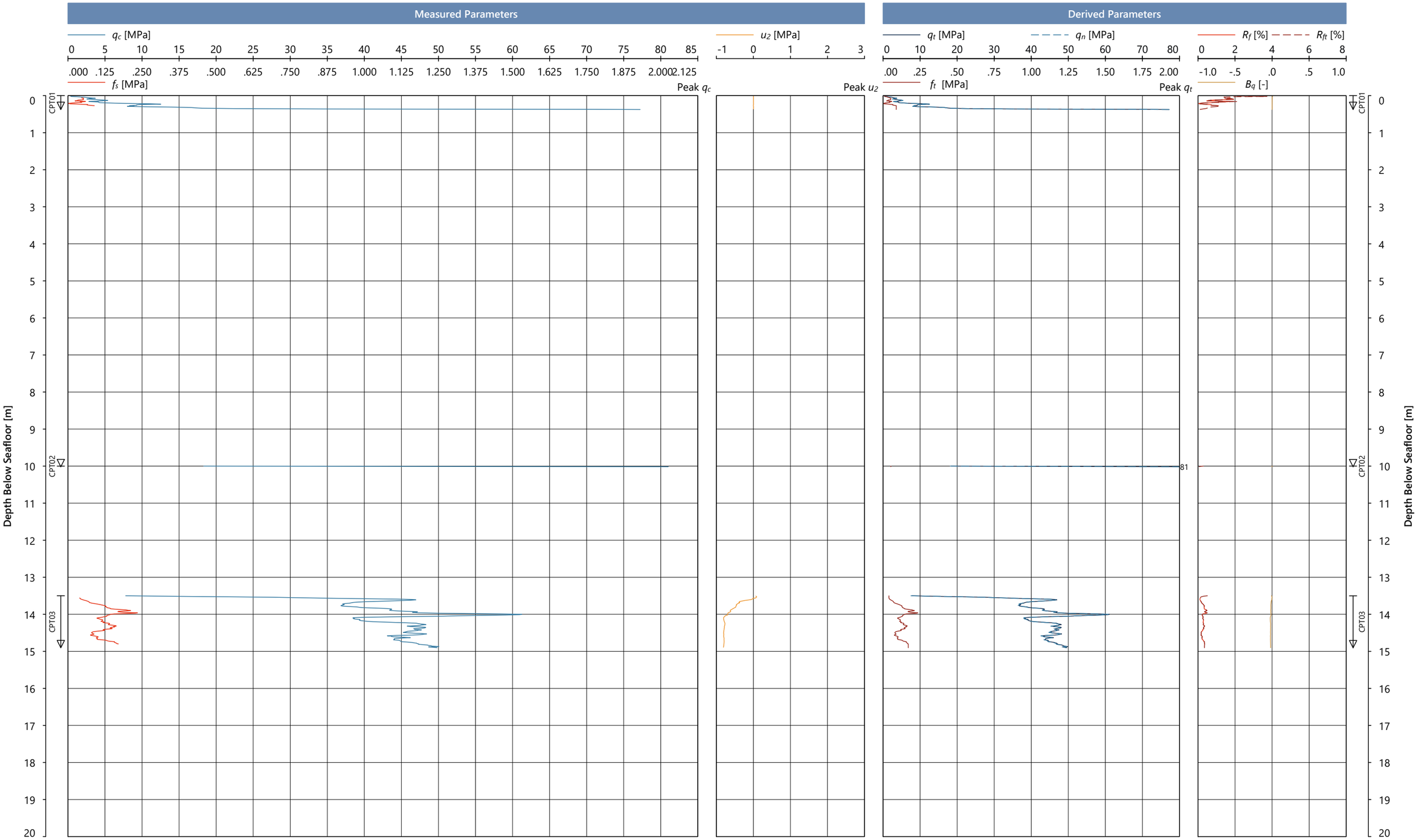
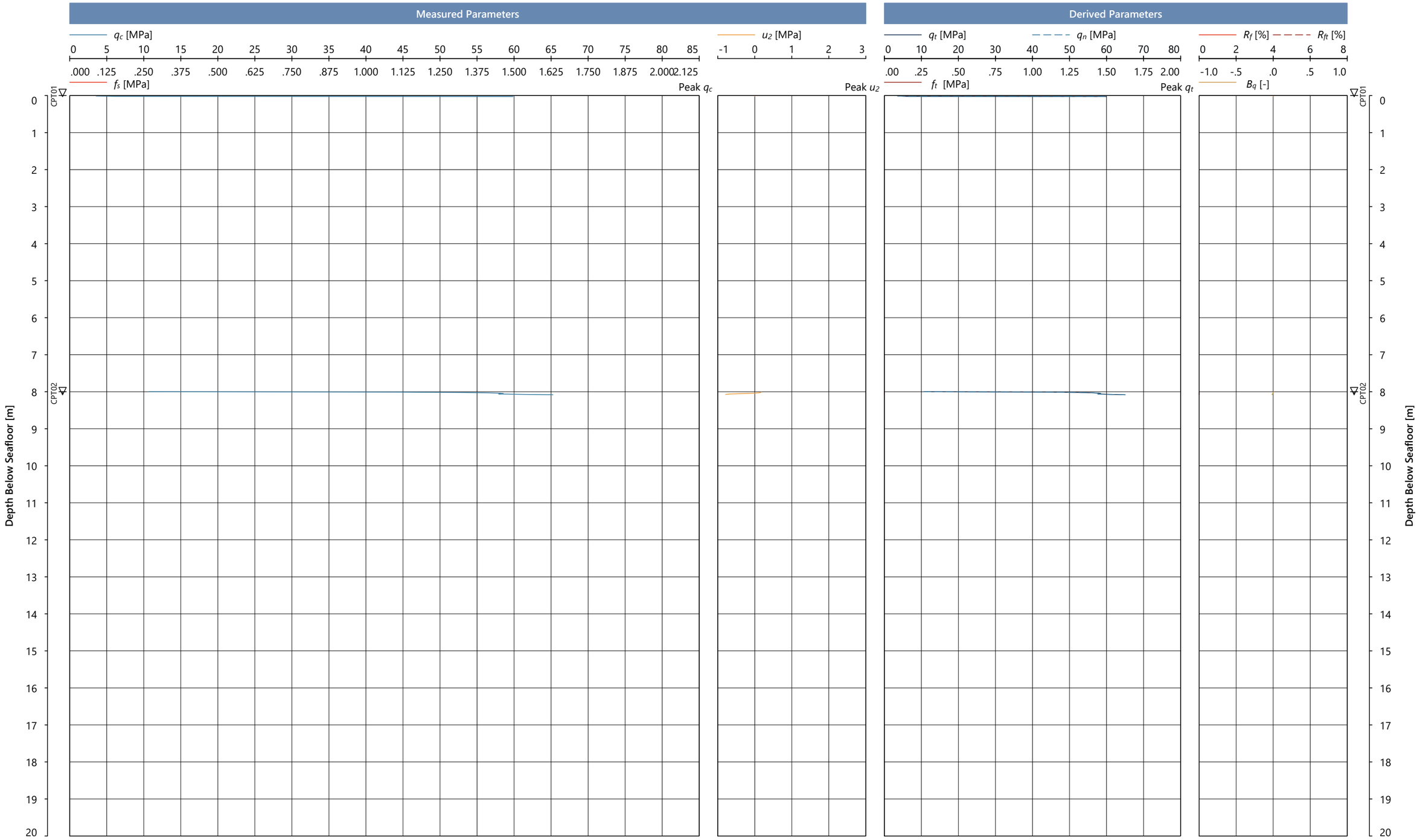


Date of Testing : 21 August 2025
Location : BNO-OWF-BH15
Water Depth [m] : 81.0
Coordinates [m] : E 432314.7 N 5429579.0

Cone Penetration Test Results: Measured and Derived Parameters

GeoVisual 5.5.0 | DM-MDP | 2026-02-17 09:32:23



Date of Testing : 22 August 2025
Location : BNO-OWF-BH17
Water Depth [m] : 80.2
Coordinates [m] : E 437034.1 N 5421322.7

Cone Penetration Test Results: Measured and Derived Parameters

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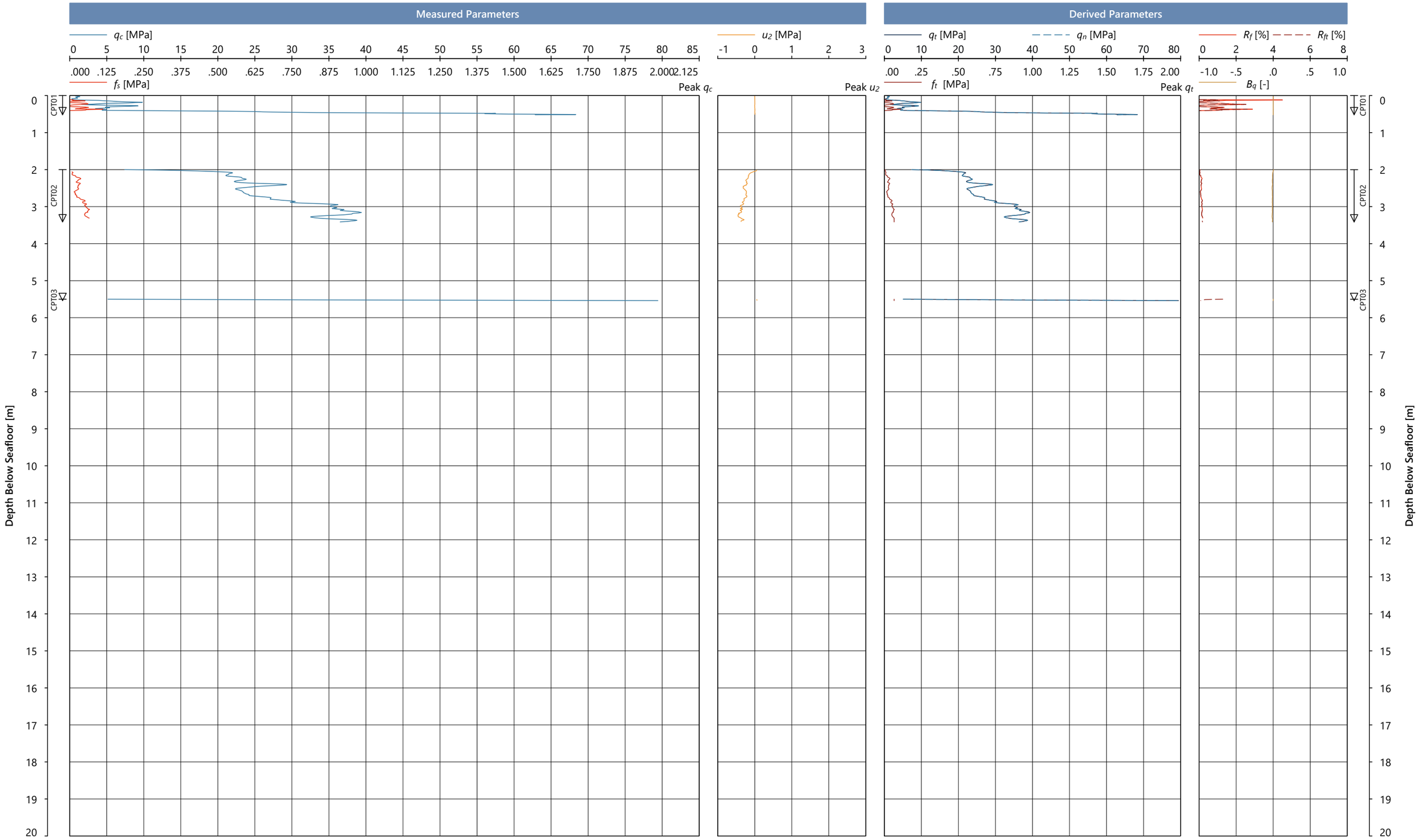

Date of Testing : 13 August 2025
Location : BNO-OWF-BH19
Water Depth [m] : 90.5
Coordinates [m] : E 409659.8 N 5417657.1

Cone Penetration Test Results: Measured and Derived Parameters

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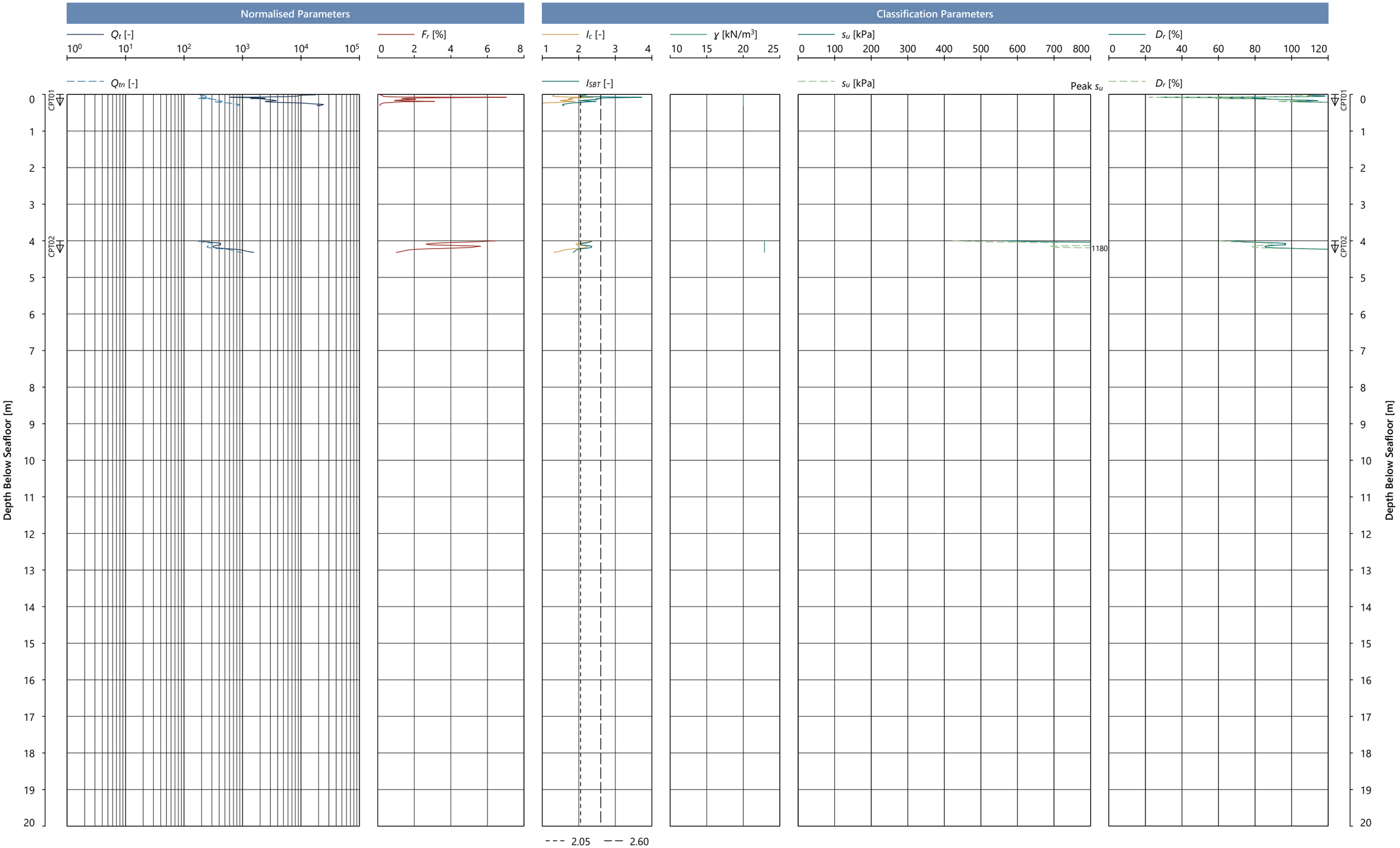

Date of Testing : 19 August 2025
Location : BNO-OWF-BH01
Water Depth [m] : 85.4
Coordinates [m] : E 427075.8 N 5428214.4

Cone Penetration Test Results: Normalised and Classification Parameters

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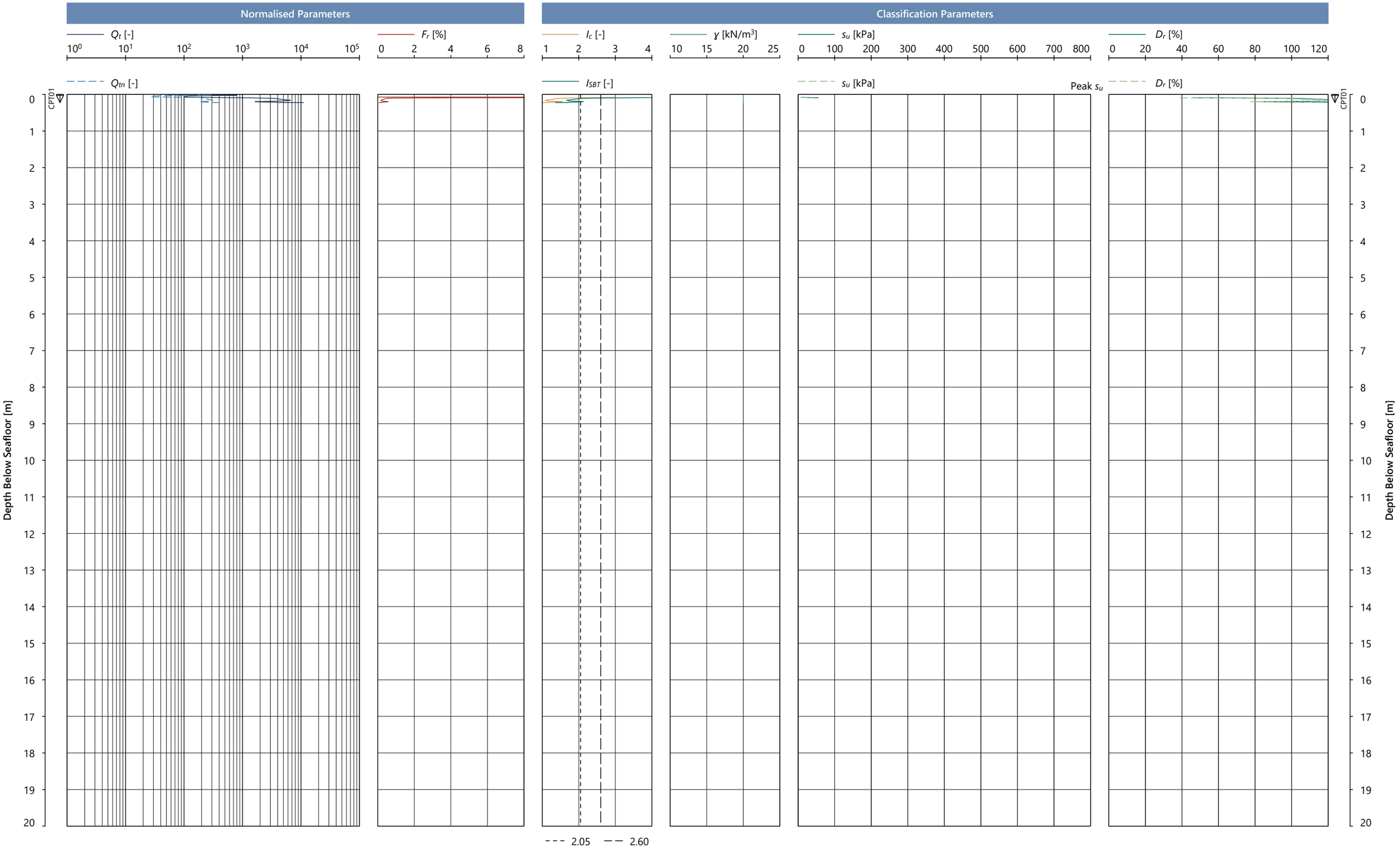
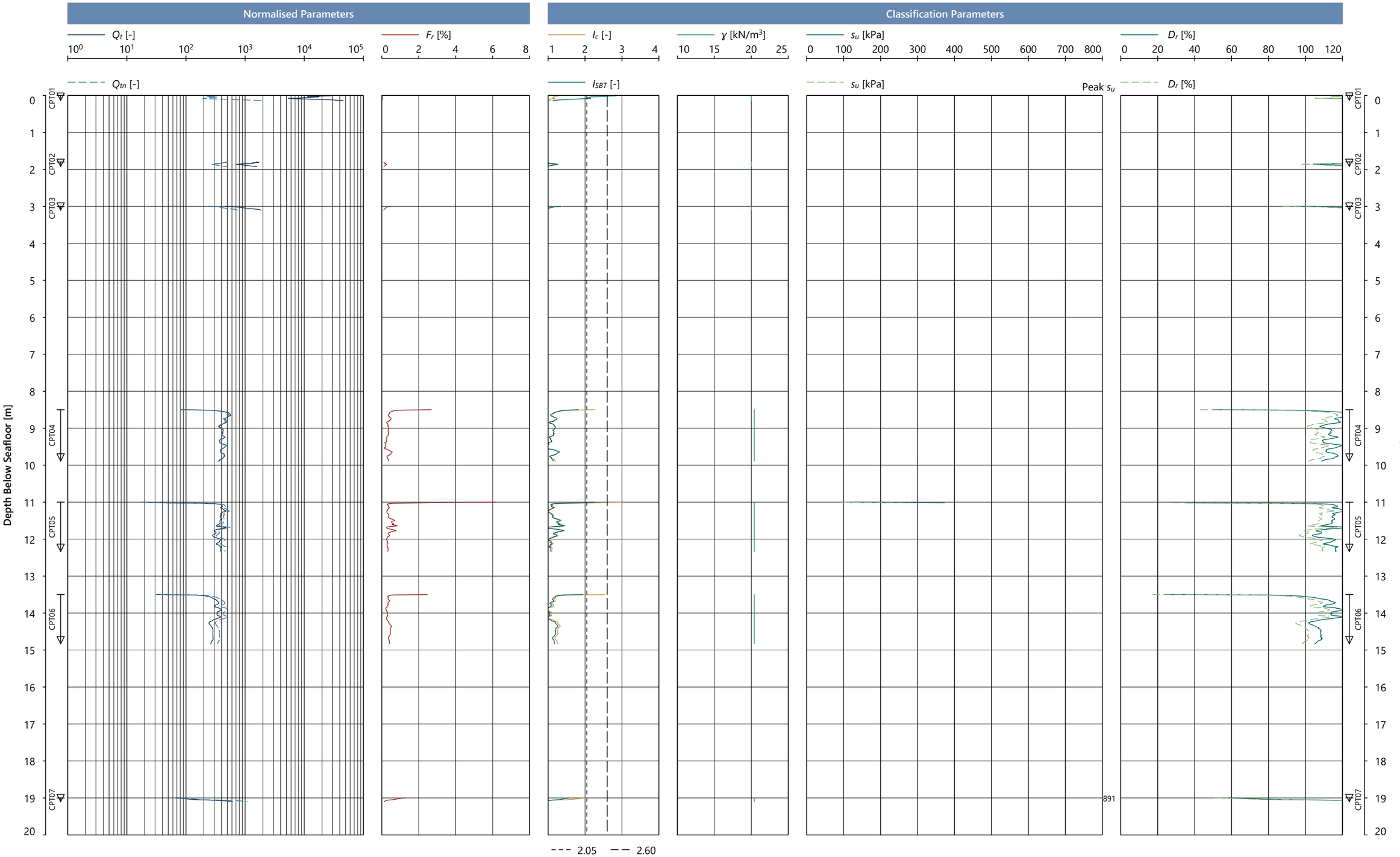


Date of Testing : 21 August 2025
Location : BNO-OWF-BH02
Water Depth [m] : 80.2
Coordinates [m] : E 437799.0 N 5426682.6

Cone Penetration Test Results: Normalised and Classification Parameters

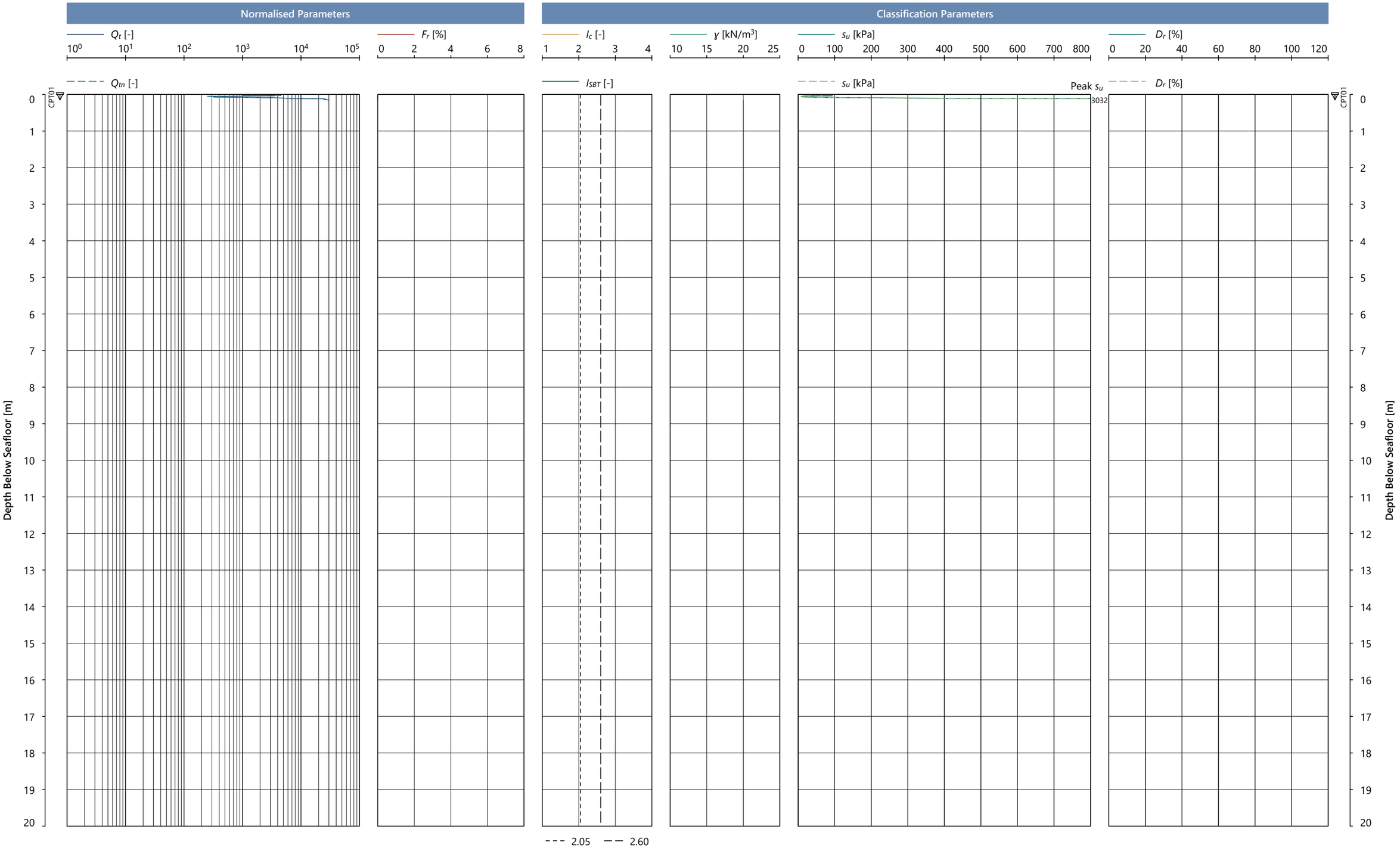
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 20 August 2025
Location : BNO-OWF-BH03
Water Depth [m] : 84.5
Coordinates [m] : E 431213.7 N 5432684.6

Cone Penetration Test Results: Normalised and Classification Parameters

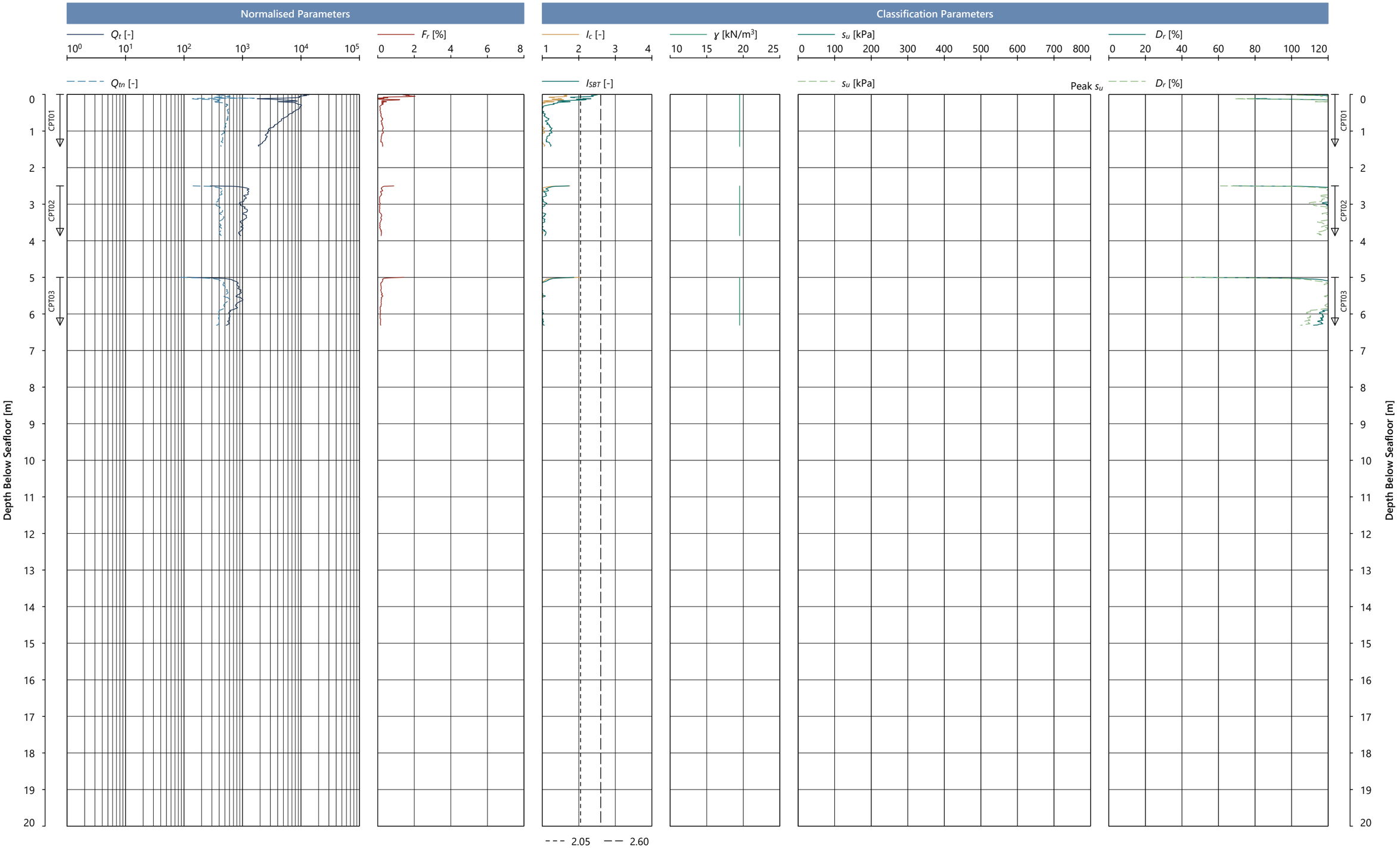
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 25 August 2025
Location : BNO-OWF-BH04
Water Depth [m] : 82.6
Coordinates [m] : E 426592.7 N 5418623.6

Cone Penetration Test Results: Normalised and Classification Parameters

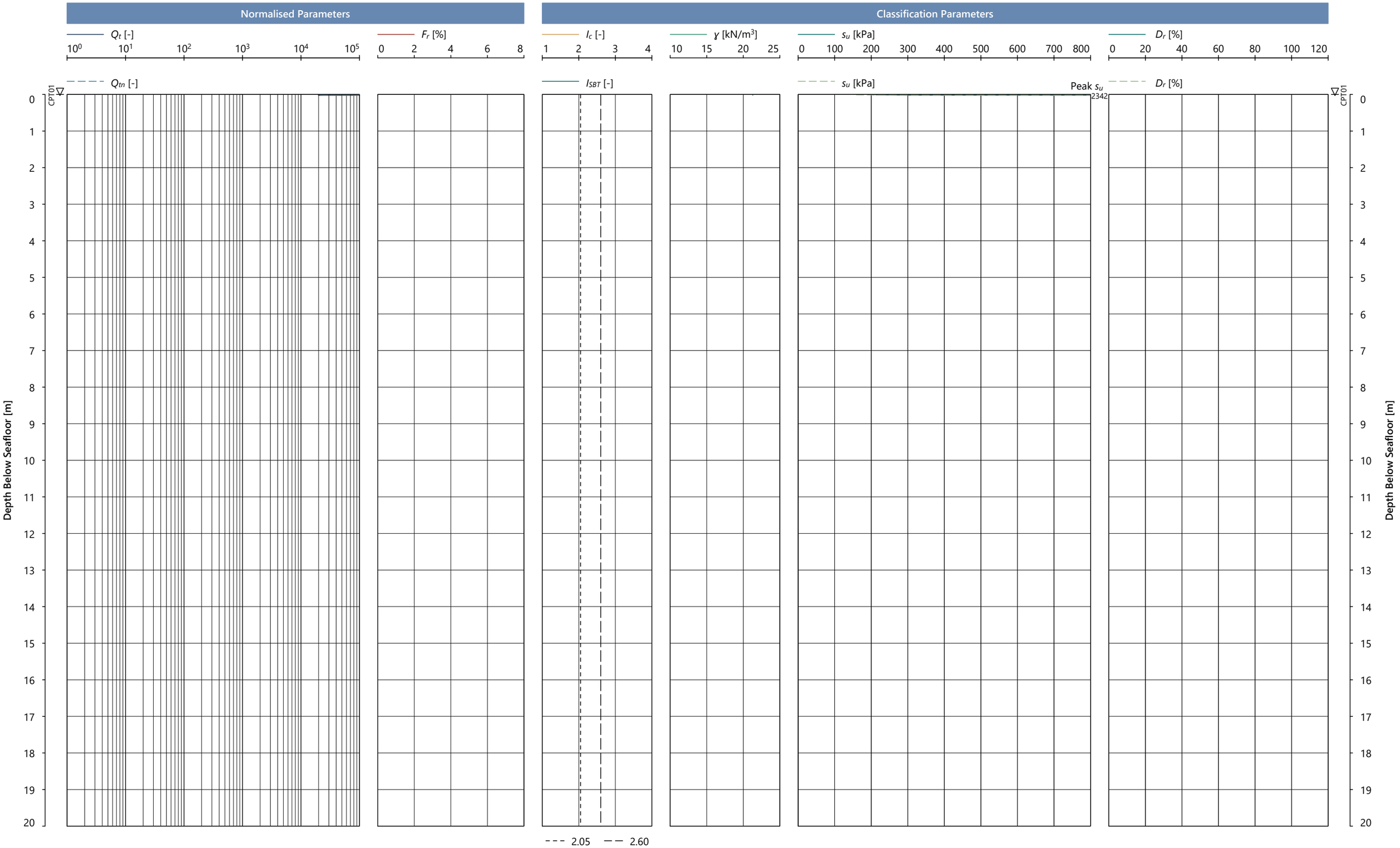
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 23 August 2025
Location : BNO-OWF-BH07
Water Depth [m] : 80.0
Coordinates [m] : E 434030.6 N 5417960.7

Cone Penetration Test Results: Normalised and Classification Parameters

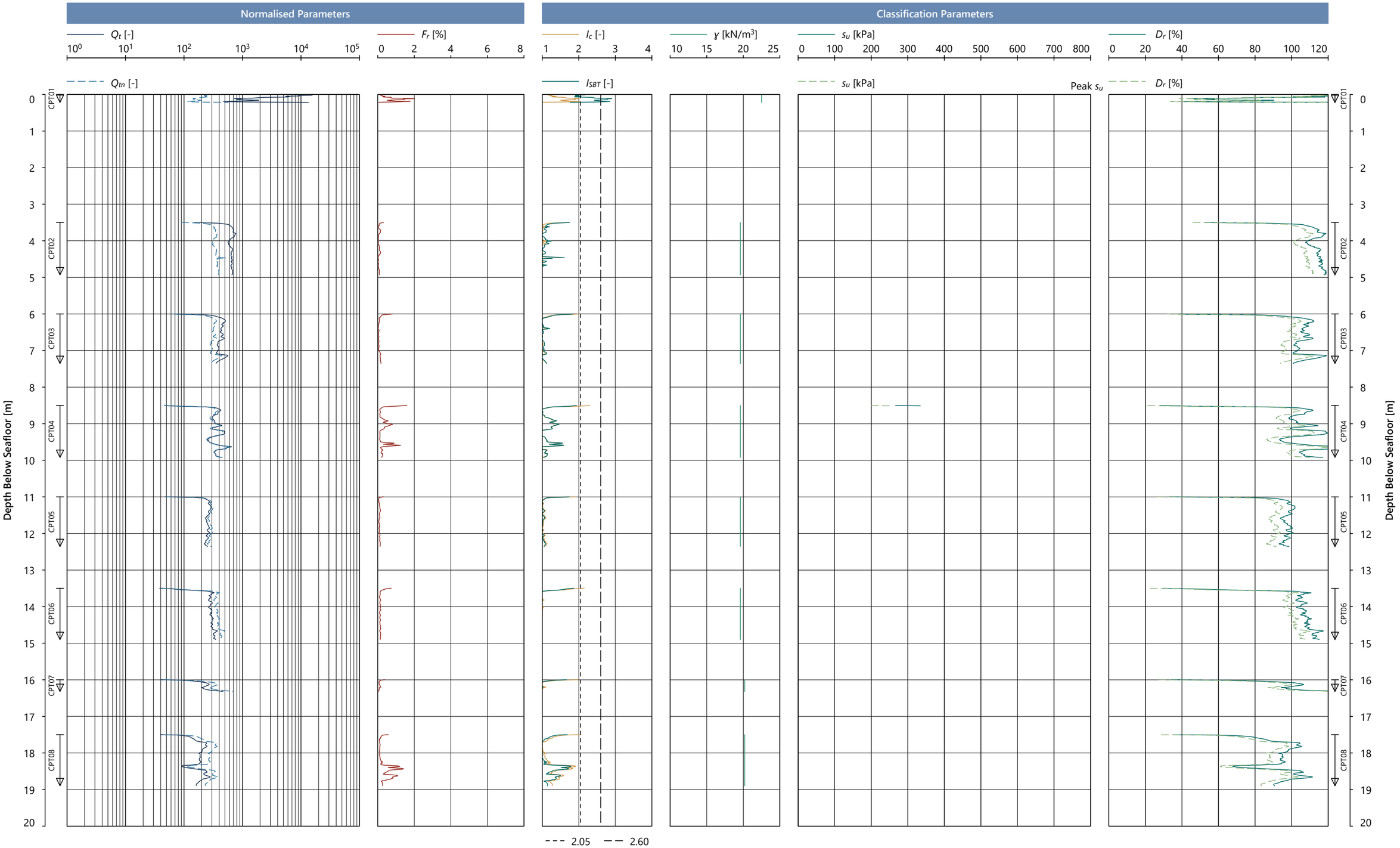
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 15 August 2025
Location : BNO-OWF-BH08
Water Depth [m] : 85.8
Coordinates [m] : E 414111.1 N 5413632.7

Cone Penetration Test Results: Normalised and Classification Parameters

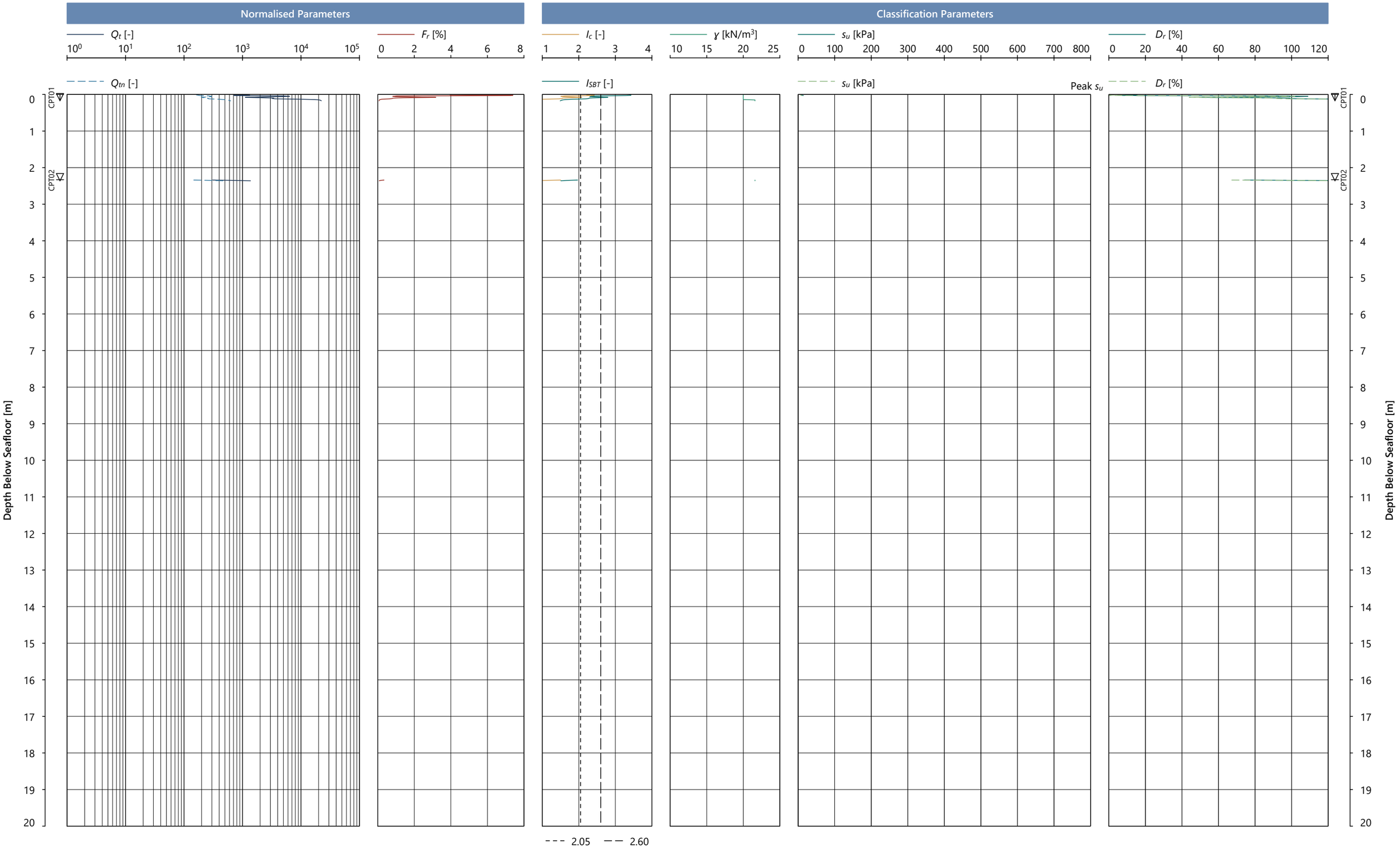
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 14 August 2025
Location : BNO-OWF-BH10
Water Depth [m] : 87.7
Coordinates [m] : E 411963.3 N 5415669.8

Cone Penetration Test Results: Normalised and Classification Parameters

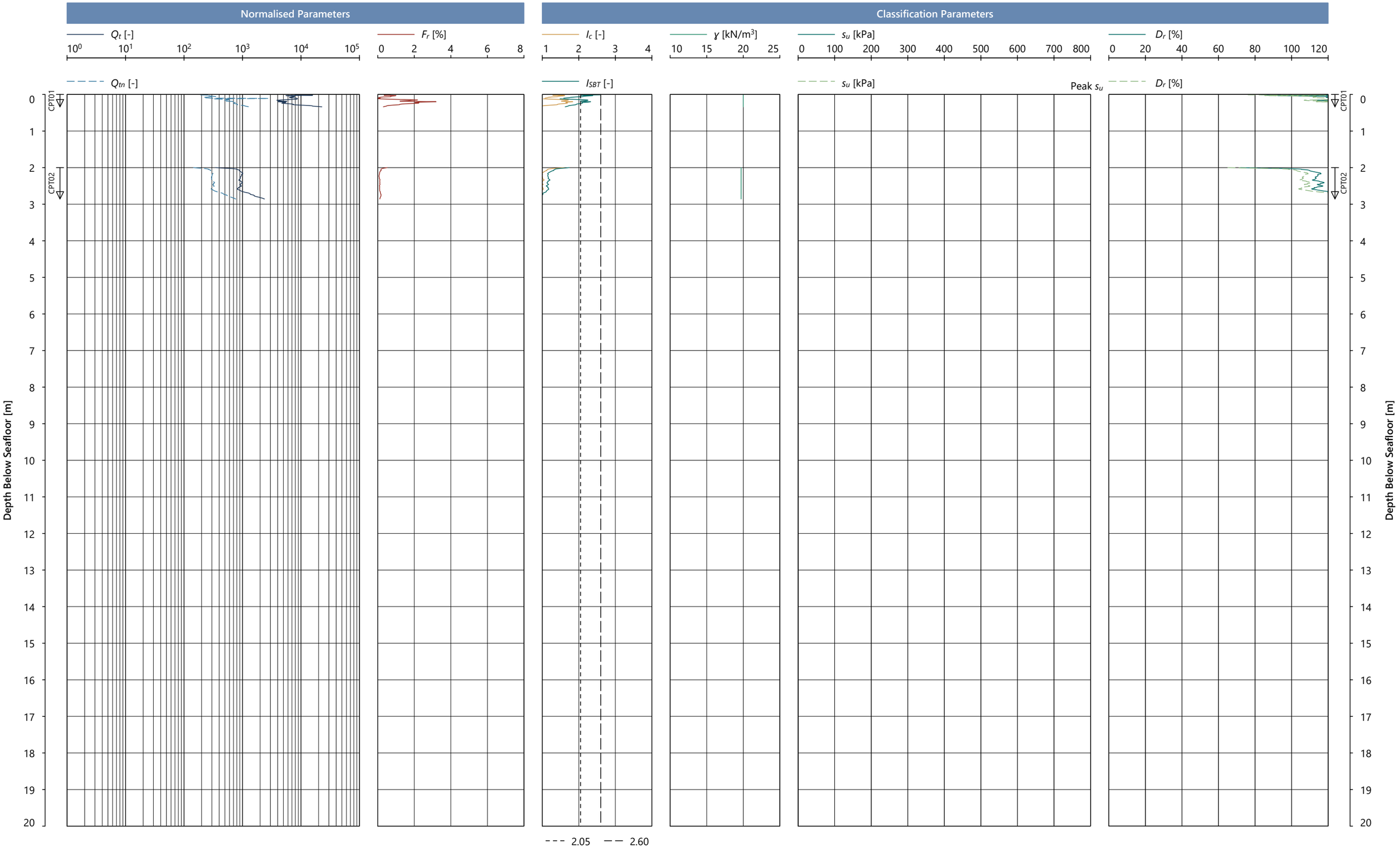
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 16 August 2025
Location : BNO-OWF-BH11
Water Depth [m] : 86.8
Coordinates [m] : E 416829.8 N 5421236.9

Cone Penetration Test Results: Normalised and Classification Parameters

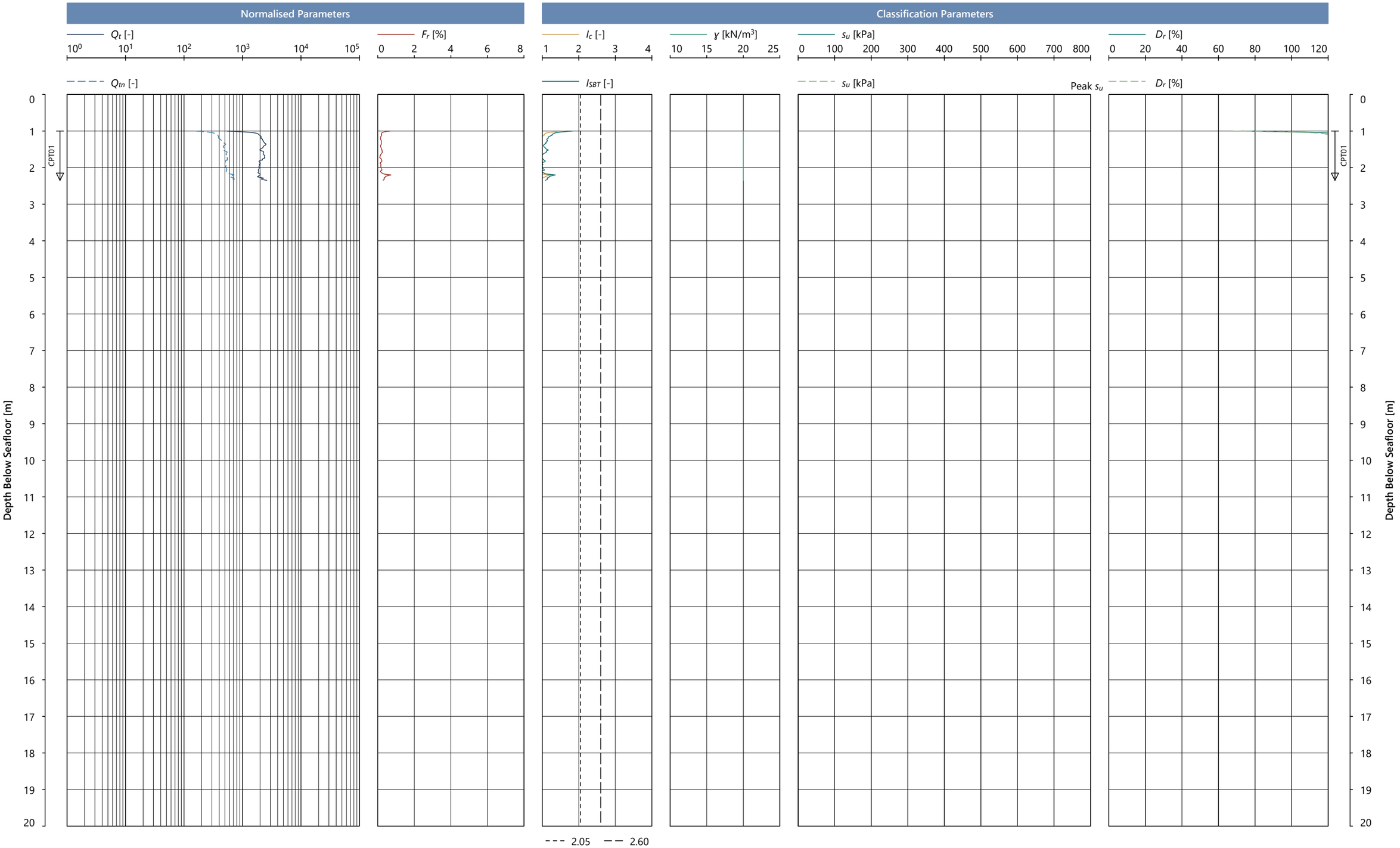
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 17 August 2025
Location : BNO-OWF-BH12
Water Depth [m] : 85.6
Coordinates [m] : E 421008.9 N 5423622.0

Cone Penetration Test Results: Normalised and Classification Parameters

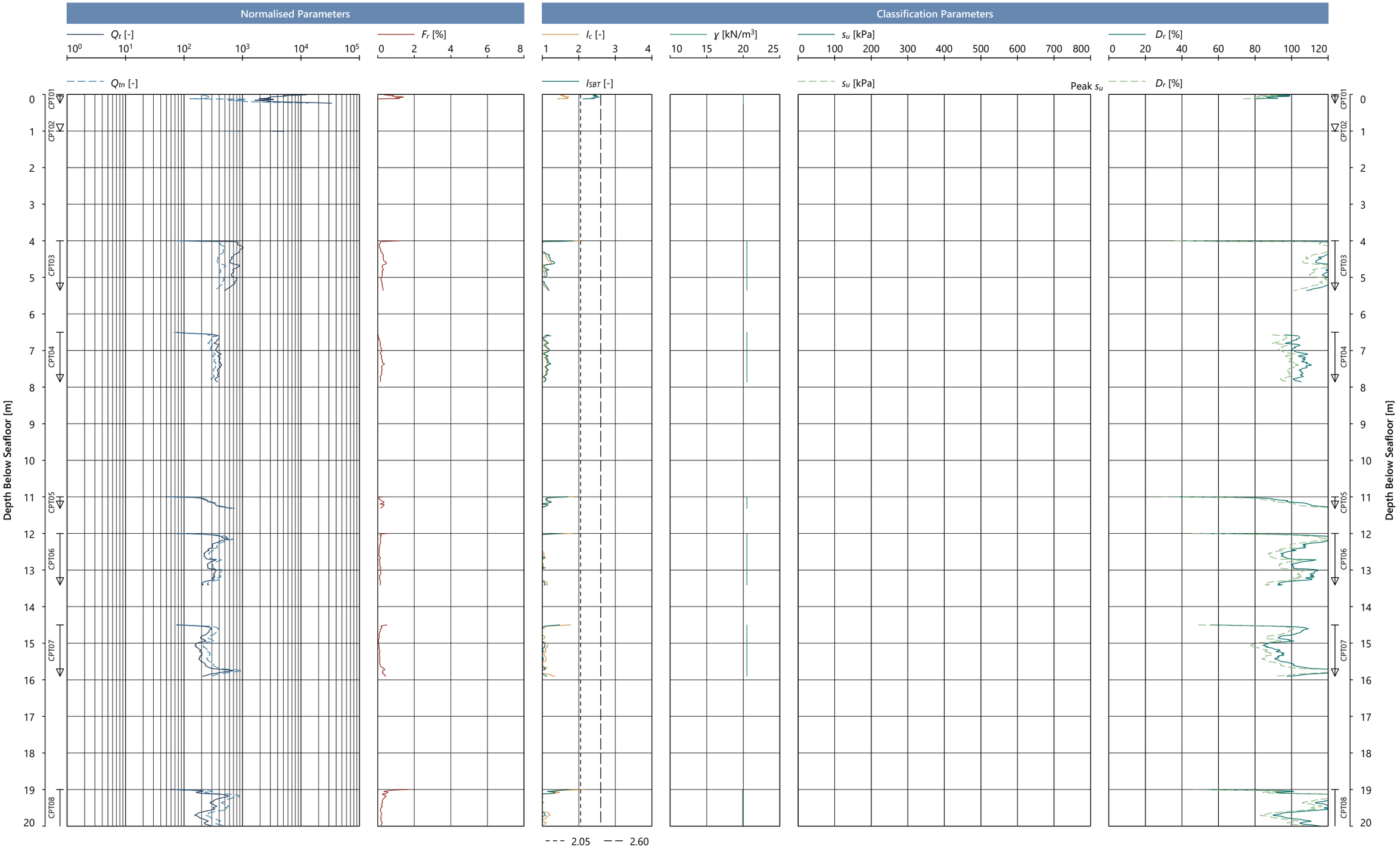
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 17 August 2025
Location : BNO-OWF-BH12-a
Water Depth [m] : 85.5
Coordinates [m] : E 421009.4 N 5423626.8

Cone Penetration Test Results: Normalised and Classification Parameters

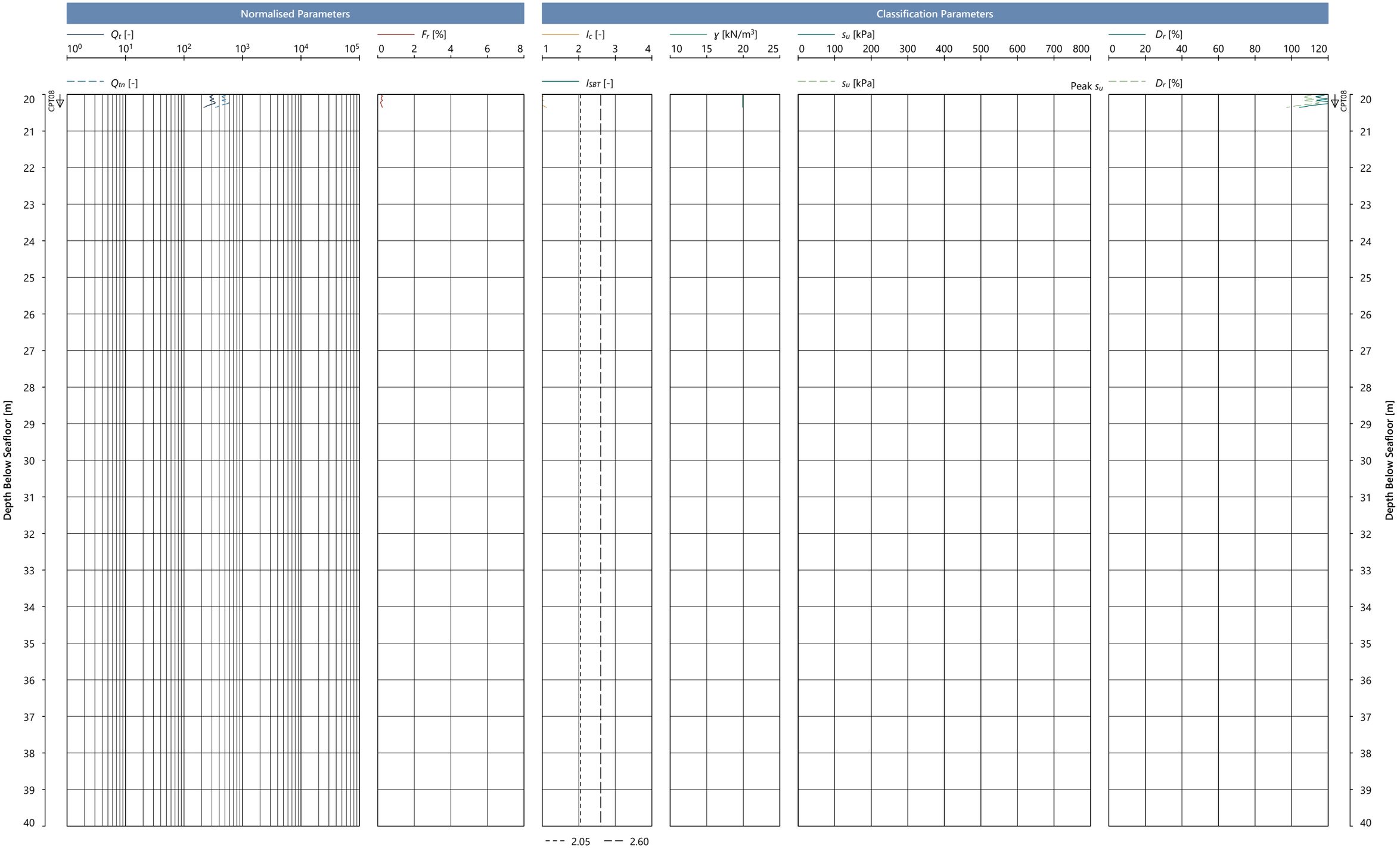
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:56



Date of Testing : 18 August 2025
Location : BNO-OWF-BH13
Water Depth [m] : 83.3
Coordinates [m] : E 426180.9 N 5425025.9

Cone Penetration Test Results: Normalised and Classification Parameters

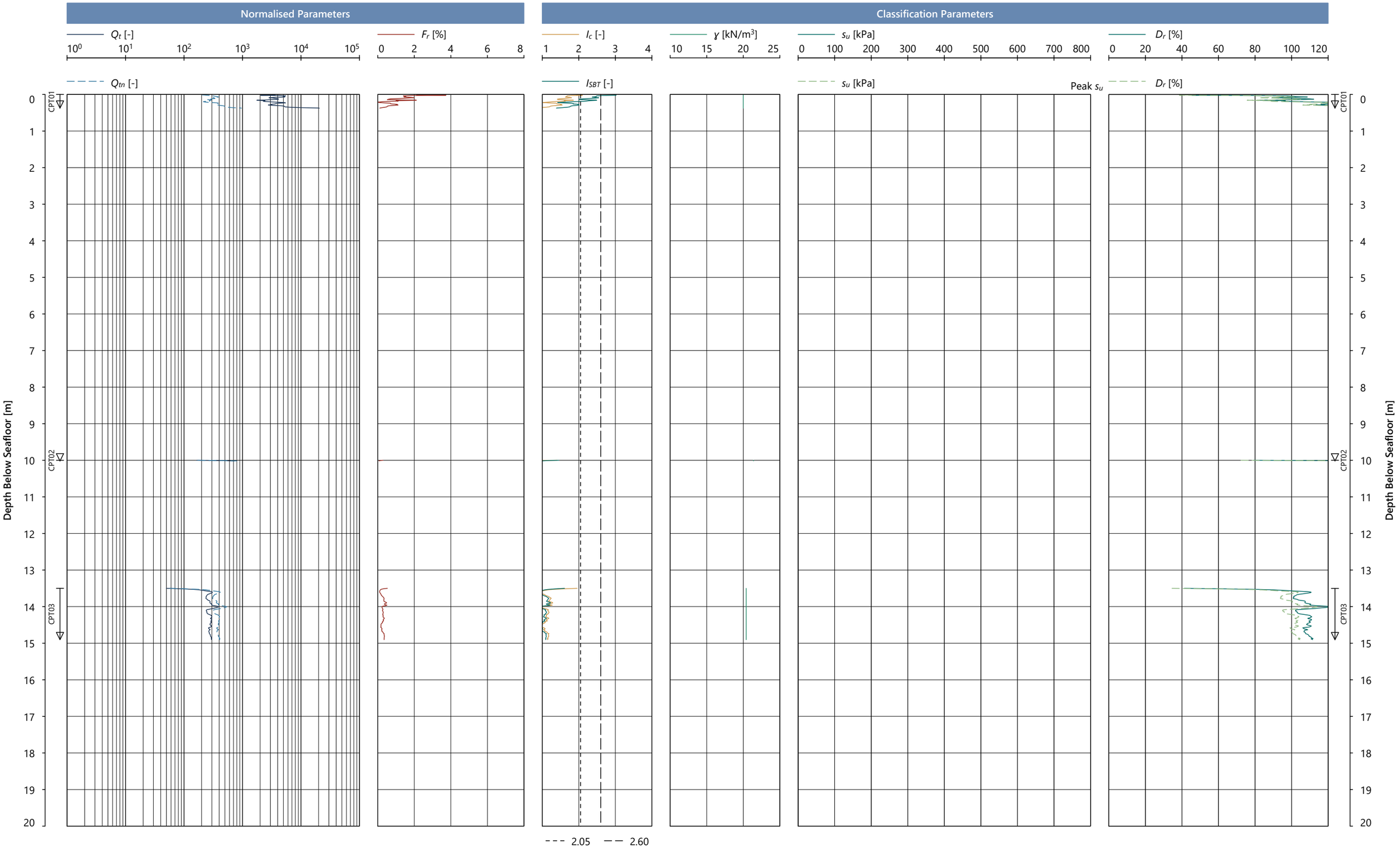
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:59



Date of Testing : 18 August 2025
Location : BNO-OWF-BH13
Water Depth [m] : 83.3
Coordinates [m] : E 426180.9 N 5425025.9

Cone Penetration Test Results: Normalised and Classification Parameters

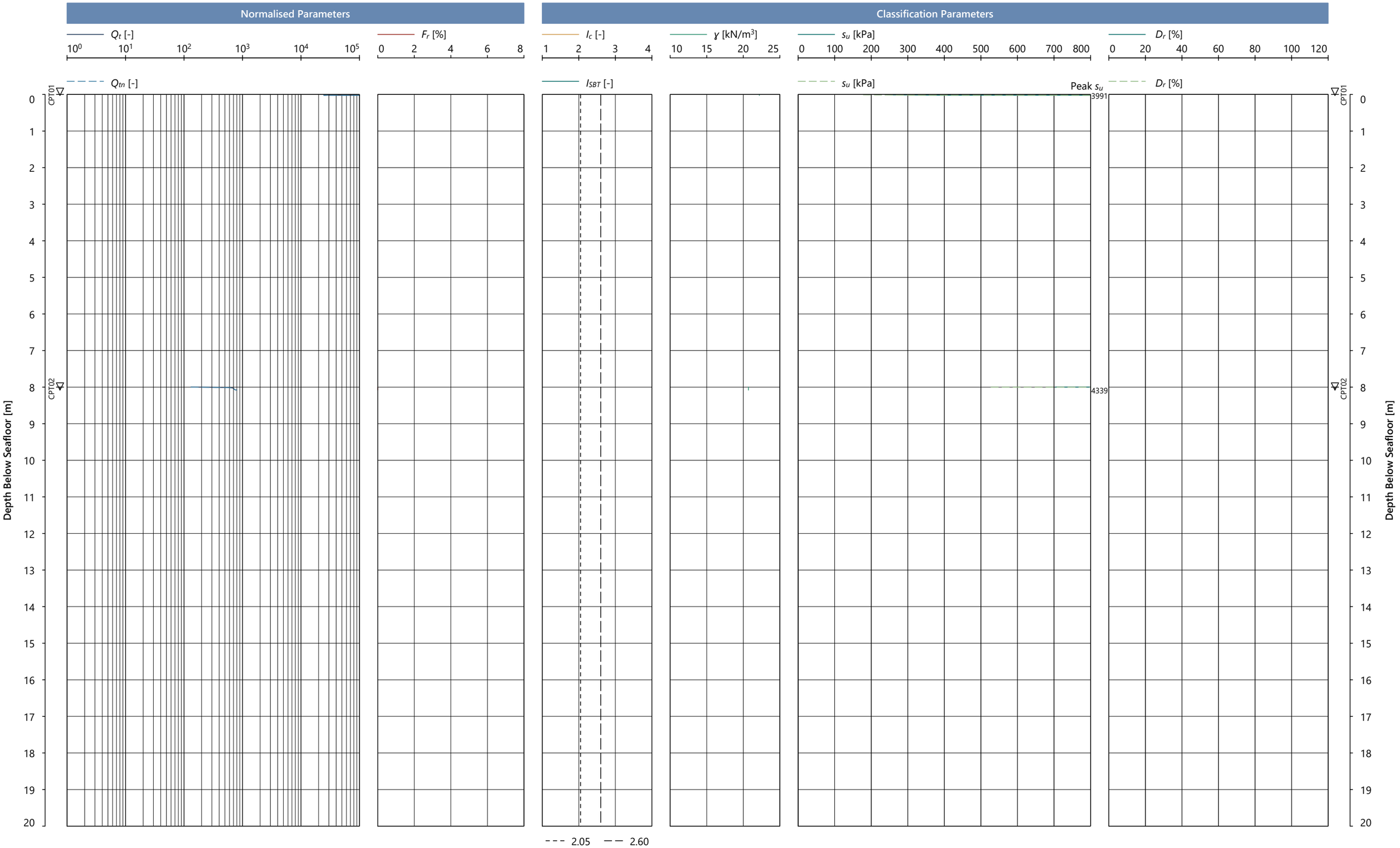
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:59



Date of Testing : 21 August 2025
Location : BNO-OWF-BH15
Water Depth [m] : 81.0
Coordinates [m] : E 432314.7 N 5429579.0

Cone Penetration Test Results: Normalised and Classification Parameters

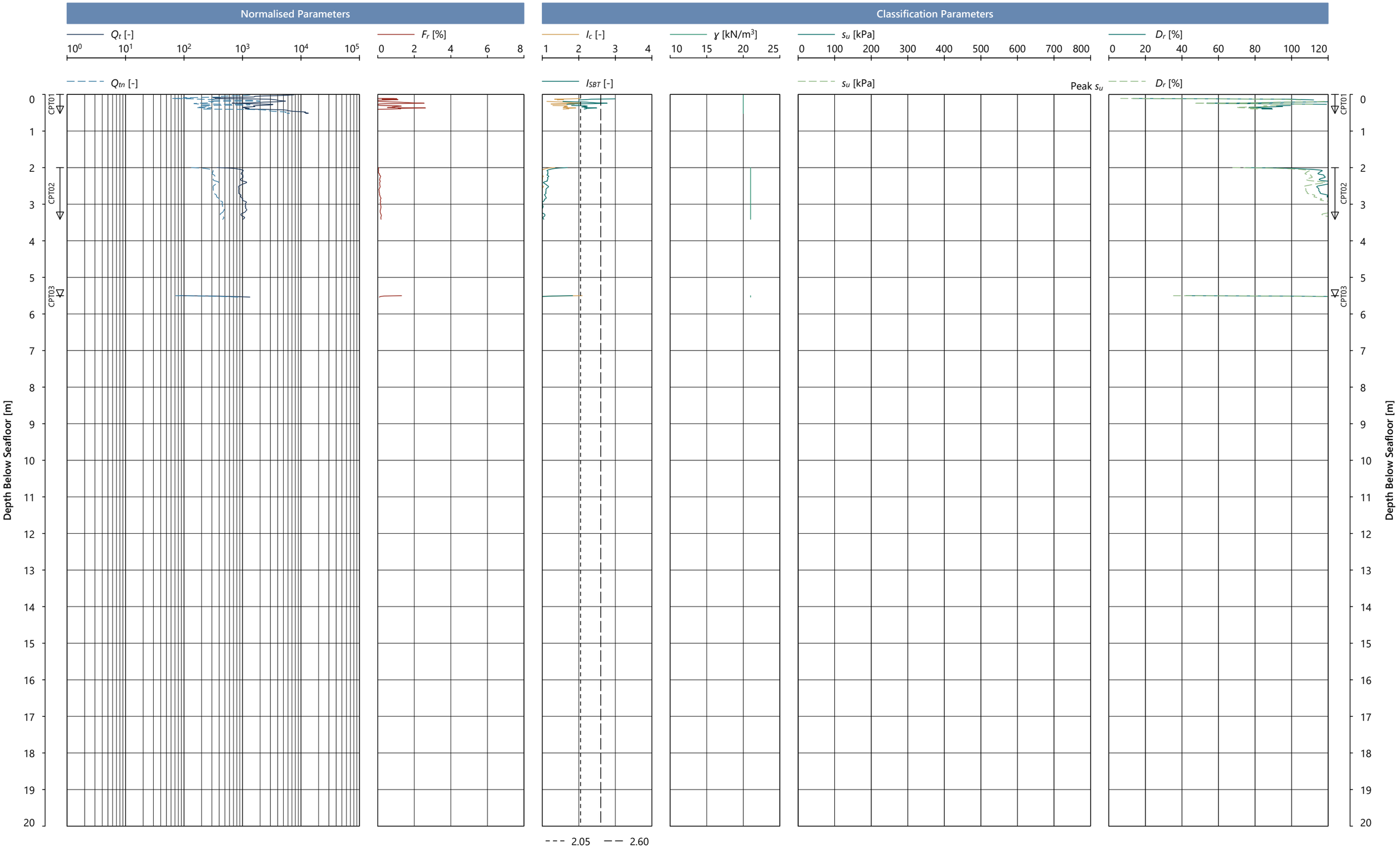
GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:33:59



Date of Testing : 22 August 2025
Location : BNO-OWF-BH17
Water Depth [m] : 80.2
Coordinates [m] : E 437034.1 N 5421322.7

Cone Penetration Test Results: Normalised and Classification Parameters

GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:34:01



Date of Testing : 13 August 2025
Location : BNO-OWF-BH19
Water Depth [m] : 90.5
Coordinates [m] : E 409659.8 N 5417657.1

Cone Penetration Test Results: Normalised and Classification Parameters

GeoVisual 5.5.0 | DM-NCP(multi) | 2026-02-17 09:34:06

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH01	CPT01	0.015	-0.004	-0.009	0.013	0.006	-0.002	CP10-CF80PB10	1706-2834	0.75
BNO-OWF-BH01	CPT02	0.021	0.007	-0.009	-0.004	-0.004	0.002	CP10-CF80PB10	1706-2834	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH02	CPT01	-0.020	0.003	-0.010	0.018	-0.002	0.000	CP10-CF80PB10	1706-2584	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH03	CPT01	0.016	0.009	-0.010	0.000	0.027	0.003	CP10-CF80PB10	1706-2834	0.75
BNO-OWF-BH03	CPT02	0.001	0.048	-0.009	0.043	0.831	0.004	CP10-CF80PB10	1706-2834	0.75
BNO-OWF-BH03	CPT03	-0.027	0.004	-0.009	-0.007	0.000	0.001	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH03	CPT04	-0.044	0.006	-0.009	0.009	-0.002	0.002	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH03	CPT05	-0.039	0.013	-0.009	-0.011	-0.010	0.002	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH03	CPT06	-0.037	0.005	-0.010	-0.006	0.000	0.012	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH03	CPT07	0.123	0.002	-0.016	-0.083	0.006	-0.001	CP5-CF80PB10	1703-0085	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH04	CPT01	-0.016	0.006	-0.007	34.855	-0.311	0.844	CP10-CF80PB10	1706-2584	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH07	CPT01	-0.019	-0.003	-0.009	0.015	0.004	0.001	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH07	CPT02	-0.022	0.003	-0.009	0.005	-0.003	0.003	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH07	CPT03	-0.011	-0.002	-0.009	0.008	0.002	0.003	CP10-CF80PB10	1706-2584	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH08	CPT01	0.027	0.004	-0.010	0.027	-0.002	-0.001	CP10-CF80PB10	1706-2851	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH10	CPT01	0.032	0.005	-0.009	0.011	-0.001	0.003	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH10	CPT02	0.028	0.009	-0.010	-0.011	-0.003	0.003	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH10	CPT03	0.030	0.005	-0.010	-0.009	0.001	0.004	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH10	CPT04	0.033	0.017	-0.009	0.000	-0.011	0.003	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH10	CPT05	0.035	0.019	-0.010	0.018	-0.014	0.003	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH10	CPT06	0.014	-0.008	-0.009	-0.022	0.009	0.003	CP10-CF80PB10	1706-2851	0.75
BNO-OWF-BH10	CPT07	0.016	-0.004	-0.009	-0.005	0.004	0.001	CP10-CF80PB10	1706-2851	0.75
BNO-OWF-BH10	CPT08	0.018	-0.003	-0.009	-0.029	0.007	0.002	CP10-CF80PB10	1706-2851	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH11	CPT01	0.024	-0.007	-0.009	0.013	0.010	0.001	CP10-CF80PB10	1706-2851	0.75
BNO-OWF-BH11	CPT02	0.018	0.006	-0.009	0.020	-0.003	0.001	CP10-CF80PB10	1706-2851	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH12	CPT01	0.029	0.011	-0.011	-0.024	-0.006	0.002	CP10-CF80PB10	1706-2851	0.75
BNO-OWF-BH12	CPT02	0.031	0.003	-0.011	0.007	0.002	0.002	CP10-CF80PB10	1706-2851	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH12-a	CPT01	0.016	0.006	-0.010	-0.036	-0.001	0.001	CP10-CF80PB10	1706-2851	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:55

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH13	CPT01	0.036	-0.002	-0.010	0.005	0.007	-0.001	CP10-CF80PB10	1706-2851	0.75
BNO-OWF-BH13	CPT02	0.052	0.011	-0.011	0.207	0.038	0.005	CP10-CF80PB10	1706-2851	0.75
BNO-OWF-BH13	CPT03	0.033	-0.005	-0.009	0.005	0.006	0.004	CP10-CF80PB10	1706-2834	0.75
BNO-OWF-BH13	CPT04	-0.002	-0.003	-0.008	0.003	0.004	0.002	CP10-CF80PB10	1706-2834	0.75
BNO-OWF-BH13	CPT05	0.004	0.005	-0.008	0.008	-0.003	0.001	CP10-CF80PB10	1706-2834	0.75
BNO-OWF-BH13	CPT06	0.118	0.004	-0.014	-0.034	-0.003	-0.001	CP5-CF80PB10	1703-0085	0.75
BNO-OWF-BH13	CPT07	0.125	0.003	-0.011	-0.029	-0.003	-0.001	CP5-CF80PB10	1703-0085	0.75
BNO-OWF-BH13	CPT08	0.116	0.001	-0.014	-0.011	0.002	-0.002	CP5-CF80PB10	1703-0085	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:57

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH15	CPT01	-0.029	0.016	-0.008	0.003	-0.010	0.000	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH15	CPT02	-0.030	0.000	-0.006	0.034	-0.004	0.000	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH15	CPT03	-0.031	0.003	-0.011	-0.007	-0.005	0.002	CP10-CF80PB10	1706-2584	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

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GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:58

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH17	CPT01	-0.020	0.002	-0.008	0.020	-0.002	0.002	CP10-CF80PB10	1706-2584	0.75
BNO-OWF-BH17	CPT02	-0.020	0.000	-0.008	0.008	0.001	0.002	CP10-CF80PB10	1706-2584	0.75

Notes

* : Zero drift is the difference between the zero output at the start of the test and the zero output at the end of the test. The zero reading at start of test is a value presented in units of measurement result. The value itself is a conversion from system output, usually in mV or in bits. It has no explicit physical meaning.

\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:58

Location	Test ID	Zero Reading at Start of Test			Zero Drift*			Cone Penetrometer	Serial Number	Net Area Ratio
		q_c [MPa]	f_s [MPa]	u_2 [MPa]	q_c [MPa]	f_s [MPa]	u_2 [MPa]			a [-]
BNO-OWF-BH19	CPT01	0.039	0.003	-0.008	-0.017	0.000	0.001	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH19	CPT02	0.023	0.002	-0.010	-0.029	0.001	0.003	CP10-CF80PB10	1706-2672	0.75
BNO-OWF-BH19	CPT03	0.025	0.011	-0.011	-0.019	-0.006	0.004	CP10-CF80PB10	1706-2672	0.75

Notes

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\- : Zero drift could not be calculated. Zero drift can be assessed by comparing zero drift values of successive tests.

GeoVisual 5.5.0 / DM-ZD / 2026-02-17 09:36:59

4. Sampling Data

Title	Plate No.
Sample Photographs	4.1 to 4.122
Sample List and Laboratory Testing Schedule	4.123 to 4.138

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH01\03_renamed Drawn with: Photo_Plate_Maker v6.5 1.xlsm

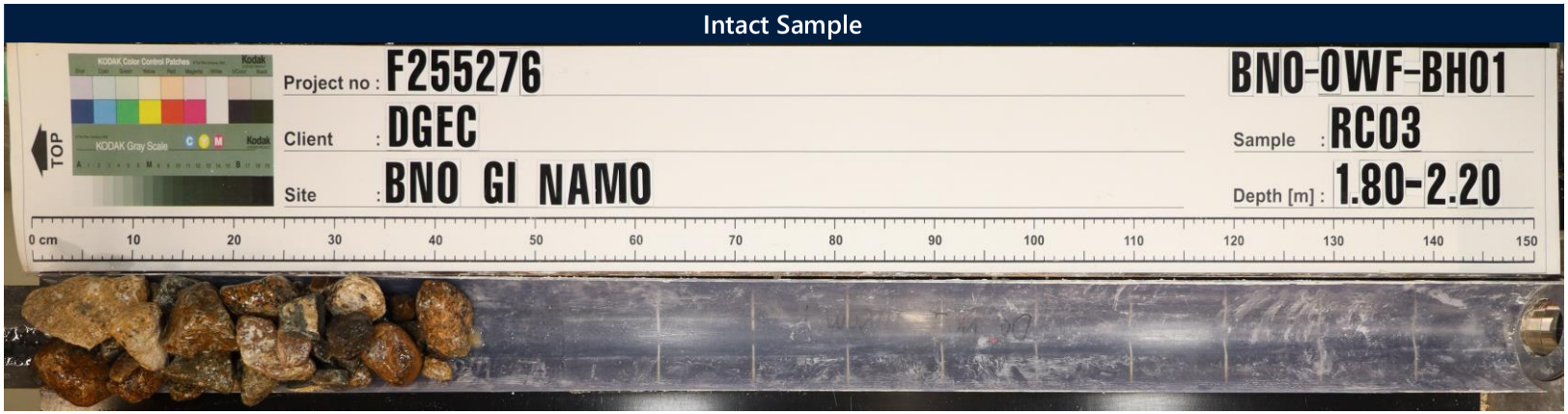
Sample Point : BNO-OWF-BH01 Sample : RC01 Depth [m BSF] : 0.00 to 0.80

Sample Point : BNO-OWF-BH01 Sample : RC02 Depth [m BSF] : 0.80 to 1.80

SAMPLE PHOTOGRAPHS

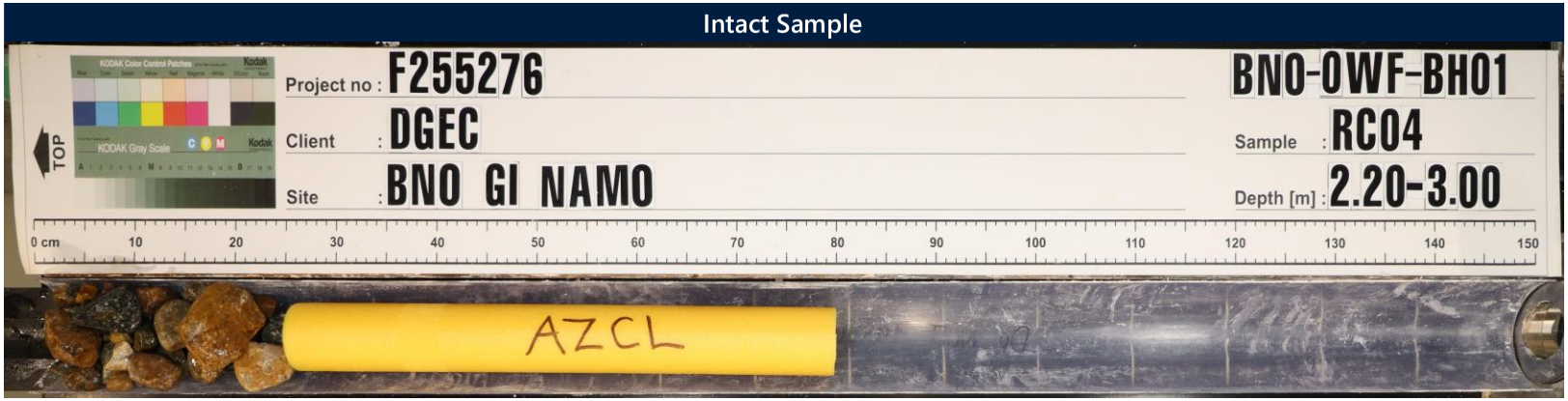
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC03 Depth [m BSF] : 1.80 to 2.20

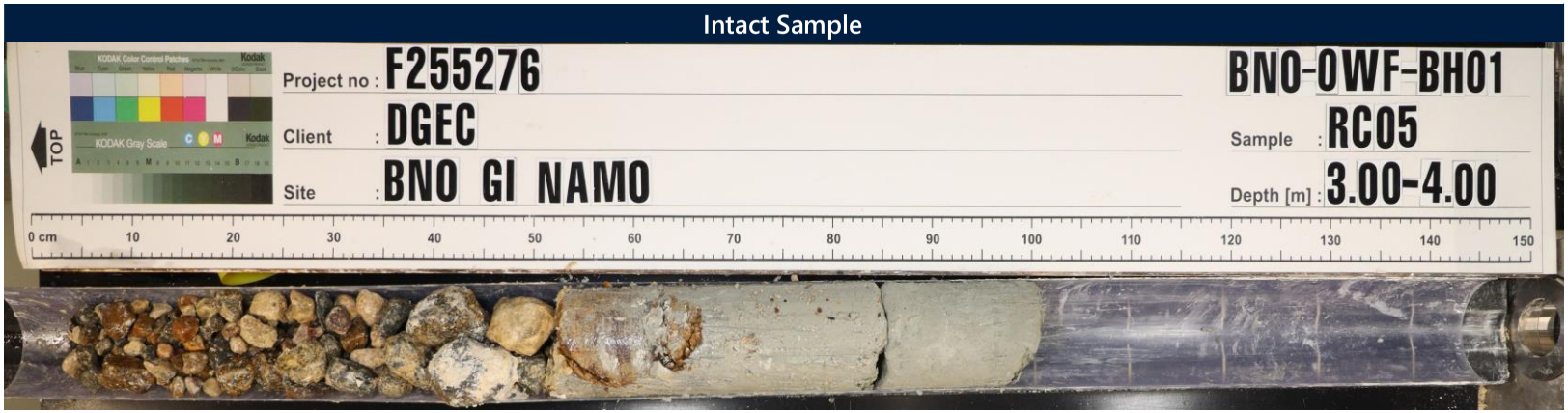
Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC04 Depth [m BSF] : 2.20 to 3.00

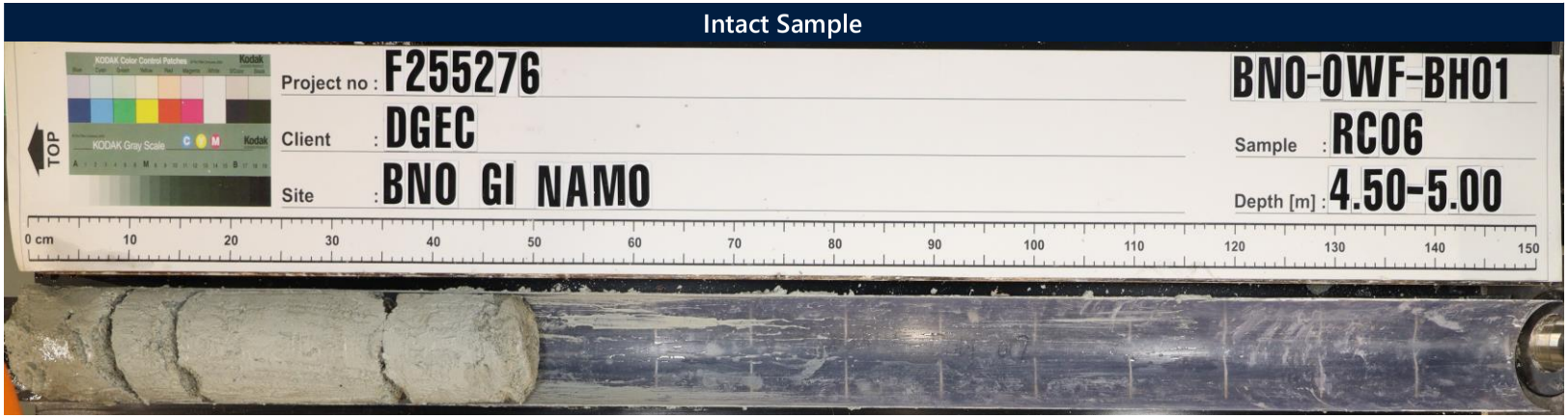
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC05 Depth [m BSF] : 3.00 to 4.00

Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC06 Depth [m BSF] : 4.50 to 5.00

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH01\03_renamed Drawn with: Photo_Plate_Maker v6.5 1.xlsm

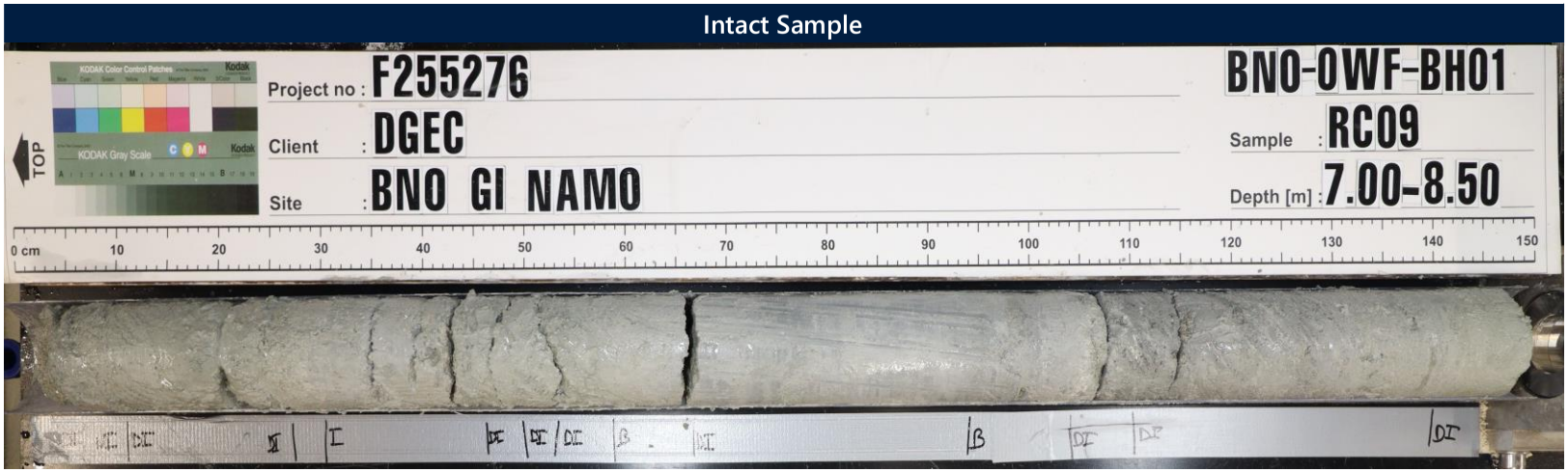
Sample Point : BNO-OWF-BH01 Sample : RC07 Depth [m BSF] : 5.00 to 6.00

Sample Point : BNO-OWF-BH01 Sample : RC08 Depth [m BSF] : 6.00 to 7.00

SAMPLE PHOTOGRAPHS

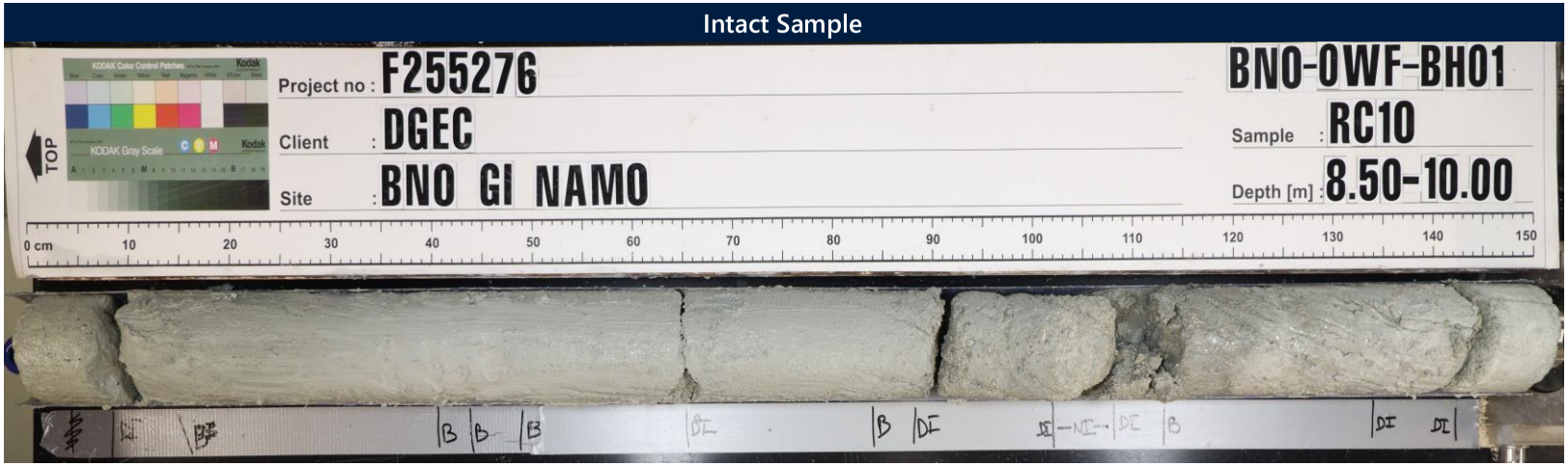
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC09 Depth [m BSF] : 7.00 to 8.50

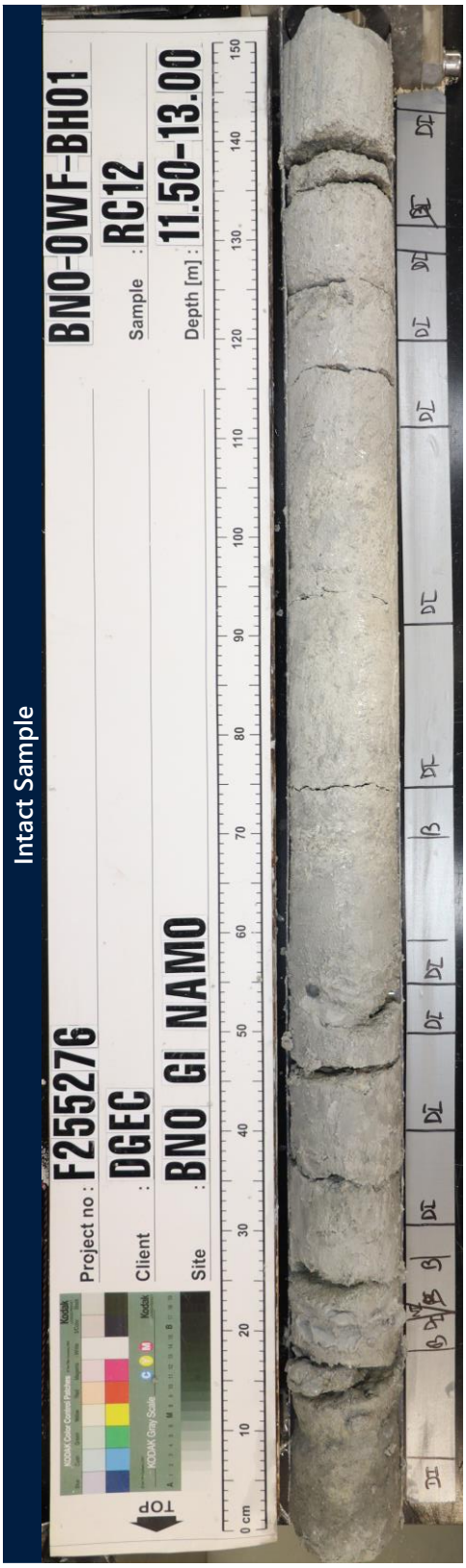
Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC10 Depth [m BSF] : 8.50 to 10.00

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH01\03_renamed Drawn with: Photo_Plate_Maker v6.5 1.xlsm

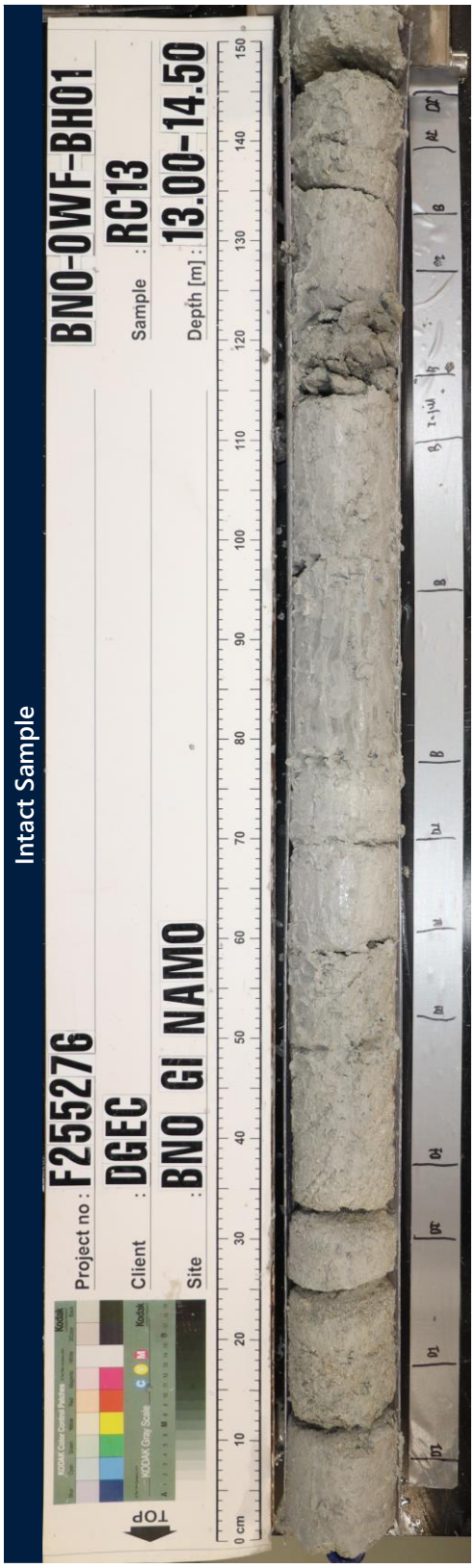
Sample Point : BNO-OWF-BH01 Sample : RC11 Depth [m BSF] : 10.00 to 11.50



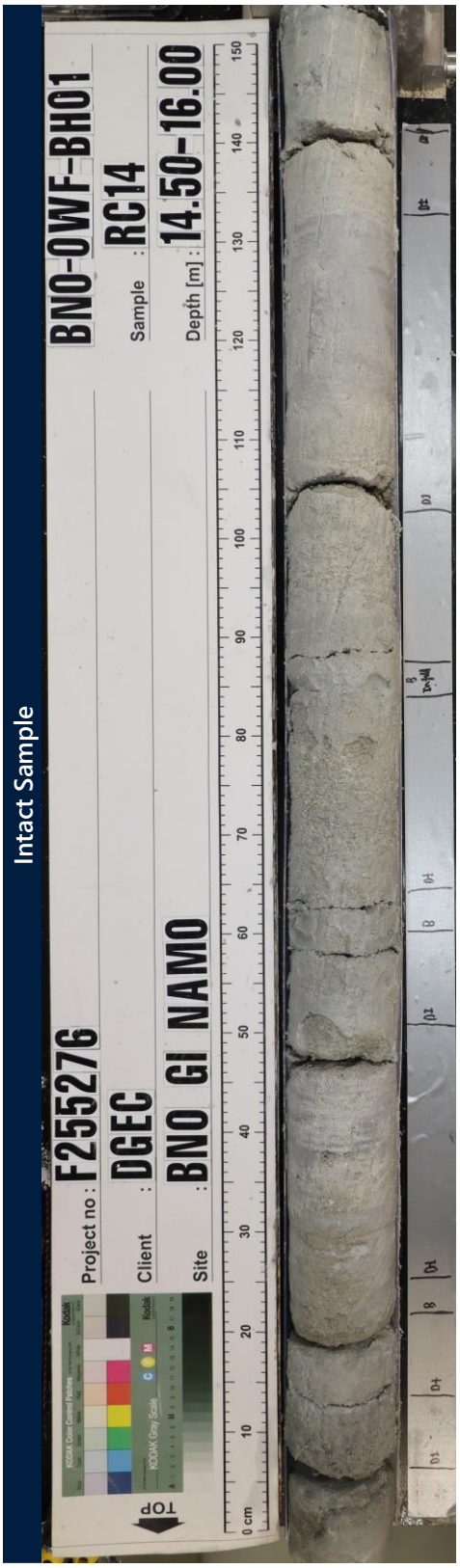
Sample Point : BNO-OWF-BH01 Sample : RC12 Depth [m BSF] : 11.50 to 13.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH01\03_renamed Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH01 Sample : RC13 Depth [m BSF] : 13.00 to 14.50

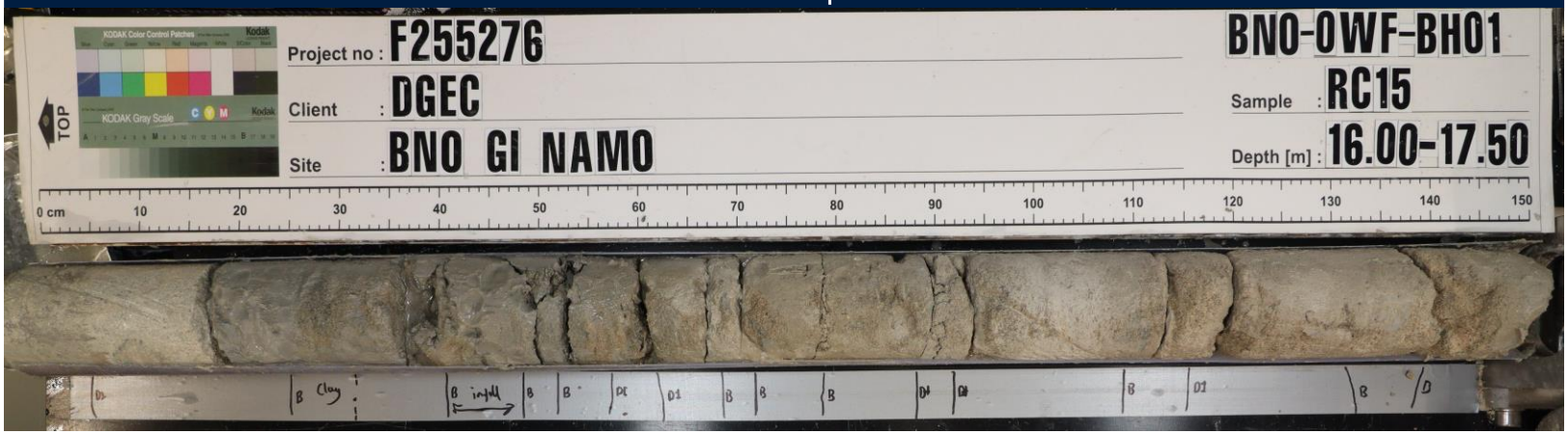


Sample Point : BNO-OWF-BH01 Sample : RC14 Depth [m BSF] : 14.50 to 16.00

SAMPLE PHOTOGRAPHS

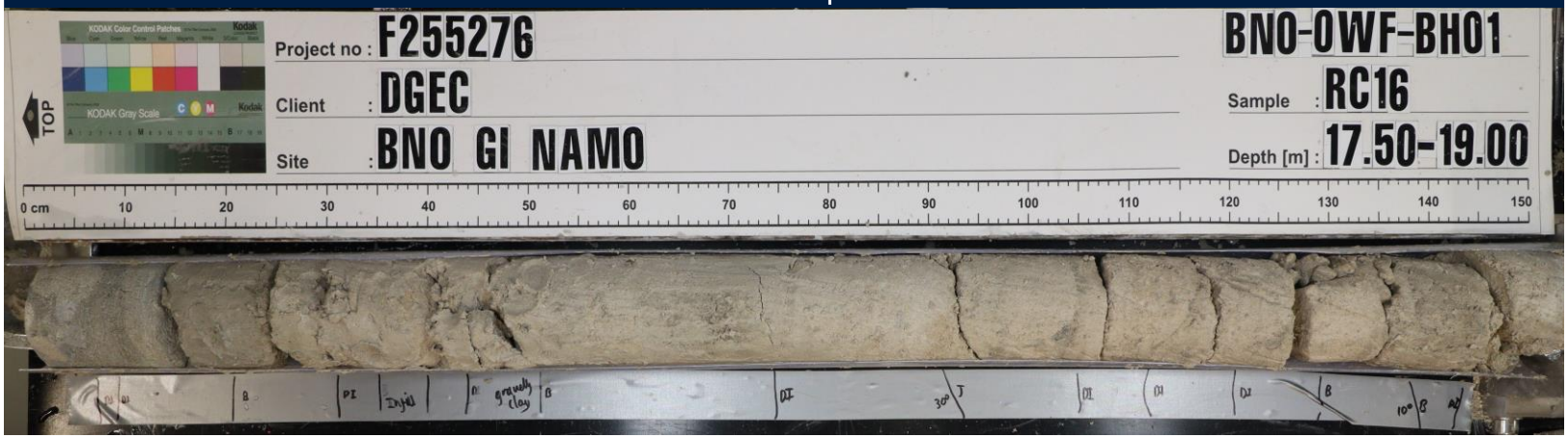
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC15 Depth [m BSF] : 16.00 to 17.50

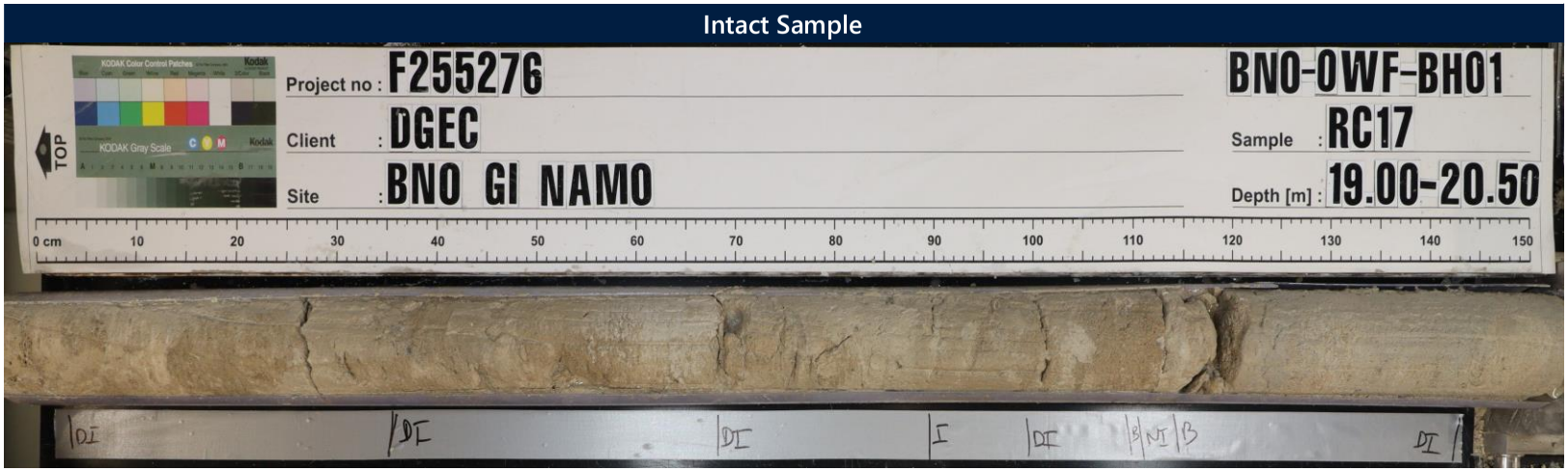
Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC16 Depth [m BSF] : 17.50 to 19.00

SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH01 Sample : RC19 Depth [m BSF] : 19.00 to 20.50

Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH02 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

Sample Point : BNO-OWF-BH02 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

SAMPLE PHOTOGRAPHS

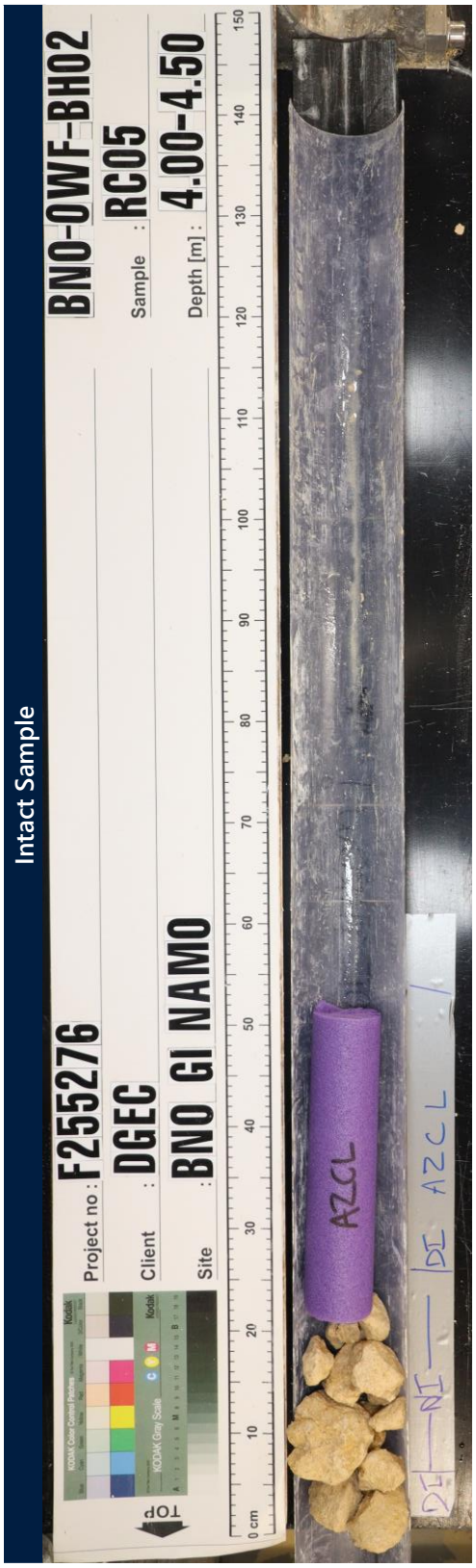
Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH02 Sample : RC03 Depth [m BSF] : 2.00 to 3.00

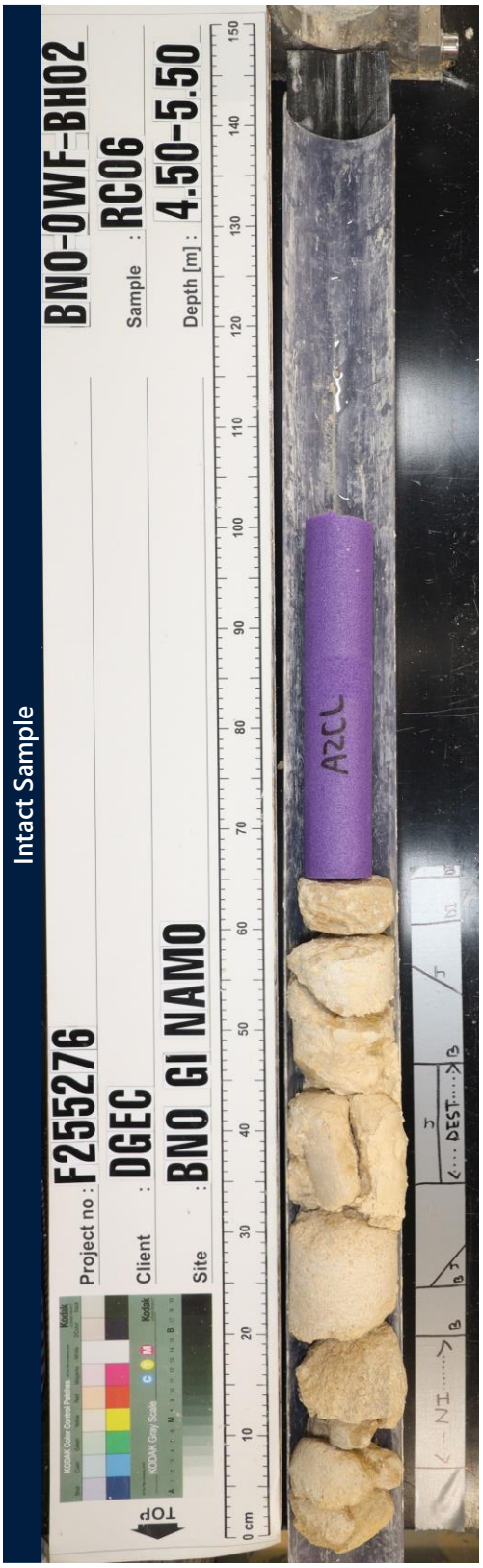
Sample Point : BNO-OWF-BH02 Sample : RC04 Depth [m BSF] : 3.00 to 4.00

SAMPLE PHOTOGRAPHS

Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH02 Sample : RC05 Depth [m BSF] : 4.00 to 4.50



Sample Point : BNO-OWF-BH02 Sample : RC06 Depth [m BSF] : 4.50 to 5.50

SAMPLE PHOTOGRAPHS

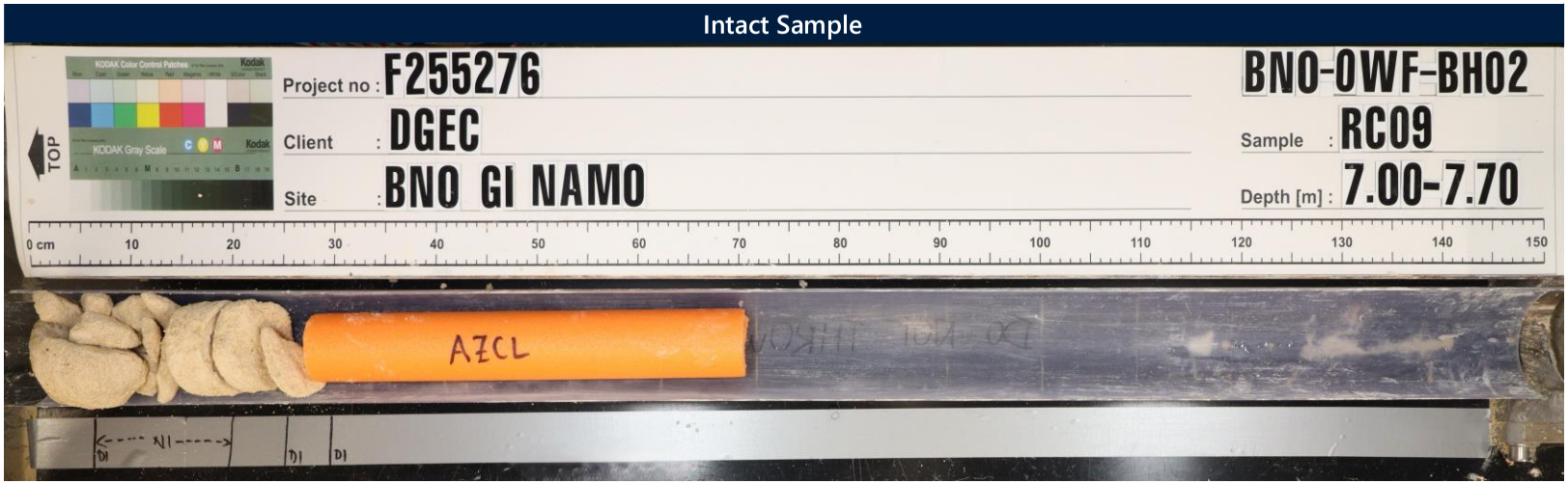
Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH02 Sample : RC07 Depth [m BSF] : 5.50 to 6.50

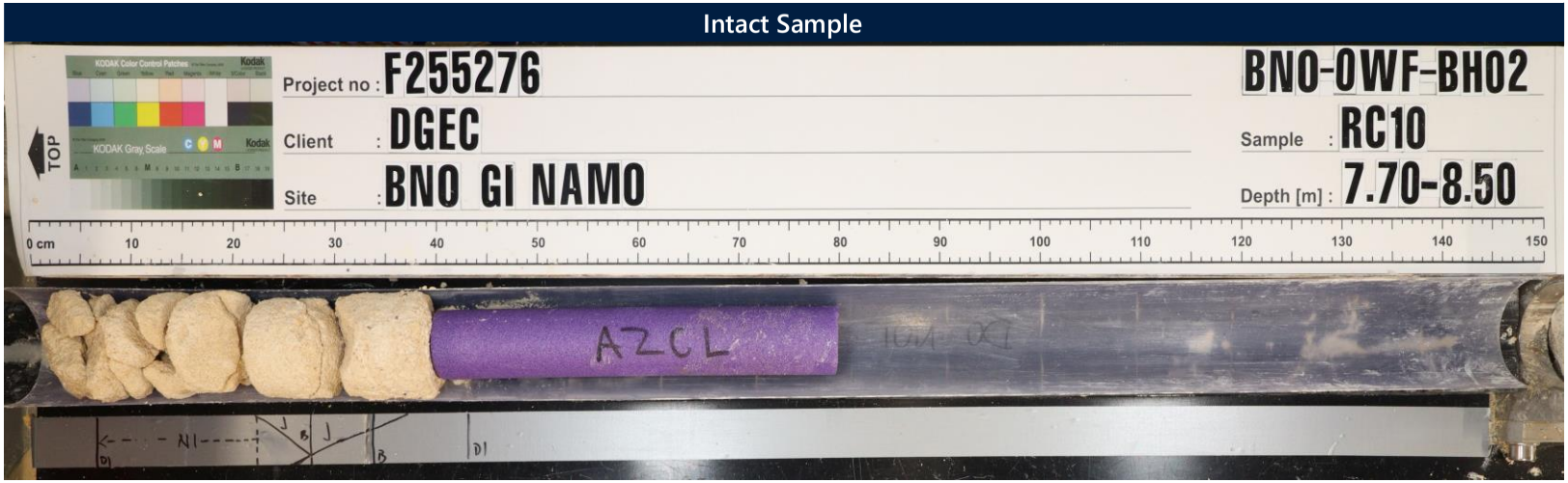
Sample Point : BNO-OWF-BH02 Sample : RC08 Depth [m BSF] : 6.50 to 7.00

SAMPLE PHOTOGRAPHS

SAMPLE PHOTOGRAPHS



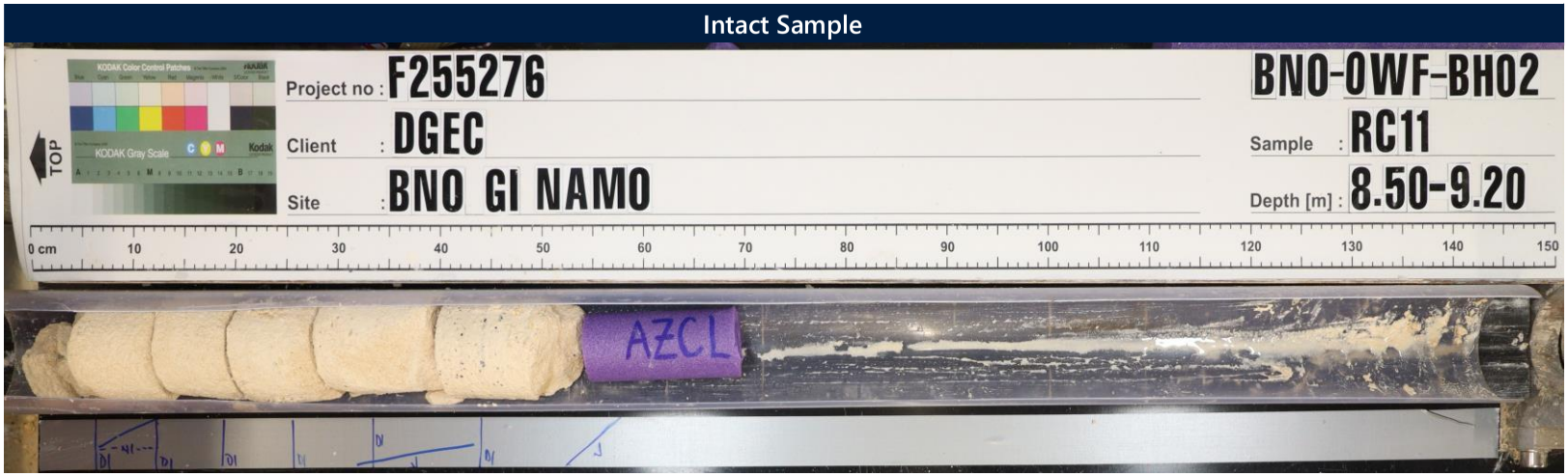
Sample Point : BNO-OWF-BH02 Sample : RC09 Depth [m BSF] : 7.00 to 7.70



Sample Point : BNO-OWF-BH02 Sample : RC10 Depth [m BSF] : 7.70 to 8.50

SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH02 Sample : RC11 Depth [m BSF] : 8.50 to 9.20

Intact Sample

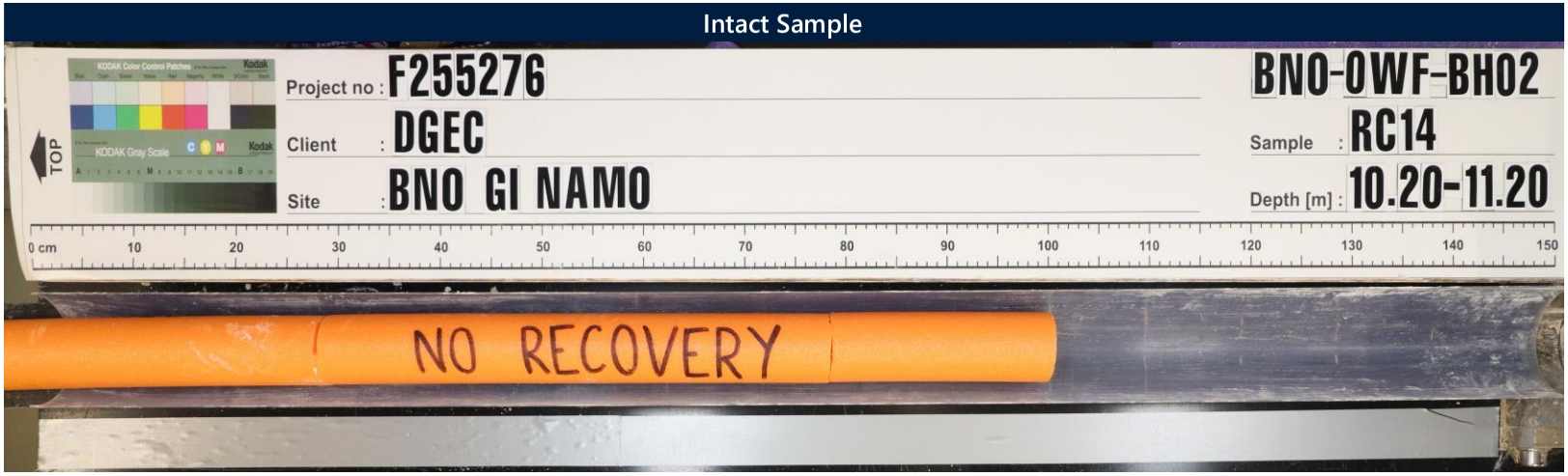
Sample Point : BNO-OWF-BH02 Sample : RC12 Depth [m BSF] : 9.20 to 9.70

SAMPLE PHOTOGRAPHS

Intact Sample

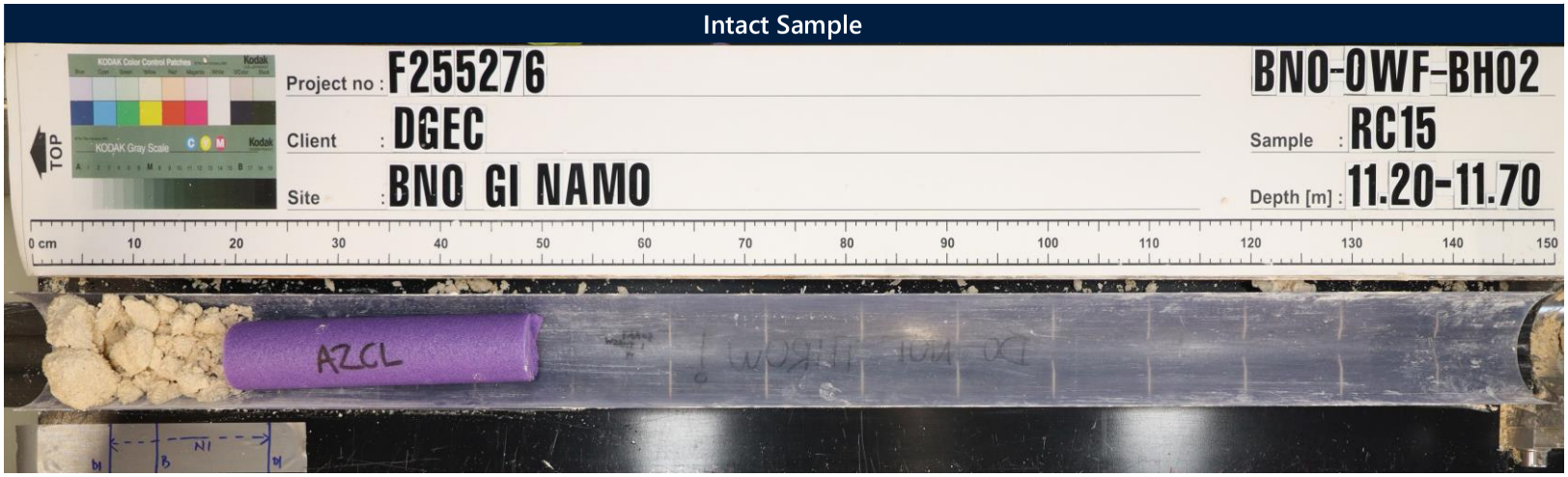
Sample Point : BNO-OWF-BH02 Sample : RC13 Depth [m BSF] : 9.70 to 10.20

Intact Sample

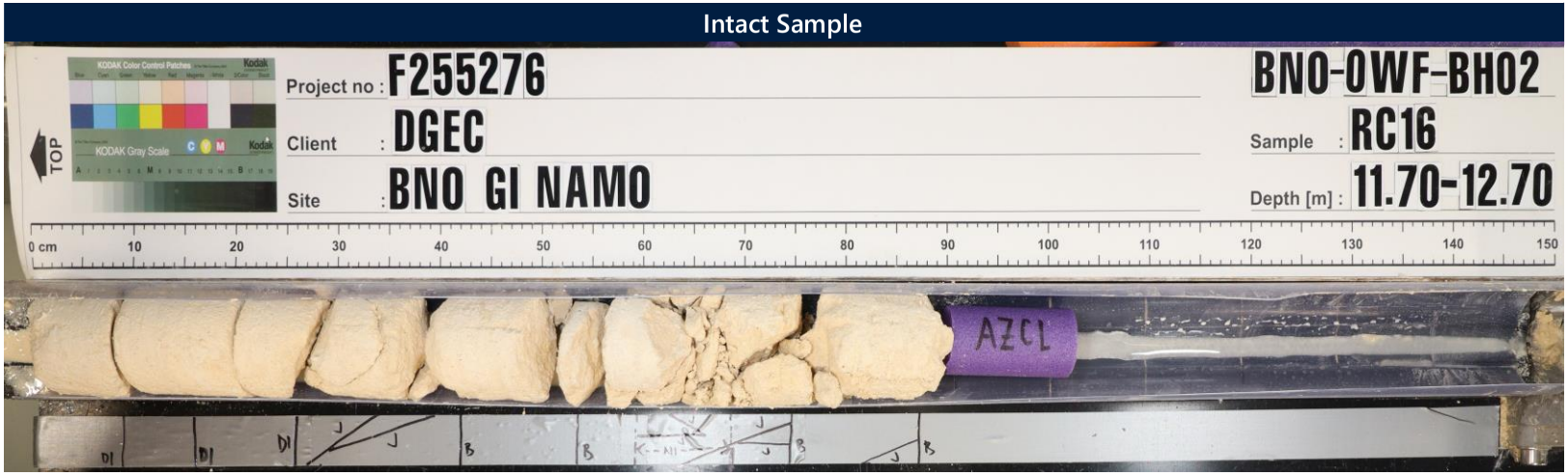


Sample Point : BNO-OWF-BH02 Sample : RC14 Depth [m BSF] : 10.20 to 11.20

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH02 Sample : RC15 Depth [m BSF] : 11.20 to 11.70



Sample Point : BNO-OWF-BH02 Sample : RC16 Depth [m BSF] : 11.70 to 12.70

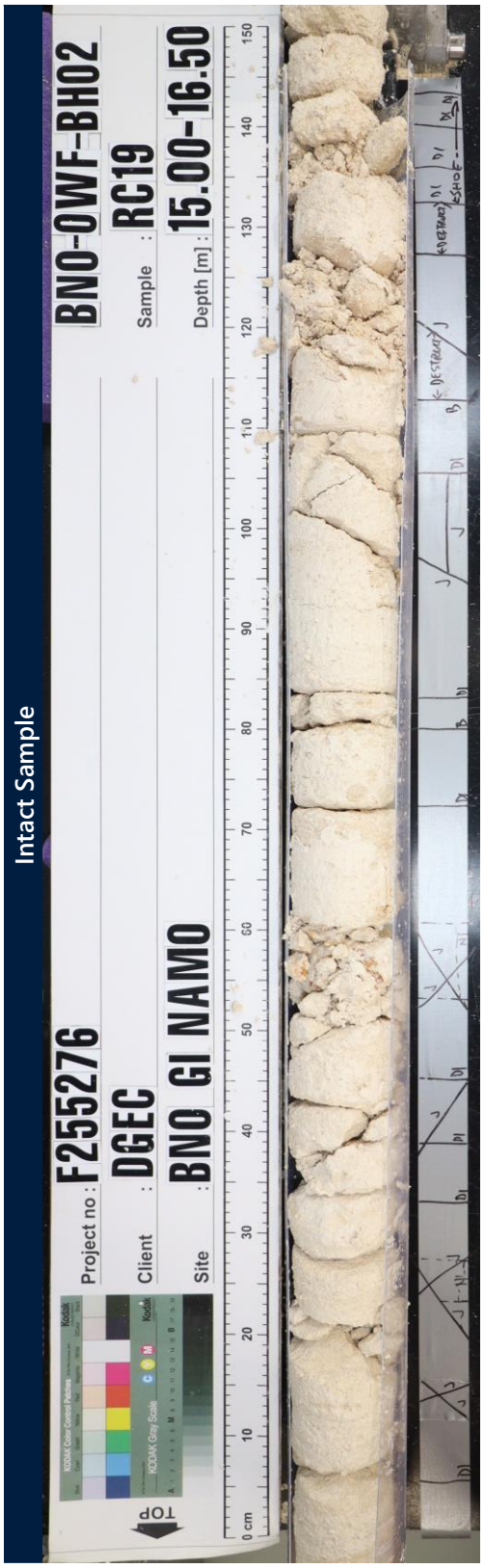
Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH02 Sample : RC17 Depth [m BSF] : 12.70 to 13.70

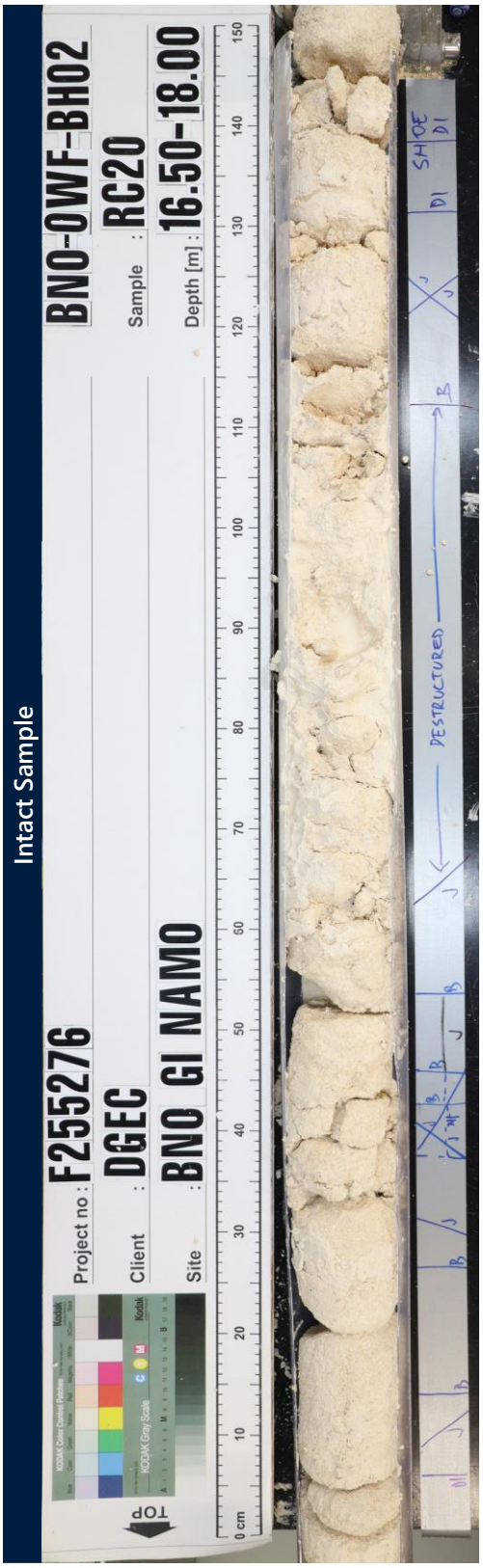
Sample Point : BNO-OWF-BH02 Sample : RC18 Depth [m BSF] : 13.70 to 15.00

SAMPLE PHOTOGRAPHS

Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



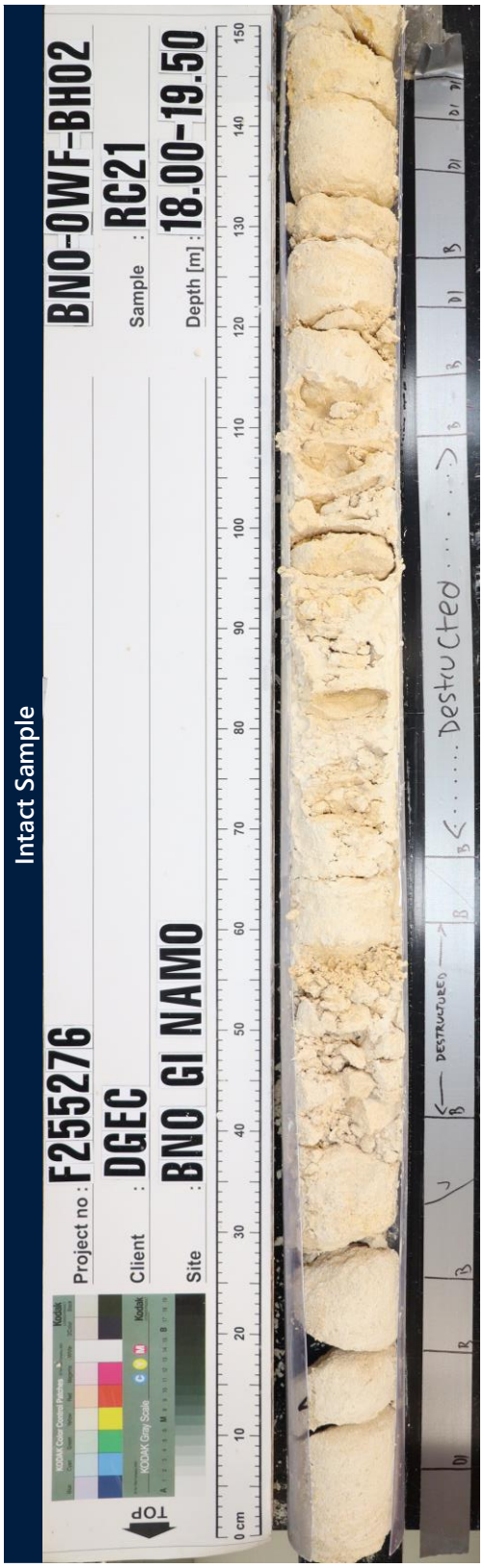
Sample Point : BNO-OWF-BH02 Sample : RC19 Depth [m BSF] : 15.00 to 16.50



Sample Point : BNO-OWF-BH02 Sample : RC20 Depth [m BSF] : 16.50 to 18.00

SAMPLE PHOTOGRAPHS

Processed by: DAY Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH02\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



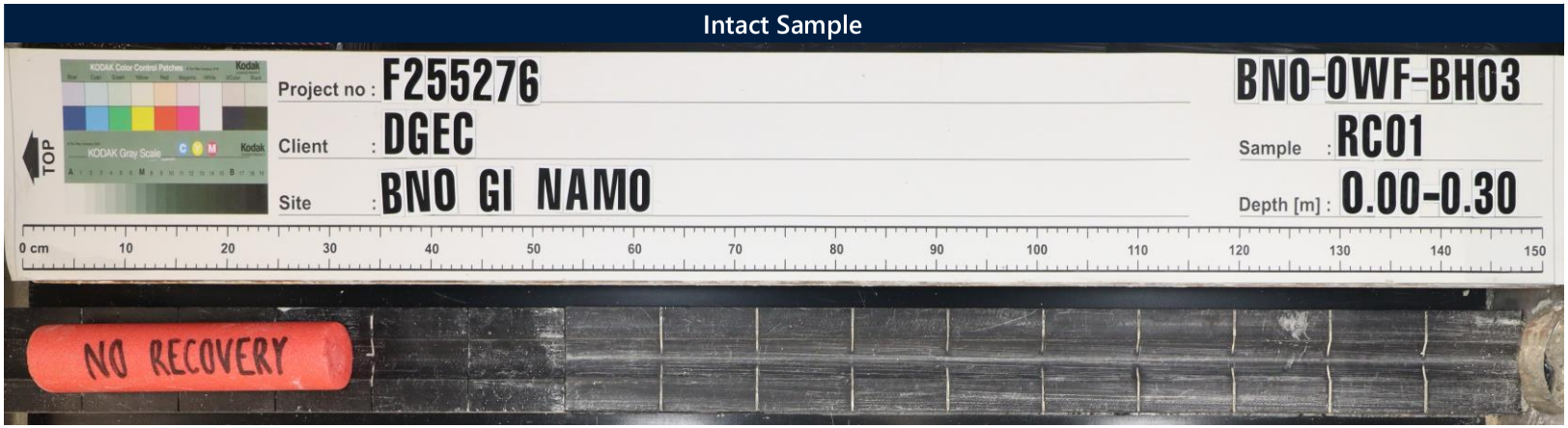
Sample Point : BNO-OWF-BH02 Sample : RC21 Depth [m BSF] : 18.00 to 19.50

Sample Point : BNO-OWF-BH02 Sample : RC22 Depth [m BSF] : 19.50 to 21.00

SAMPLE PHOTOGRAPHS

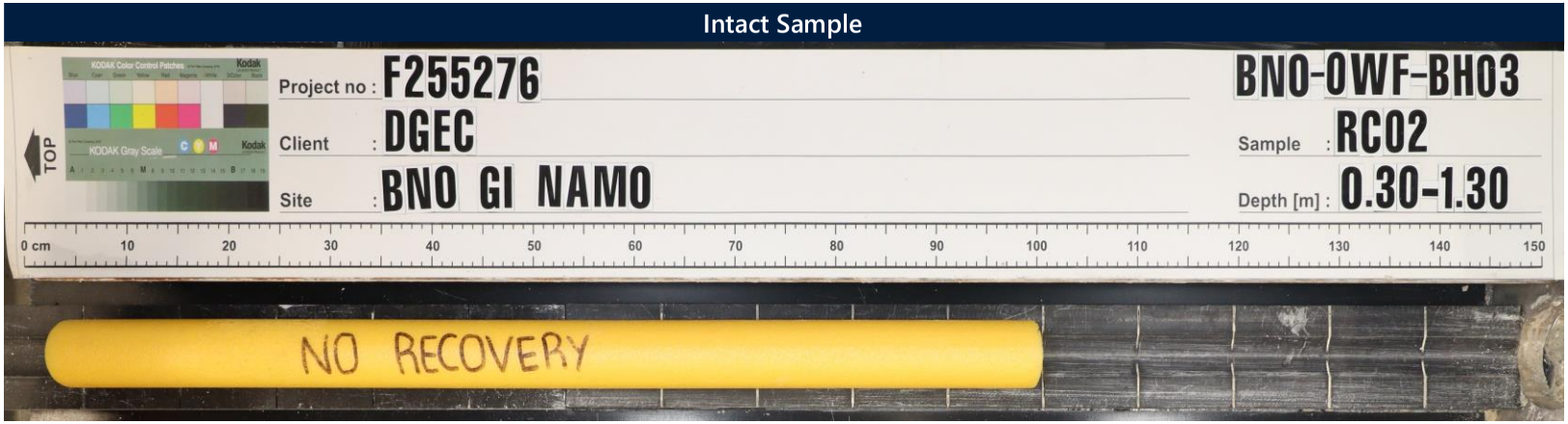
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH03 Sample : RC01 Depth [m BSF] : 0.00 to 0.30

Intact Sample



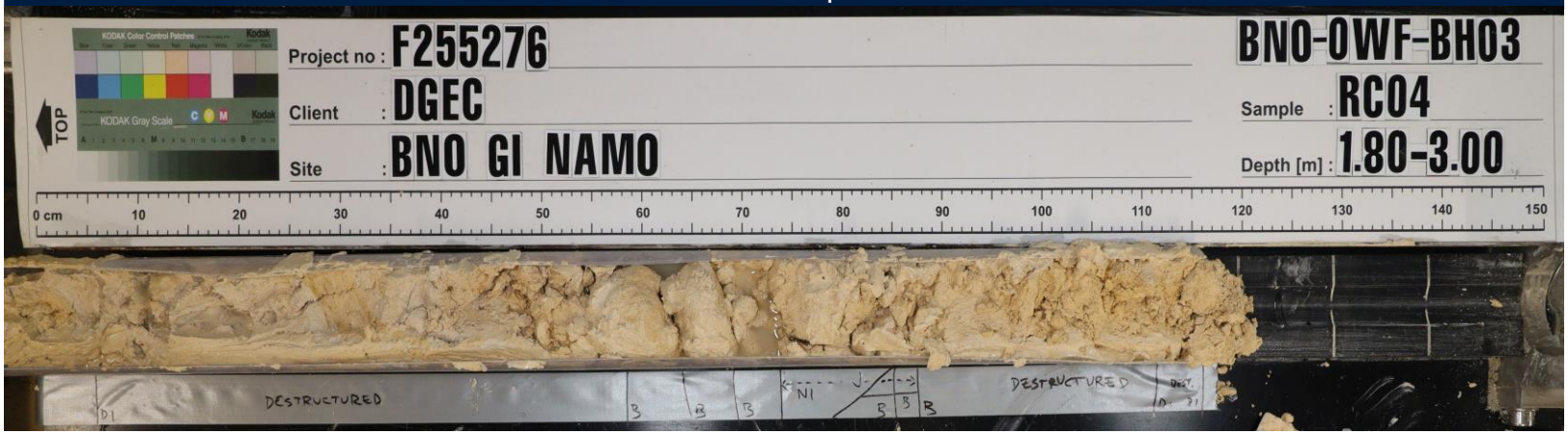
Sample Point : BNO-OWF-BH03 Sample : RC02 Depth [m BSF] : 0.30 to 1.30

SAMPLE PHOTOGRAPHS

Intact Sample

Sample Point : BNO-OWF-BH03 Sample : RC03 Depth [m BSF] : 1.30 to 1.80

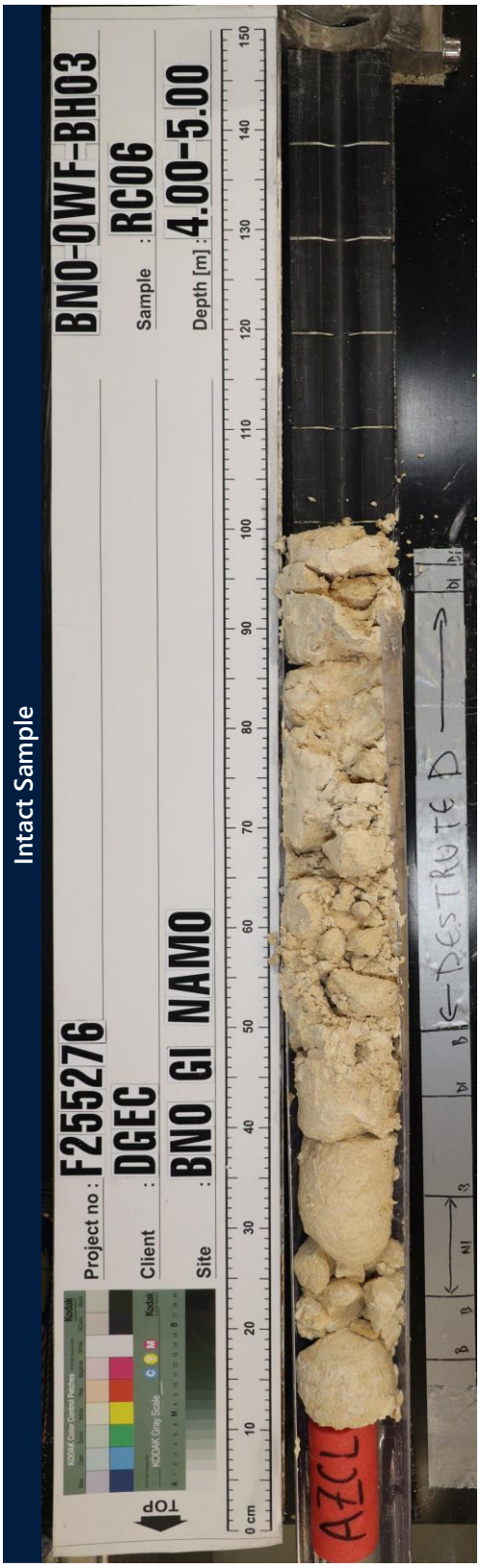
Intact Sample



Sample Point : BNO-OWF-BH03 Sample : RC04 Depth [m BSF] : 1.80 to 3.00

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH03 Sample : RC05 Depth [m BSF] : 3.20 to 4.00

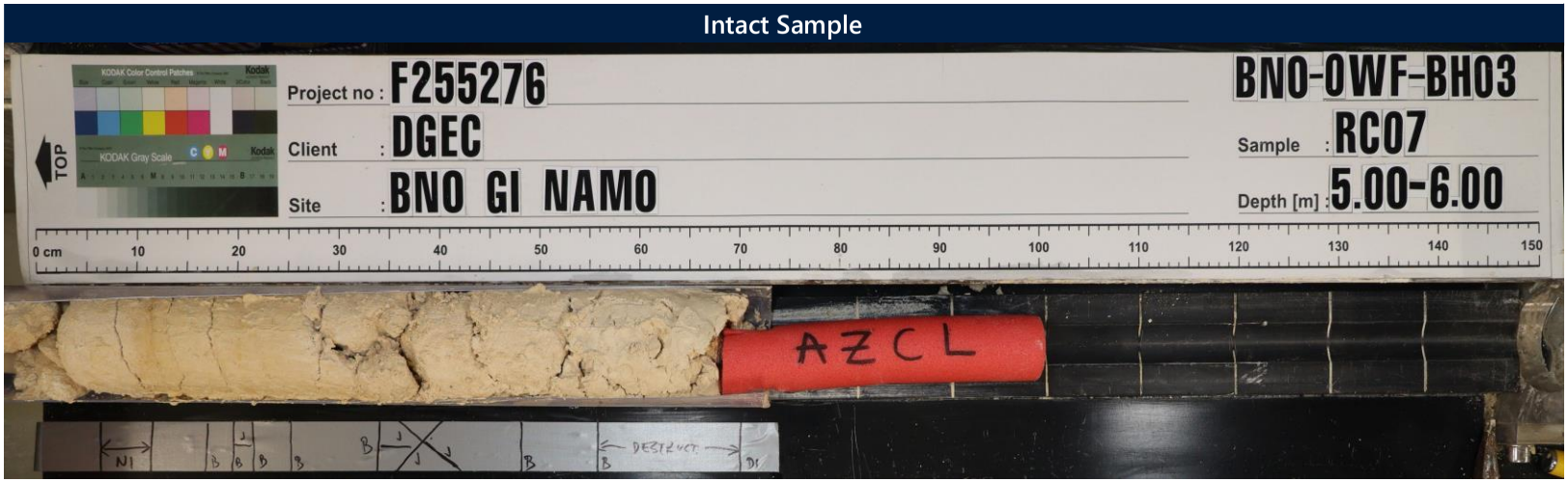


Sample Point : BNO-OWF-BH03 Sample : RC06 Depth [m BSF] : 4.00 to 5.00

SAMPLE PHOTOGRAPHS

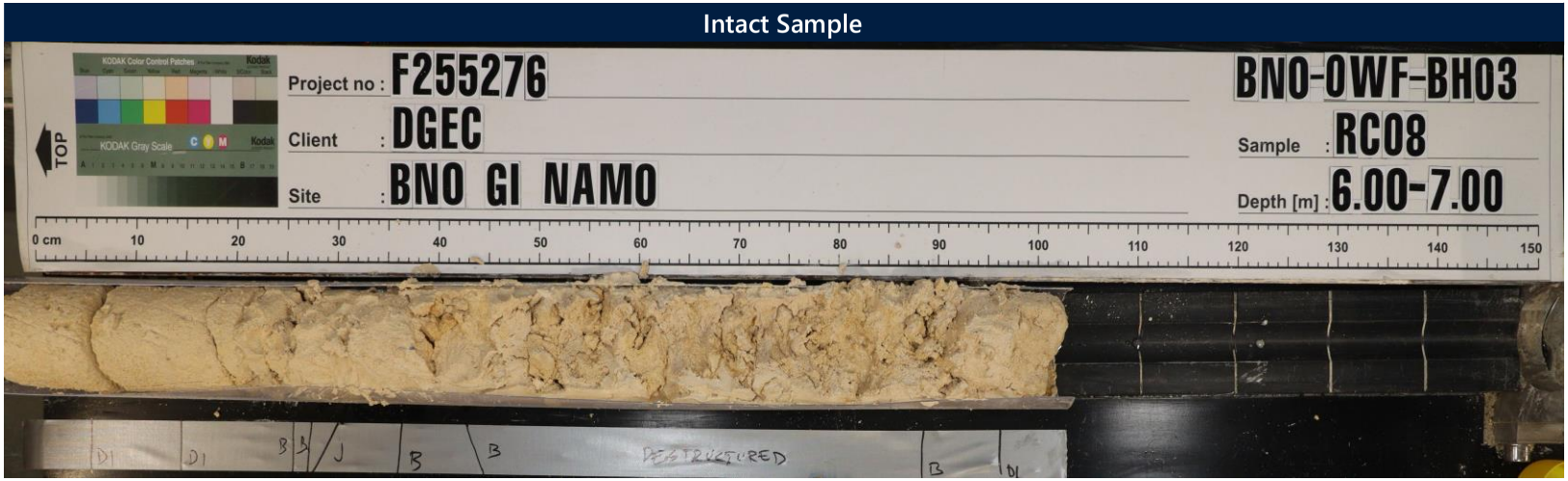
SAMPLE PHOTOGRAPHS

Intact Sample

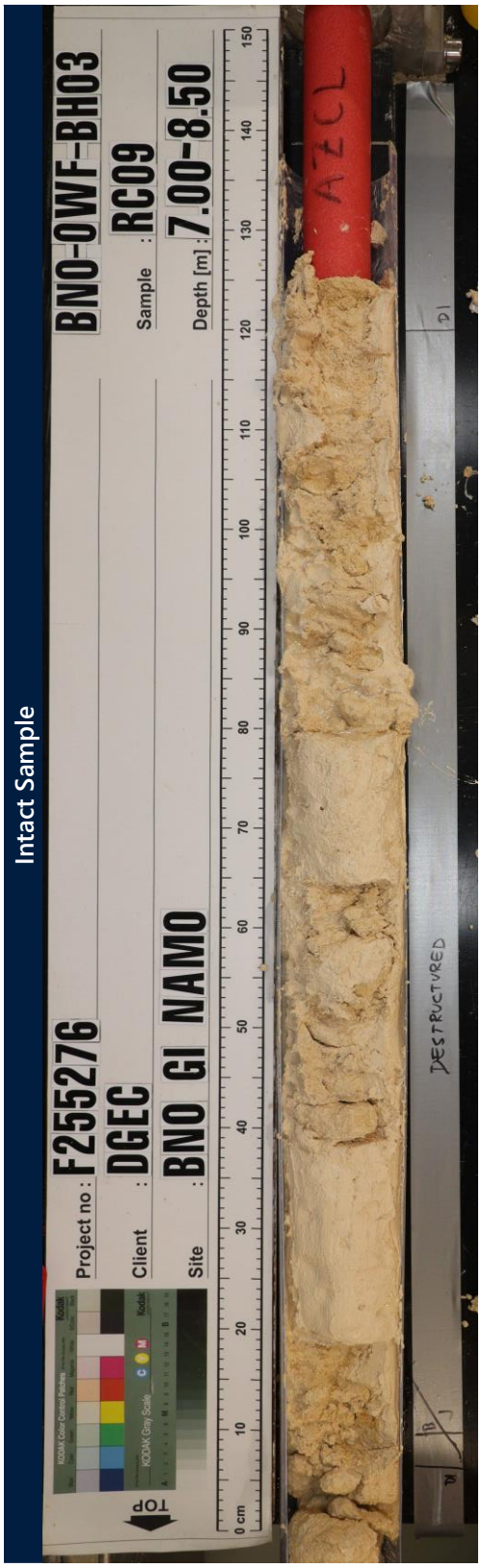


Sample Point : BNO-OWF-BH03 Sample : RC07 Depth [m BSF] : 5.00 to 6.00

Intact Sample



Sample Point : BNO-OWF-BH03 Sample : RC08 Depth [m BSF] : 6.00 to 7.00



Sample Point : BNO-OWF-BH03 Sample : RC09 Depth [m BSF] : 7.00 to 8.50

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

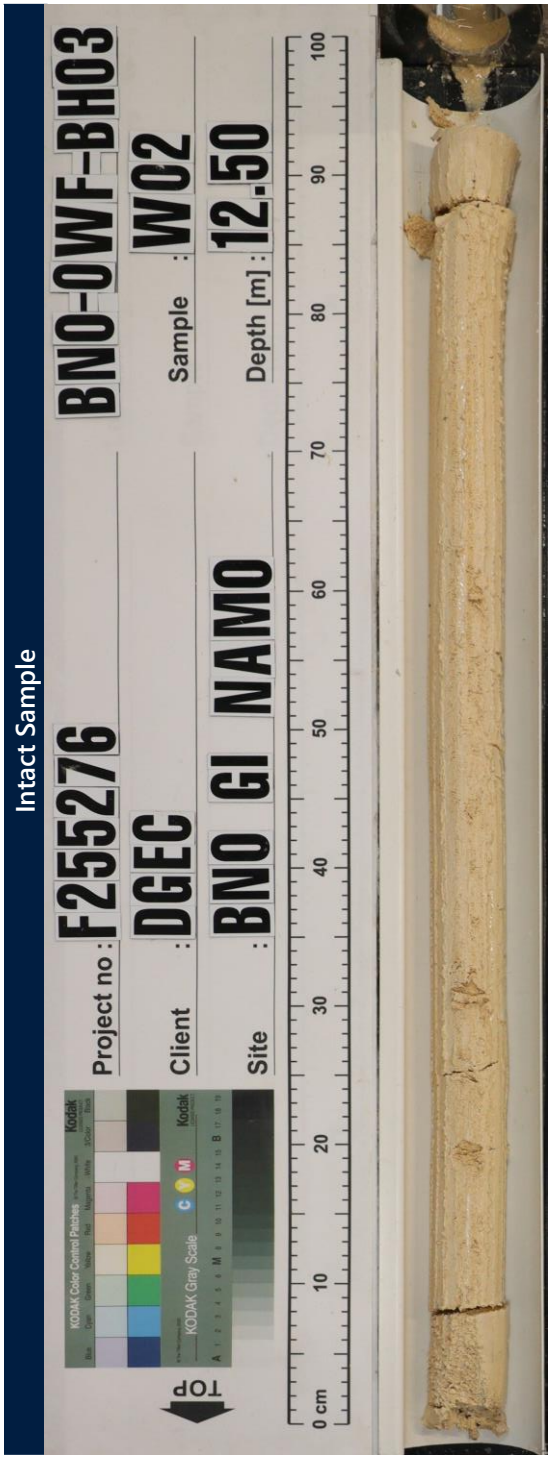
Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH03 Sample : W01 Depth [m BSF] : 10.00

Sample Point : BNO-OWF-BH03 Sample : W01 Depth [m BSF] : 10.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

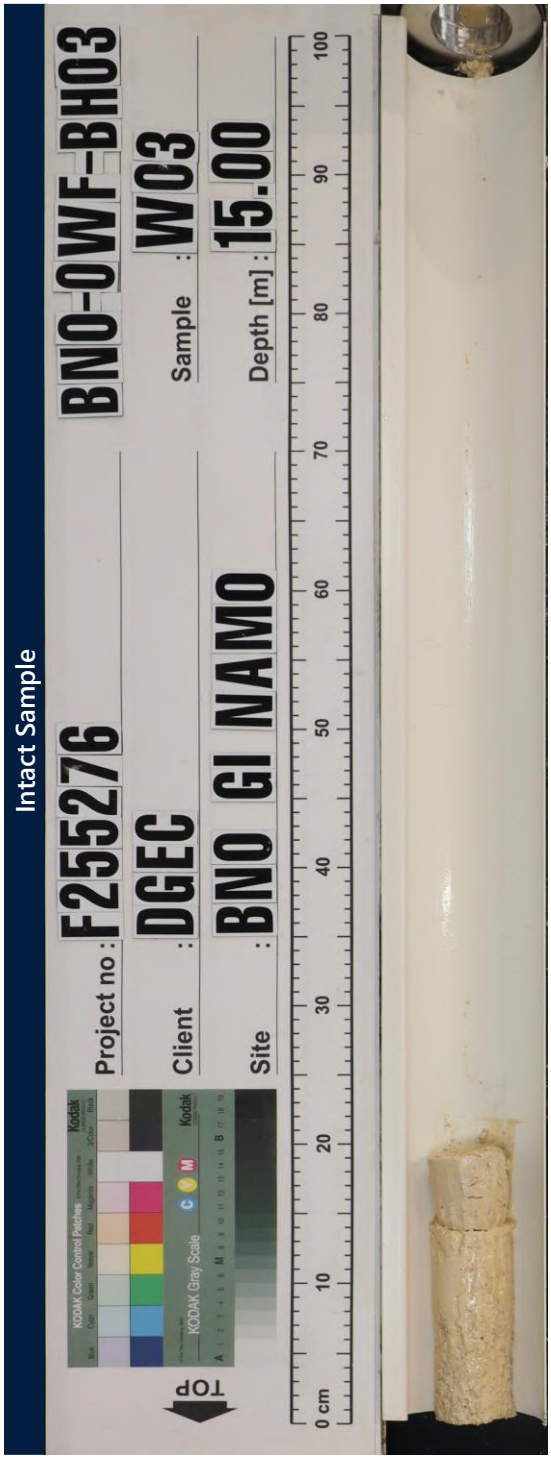


Sample Point : BNO-OWF-BH03 Sample : W02 Depth [m BSF] : 12.50

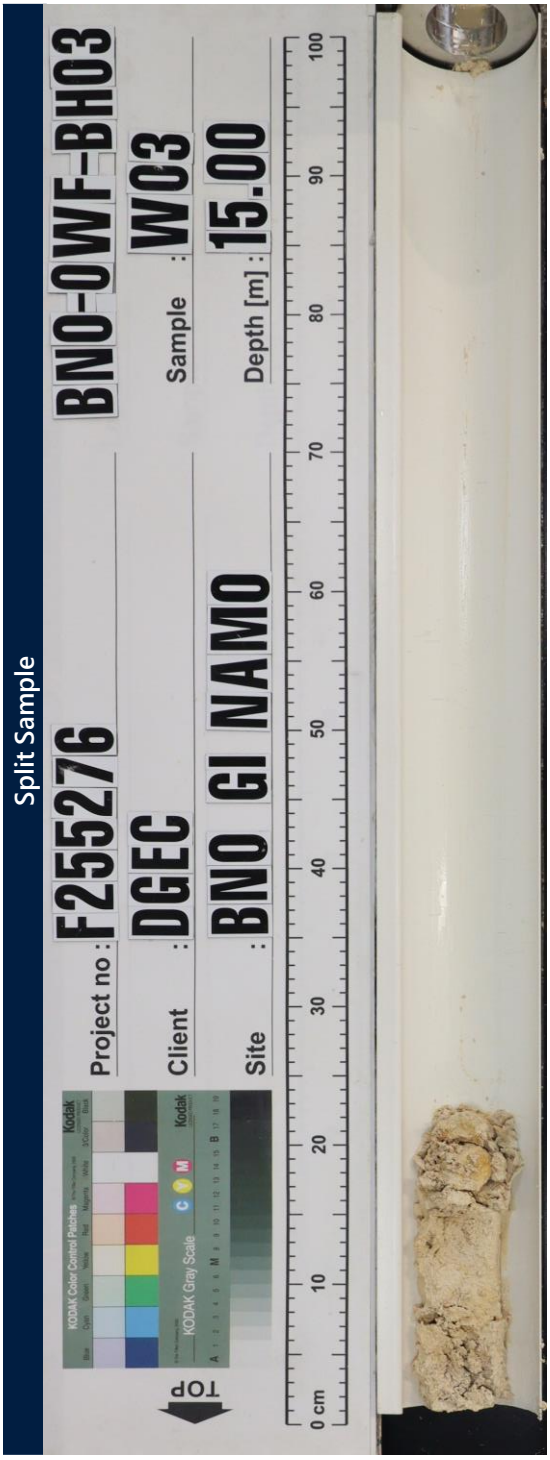
Sample Point : BNO-OWF-BH03 Sample : W02 Depth [m BSF] : 12.50

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH03 Sample : W03 Depth [m BSF] : 15.00

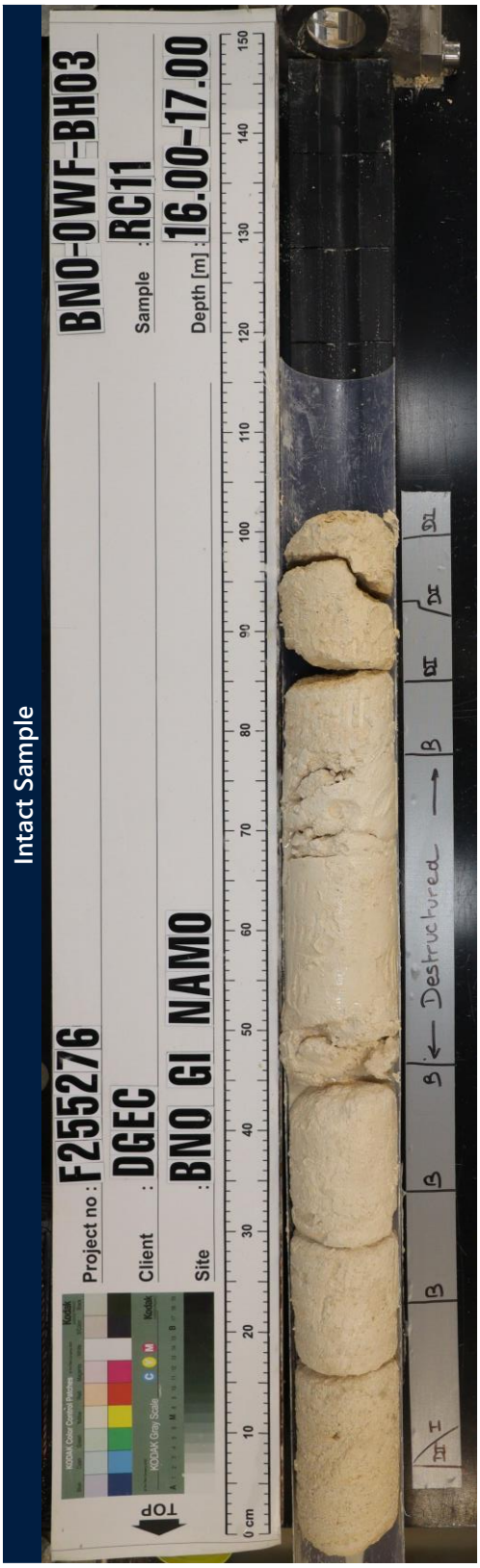


Sample Point : BNO-OWF-BH03 Sample : W03 Depth [m BSF] : 15.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH03 Sample : RC10 Depth [m BSF] : 15.00 to 16.00



Sample Point : BNO-OWF-BH03 Sample : RC11 Depth [m BSF] : 16.00 to 17.00

SAMPLE PHOTOGRAPHS

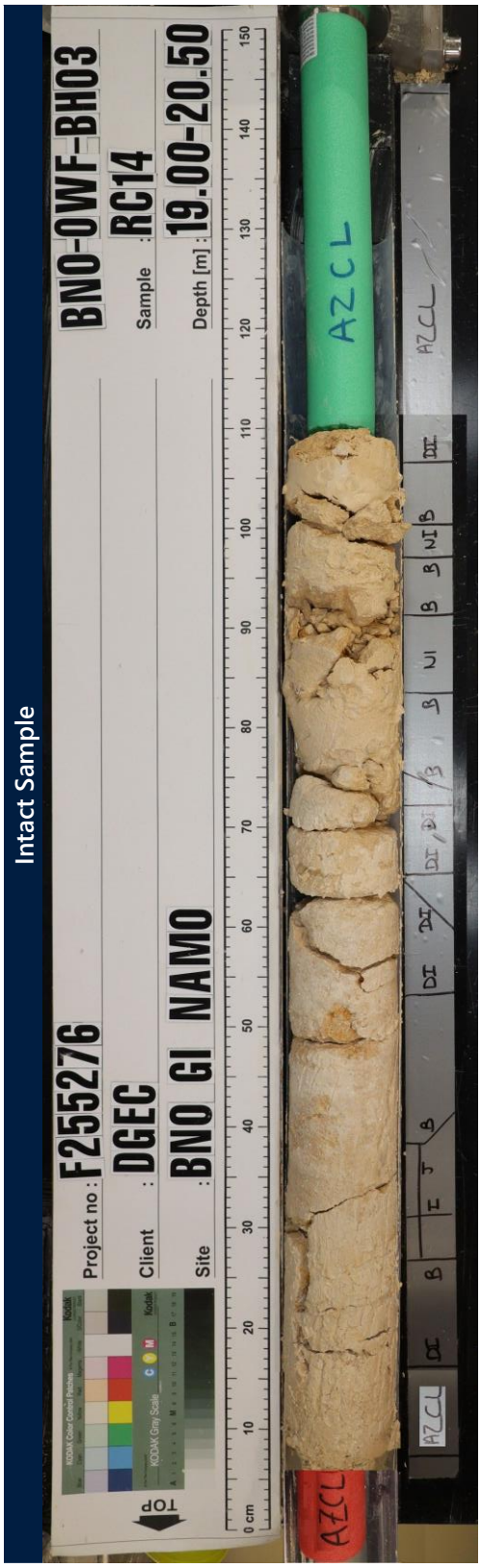
Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH03 Sample : RC12 Depth [m BSF] : 17.00 to 18.00

Sample Point : BNO-OWF-BH03 Sample : RC13 Depth [m BSF] : 18.00 to 19.00

SAMPLE PHOTOGRAPHS

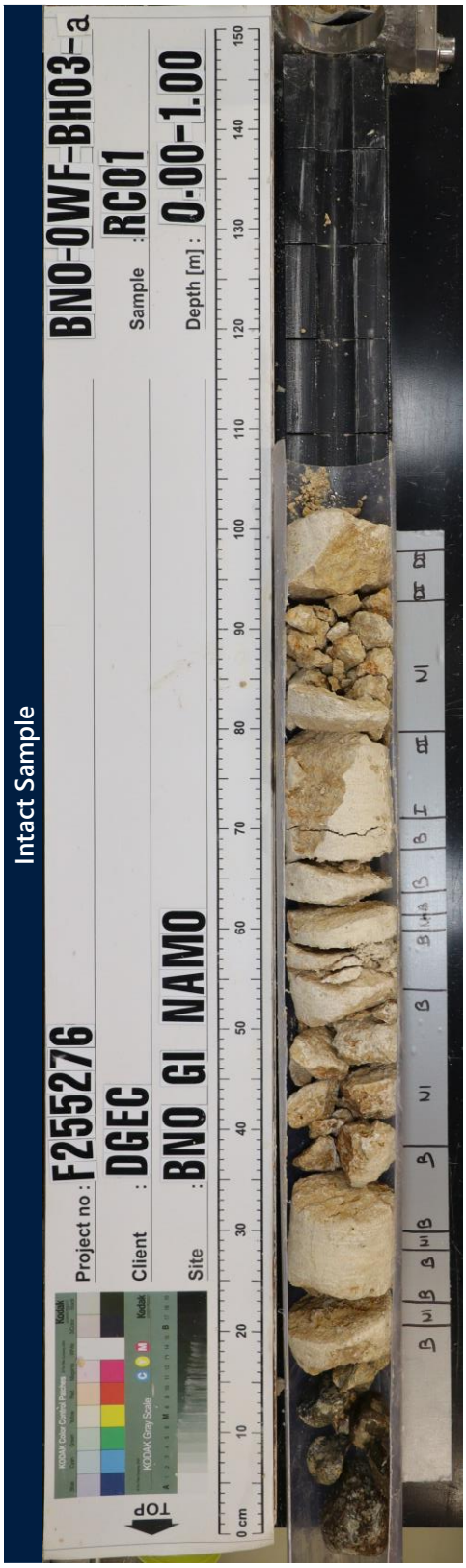
Processed by: LFA Date: 20-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH03\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



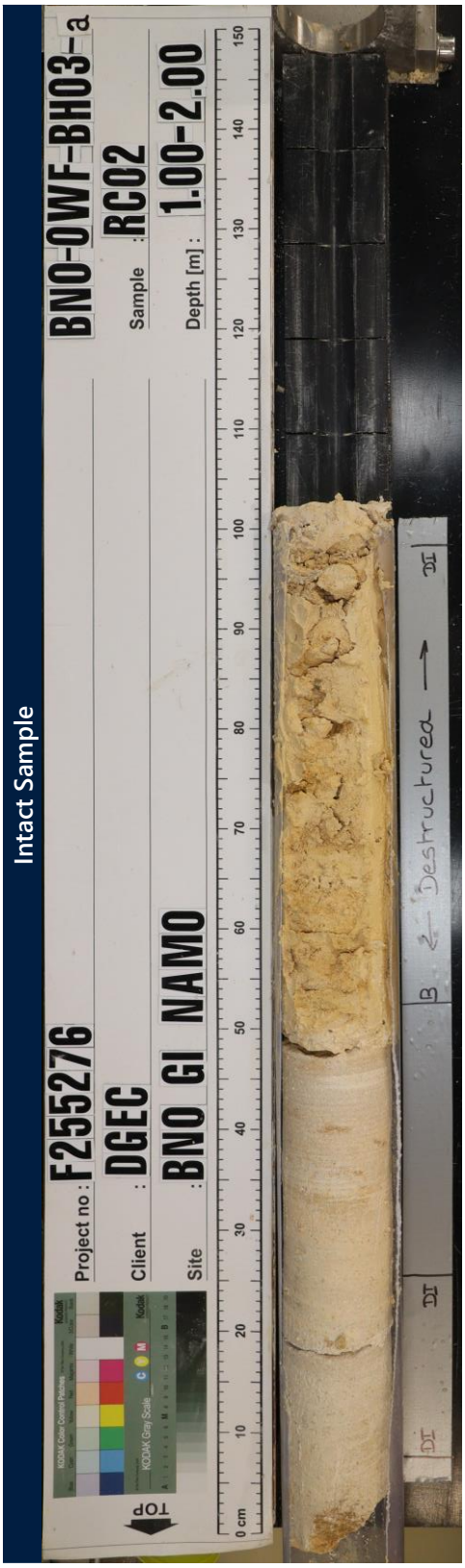
Sample Point : BNO-OWF-BH03 Sample : RC14 Depth [m BSF] : 19.00 to 20.50

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 20-Aug-2025 Photo Folder: ...I NAMO\From Field\Photos\BNO-OWF-BH03-a\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

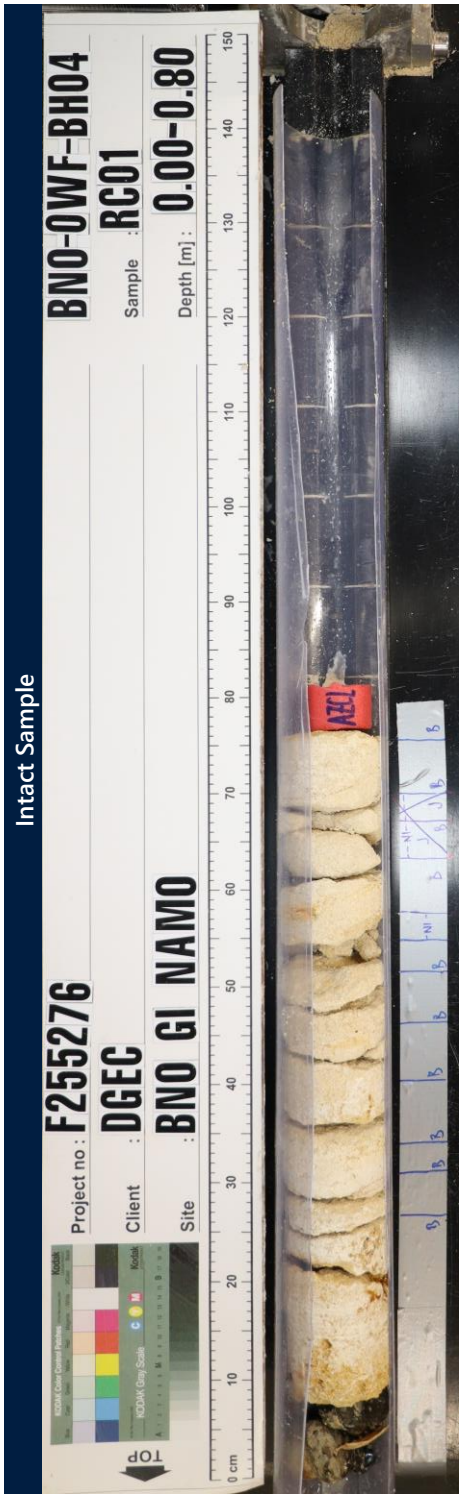


Sample Point : BNO-OWF-BH03-a Sample : RC01 Depth [m BSF] : 0.00 to 1.00



Sample Point : BNO-OWF-BH03-a Sample : RC02 Depth [m BSF] : 1.00 to 2.00

SAMPLE PHOTOGRAPHS



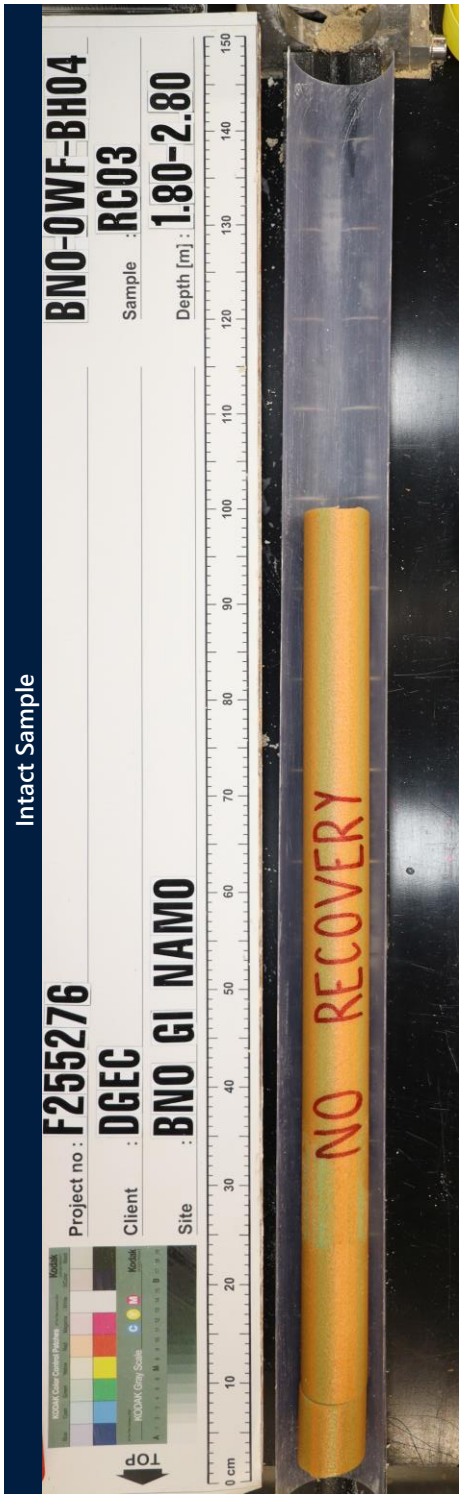
Sample Point : BNO-OWF-BH04 Sample : RC01 Depth [m BSF] : 0.00 to 0.80

Sample Point : BNO-OWF-BH04 Sample : RC02 Depth [m BSF] : 0.80 to 1.80

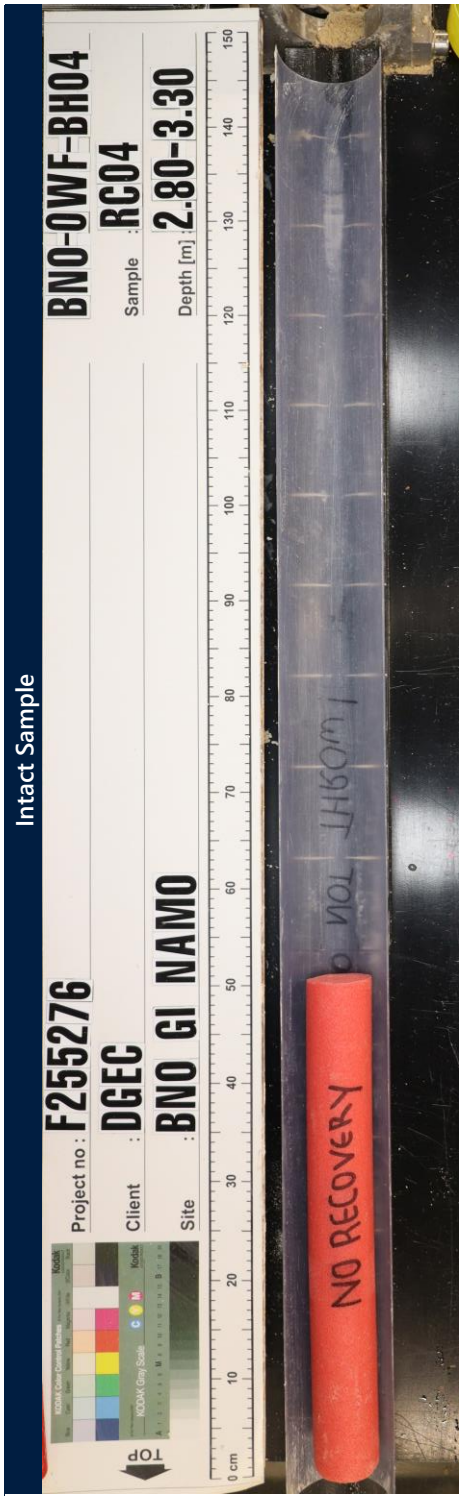
Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

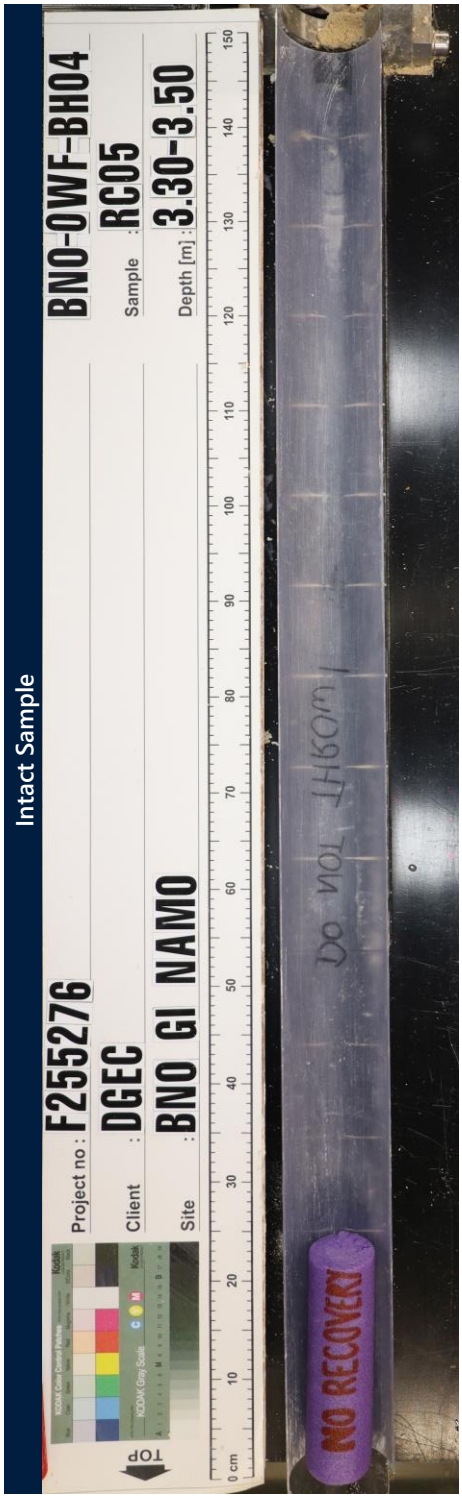


Sample Point : BNO-OWF-BH04 Sample : RC03 Depth [m BSF] : 1.80 to 2.80

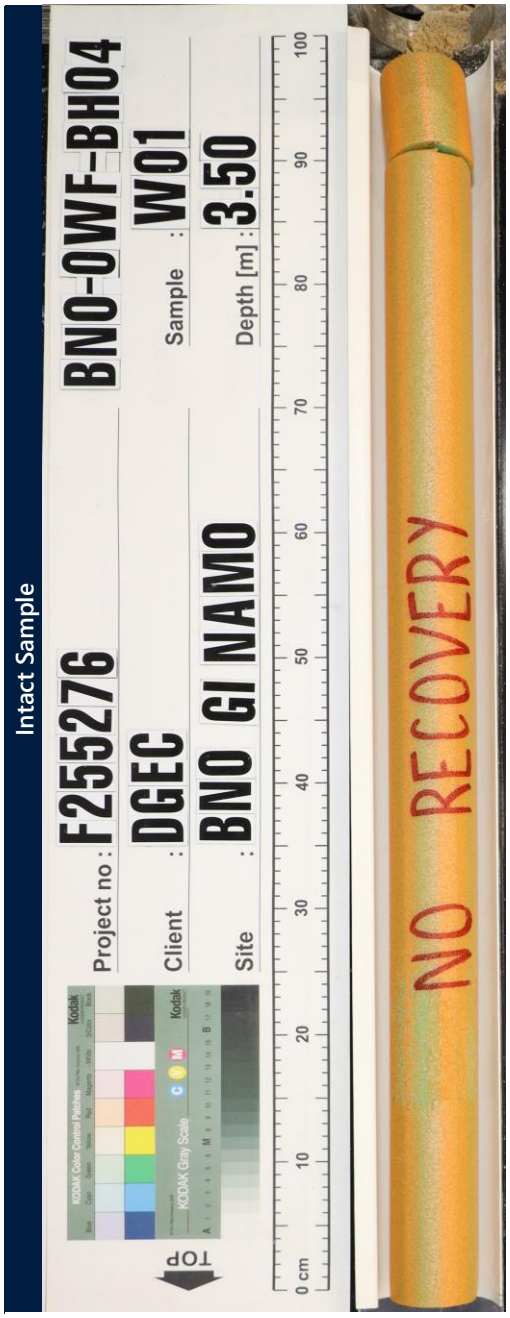


Sample Point : BNO-OWF-BH04 Sample : RC04 Depth [m BSF] : 2.80 to 3.30

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH04 Sample : RC05 Depth [m BSF] : 3.30 to 3.50

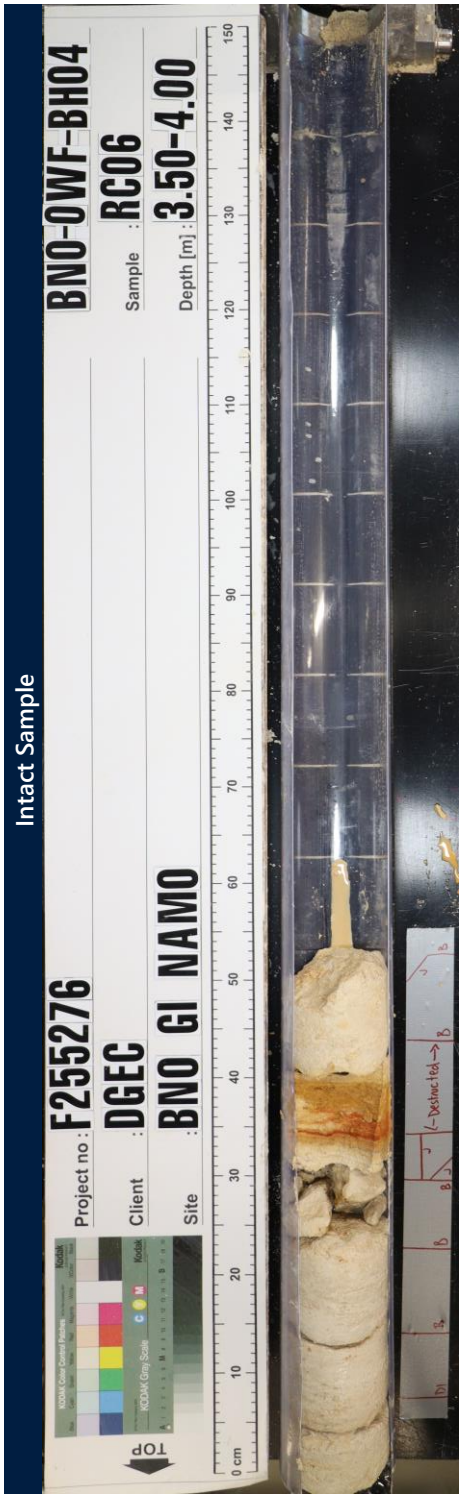


Sample Point : BNO-OWF-BH04 Sample : W01 Depth [m BSF] : 3.50

Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

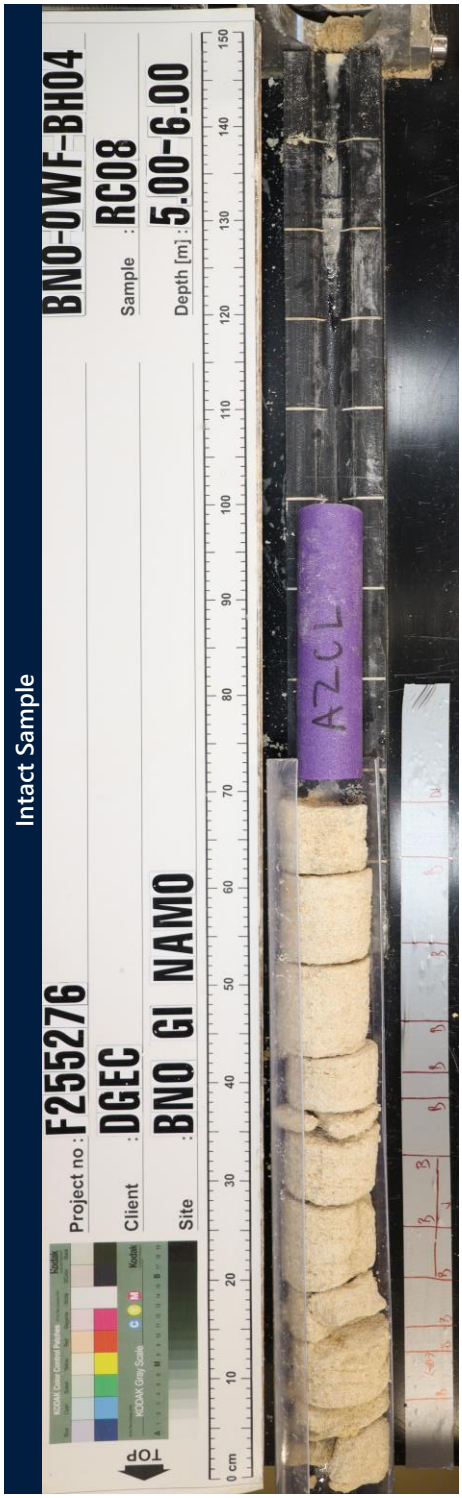
Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH04 Sample : RC06 Depth [m BSF] : 3.50 to 4.00

Sample Point : BNO-OWF-BH04 Sample : RC07 Depth [m BSF] : 4.00 to 5.00

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH04 Sample : RC08 Depth [m BSF] : 5.00 to 6.00

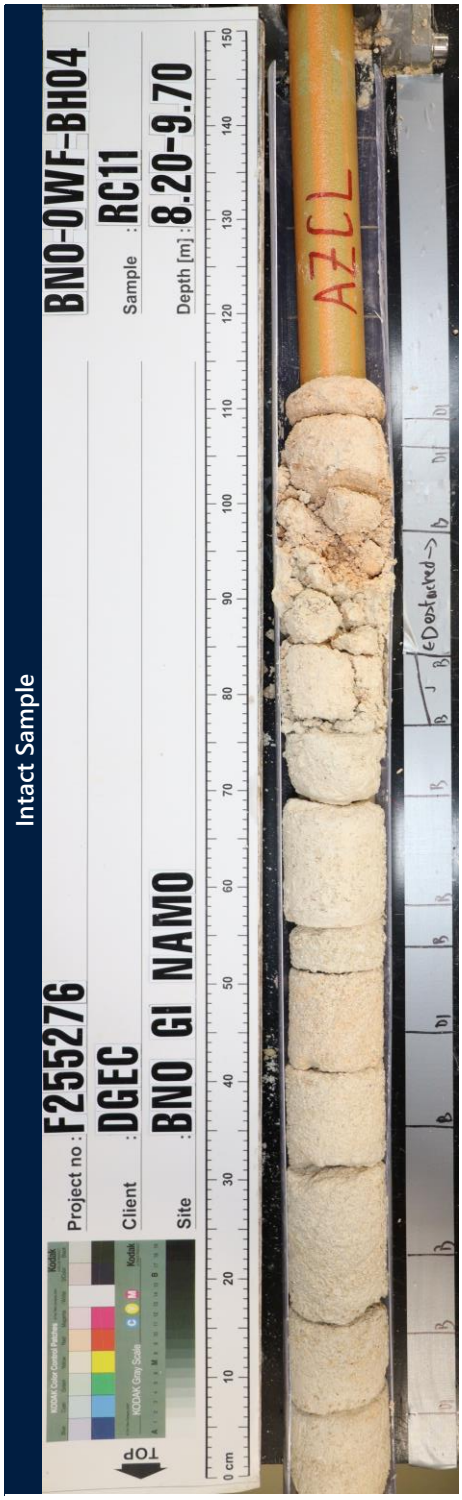
Sample Point : BNO-OWF-BH04 Sample : RC09 Depth [m BSF] : 6.00 to 7.00

Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH04 Sample : RC10 Depth [m BSF] : 7.00 to 8.20



Sample Point : BNO-OWF-BH04 Sample : RC11 Depth [m BSF] : 8.20 to 9.70

SAMPLE PHOTOGRAPHS

Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH04 Sample : RC12 Depth [m BSF] : 9.70 to 11.20

Sample Point : BNO-OWF-BH04 Sample : RC13 Depth [m BSF] : 11.20 to 12.70

SAMPLE PHOTOGRAPHS

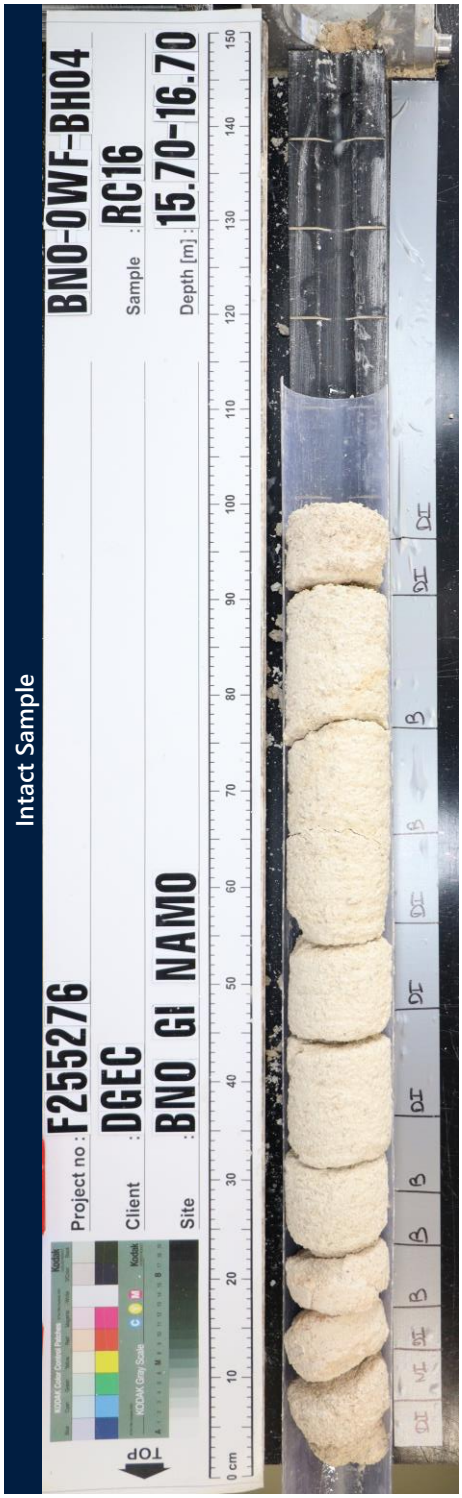
Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH04 Sample : RC14 Depth [m BSF] : 12.70 to 14.20

Sample Point : BNO-OWF-BH04 Sample : RC15 Depth [m BSF] : 14.20 to 15.70

SAMPLE PHOTOGRAPHS

Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH04 Sample : RC16 Depth [m BSF] : 15.70 to 16.70

Sample Point : BNO-OWF-BH04 Sample : RC17 Depth [m BSF] : 16.70 to 17.20

SAMPLE PHOTOGRAPHS

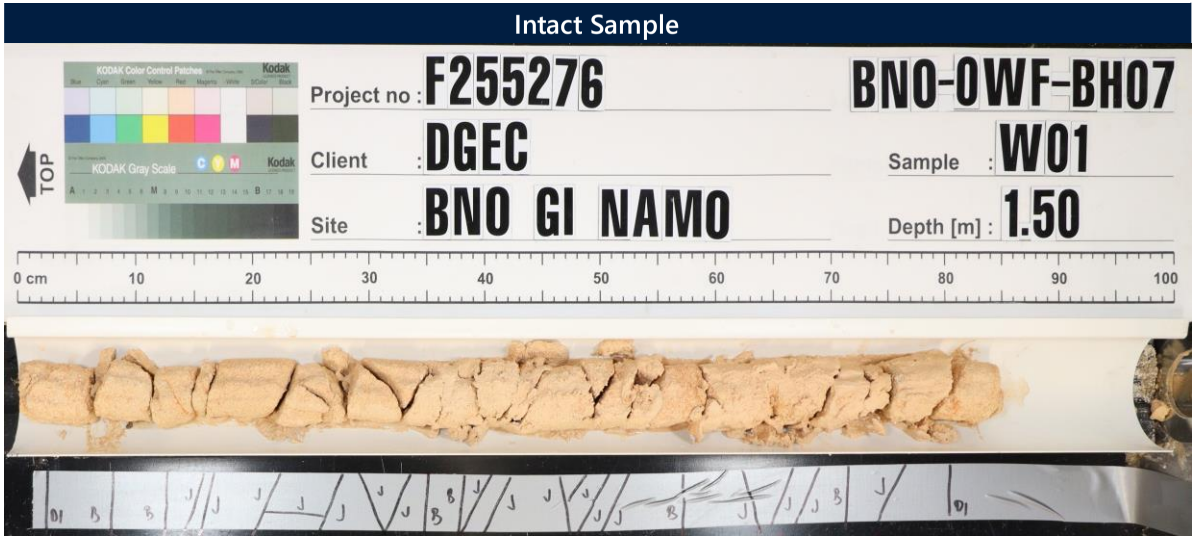
Processed by: XXX Date: 25-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH04\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH04 Sample : RC18 Depth [m BSF] : 17.20 to 18.70

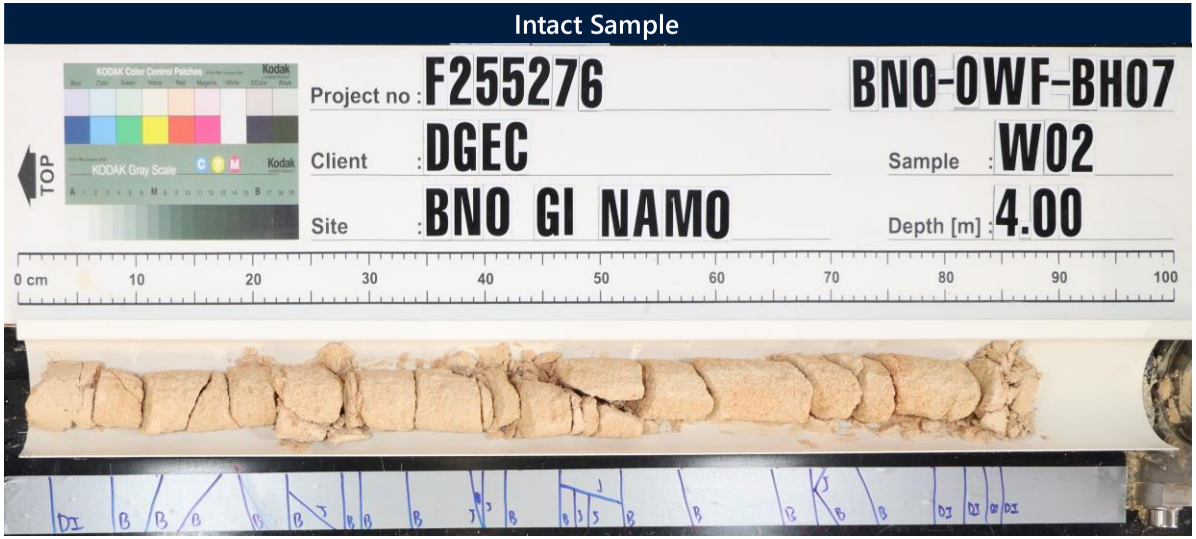
Sample Point : BNO-OWF-BH04 Sample : RC19 Depth [m BSF] : 18.70 to 20.20

SAMPLE PHOTOGRAPHS

SAMPLE PHOTOGRAPHS



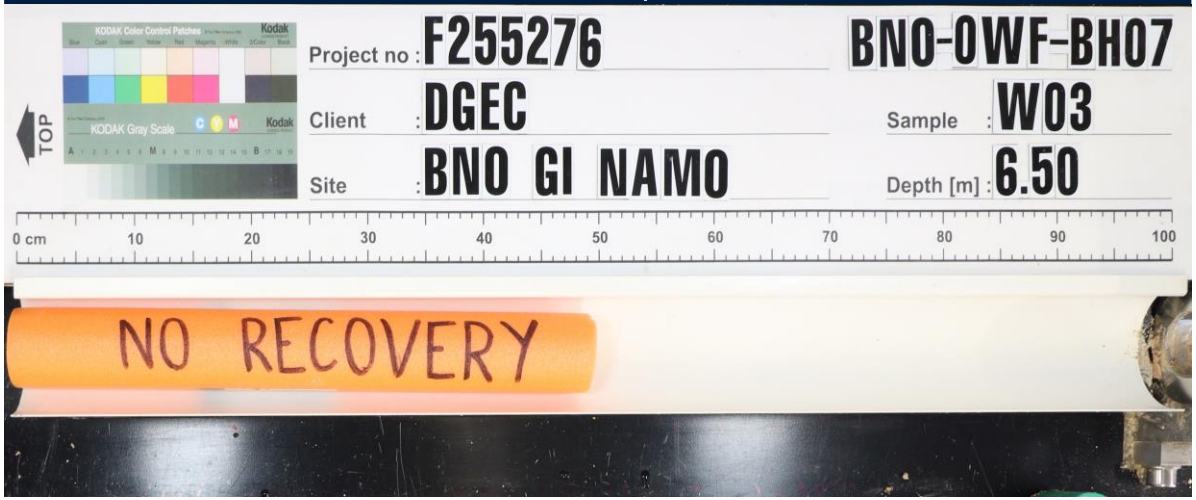
Sample Point : BNO-OWF-BH07 Sample : W01 Depth [m BSF] : 1.50



Sample Point : BNO-OWF-BH07 Sample : W02 Depth [m BSF] : 4.00

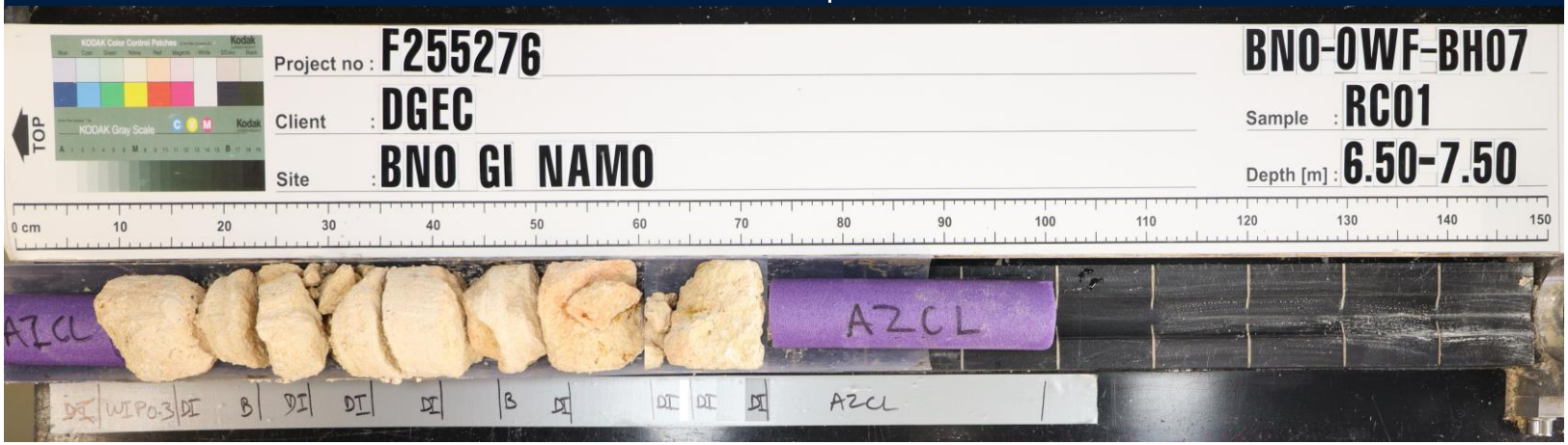
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH07 Sample : W03 Depth [m BSF] : 6.50

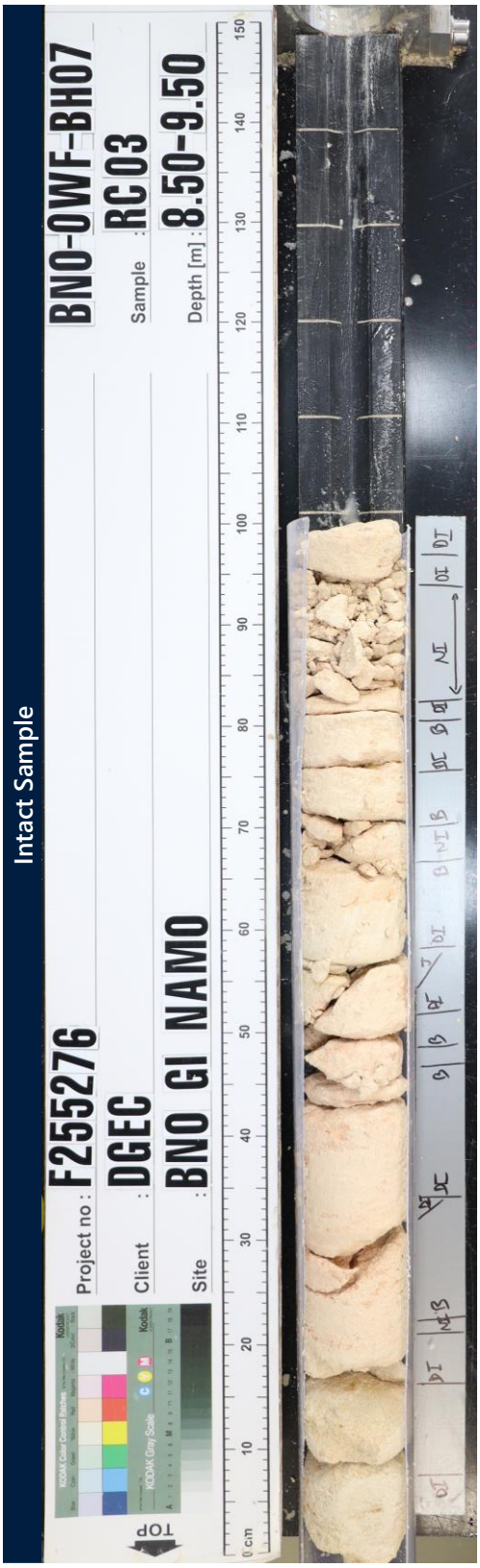
Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC01 Depth [m BSF] : 6.50 to 7.50

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH07\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH07 Sample : RC02 Depth [m BSF] : 7.50 to 8.50



Sample Point : BNO-OWF-BH07 Sample : RC03 Depth [m BSF] : 8.50 to 9.50

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH07\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

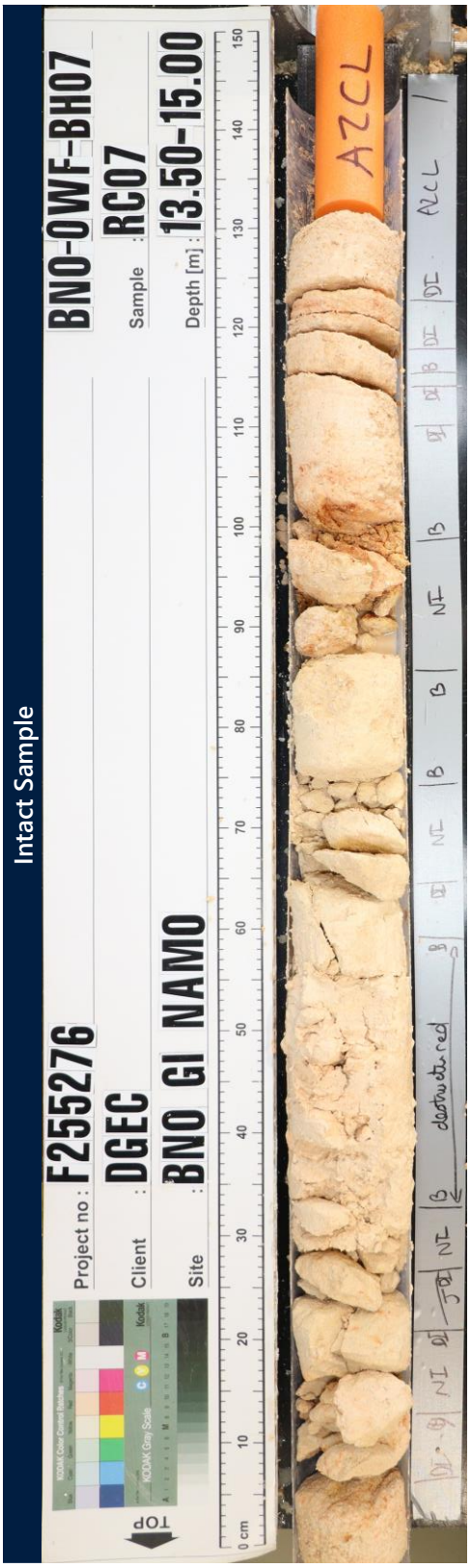
Sample Point : BNO-OWF-BH07 Sample : RC04 Depth [m BSF] : 9.50 to 10.50

Sample Point : BNO-OWF-BH07 Sample : RC05 Depth [m BSF] : 10.50 to 12.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH07\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH07 Sample : RC06 Depth [m BSF] : 12.00 to 13.50



Sample Point : BNO-OWF-BH07 Sample : RC07 Depth [m BSF] : 13.50 to 15.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH07\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

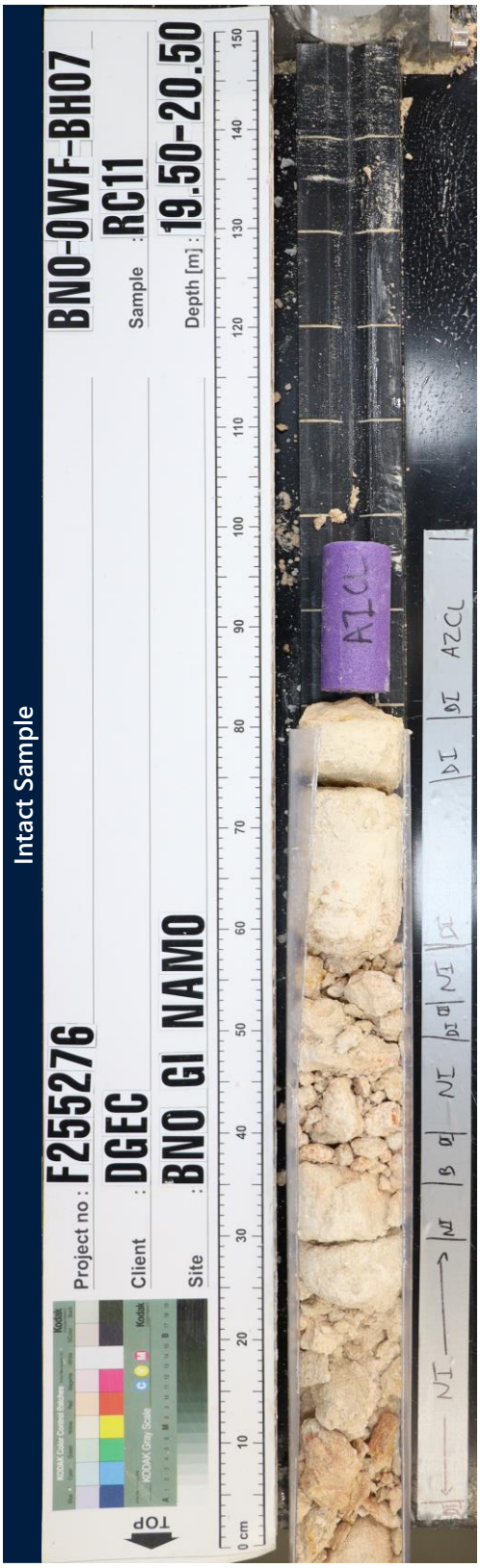
Sample Point : BNO-OWF-BH07 Sample : RC08 Depth [m BSF] : 15.00 to 16.50

Sample Point : BNO-OWF-BH07 Sample : RC09 Depth [m BSF] : 16.50 to 18.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH07\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH07 Sample : RC10 Depth [m BSF] : 18.00 to 19.50



Sample Point : BNO-OWF-BH07 Sample : RC11 Depth [m BSF] : 19.50 to 20.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH08 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

Sample Point : BNO-OWF-BH08 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH08 Sample : RC03 Depth [m BSF] : 2.00 to 3.00

Sample Point : BNO-OWF-BH08 Sample : RC04 Depth [m BSF] : 3.00 to 4.50

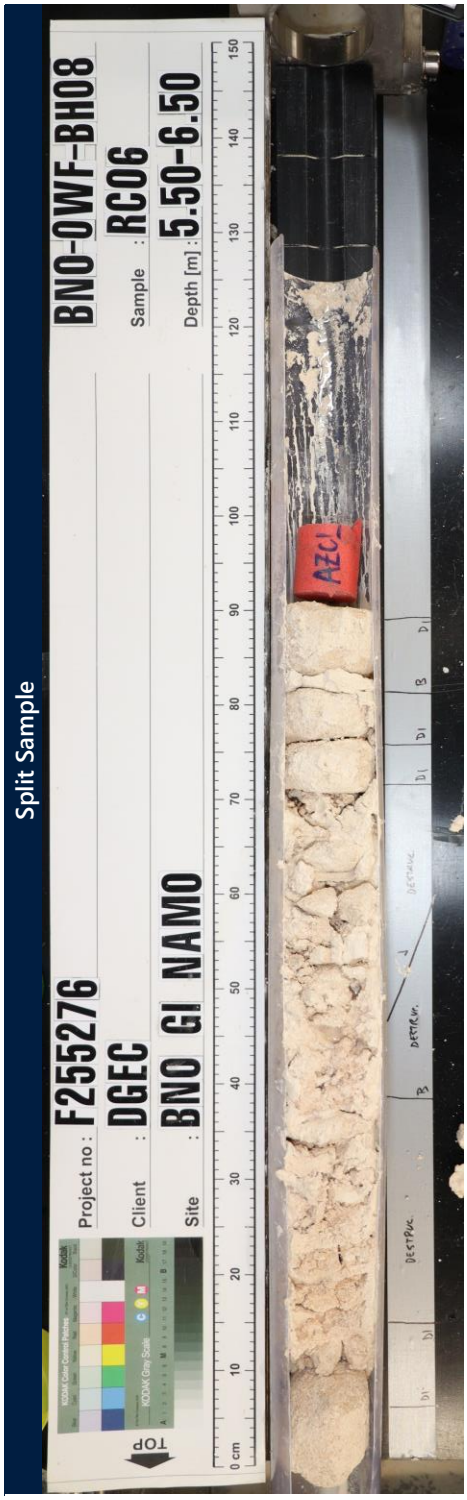
SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH08 Sample : RC05 Depth [m BSF] : 4.50 to 5.50

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH08 Sample : RC06 Depth [m BSF] : 5.50 to 6.50



Sample Point : BNO-OWF-BH08 Sample : RC06 Depth [m BSF] : 5.50 to 6.50

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SAMPLE PHOTOGRAPHS

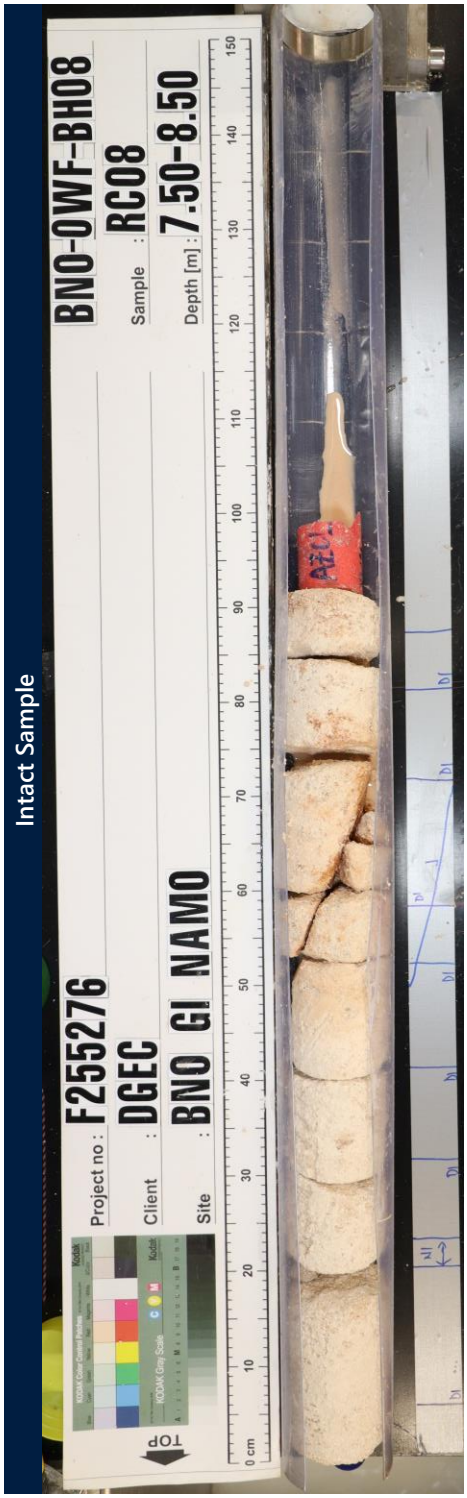
Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH08 Sample : RC07 Depth [m BSF] : 6.50 to 7.50

Sample Point : BNO-OWF-BH08 Sample : RC07 Depth [m BSF] : 6.50 to 7.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH08 Sample : RC08 Depth [m BSF] : 7.50 to 8.50

Sample Point : BNO-OWF-BH08 Sample : RC09 Depth [m BSF] : 8.50 to 9.50

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH08 Sample : RC10 Depth [m BSF] : 9.50 to 11.00

Sample Point : BNO-OWF-BH08 Sample : RC11 Depth [m BSF] : 11.00 to 12.50

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

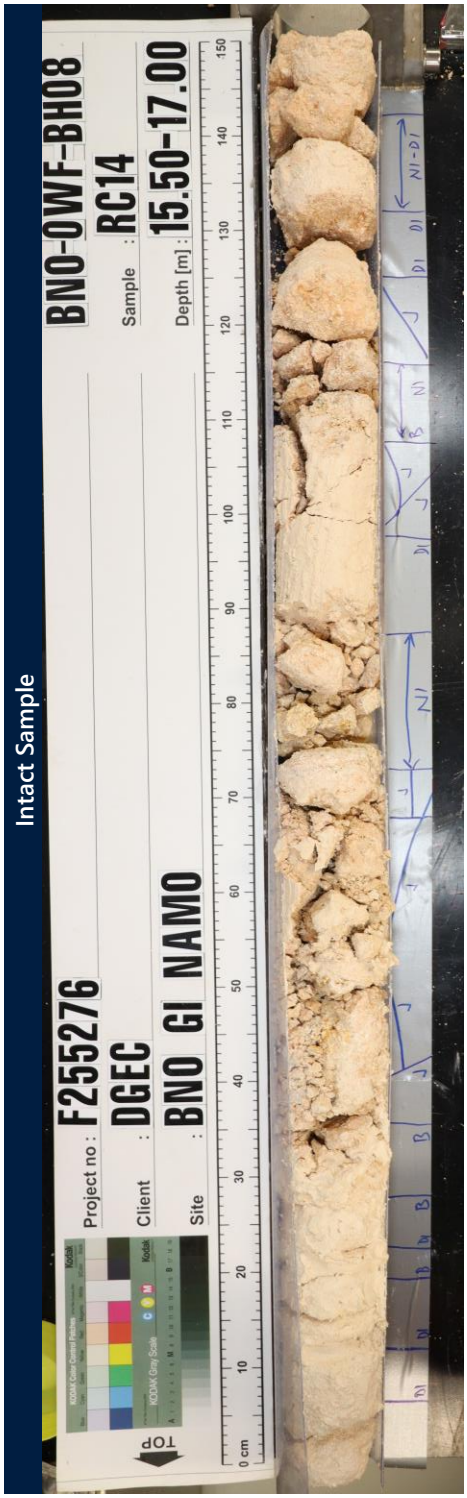
SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH08 Sample : RC12 Depth [m BSF] : 12.50 to 14.00

Sample Point : BNO-OWF-BH08 Sample : RC13 Depth [m BSF] : 14.00 to 15.50

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH08 Sample : RC14 Depth [m BSF] : 15.50 to 17.00

Sample Point : BNO-OWF-BH08 Sample : RC15 Depth [m BSF] : 17.00 to 18.50

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 16-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH08\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH08 Sample : RC16 Depth [m BSF] : 18.50 to 19.50

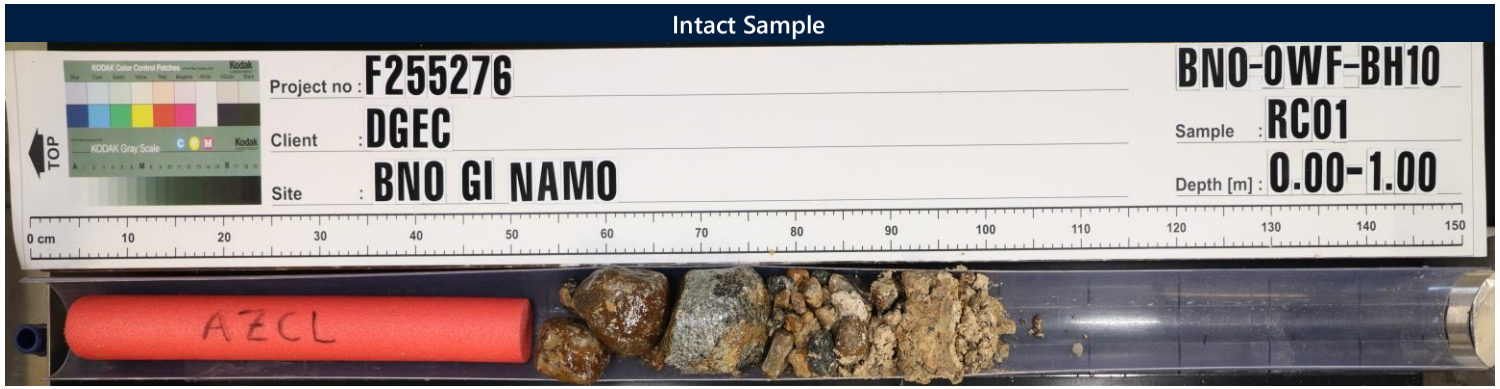
Sample Point : BNO-OWF-BH08 Sample : RC17 Depth [m BSF] : 19.50 to 20.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

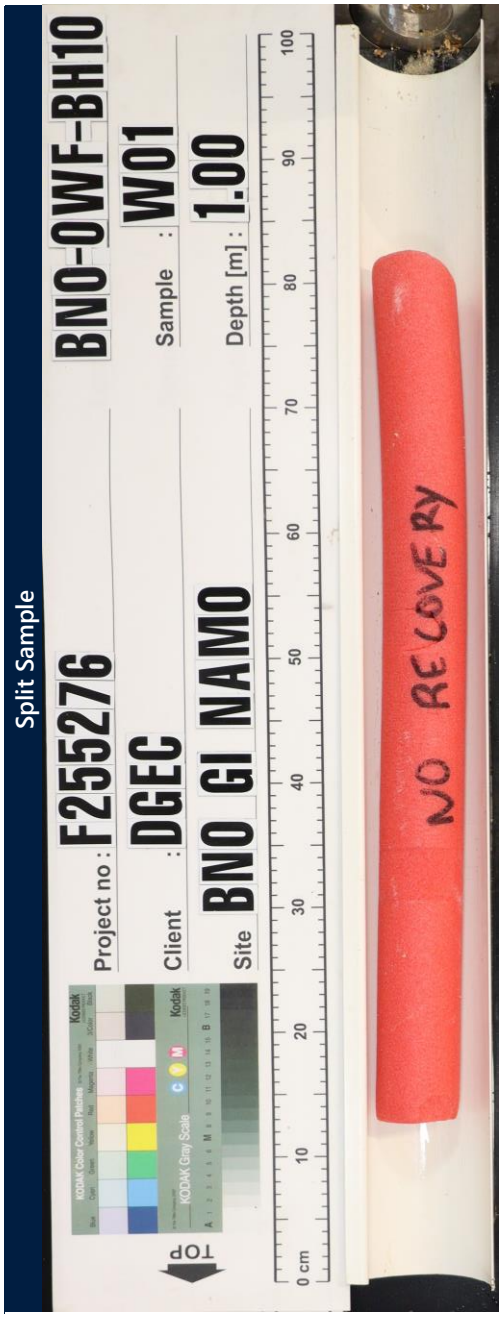
Intact Sample



Sample Point : BNO-OWF-BH10 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

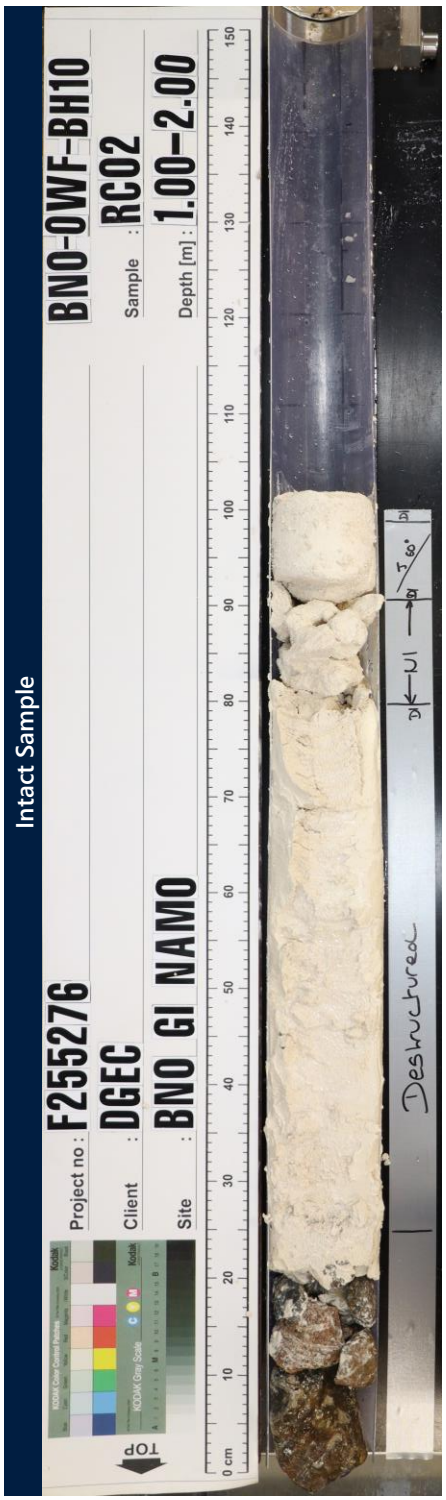
Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH10 Sample : W01 Depth [m BSF] : 1.00

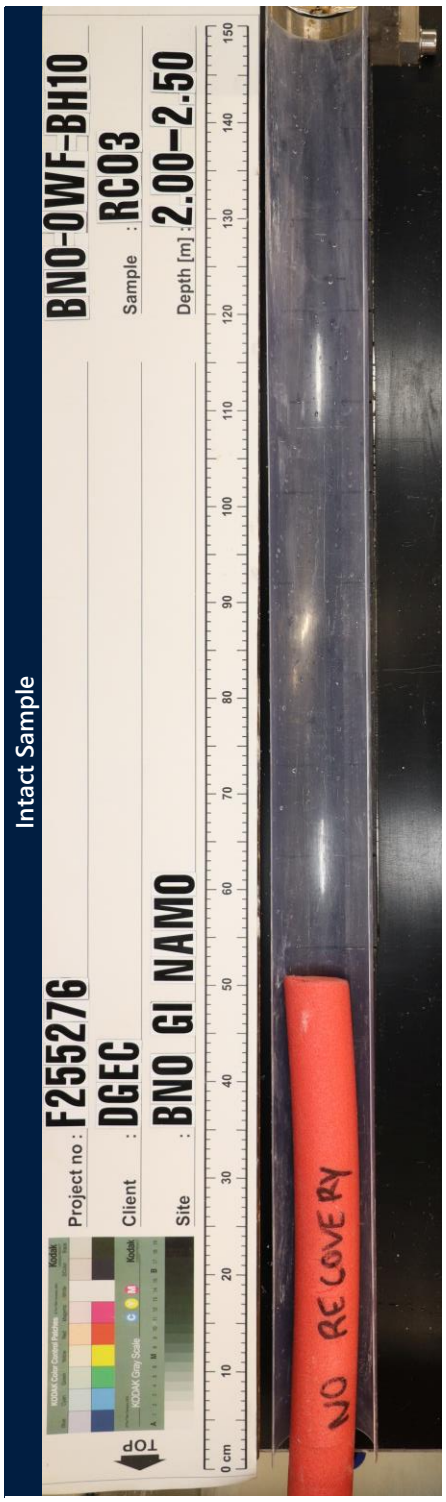


Sample Point : BNO-OWF-BH10 Sample : W01 Depth [m BSF] : 1.00

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH10 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

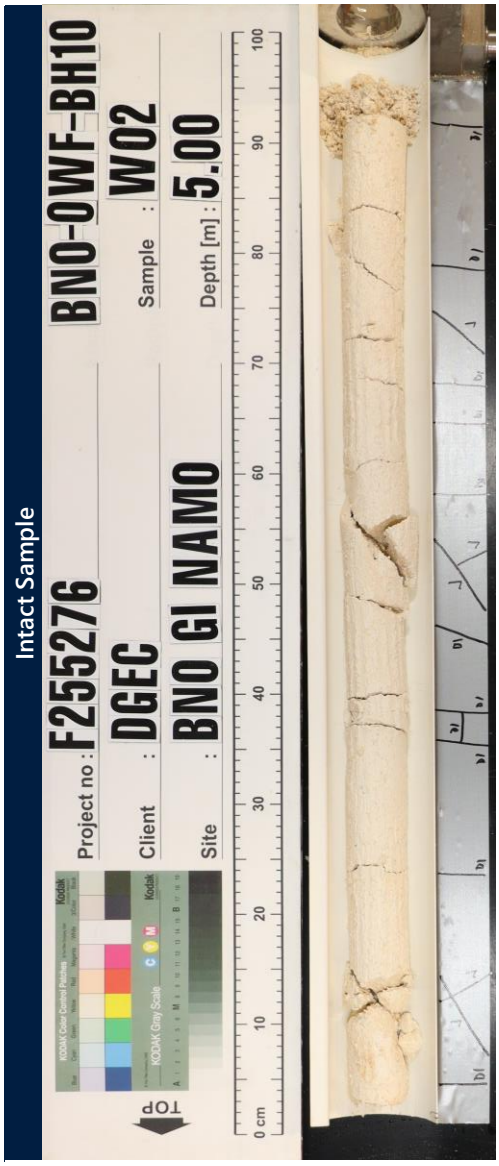


Sample Point : BNO-OWF-BH10 Sample : RC03 Depth [m BSF] : 2.00 to 2.50

Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH10 Sample : RC04 Depth [m BSF] : 2.50 to 3.50

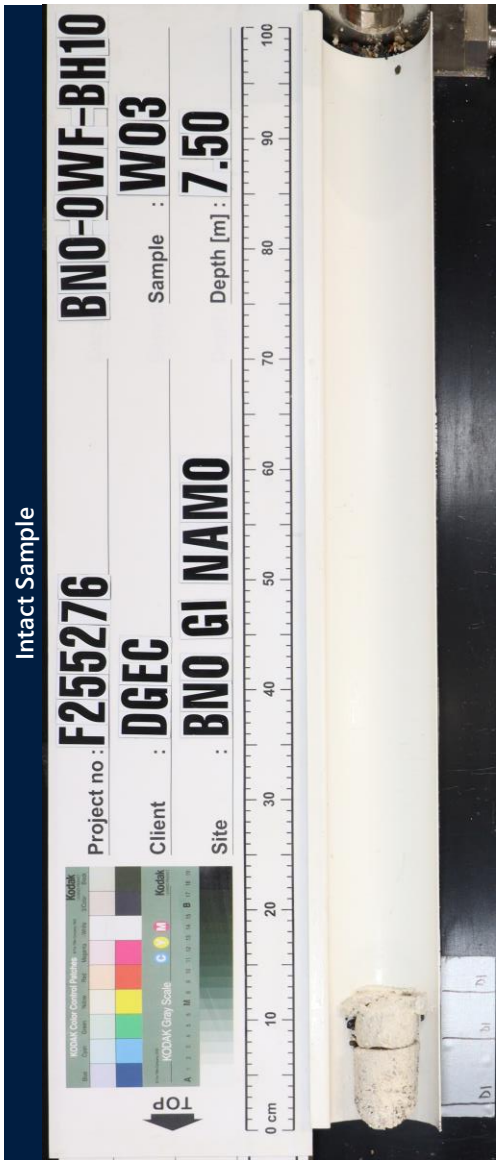


Sample Point : BNO-OWF-BH10 Sample : W02 Depth [m BSF] : 5.00

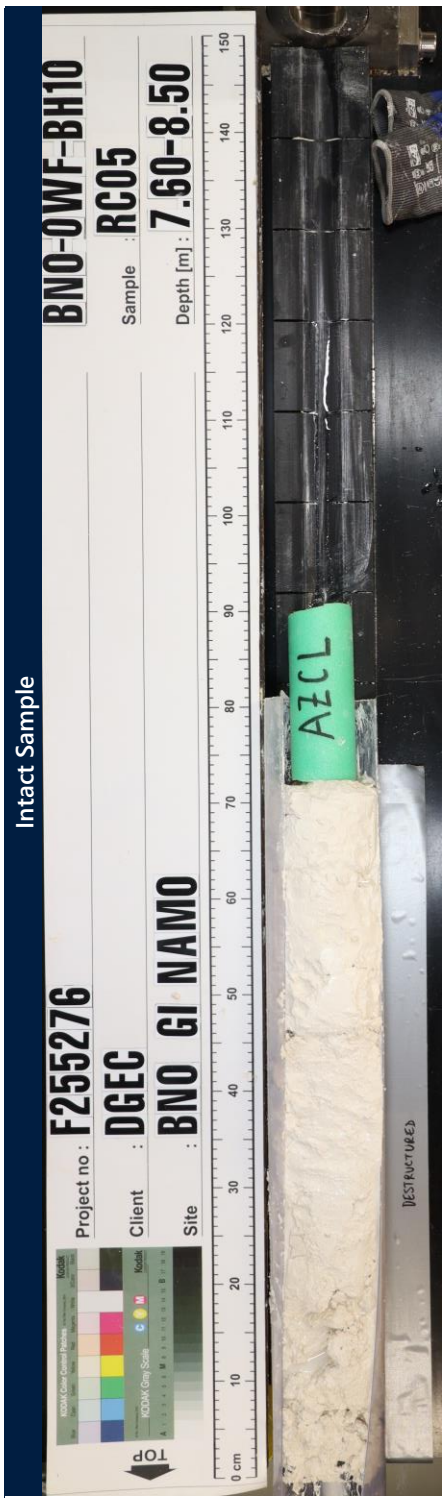
Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



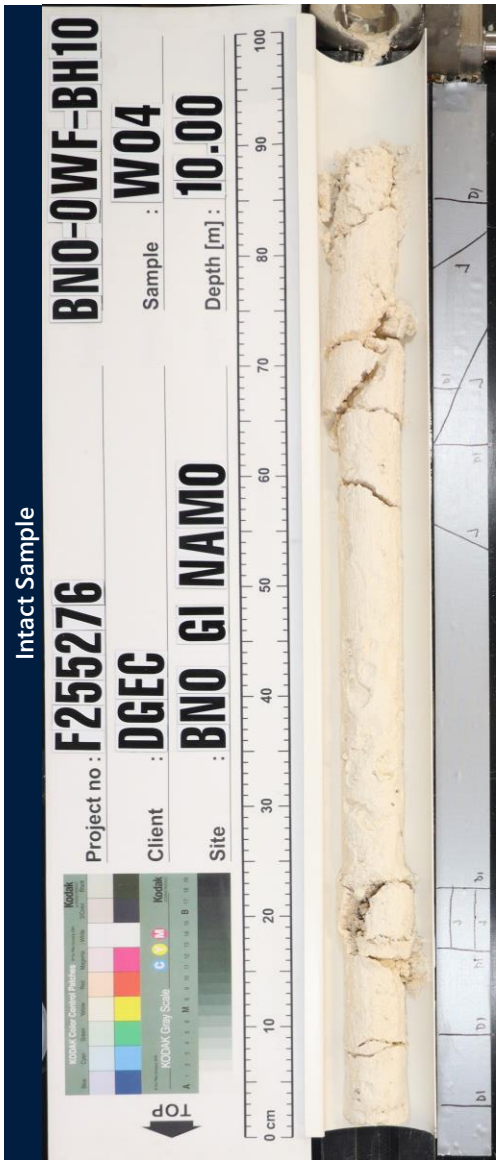
Sample Point : BNO-OWF-BH10 Sample : W03 Depth [m BSF] : 7.50



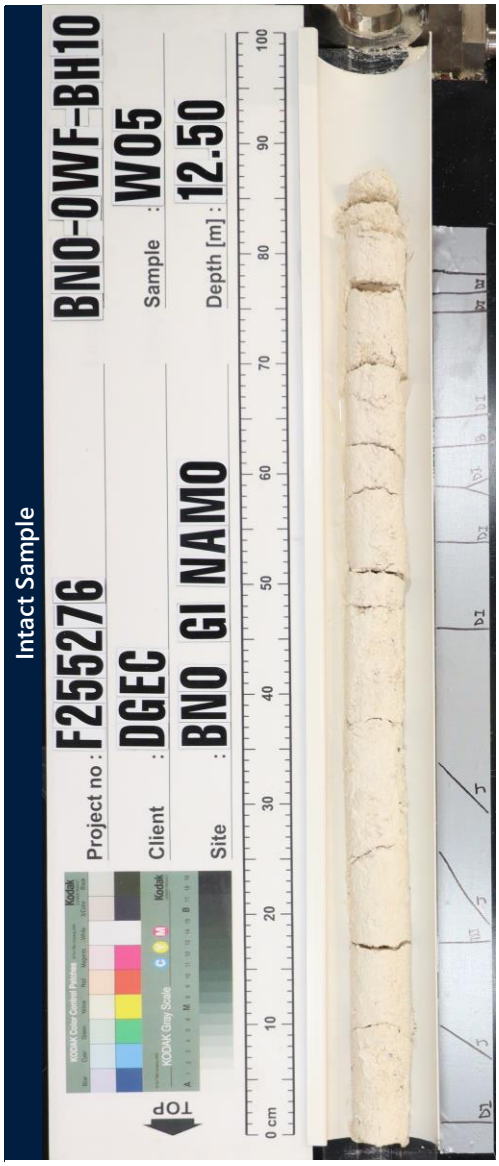
Sample Point : BNO-OWF-BH10 Sample : RC05 Depth [m BSF] : 7.60 to 8.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



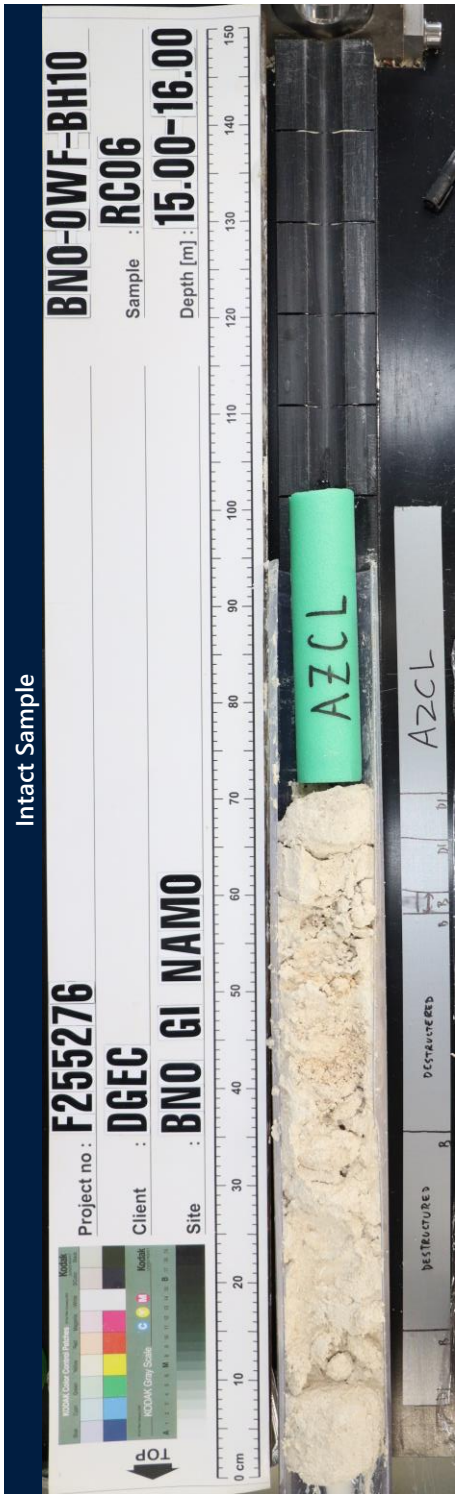
Sample Point : BNO-OWF-BH10 Sample : W04 Depth [m BSF] : 10.00



Sample Point : BNO-OWF-BH10 Sample : W05 Depth [m BSF] : 12.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH10 Sample : RC06 Depth [m BSF] : 15.00 to 16.00

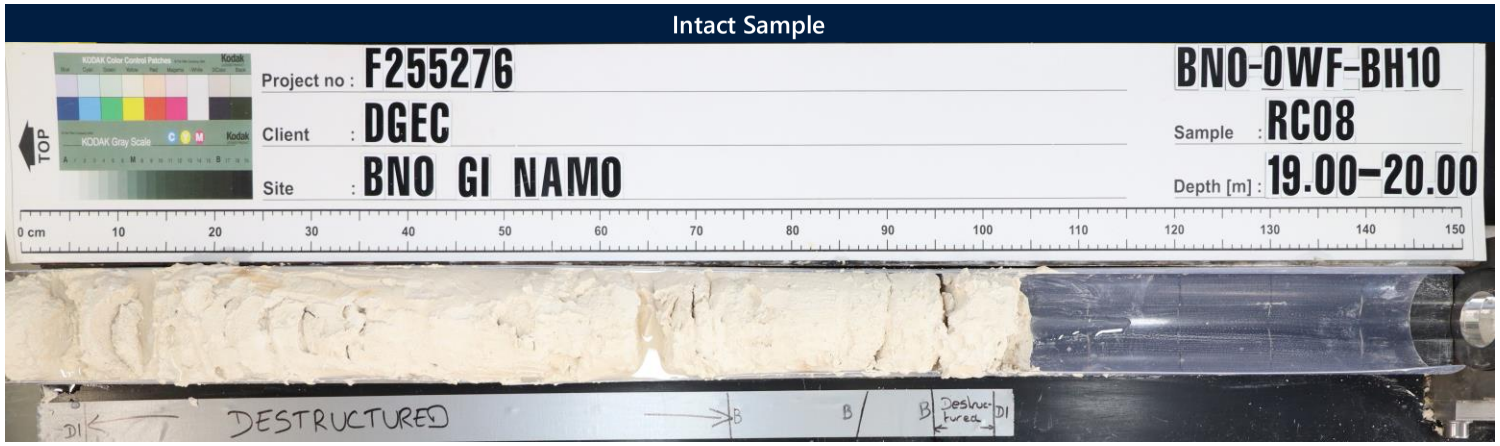
Sample Point : BNO-OWF-BH10 Sample : RC07 Depth [m BSF] : 16.50 to 17.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 15-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH10\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH10 Sample : RC08 Depth [m BSF] : 19.00 to 20.00

Sample Point : BNO-OWF-BH11 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

Sample Point : BNO-OWF-BH11 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

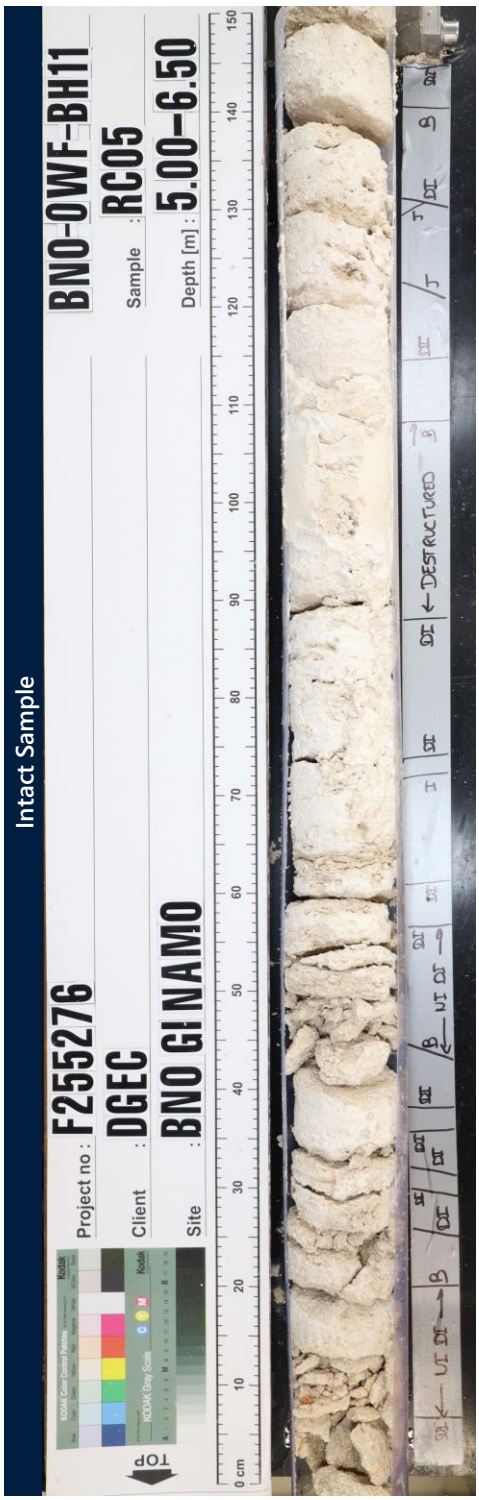
SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH11 Sample : RC03 Depth [m BSF] : 2.00 to 3.50

Sample Point : BNO-OWF-BH11 Sample : RC04 Depth [m BSF] : 3.50 to 5.00

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH11 Sample : RC05 Depth [m BSF] : 5.00 to 6.50

Sample Point : BNO-OWF-BH11 Sample : RC06 Depth [m BSF] : 6.50 to 8.00

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

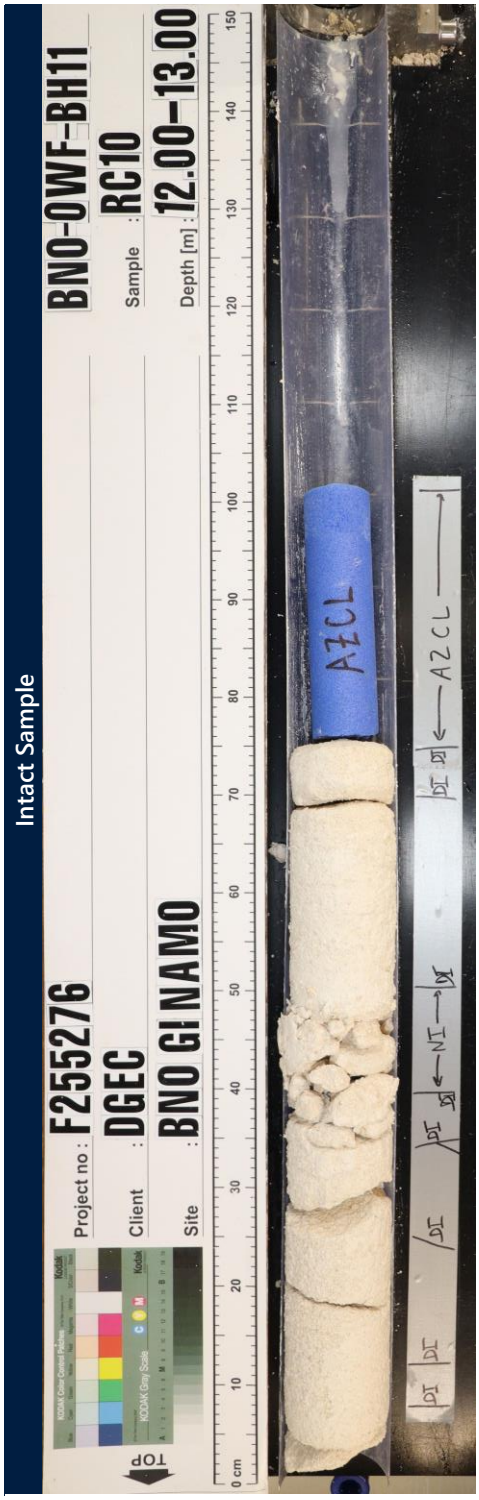
Sample Point : BNO-OWF-BH11 Sample : RC07 Depth [m BSF] : 8.00 to 9.50

Sample Point : BNO-OWF-BH11 Sample : RC08 Depth [m BSF] : 9.50 to 11.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH11 Sample : RC09 Depth [m BSF] : 11.00 to 12.00



Sample Point : BNO-OWF-BH11 Sample : RC10 Depth [m BSF] : 12.00 to 13.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

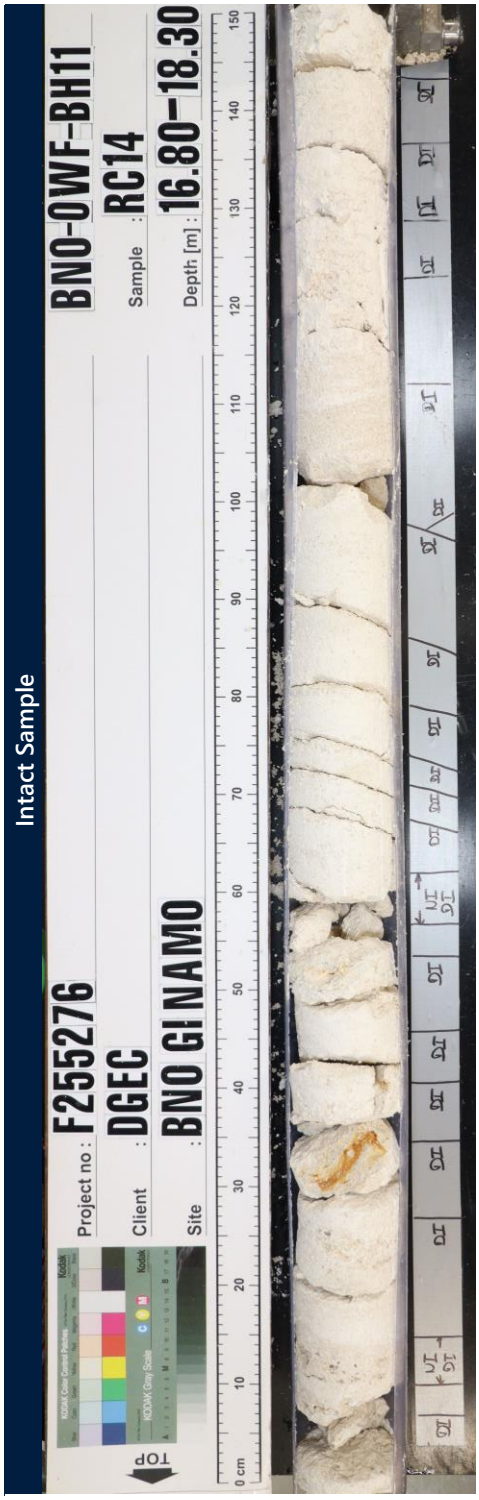
Sample Point : BNO-OWF-BH11 Sample : RC11 Depth [m BSF] : 13.00 to 14.50

Sample Point : BNO-OWF-BH11 Sample : RC12 Depth [m BSF] : 14.50 to 15.50

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH11 Sample : RC13 Depth [m BSF] : 15.50 to 16.80

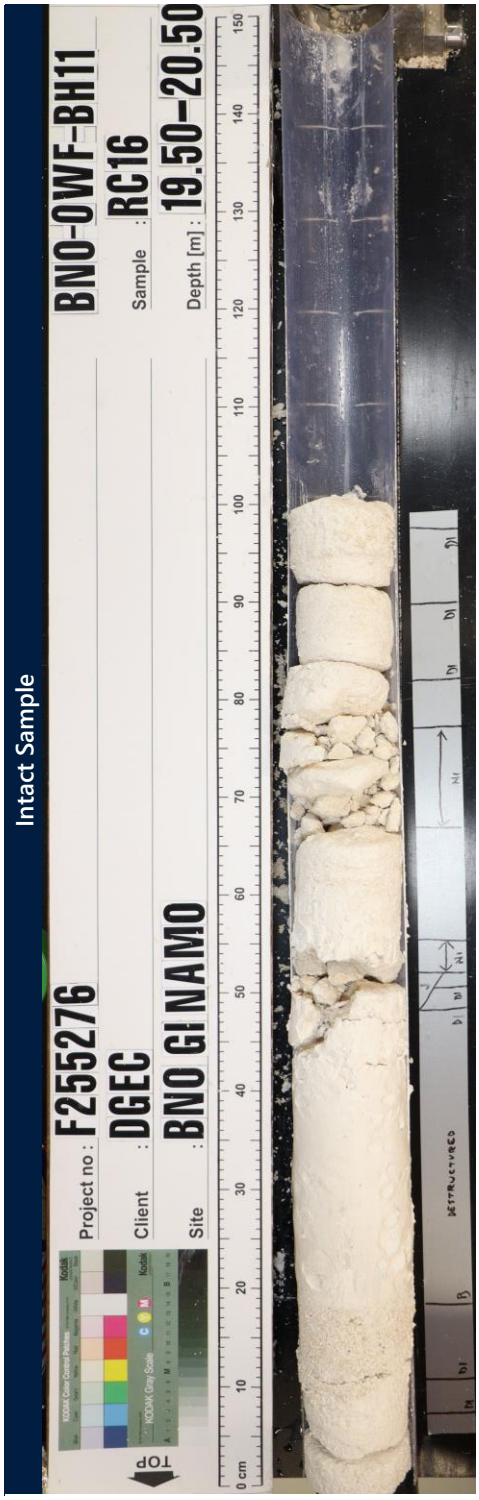


Sample Point : BNO-OWF-BH11 Sample : RC14 Depth [m BSF] : 16.80 to 18.30

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 22-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH11\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH11 Sample : RC15 Depth [m BSF] : 18.30 to 19.50



Sample Point : BNO-OWF-BH11 Sample : RC16 Depth [m BSF] : 19.50 to 20.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

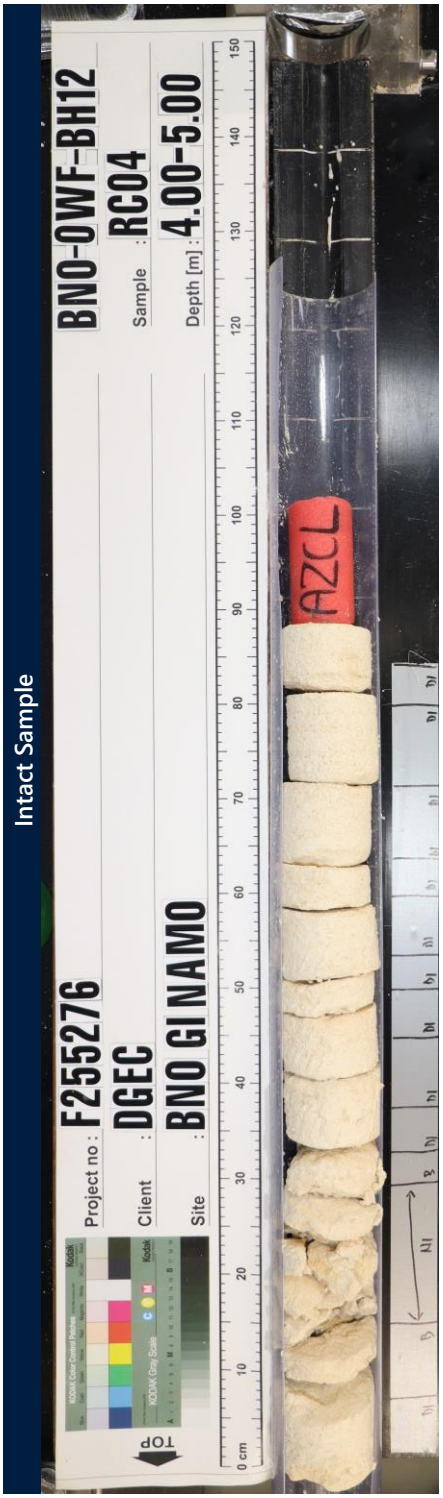
Sample Point : BNO-OWF-BH12 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

Sample Point : BNO-OWF-BH12 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

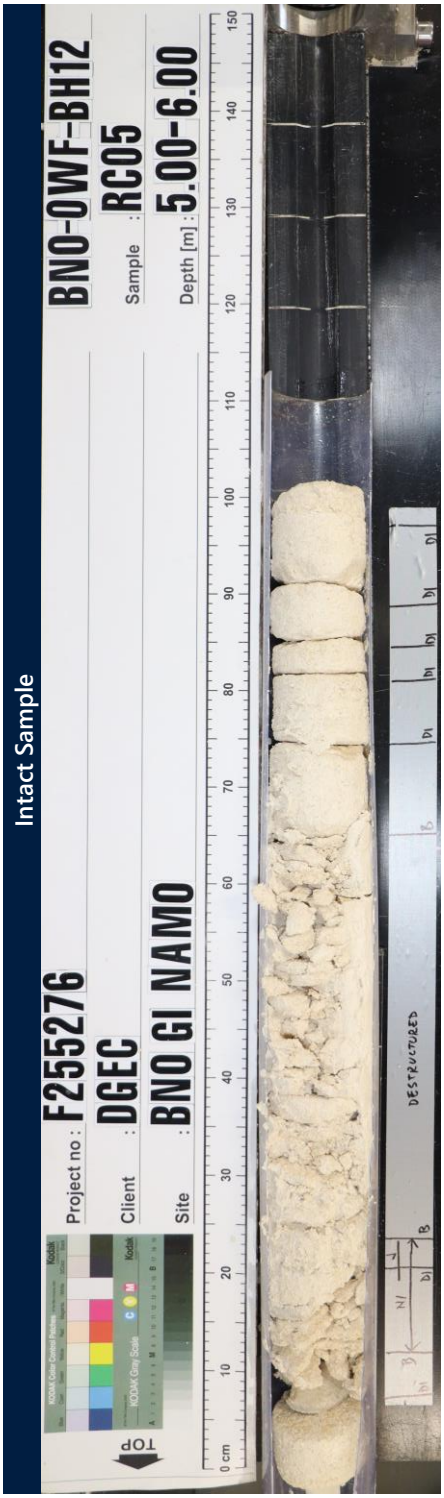
Sample Point : BNO-OWF-BH12 Sample : RC03 Depth [m BSF] : 3.00 to 4.00



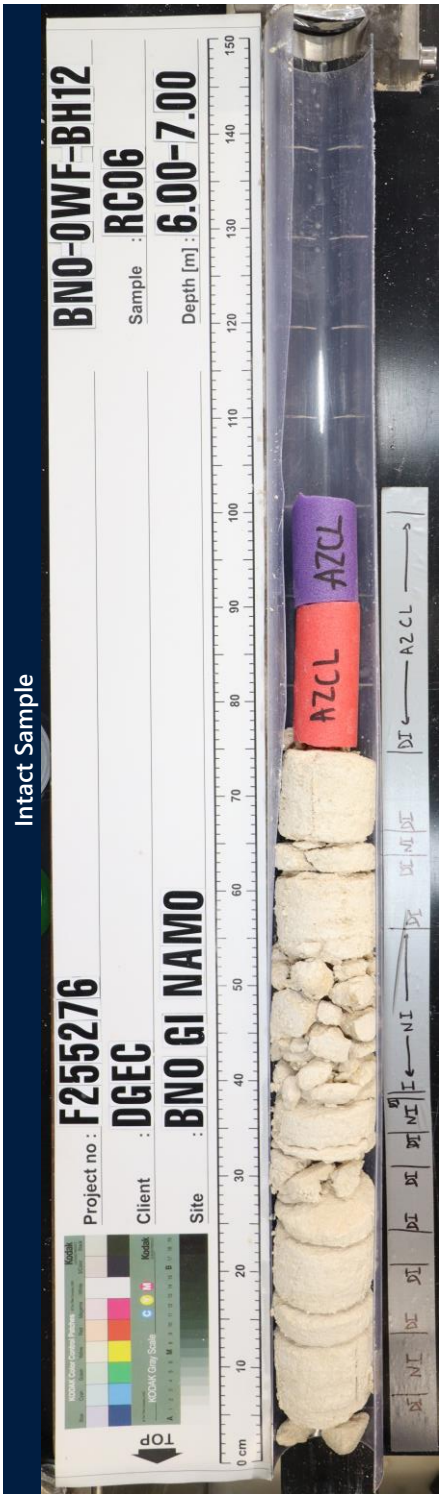
Sample Point : BNO-OWF-BH12 Sample : RC04 Depth [m BSF] : 4.00 to 5.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH12 Sample : RC05 Depth [m BSF] : 5.00 to 6.00



Sample Point : BNO-OWF-BH12 Sample : RC06 Depth [m BSF] : 6.00 to 7.00

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH12 Sample : RC07 Depth [m BSF] : 7.00 to 8.00

Sample Point : BNO-OWF-BH12 Sample : RC08 Depth [m BSF] : 8.00 to 9.00

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH12 Sample : RC09 Depth [m BSF] : 9.00 to 10.50

Sample Point : BNO-OWF-BH12 Sample : RC10 Depth [m BSF] : 10.50 to 12.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

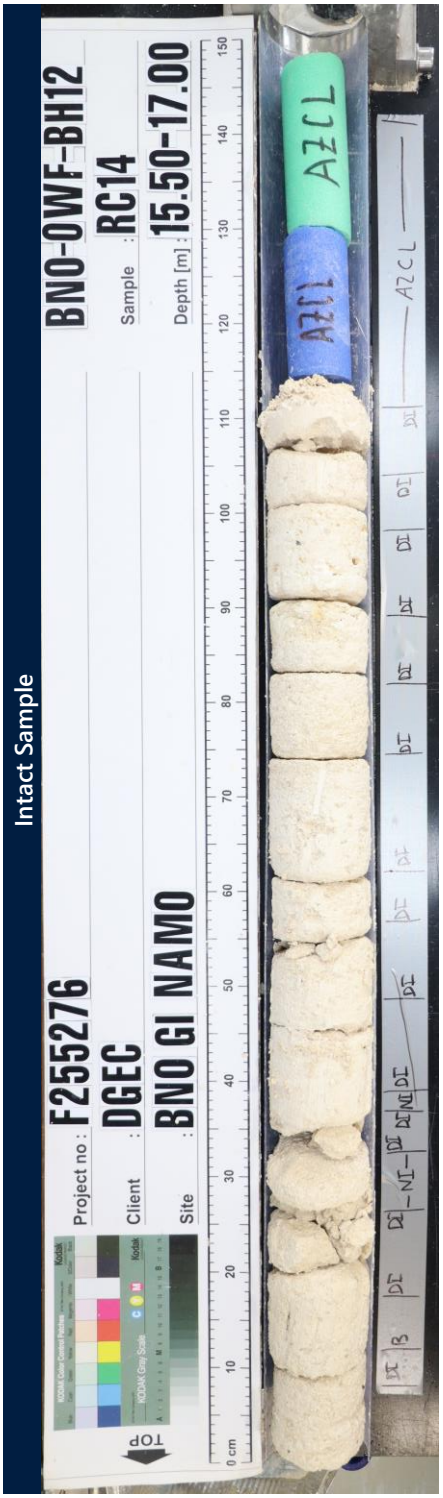
Sample Point : BNO-OWF-BH12 Sample : RC11 Depth [m BSF] : 12.00 to 13.50

Sample Point : BNO-OWF-BH12 Sample : RC12 Depth [m BSF] : 13.50 to 14.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH12 Sample : RC13 Depth [m BSF] : 14.50 to 15.50



Sample Point : BNO-OWF-BH12 Sample : RC14 Depth [m BSF] : 15.50 to 17.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...GI NAMO\From Field\Photos\BNO-OWF-BH12\014 Cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

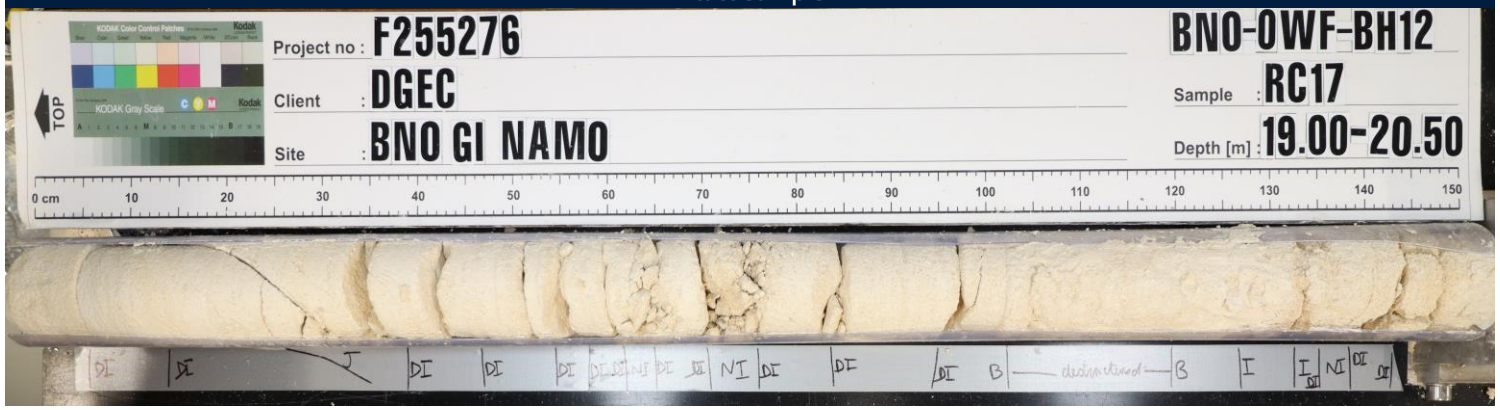
Sample Point : BNO-OWF-BH12 Sample : RC15 Depth [m BSF] : 17.00 to 18.00

Sample Point : BNO-OWF-BH12 Sample : RC16 Depth [m BSF] : 18.00 to 19.00

SAMPLE PHOTOGRAPHS

SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH12 Sample : RC17 Depth [m BSF] : 19.00 to 20.50

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ...I NAMO\From Field\Photos\BNO-OWF-BH12-a\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH12-a Sample : RC01 Depth [m BSF] : 0.00 to 1.00

SAMPLE PHOTOGRAPHS

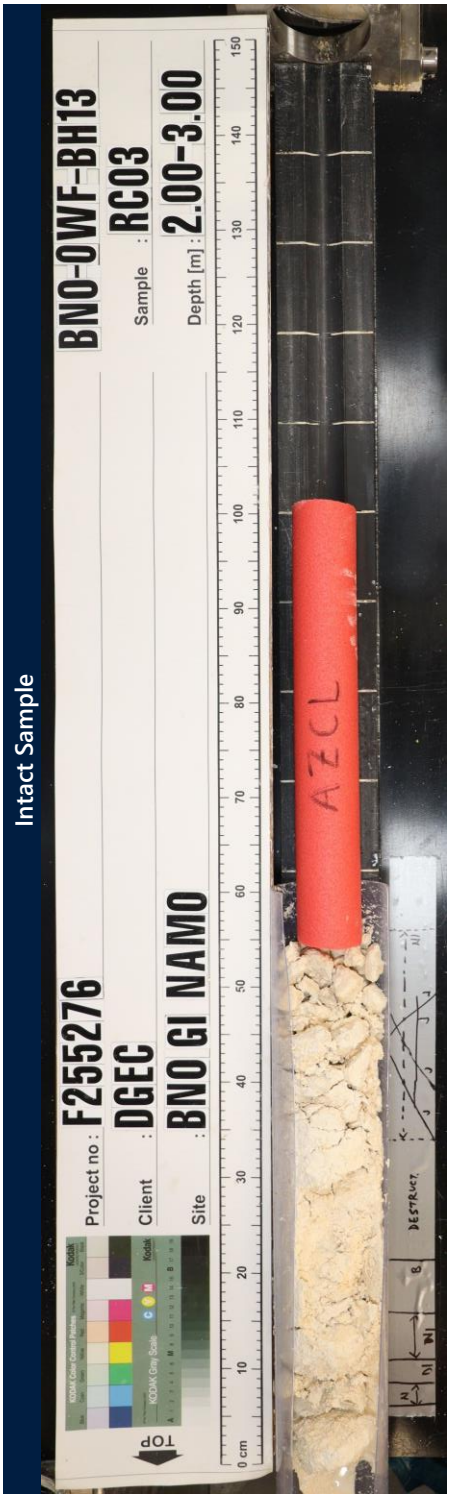
Sample Point : BNO-OWF-BH13 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

Sample Point : BNO-OWF-BH13 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

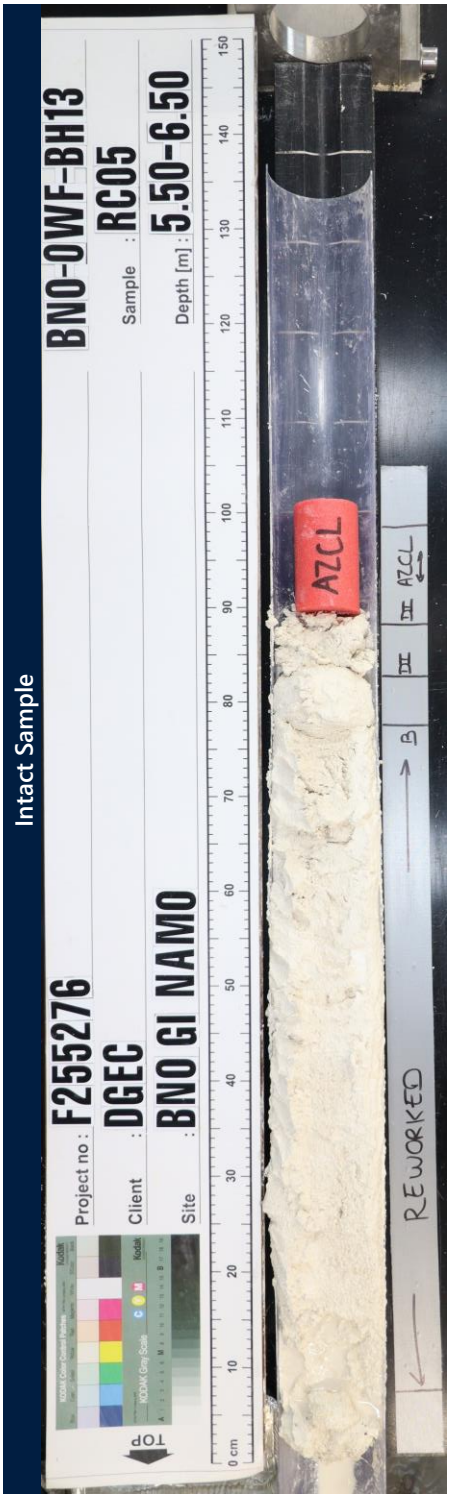


Sample Point : BNO-OWF-BH13 Sample : RC03 Depth [m BSF] : 2.00 to 3.00

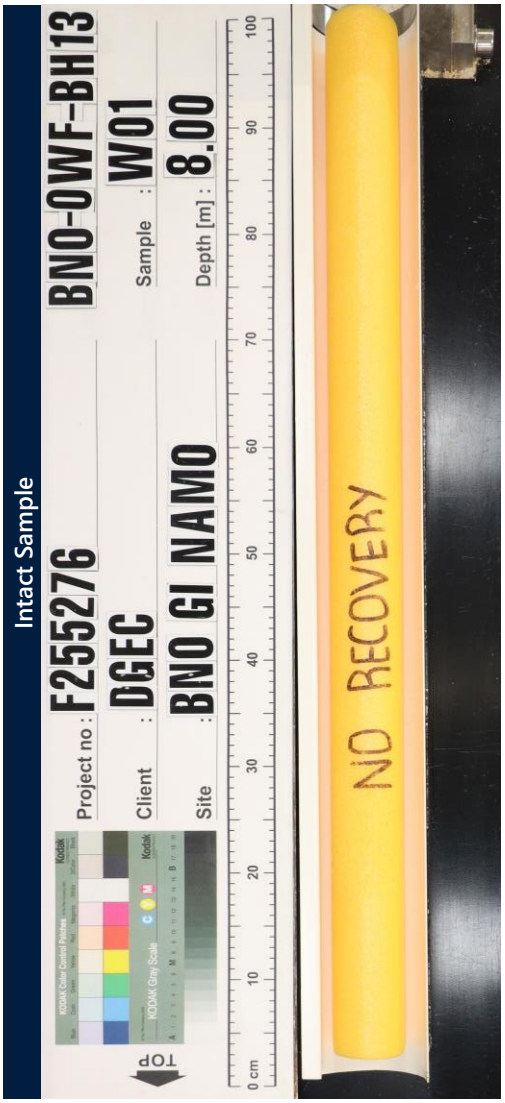
Sample Point : BNO-OWF-BH13 Sample : RC04 Depth [m BSF] : 3.00 to 4.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH13 Sample : RC05 Depth [m BSF] : 5.50 to 6.50

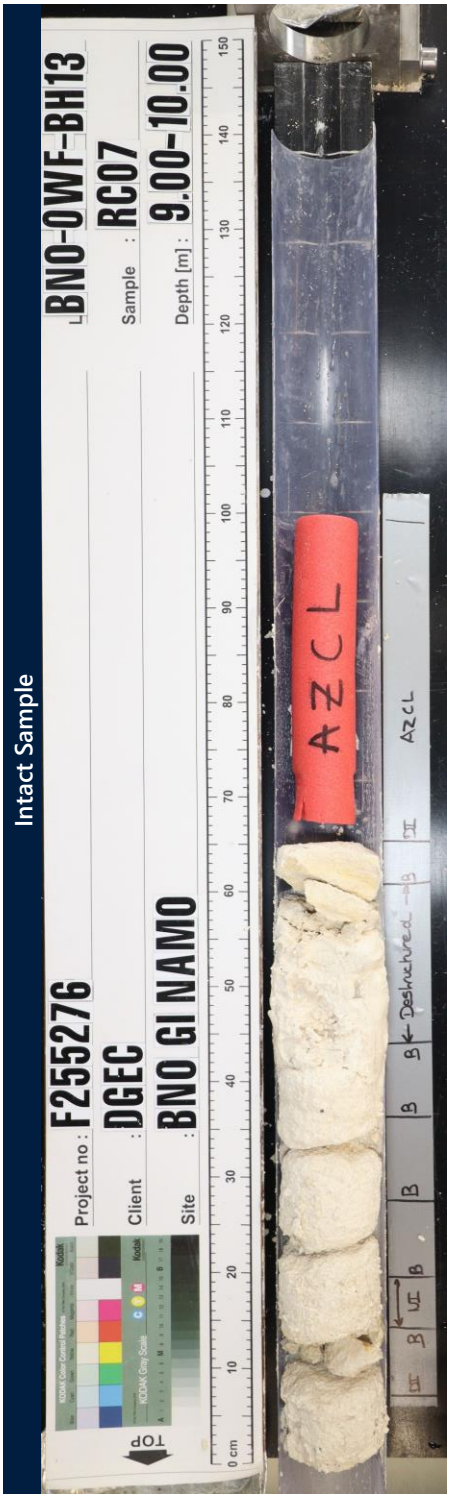


Sample Point : BNO-OWF-BH13 Sample : W01 Depth [m BSF] : 8.00

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH13 Sample : RC06 Depth [m BSF] : 8.00 to 9.00



Sample Point : BNO-OWF-BH13 Sample : RC07 Depth [m BSF] : 9.00 to 10.00

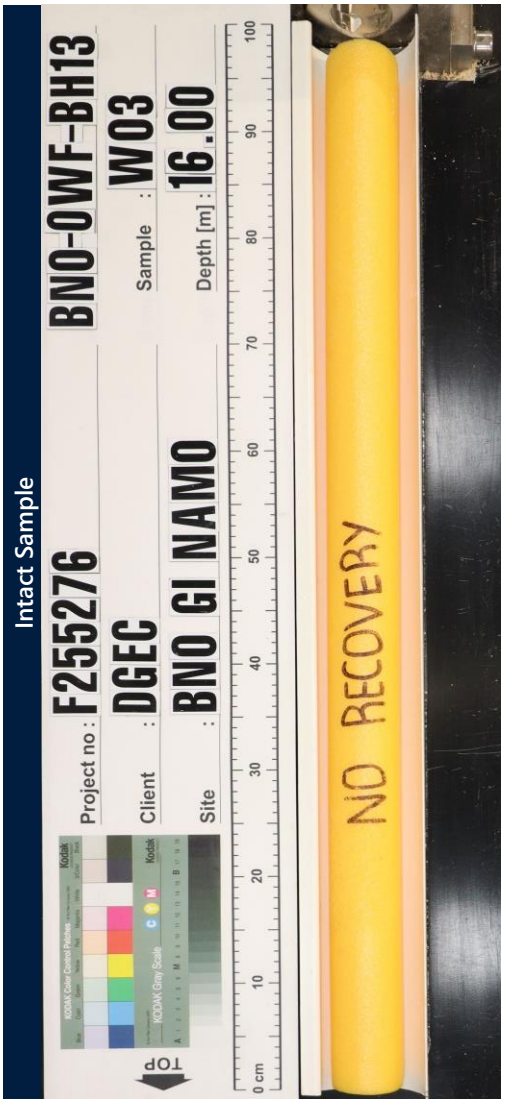
SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH13 Sample : RC08 Depth [m BSF] : 10.00 to 11.00

Sample Point : BNO-OWF-BH13 Sample : W02 Depth [m BSF] : 13.50

SAMPLE PHOTOGRAPHS



Sample Point : BNO-OWF-BH13 Sample : W03 Depth [m BSF] : 16.00

Sample Point : BNO-OWF-BH13 Sample : RC09 Depth [m BSF] : 16.00 to 17.00

SAMPLE PHOTOGRAPHS

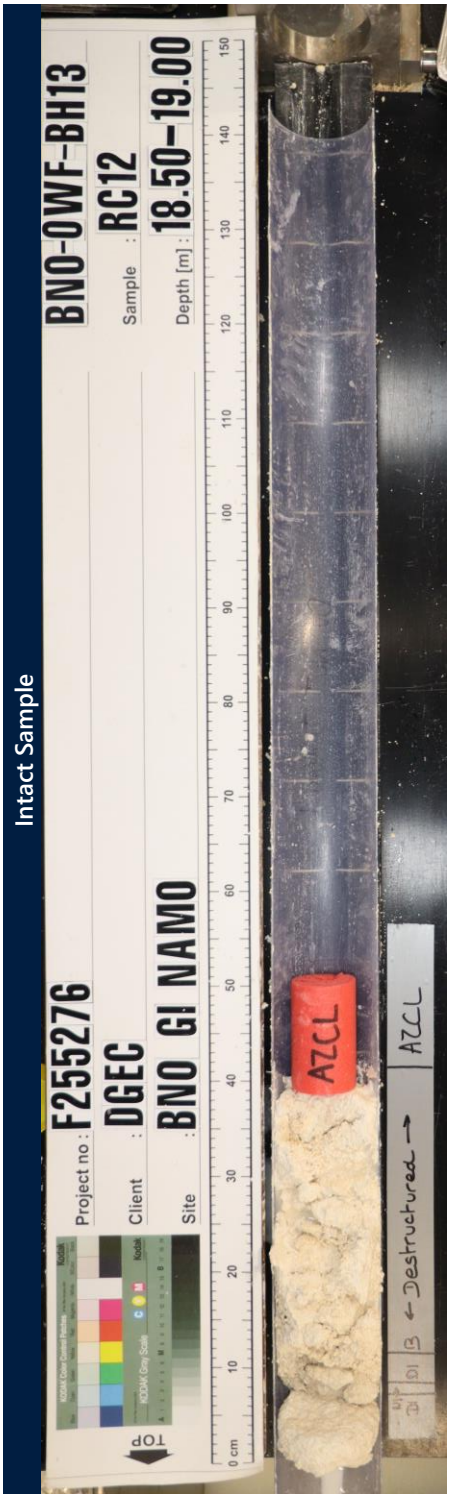
Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH13 Sample : RC10 Depth [m BSF] : 17.00 to 18.00

Sample Point : BNO-OWF-BH13 Sample : RC11 Depth [m BSF] : 18.00 to 18.50

SAMPLE PHOTOGRAPHS

Processed by: NLG Date: 27-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH13\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



Sample Point : BNO-OWF-BH13 Sample : RC12 Depth [m BSF] : 18.50 to 19.00

Sample Point : BNO-OWF-BH13 Sample : W04 Depth [m BSF] : 20.50

SAMPLE PHOTOGRAPHS

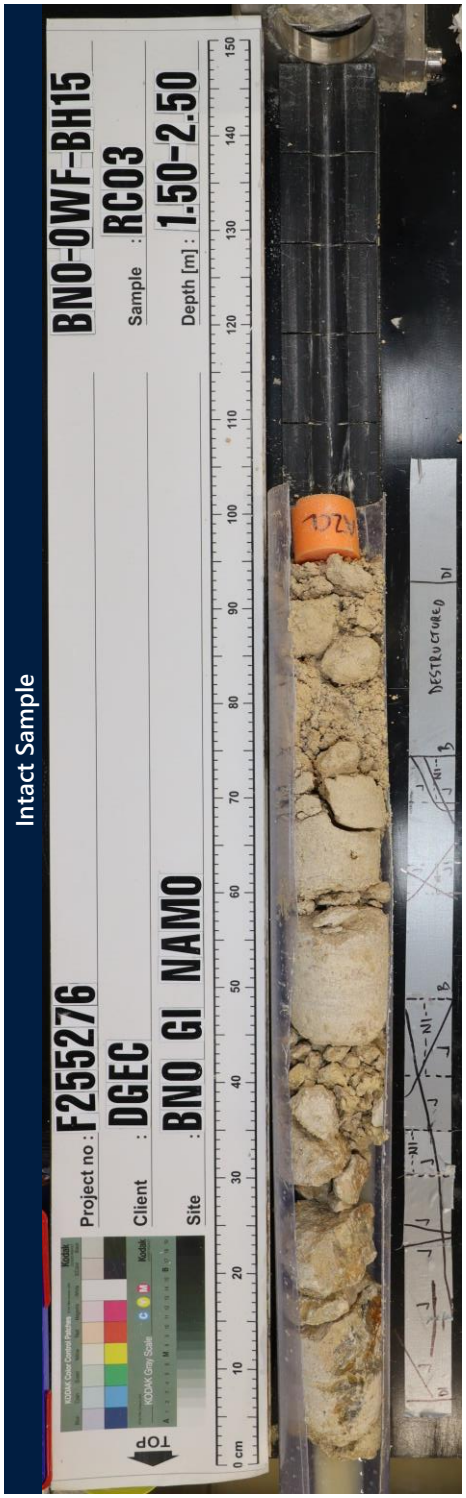
Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH15 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

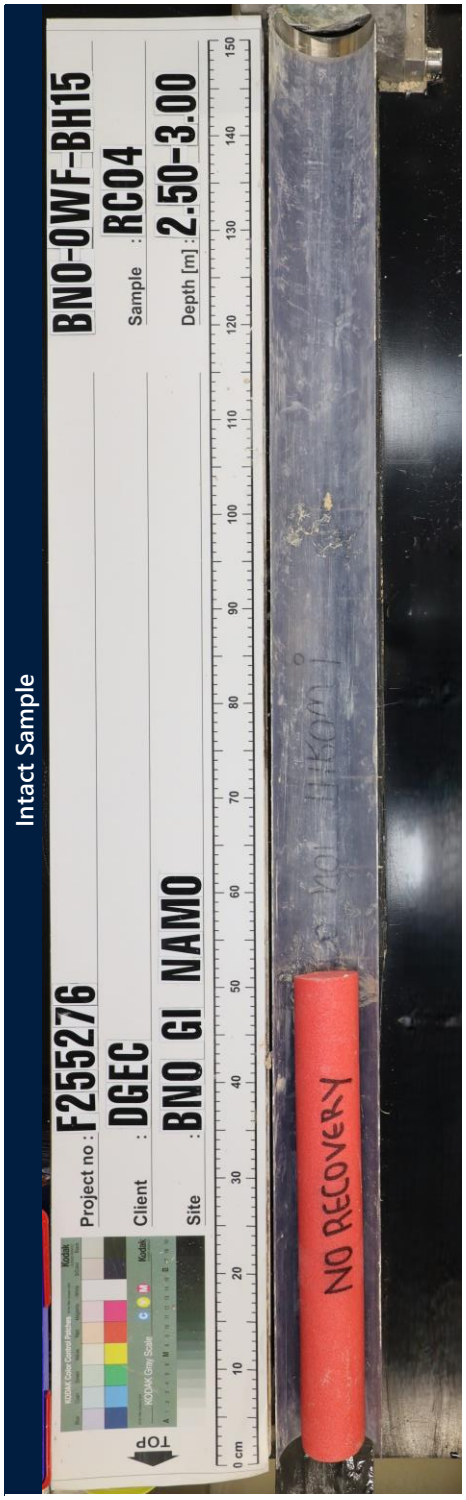
Sample Point : BNO-OWF-BH15 Sample : RC02 Depth [m BSF] : 1.00 to 1.50

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm



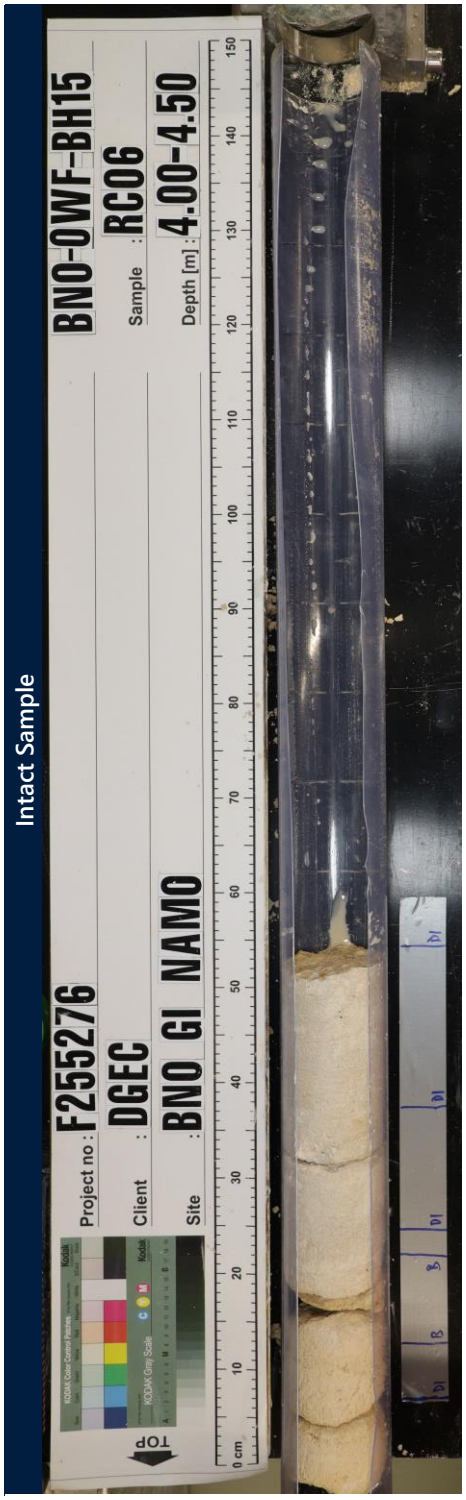
Sample Point : BNO-OWF-BH15 Sample : RC03 Depth [m BSF] : 1.50 to 2.50



Sample Point : BNO-OWF-BH15 Sample : RC04 Depth [m BSF] : 2.50 to 3.00

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH15 Sample : RC05 Depth [m BSF] : 3.00 to 4.00



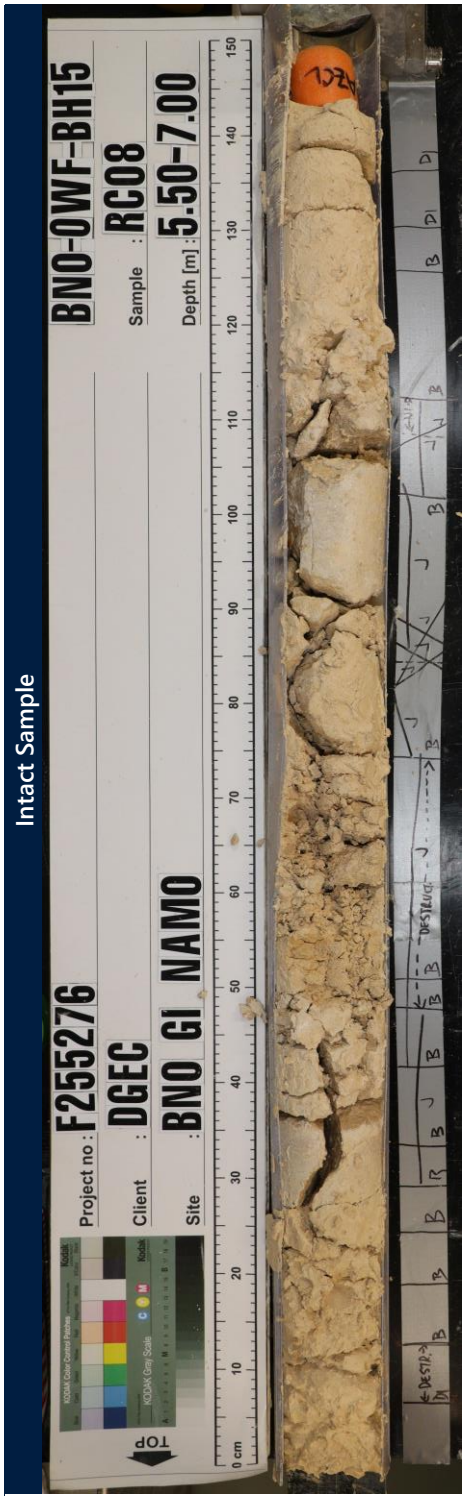
Sample Point : BNO-OWF-BH15 Sample : RC06 Depth [m BSF] : 4.00 to 4.50

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH15 Sample : RC07 Depth [m BSF] : 4.50 to 5.50



Sample Point : BNO-OWF-BH15 Sample : RC08 Depth [m BSF] : 5.50 to 7.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH15 Sample : RC09 Depth [m BSF] : 7.00 to 8.50

Sample Point : BNO-OWF-BH15 Sample : RC10 Depth [m BSF] : 8.50 to 10.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH15 Sample : RC11 Depth [m BSF] : 10.00 to 11.00

Sample Point : BNO-OWF-BH15 Sample : RC12 Depth [m BSF] : 11.00 to 12.00

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH15 Sample : RC13 Depth [m BSF] : 12.00 to 13.50

Sample Point : BNO-OWF-BH15 Sample : RC14 Depth [m BSF] : 15.00 to 16.00

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH15 Sample : RC15 Depth [m BSF] : 16.00 to 17.50

Sample Point : BNO-OWF-BH15 Sample : RC16 Depth [m BSF] : 17.50 to 17.70

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 21-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH15\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH15 Sample : RC17 Depth [m BSF] : 17.70 to 18.70

Sample Point : BNO-OWF-BH15 Sample : RC18 Depth [m BSF] : 18.70 to 20.20

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

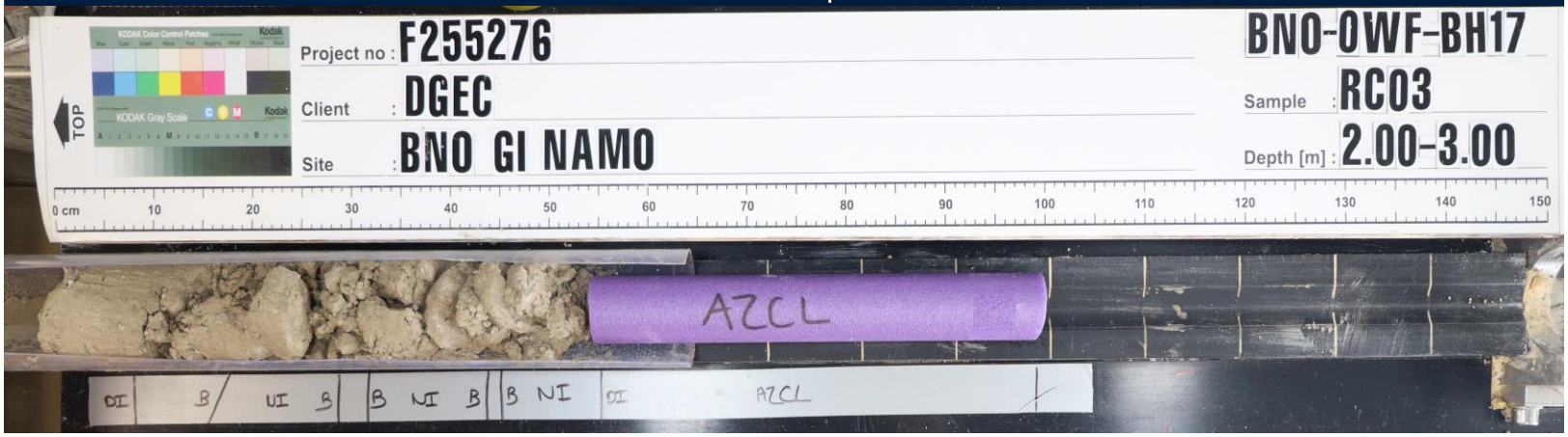
Sample Point : BNO-OWF-BH07 Sample : RC01 Depth [m BSF] : 0.00 to 1.00

Sample Point : BNO-OWF-BH07 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

SAMPLE PHOTOGRAPHS

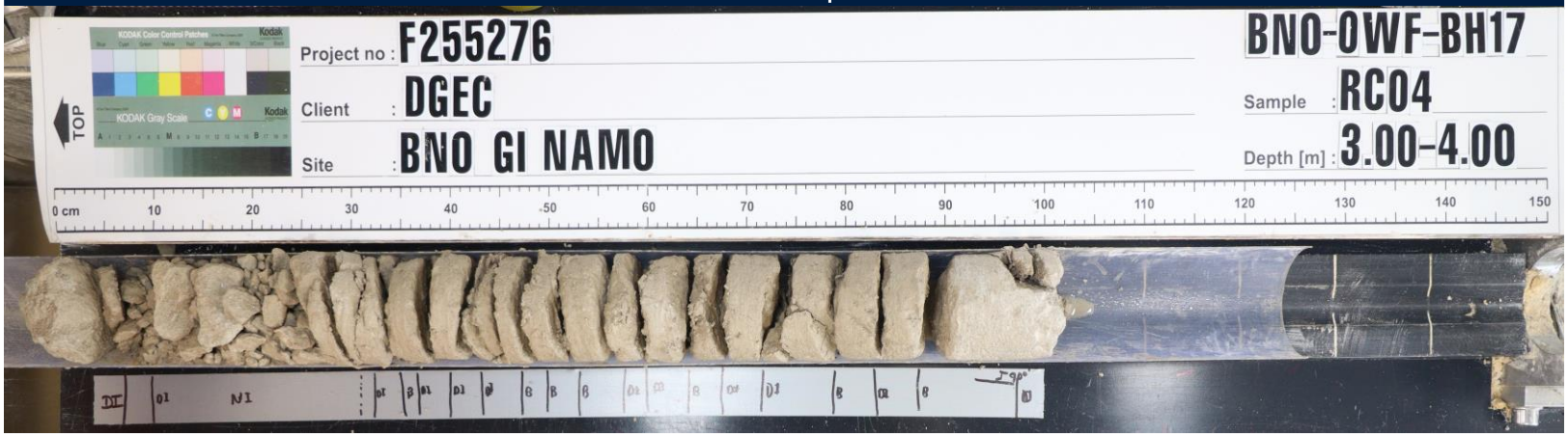
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC03 Depth [m BSF] : 2.00 to 3.00

Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC04 Depth [m BSF] : 3.00 to 4.00

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

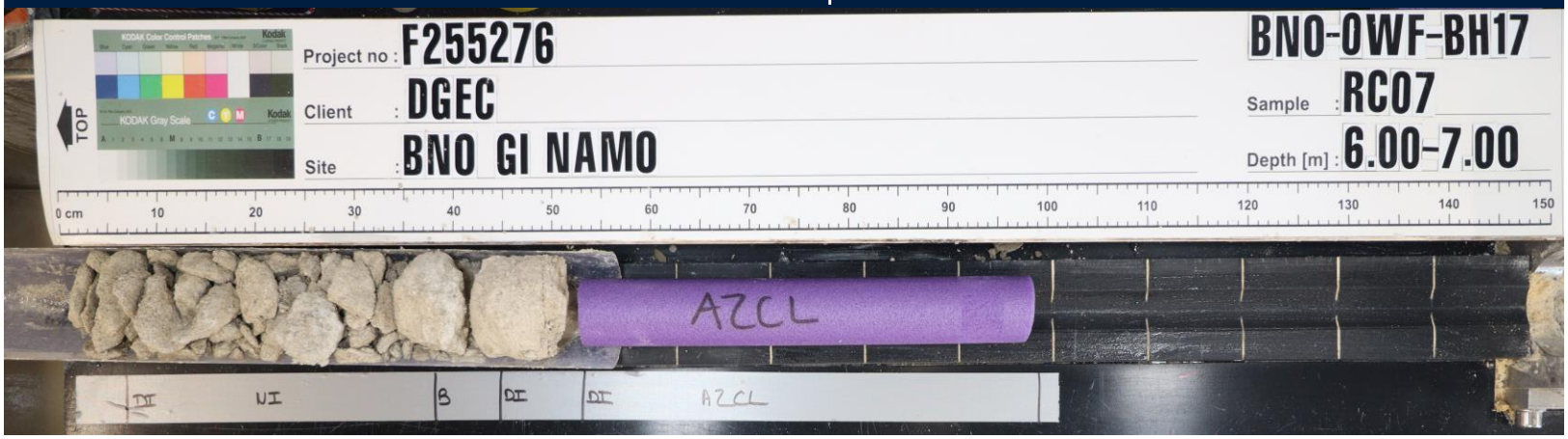
Sample Point : BNO-OWF-BH07 Sample : RC05 Depth [m BSF] : 4.00 to 5.00

Sample Point : BNO-OWF-BH07 Sample : RC06 Depth [m BSF] : 5.00 to 6.00

SAMPLE PHOTOGRAPHS

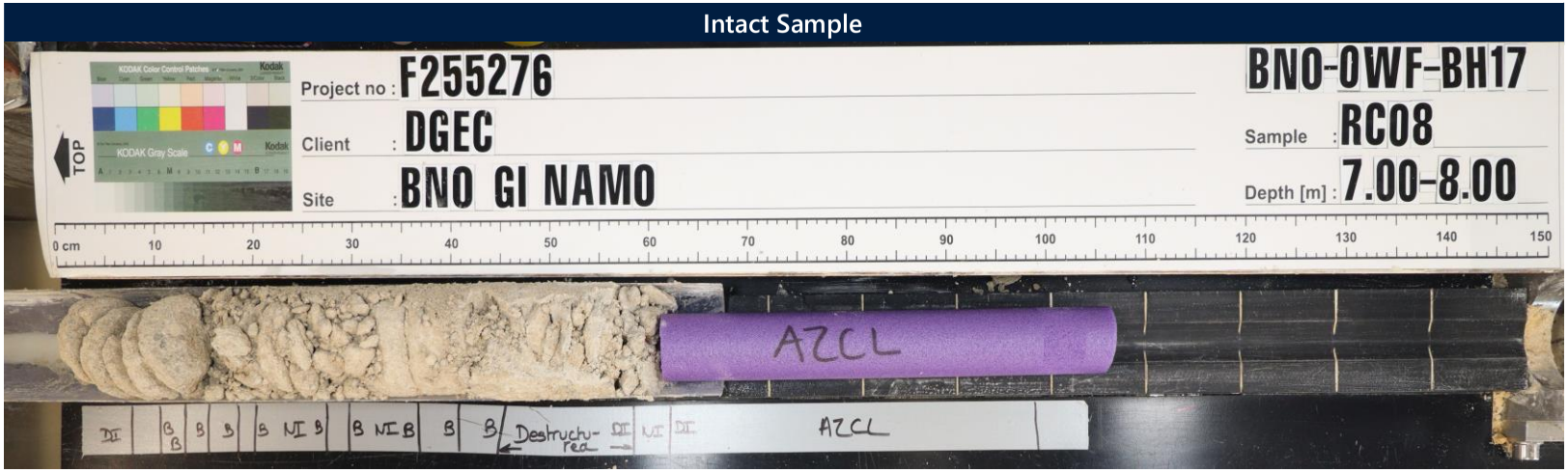
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC07 Depth [m BSF] : 6.00 to 7.00

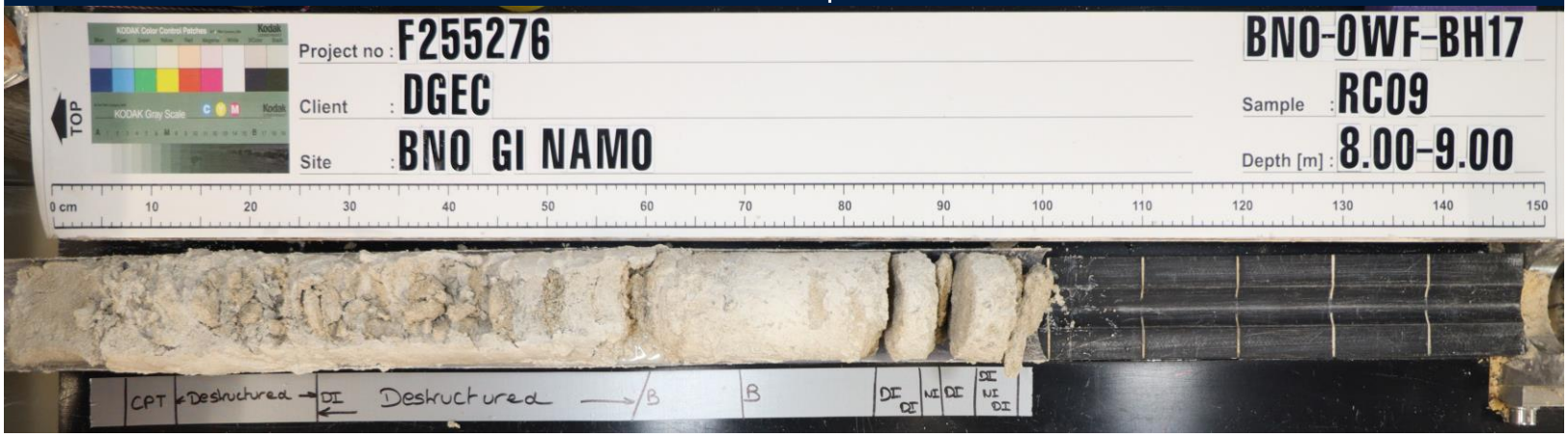
Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC08 Depth [m BSF] : 7.00 to 8.00

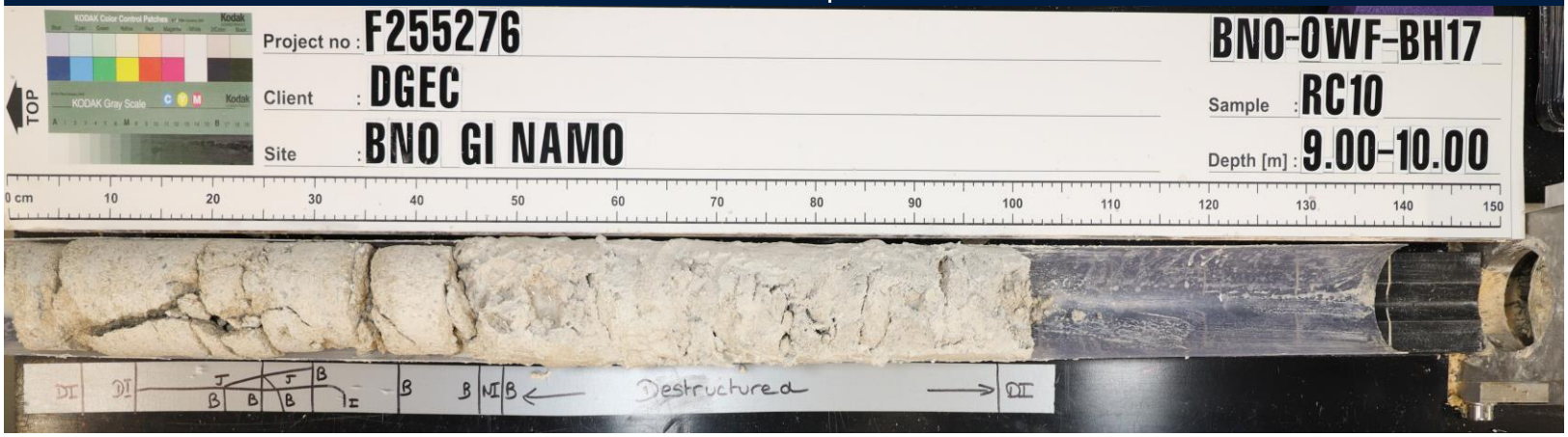
SAMPLE PHOTOGRAPHS

Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC09 Depth [m BSF] : 8.00 to 9.00

Intact Sample



Sample Point : BNO-OWF-BH07 Sample : RC10 Depth [m BSF] : 9.00 to 10.00

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH07 Sample : RC11 Depth [m BSF] : 10.00 to 10.30

Sample Point : BNO-OWF-BH07 Sample : RC12 Depth [m BSF] : 10.30 to 11.50

SAMPLE PHOTOGRAPHS

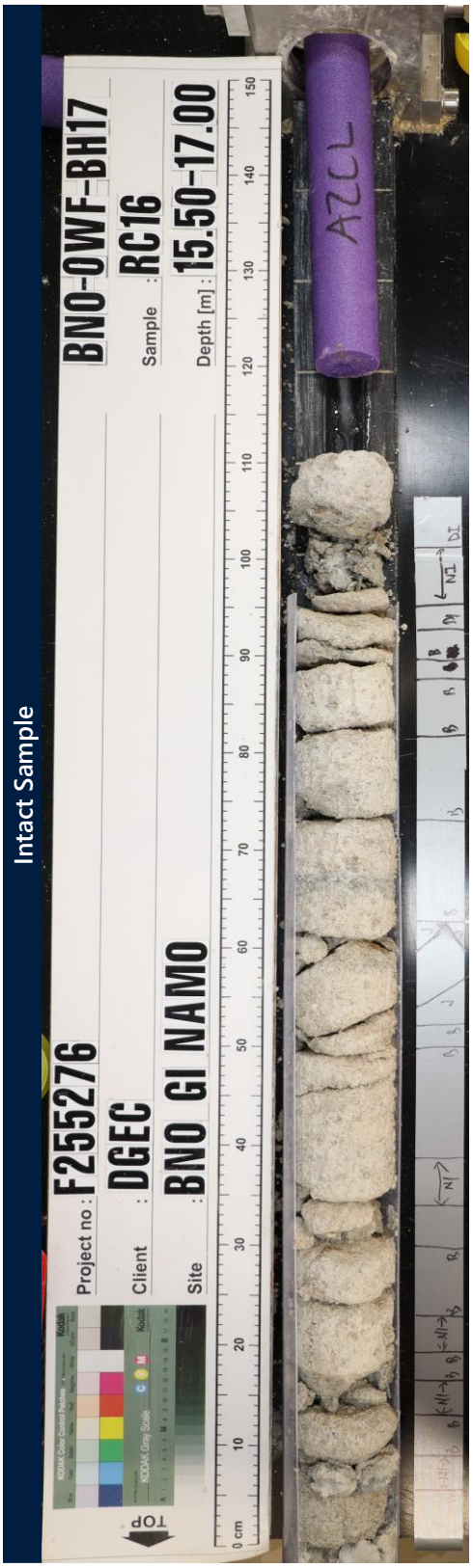
Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH07 Sample : RC13 Depth [m BSF] : 11.50 to 13.00

Sample Point : BNO-OWF-BH07 Sample : RC14 Depth [m BSF] : 13.00 to 14.50

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH07 Sample : RC15 Depth [m BSF] : 14.50 to 15.50



Sample Point : BNO-OWF-BH07 Sample : RC16 Depth [m BSF] : 15.50 to 17.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH07 Sample : RC17 Depth [m BSF] : 17.00 to 18.00

Sample Point : BNO-OWF-BH07 Sample : RC18 Depth [m BSF] : 18.00 to 19.00

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH07 Sample : RC19 Depth [m BSF] : 19.00 to 20.50

Processed by: LFA Date: 23-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH17\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : RC01 Depth [m BSF] : 0.50 to 1.00

Sample Point : BNO-OWF-BH19 Sample : RC02 Depth [m BSF] : 1.00 to 2.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : W01 Depth [m BSF] : 3.50

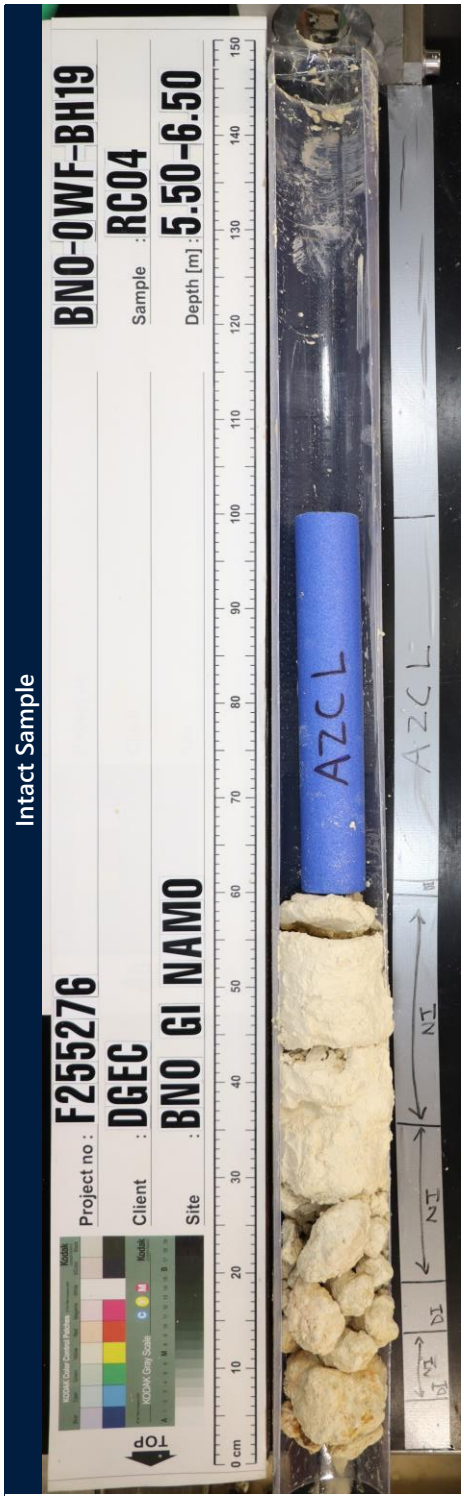
Split Sample

No photograph available

Sample Point : BNO-OWF-BH19 Sample : W01 Depth [m BSF] : 3.50

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH19 Sample : RC03 Depth [m BSF] : 4.50 to 5.50



Sample Point : BNO-OWF-BH19 Sample : RC04 Depth [m BSF] : 5.50 to 6.50

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH19 Sample : RC05 Depth [m BSF] : 6.50 to 7.50

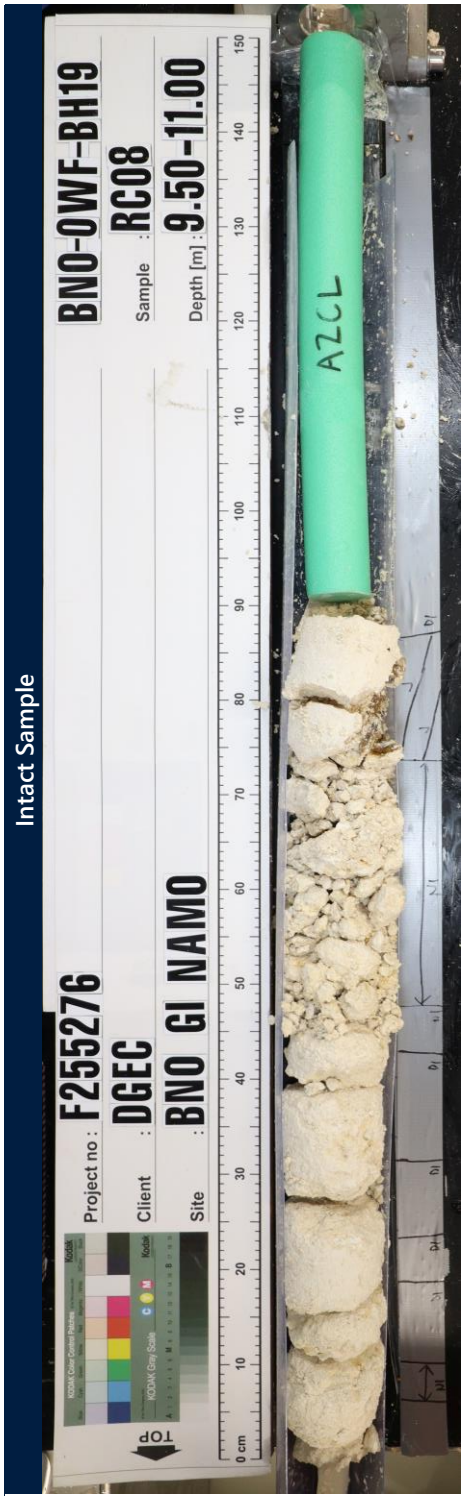
Sample Point : BNO-OWF-BH19 Sample : RC06 Depth [m BSF] : 7.50 to 8.50

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : RC07 Depth [m BSF] : 8.50 to 9.50



Sample Point : BNO-OWF-BH19 Sample : RC08 Depth [m BSF] : 9.50 to 11.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : RC09 Depth [m BSF] : 11.00 to 12.00

Sample Point : BNO-OWF-BH19 Sample : RC10 Depth [m BSF] : 12.00 to 13.00

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : RC11 Depth [m BSF] : 13.00 to 14.50

Sample Point : BNO-OWF-BH19 Sample : RC12 Depth [m BSF] : 14.50 to 15.50

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : RC13 Depth [m BSF] : 15.50 to 16.50

Sample Point : BNO-OWF-BH19 Sample : RC14 Depth [m BSF] : 16.50 to 18.00

SAMPLE PHOTOGRAPHS

Sample Point : BNO-OWF-BH19

Sample : RC15

Depth [m BSF] : 18.00 to 19.00

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

SAMPLE PHOTOGRAPHS

Processed by: LFA Date: 14-Aug-2025 Photo Folder: ... GI NAMO\From Field\Photos\BNO-OWF-BH19\03_cropped Drawn with: Photo_Plate_Maker v6.5 1.xlsm

Sample Point : BNO-OWF-BH19 Sample : RC16 Depth [m BSF] : 19.00 to 20.50

Sample Point : BNO-OWF-BH19 Sample : RC16 Depth [m BSF] : 19.00 to 20.50

SAMPLE PHOTOGRAPHS

CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 09/09/2025

| | | |

CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 09/09/2025

| | Borehole Number | Sampling method | Sample | Depth from (m) | Sample Type | Sample Length (cm) | Sample Diameter (mm) | Mass (g) | Wallingford / LLN | Sample received | Sample location | Sample used up | Core Splitting & Geotechnical Descriptio | Core Photograph | Moisture Content | Bulk Density | PP | TV | Lab Vane | Lab Vane Residual | Lab Vane Remould | Fall Cone | Fall Cone Remould | Sulphate Reducing Bacteria | Point Load | Electrical Conductivity Remould | Electrical Conductivity Reconstitute | Thermal Conductivity/Resistivity | Thermal Conductivity Remould | Thermal Conductivity Reconstituted | Thermal Conductivity Multidensity | Plasticity Index | Sieve | Sedimentation | PD | Min/Max Density | Thixotropy | Permeameter Permeability (Constant H | OED | OED Recon | Shear Box | Ring Shear | UU | UU remould | TXL Permeability [constant head] | CRS | DSS | CIDc (set of 3 tests) | CIDe | CIUc | CIUe | CADc | CADe | CAUc | CAUe | CTXL | CSS | Resonant Column | Shear Wave Velocity - BE | Detailed Microscopy | ISB | Organic Matter | Loss on Ignition | Total Organic Carbon | Sulphate Aqueous Extract | Total Sulphate Content | Water Soluble Chloride | Acid Soluble Chloride | Carbonate Content of Soil | pH Value of Soil and Water | Redox Potential of Soil and Water | Total Solids, Dissolved Solids and Tota | Sulphide in Soil and Water | Salinity (Calculated) | Sulphate and Magnesium Content | PLT (3 single tests) | UCS Type 1 (strength only) | UCS Type 2 (Stress-strain) | UCS Type 3 (determination of YM and p | particle density / specific gravity | porosity (including particle density) | Brazil indirect tensile strength | Slake Durability | CERCHAR Abrasivity | Soil Type | Remarks |
|---|---|---

CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 09/09/2025

Borehole Number	Sampling method	Sample	Depth from (m)	Sample Type	Sample Length (cm)	Sample Diameter (mm)	Mass (g)	Wallingford / LLN	Sample received	Sample location	Sample used up	Soil Type	Remarks
Total onshore tests issued by lab and Validated by report team (V)													
Total number of offshore tests (#)													
Total onshore tests unsuitable/cancelled (C)													
Total number of onshore tests (/)													
BNO-OWF-BH02	RC	1	0	Tube	80	102						GRAVEL	
BNO-OWF-BH02	RC	01-1	0,2	Bag	20	102	1088,5			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	01-2	0,4	Bag	45	102	4055			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	01-3	0,85	Bag	20	102	2850			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	2	1	Tube	70	102						calcareous moderately weak partially weathered very	
BNO-OWF-BH02	RC	02-1	1	Bag	10	102	644			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	02-2	1,1	Bag	35	102	2197			ZEP Box 21		pw CALCARENITE with num biocl	
BNO-OWF-BH02	RC	02-3	1,45	Bag	25	102	2060			ZEP Box 21		pw CALCARENITE with num biocl	
BNO-OWF-BH02	RC	3	2	Tube	30	102						calcareous very weak to moderately strong partially	
BNO-OWF-BH02	RC	03-1	2	Bag	30	102	2596			ZEP Box 21		pw CALCARENITE with occ biocl	
BNO-OWF-BH02	RC	4	3	Tube	40	102						calcareous moderately strong to strong partially	
BNO-OWF-BH02	RC	04-1	3	Bag	40	102	2913			ZEP Box 21		pw CALCARENITE with occ biocl	
BNO-OWF-BH02	RC	5	4	Tube	20	102						calcareous moderately strong to strong partially	
BNO-OWF-BH02	RC	05-1	4	Bag	20	102	543			ZEP Box 21		pw CALCARENITE with occ ox stains	
BNO-OWF-BH02	RC	6	4,5	Tube	65	102						calcareous moderately weak to moderately strong	
BNO-OWF-BH02	RC	06-1	4,5	Bag	65	102	6115			ZEP Box 21		pw CALCARENITE with ox stains	
BNO-OWF-BH02	RC	7	5,5	Tube	55	102						calcareous moderately weak to moderately strong	
BNO-OWF-BH02	RC	07-1	5,5	Liner	55	102				ZEP Collo 1		pw CALCARENITE	
BNO-OWF-BH02	RC	8	6,5	Tube	5	102						calcareous moderately weak to moderately strong	
BNO-OWF-BH02	RC	08-1	6,5	Bag	5	102	381			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	9	7	Tube	25	102						pw CALCARENITE	
BNO-OWF-BH02	RC	09-1	7	Bag	25	102	1560			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	10	7,7	Tube	40	102						pw CALCARENITE	
BNO-OWF-BH02	RC	10-1	7,7	Bag	40	102	2573			ZEP Box 21		pw CALCARENITE	
BNO-OWF-BH02	RC	11	8,5	Tube	55	102						pw CALCARENITE	
BNO-OWF-BH02	RC	11-1	8,5	Bag	55	102	1010			ZEP Box 22		pw CALCARENITE	
BNO-OWF-BH02	RC	12	9,2	Tube	0	102							No recovery
BNO-OWF-BH02	RC	13	9,7	Tube	0	102							No recovery
BNO-OWF-BH02	RC	14	10,2	Tube	0	102							No recovery
BNO-OWF-BH02	RC	15	11,2	Tube	20	102						pw CALCARENITE	
BNO-OWF-BH02	RC	15-1	11,2	Bag	20	102	919,5			ZEP Box 22		pw CALCARENITE	
BNO-OWF-BH02	RC	16	11,7	Tube	90	102						pw CALCARENITE	
BNO-OWF-BH02	RC	16-1	11,7	Liner	90	102				ZEP Collo 1		pw CALCARENITE	
BNO-OWF-BH02	RC	16-2	11,8	Wax	10	102	1629			ZEP Crate 002 (WAXES)		pw CALCARENITE	
BNO-OWF-BH02	RC	17	12,7	Tube	100	102						pw CALCARENITE	
BNO-OWF-BH02	RC	17-2	12,7	Wax	20	102	2610			ZEP Crate 002 (WAXES)		pw CALCARENITE	ATN 12, H/D ratio reduced to 1.5:1
BNO-OWF-BH02	RC	17-1	12,7	Liner	100	102				ZEP Collo 2		pw CALCARENITE	
BNO-OWF-BH02	RC	18	13,7	Tube	130	102						pw CALCARENITE	
BNO-OWF-BH02	RC	18-1	13,7	Liner	130	102				ZEP Collo 1-5		pw CALCARENITE	
BNO-OWF-BH02	RC	18-2	14,4	Wax	10	102	1802			ZEP Crate 002 (WAXES)		pw CALCARENITE	
BNO-OWF-BH02	RC	19	15	Tube	150	102						pw-dw CALCARENITE	
BNO-OWF-BH02	RC	19-1	15	Liner	150	102				ZEP Collo 1		pw-dw CALCARENITE	
BNO-OWF-BH02	RC	19-2	15	Wax	10	102	1430			ZEP Crate 002 (WAXES)		pw-dw CALCARENITE	
BNO-OWF-BH02	RC	20	16,5	Tube	150	102						pw-dw CALCARENITE	
BNO-OWF-BH02	RC	20-1	16,5	Liner	150	102				ZEP Collo 1		pw-dw CALCARENITE	
BNO-OWF-BH02	RC	20-2	16,6	Wax	15	102	1827			ZEP Crate 002 (WAXES)		pw-dw CALCARENITE	
BNO-OWF-BH02	RC	21	18	Tube	150	102						pw-dw CALCARENITE	
BNO-OWF-BH02	RC	21-1	18	Liner	150	102				ZEP Collo 1		pw-dw CALCARENITE	
BNO-OWF-BH02	RC	22	19,5	Tube	150	102						pw-dw CALCARENITE	
BNO-OWF-BH02	RC	22-1	19,5	Liner	150	102				ZEP Collo 1		pw-dw CALCARENITE	

CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 09/09/2025

| | Borehole Number | Sampling method | Sample | Depth from (m) | Sample Type | Sample Length (cm) | Sample Diameter (mm) | Mass (g) | Wallingford / LLN | Sample received | Sample location | Sample used up | Core Splitting & Geotechnical Descriptio | Core Photograph | Moisture Content | Bulk Density | PP | TV | Lab Vane | Lab Vane Residual | Lab Vane Remould | Fall Cone | Fall Cone Remould | Sulphate Reducing Bacteria | Point Load | Electrical Conductivity Remould | Electrical Conductivity Reconstitute | Thermal Conductivity/Resistivity | Thermal Conductivity Remould | Thermal Conductivity Reconstituted | Thermal Conductivity Multidensity | Plasticity Index | Sieve | Sedimentation | PD | Min/Max Density | Thixotropy | Permeameter Permeability [Constant H | OED | OED Recon | Shear Box | Ring Shear | UU | UU remould | TXL Permeability [constant head] | CRS | DSS | CIDc (set of 3 tests) | CIDe | CIUc | CIUe | CADc | CADe | CAUc | CAUe | CTXL | CSS | Resonant Column | Shear Wave Velocity - BE | Detailed Microscopy | ISB | Organic Matter | Loss on Ignition | Total Organic Carbon | Sulphate Aqueous Extract | Total Sulphate Content | Water Soluble Chloride | Acid Soluble Chloride | Carbonate Content of Soil | pH Value of Soil and Water | Redox Potential of Soil and Water | Total Solids, Dissolved Solids and Tota | Sulphide in Soil and Water | Salinity (Calculated) | Sulphate and Magnesium Content | PLT (3 single tests) | UCS Type 1 (strength only) | UCS Type 2 (Stress-strain) | UCS Type 3 (determination of YM and p | particle density / specific gravity | porosity (including particle density) | Brazil indirect tensile strength | Slake Durability | CERCHAR Abrasivity | Soil Type | Remarks |
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CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 09/09/2025

Borehole Number	Sampling method	Sample	Depth from (m)	Sample Type	Sample Length (cm)	Sample Diameter (mm)	Mass (g)	Wallingford / LLN	Sample received	Sample location	Sample used up	Soil Type	Remarks
Total onshore tests issued by lab and Validated by report team (V)													
Total number of offshore tests (#)													
Total onshore tests unsuitable/cancelled (C)													
Total number of onshore tests (/)													
BNO-OWF-BH03-a	RC	1	0	Tube	100	102							
BNO-OWF-BH03-a	RC	01-1	0	Bag	15	102	1075			ZEP Box 15		m-c GRAVEL of ls vl	
BNO-OWF-BH03-a	RC	01-2	0,15	Bag	45	102	4060			ZEP Box 15		c w-s pw CALCARENITE with bc	
BNO-OWF-BH03-a	RC	01-3	0,6	Bag	40	102	3655			ZEP Box 15		c w-s pw CALCARENITE with bc	
BNO-OWF-BH03-a	RC	2	1	Tube	100	102							
BNO-OWF-BH03-a	RC	02-1	1	Bag	20	102	2659			ZEP Box 15		c ms-s pw CALCARENITE with bc	
BNO-OWF-BH03-a	RC	02-2	1,2	Wax	30	102	5425			ZEP Crate 002 (WAXES)		c ms-s pw CALCARENITE with bc	
BNO-OWF-BH03-a	RC	02-3	1,5	Bag	25	102	3575			ZEP Box 15		c dest CALCARENITE composed s m4 G	
BNO-OWF-BH03-a	RC	02-4	1,75	Bag	25	102	3610			ZEP Box 15		c dest CALCARENITE composed s m4 G	

CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 10/09/2025

| | Borehole Number | Sampling method | Sample | Depth from (m) | Sample Type | Sample Length (cm) | Sample Diameter (mm) | Mass (g) | Wallingford / LLN | Sample received | Sample location | Sample used up | Core Splitting & Geotechnical Descriptio | Core Photograph | Moisture Content | Bulk Density | PP | TV | Lab Vane | Lab Vane Residual | Lab Vane Remould | Fall Cone | Fall Cone Remould | Sulphate Reducing Bacteria | Point Load | Electrical Conductivity Remould | Electrical Conductivity Reconstitute | Thermal Conductivity/Resistivity | Thermal Conductivity Remould | Thermal Conductivity Reconstituted | Thermal Conductivity Multidensity | Plasticity Index | Sieve | Sedimentation | PD | MinMax Density | Thixotropy | Permeameter Permeability [Constant H | OED | OED Recon | Shear Box | Ring Shear | UU | UU remould | TXL Permeability [constant head] | CRS | DSS | CIDc (set of 3 tests) | CIDe | CIUc | CIUe | CADc | CADe | CAUc | CAUe | CTXL | CSS | Resonant Column | Shear Wave Velocity - BE | Detailed Microscopy | ISB | Organic Matter | Loss on Ignition | Total Organic Carbon | Sulphate Aqueous Extract | Total Sulphate Content | Water Soluble Chloride | Acid Soluble Chloride | Carbonate Content of Soil | pH Value of Soil and Water | Redox Potential of Soil and Water | Total Solids, Dissolved Solids and Total | Sulphide in Soil and Water | Salinity (Calculated) | Sulphate and Magnesium Content | PLT (3 single tests) | UCS Type 1 (strength only) | UCS Type 2 (Stress-strain) | **UCS Type 3 (determination of YM an** | particle density / specific gravity | porosity (including particle density) | Brazil indirect tensile strength | Slake Durability | CERCHAR Abrasivity | Soil Type | Remarks |
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CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 11/09/2025

| Borehole Number | Sampling method | Sample | Depth from (m) | Sample Type | Sample Length (cm) | Sample Diameter (mm) | Mass (g) | Wallingford / LLN | Sample received | Sample location | Sample used up | Core Splitting & Geotechnical Descriptio | Core Photograph | Moisture Content | Bulk Density | PP | TV | Lab Vane | Lab Vane Residual | Lab Vane Remould | Fall Cone | Fall Cone Remould | Sulphate Reducing Bacteria | Point Load | Electrical Conductivity Remould | Electrical Conductivity Reconstitute | Thermal Conductivity/Resistivity | Thermal Conductivity Remould | Thermal Conductivity Reconstituted | Thermal Conductivity Multidensity | Plasticity Index | Sieve | Sedimentation | PD | Min/Max Density | Thixotropy | Permeameter Permeability [Constant H | OED | OED Recon | Shear Box | Ring Shear | UU | UU remould | TXL Permeability [constant head] | CRS | DSS | CIDc (set of 3 tests) | CIDe | CIUc | CIUe | CADc | CADe | CAUc | CAUe | CTXL | CSS | Resot Column | Shear Wave Velocity - BE | Detailed Microscopy | ISB | Organic Matter | Loss on Ignition | Total Organic Carbon | Sulphate Aqueous Extract | Total Sulphate Content | Water Soluble Chloride | Acid Soluble Chloride | Carbonate Content of Soil | pH Value of Soil and Water | Redox Potential of Soil and Water | Total Solids, Dissolved Solids and Tota | Sulphide in Soil and Water | Salinity (Calculated) | Sulphate and Magnesium Content | PLT (3 single tests) | UCS Type 1 (strength only) | UCS Type 2 (Stress-strain) | **UCS Type 3 (determination of YM an** | particle density / specific gravity | porosity (including particle density) | Brazil indirect tensile strength | Slake Durability | CERCHAR Abrasivity | Soil Type | Remarks |
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CLIENT: DGEC
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JOB NO: F255276

Drawn by: KJL
Date: 11/09/2025

Total onshore tests issued by lab and Validated by report team (V)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

CLIENT: DGEC
SITE: Bretagne Nord Ouest OWF Preliminary Geotech SI
JOB NO: F255276

Drawn by: ALA
Date: 11/09/2025

| Borehole Number | Sampling method | Sample | Depth from (m) | Sample Type | Sample Length (cm) | Sample Diameter (mm) | Mass (g) | Wallingford / LLN | Sample received | Sample location | Sample used up | Core Splitting & Geotechnical Descriptio | Core Photograph | Moisture Content | Bulk Density | PP | TV | Lab Vane | Lab Vane Residual | Lab Vane Remould | Fall Cone | Fall Cone Remould | Sulphate Reducing Bacteria | Point Load | Electrical Conductivity Remould | Electrical Conductivity Reconstitute | Thermal Conductivity/Resistivity | Thermal Conductivity Remould | Thermal Conductivity Reconstituted | Thermal Conductivity Multidensity | Plasticity Index | Sieve | Sedimentation | PD | MiniMax Density | Thixotropy | Permeameter Permeability [Constant H | OED | OED Recon | Shear Box | Ring Shear | UU | UU remould | TXL Permeability [constant head] | CRS | DSS | CIDc (set of 3 tests) | CIDe | CIUc | CIUe | CADc | CADe | CAUc | CAUe | CTXL | CSS | Resonant Column | Shear Wave Velocity - BE | Detailed Microscopy | ISB | Organic Matter | Loss on Ignition | Total Organic Carbon | Sulphate Aqueous Extract | Total Sulphate Content | Water Soluble Chloride | Acid Soluble Chloride | Carbonate Content of Soil | pH Value of Soil and Water | Redox Potential of Soil and Water | Total Solids, Dissolved Solids and Tota | Sulphide in Soil and Water | Salinity (Calculated) | Sulphate and Magnesium Content | PLT (3 single tests) | UCS Type 1 (strength only) | UCS Type 2 (Stress-str ain) | **UCS Type 3 (determination of YM an** | particle density / specific gravity | porosity (including particle density) | Brazil indirect tensile st ength | Slake Durability | CERCHAR Abrasivity | Soil Type | Remarks |
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CLIENT: DGEC
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JOB NO: F255276

Drawn by: ALA
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| | Borehole Number | Sampling method | Sample | Depth from (m) | Sample Type | Sample Length (cm) | Sample Diameter (mm) | Mass (g) | Wallingford / LLN | Sample received | Sample location | Sample used up | Core Splitting & Geotechnical Descriptio | Core Photograph | Moisture Content | Bulk Density | PP | TV | Lab Vane | Lab Vane Residual | Lab Vane Remould | Fall Cone | Fall Cone Remould | Sulphate Reducing Bacteria | Point Load | Electrical Conductivity Remould | Electrical Conductivity Reconstitute | Thermal Conductivity/Resistivity | Thermal Conductivity Remould | Thermal Conductivity Reconstituted | Thermal Conductivity Multidensity | Plasticity Index | Sieve | Sedimentation | PD | MiniMax Density | Thixotropy | Permeameter Permeability [Constant H | OED | OED Recon | Shear Box | Ring Shear | UU | UU remould | TXL Permeability [constant head] | CRS | DSS | CIDc (set of 3 tests) | CIDe | CIUc | CIUe | CADc | CADe | CAUc | CAUe | CTXL | CSS | Resonant Column | Shear Wave Velocity - BE | Detailed Microscopy | ISB | Organic Matter | Loss on Ignition | Total Organic Carbon | Sulphate Aqueous Extract | Total Sulphate Content | Water Soluble Chloride | Acid Soluble Chloride | Carbonate Content of Soil | pH Value of Soil and Water | Redox Potential of Soil and Water | Total Solids, Dissolved Solids and Total | Sulphide in Soil and Water | Salinity (Calculated) | Sulphate and Magnesium Content | PLT (3 single tests) | UCS Type 1 (strength only) | UCS Type 2 (Stress-strain) | **UCS Type 3 (determination of YM an** | particle density / specific gravity | porosity (including particle density) | Brazil indirect tensile strength | Slake Durability | CERCHAR Abrasivity | Soil Type | Remarks |
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5. Laboratory Test Data

Title	Plate No.
Summary of Laboratory Test Results	5.1 to 5.53
Summary of Plasticity Index Test Results	5.54
Plasticity Chart	5.55
Summary of Particle Size Distribution Test Results	5.56
Particle Size Distribution Test Results	5.57 to 5.58
Summary of Particle Density Test Results	5.59
Summary of Consolidated Isotropically Undrained Triaxial in Compression Test Results	5.60
Consolidated Isotropically Undrained Triaxial in Compression Test Results	5.61 to 5.69
Summary of Offshore Thermal Resistivity Test Results	5.70 to 5.73
Summary of Onshore Thermal Resistivity Test Results	5.74
Onshore Thermal Resistivity Test Results	5.75
Summary of Carbonate Content Test Results	5.76
Summary of Organic Content Test Results	5.77
Summary of Chloride Content Test Results	5.78
Summary of Sulphate Content and pH Test Results	5.78 to 5.79
Summary of Sulphate Reducing Bacteria Test Results	5.80 to 5.118
Summary of Porosity and Particle Density Tests Results	5.119 to 5.121
Summary of Rock Particle Density Tests Results	5.122 to 5.123
Summary of Offshore Point Load Test Results	5.124 to 5.130
Summary of Onshore Point Load Test Results	5.131 to 5.138
Summary of Uniaxial Compressive Strength Test Results	5.139 to 5.141
Uniaxial Compressive Strength Test Results	5.142 to 5.164
Summary of Brazilian Indirect Tensile Strength Test Results	5.165 to 5.166
Brazilian Indirect Tensile Strength Test Results	5.167 to 5.180
Summary of CERCHAR Abrasivity Test Results	5.181 to 5.182
CERCHAR Abrasivity Test Results	5.183 to 5.202
Summary of Slake Durability Test Results	5.203 to 5.205

Laboratory Classification Test Results

BNO-OWF-BH01

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.20 m - subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, granite and other igneous and metamorphic lithologies At 0.00 m - with a subangular cobble of granite	0.00																						
RC02	From 0.80 m to 1.05 m - subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, rhyolite, granite and other igneous and metamorphic lithologies	0.80																						
RC03	From 1.80 m to 2.20 m - subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, rhyolite, granite and other igneous and metamorphic lithologies	1.80																						
RC04	From 2.20 m to 2.45 m - subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, rhyolite, granite and other igneous and metamorphic lithologies	2.20																						
RC05	From 3.00 m to 3.50 m - subangular to subrounded medium to coarse GRAVEL of quartzite, quartz, rhyolite, granite and other igneous and metamorphic lithologies From 3.50 m to 4.00 m - very stiff extremely high strength grey (2.5Y 6/1) slightly gravelly sandy highly calcareous CLAY - with medium spaced thin laminae of silt From 3.50 m to 3.65 m - with a full diameter cobble of igneous lithology	3.00 3.50 3.70 3.85	16.0	21.7	24.2	20.9			2.72	79.5	4.1	13.0	21.0	8.0	49.8	>900								
RC06	From 4.50 m to 5.00 m - calcareous very weak partially weathered grey (2.5Y 5/1) CALCARENITE	4.50 4.65 4.65 4.65	15.9	21.3	24.0	20.7																0.22		0.05 0.04
RC07	From 5.00 m to 5.95 m - calcareous very weak partially weathered grey (2.5Y 5/1) CALCARENITE	5.00 5.20 5.40 5.65	16.6	21.2	23.7	20.3															0.14[a] 0.15[d]			
RC08	From 6.00 m to 7.00 m - calcareous very weak partially weathered grey (2.5Y 5/1) CALCARENITE	6.00 6.60	16.6	21.2	21.6	18.5																		

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH01

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC09	From 7.00 m to 7.60 m - moderately weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to fine gravel) From 7.60 m to 7.95 m - medium strong partially weathered dark greenish grey (10Y 4/1) CALCARENITE with occasional to frequent glauconite crystals. (grain size is fine sand to fine gravel) From 7.95 m to 8.50 m - moderately weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to medium gravel)	7.00 7.05 7.20 7.20 7.20 7.50 7.50 7.50 8.15	15.7 21.0	21.4 20.3	20.3 21.0	16.8 17.3														0.48[d] 0.43[a] 0.50[a] 0.08[d] 0.06[a] 0.23[a]			
RC10	From 8.50 m to 9.40 m - weak partially weathered greenish grey (10Y 6/1) CALCARENITE with rare glauconite crystals (grain size is fine to medium sand, occasionally coarse sand to fine gravel size) From 8.50 m to 8.60 m - moderately weak From 9.40 m to 9.65 m - weak to moderately weak partially weathered light greenish grey (10Y 7/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to coarse sand) From 9.65 m to 10.00 m - moderately weak partially weathered greenish grey (10Y 5/1) CALCARENITE with frequent glauconite crystals (grain size is fine sand to fine gravel)	8.50 8.60 8.85 9.15 9.65 9.90	17.0 11.5	21.1 22.3	23.3 22.9 21.2 21.5	19.9 19.6 18.1 19.3				77.2	2.8									0.11[a]			
RC11	From 10.00 m to 10.05 m - weak to moderately weak partially weathered greenish grey (10GY 6/1) CALCARENITE with numerous to abundant glauconite crystals (grain size is fine sand to fine gravel) From 10.05 m to 11.50 m - very weak to weak distinctly weathered light greenish grey (5GY 7/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to fine gravel)	10.00 10.05 10.05 11.25	19.2 20.3	20.7 20.5																0.08[d] 0.26[a] 0.27[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH01

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC12	From 11.50 m to 11.60 m - very weak to weak partially weathered light greenish grey (5GY 7/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to fine gravel) From 11.60 m to 13.00 m - very weak to weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional glauconite crystals (grain size is fine sand to medium gravel)	11.50																							
		12.00																					0.05		
		12.00																				0.07			
		12.00																				0.20			
		12.05			21.3	18.9																			
		12.25			21.9	19.5																			
		12.45			21.8	19.4																			
		12.75	13.3	21.9																					
		12.90	11.9	22.2																					
RC13	From 13.00 m to 13.70 m - very weak to weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to medium gravel) From 13.70 m to 14.50 m - weak to moderately weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional to frequent glauconite crystals (grain size is fine sand to medium sand)	13.00																							
		13.10	21.4	20.3																	0.14[d]				
		13.10																			0.17[a]				
		13.35			22.5	18.5																			
		13.80			23.6	19.2																			
		13.95			23.7	19.3																			
		14.20																			0.43[d]				
		14.20																			0.55[a]				
		14.25	22.9	20.0																					
RC14	From 14.50 m to 15.05 m - very weak to weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional medium to coarse sand-size glauconite crystals (grain size is fine sand to coarse sand) From 15.05 m to 16.00 m - weak to moderately weak partially weathered greenish grey (10Y 5/1) CALCARENITE with occasional coarse sand-size glauconite crystals and fine to medium gravel-size bioclast (grain size is fine sand to medium sand) At 15.65 m - thin bed with grain size of fine to medium sand At 16.00 m - thin bed of glauconite	14.50																							
		14.70			23.5	20.3																			
		15.00	15.9	21.3																	0.15[d]				
		15.00																			0.64[a]				
		15.15	20.1	20.5																					
		15.70	20.6	20.4																					

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH01

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC15	From 16.00 m to 16.20 m - moderately weak partially weathered light greenish grey (10Y 7/1) CALCARENITE with occasional medium to coarse gravel-size glauconite crystals and fine to medium gravel-size bioclasts (grain size is fine sand to coarse sand)	16.00																						
		16.20	16.4	21.2																	0.26[d]			
		16.80	25.9	19.6																				
		16.90	30.3	18.9	22.4	17.5																		
	From 16.20 m to 17.50 m - very weak distinctly weathered light brownish grey (2.5Y 6/2) CALCARENITE with occasional fine to medium gravel-size bioclasts (grain size is fine sand to coarse sand)	17.10																				0.57		
		17.10																						0.54
		17.10																				0.85		
		17.15			21.3	16.6																		
RC16	From 17.50 m to 17.65 m - strong unweathered to partially weathered light grey (2.5Y 7/2) to grey (2.5Y 5/1) CALCARENITE with occasional fine gravel-size bioclasts and glauconite (grain size is fine sand to medium sand)	17.50																			2.84[d]			
		18.00	32.2	18.7	21.2	16.0																		
		18.25			18.3	13.7																		
		18.40	35.1	18.4						84.0	2.3										0.04[d]			
	From 17.65 m to 19.00 m - very weak to weak partially weathered to distinctly weathered light grey (2.5Y 7/2) CALCARENITE with occasional grey reduced glauconite of medium gravel-size (grain size is fine sand to medium sand)	18.40																			0.11[a]			
RC17	From 19.00 m to 20.50 m - weak to moderately weak partially weathered light brownish grey (2.5Y 6/2) CALCARENITE (grain size is fine to medium sand. Rare fine to coarse gravel-size bioclasts) At 20.10 m - a very thin bed of light grey (25Y 7/1) clay	19.00	16.0	21.3																				
		19.40			21.4	18.5																0.46		
		19.40																						0.68
		19.40																						0.73
		19.90	21.2	20.3																				
		20.00	20.4	20.5																	0.76[a]			
		20.00																			0.64[a]			
		20.20	27.3	19.4																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH02

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.20 m to 0.40 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of various lithologies From 0.20 m to 0.40 m - with a subrounded cobble of granite From 0.40 m to 0.99 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 7/3) CALCARENITE (grain size is medium to coarse sand) From 0.99 m to 1.00 m - calcareous medium strong to strong partially weathered brownish yellow (10YR 6/6) CALCARENITE with frequent fine to coarse gravel-size bioclasts (grain size is fine to coarse sand)	0.20 0.60 0.60 0.80 0.80 1.00	11.8 6.6	22.2 23.6																	1.56[d] 0.88[a] 4.11[a] 2.76[a]			
RC02	From 1.00 m to 1.10 m - calcareous moderately weak partially weathered very pale brown (10YR 7/3) CALCARENITE (grain size is fine to coarse sand) From 1.10 m to 1.70 m - calcareous moderately weak partially weathered light yellowish brown (10YR 6/4) CALCARENITE with numerous fine to coarse gravel-size bioclasts. (grain size is fine to medium sand)	1.00 1.05 1.70	11.7 12.3	22.3 22.1						93.1	0.1													
RC03	From 2.00 m to 2.30 m - calcareous very weak to medium strong partially weathered very pale brown (10YR 7/3) CALCARENITE with occasional fine to coarse gravel-size bioclasts and rare brown oxidation staining (grain size is fine to coarse sand)	2.00 2.20 2.20	13.9	21.7																	1.15[a] 1.09[a]			
RC04	From 3.00 m to 3.40 m - calcareous medium strong to strong partially weathered very pale brown (10YR 7/4) CALCARENITE with occasional fine to coarse gravel-size bioclasts and with rare brown oxidation staining (grain size is fine to medium sand)	3.00 3.30	10.8	22.5																				
RC05	From 4.00 m to 4.20 m - calcareous medium strong to strong partially weathered very pale brown (10YR 7/3) CALCARENITE with occasional brown oxidation stains (grain size is fine to medium sand)	4.00 4.10	22.9	20.0																				

Notes

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γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10[r] : r refers to test on remoulded soil
10[d] : d refers to test on disturbed soil
10[s] : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH02

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC06	From 4.50 m to 5.15 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 7/3) CALCARENITE with brown oxidation staining From 4.80 m to 4.95 m - reworked very pale brown (10YR 8/4) calcarenite composed of sandy clay	4.50																						
		4.65	14.3	21.7																				
		4.85	29.1	19.1																				
RC07	From 5.50 m to 6.05 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 7/3) CALCARENITE	5.50																						
		5.85	20.6	20.4																				
RC08	From 6.50 m to 6.55 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 7/3) CALCARENITE	6.50																						
RC09	From 7.00 m to 7.25 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE	7.00																						
		7.15	31.4	18.8																				
RC10	From 7.70 m to 8.10 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE	7.70																						
		7.90	28.9	19.1																				
RC11	From 8.50 m to 9.05 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE	8.50																						
		8.60																			0.38[a]			
		8.70	30.3	18.9																	0.48[a]			
RC12	no recovery	9.20																						
RC13	no recovery	9.70																						
RC14	no recovery	10.20																						
RC15	From 11.20 m to 11.40 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE	11.20																						
		11.30	24.7	19.7																				
RC16	From 11.70 m to 12.60 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/4) CALCARENITE	11.70																						
		11.90	27.0	19.4																				
		12.10																			0.78[a]			
		12.10																			0.83[d]			
		12.30	18.9	20.7																				
RC17	From 12.70 m to 13.70 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/4) CALCARENITE	12.70			19.7	15.5																		0.19
		12.70																						0.04
		12.70																						0.12
		13.00																			0.46[d]			
		13.00																			0.40[a]			
		13.00																			0.58[a]			
		13.70	27.1	19.4																				

Notes

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γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH02

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC18	From 13.70 m to 15.00 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 14.85 m to 15.00 m - calcareous destructured very pale brown (10YR 8/4) calcarenite	13.70																						
		14.05																			0.32[d]			
		14.05																			0.13[a]			
		14.05																			0.32[a]			
		14.40			18.9	14.3																		
		15.00	32.1	18.7																				
RC19	From 15.00 m to 16.50 m - highly calcareous weak to moderately weak partially weathered to distinctly weathered very pale brown CALCARENITE (grain size is fine to coarse sand) From 15.50 m to 15.70 m - occasional reddish brown staining	15.00	29.2	19.1	18.0	13.9																		
		15.30																			0.35[a]			
		15.75	25.4	19.6																	0.33[a]			
RC20	From 16.50 m to 18.00 m - calcareous weak to moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE From 17.15 m to 17.65 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy silty gravel. Clasts are very weak pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) with yellow (10YR 8/6) staining	16.50																						
		16.75	27.0	19.4	20.0	15.8															0.32[a]			
		17.40	19.2	20.7																				
		17.65																			0.21[a]			
		17.65																			0.34[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH02

Sample No	Ground Description	Depth BSF [m]	w [%]	Unit Weight [kN/m³] γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	Atterberg Limits w_P [%]	w_L [%]	I_P [%]	Fines [%]	Undrained Shear Strength PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	Is_{50} [MPa] O	A	D	Ir
RC21	From 18.00 m to 18.40 m - calcareous very weak to weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	18.00 18.60																			0.79[a]			
	From 18.40 m to 18.60 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy silty gravel. Clasts are very weak very pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) with yellow stains (10YR 8/6)	18.80 19.20 19.30	18.0 25.7	20.9 19.6																	0.37[a]			
	From 18.60 m to 18.65 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE with yellow (10YR 8/8) staining																							
	From 18.65 m to 19.10 m - calcareous destructured yellow (10YR 8/6) CALCARENITE composed of sandy gravelly CLAY. Clasts are extremely weak to very weak yellow (10YR 8/6) angular to subrounded fine to coarse. Matrix is yellow (10YR 8/6).																							
	From 19.10 m to 19.50 m - calcareous very weak partially weathered yellow (10YR 8/6) CALCARENITE																							

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH02

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC22	From 19.50 m to 19.70 m - calcareous very weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	19.50																						
		19.60																			0.35[a]			
		19.90	17.0	21.1																				
	From 19.70 m to 19.75 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of gravelly clayey SAND. Clasts are extremely weak to weak very pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4).	20.40	10.5	22.6																				
	From 19.75 m to 19.80 m - calcareous weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE																							
	From 19.80 m to 19.85 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of clayey SAND with fine to medium gravel. Clasts are extremely weak to weak very pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4).																							
	From 19.85 m to 20.00 m - calcareous weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE																							
	From 20.00 m to 20.60 m - destructured yellow (10YR 8/6) CALCARENITE composed of sandy gravelly CLAY. Clasts are extremely weak to weak yellow (10YR 8/6) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) and yellow (10YR 7/8) mottled CALCARENITE with stains of dark yellowish brown (10YR 4/6).																							
	From 20.60 m to 21.00 m - calcareous very weak partially weathered to distinctly weathered yellow (10YR 7/8) CALCARENITE																							

Notes

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γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
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UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH03

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	no recovery	0.00																						
RC02	no recovery	0.30																						
RC03	no recovery	1.30																						
RC04	From 1.80 m to 2.35 m - reworked very pale brown (10YR 8/4) CALCARENITE composed of sandy very clayey very silty gravel. Clasts are extremely weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4) From 2.35 m to 2.70 m - very weak to moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE From 2.70 m to 3.00 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy very clayey very silty gravel. Clasts are extremely weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	1.80 2.20 2.45 2.70	 22.2 26.2 							90.8	0.6													
RC05	From 3.00 m to 3.45 m - destructured to reworked very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty gravel. Clasts are very weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4) slightly sandy slightly gravelly silty CLAY. From 3.35 m to 3.45 m - very weak partially weathered very pale brown (10YR 8/4) (grain size is medium sand)	3.00 3.20	 20.5																					
RC06	From 4.10 m to 4.50 m - highly calcareous very weak partially weathered very pale brown CALCARENITE From 4.50 m to 5.00 m - destructured to reworked very pale brown (10YR 8/4) CALCARENITE composed of sandy very clayey very silty gravel. Clasts are very weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	4.10 4.30 4.50 4.80	 27.1 18.1																		0.26[a]			
RC07	From 5.00 m to 5.55 m - highly calcareous very weak partially weathered very pale brown CALCARENITE From 5.55 m to 5.70 m - destructured very pale brown CALCARENITE composed of sandy very silty gravel. Clasts are very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	5.00 5.20 5.30 5.55	 26.3 22.5																		0.03[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH03

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC08	From 6.00 m to 6.40 m - highly calcareous very weak partially weathered very pale brown CALCARENITE From 6.40 m to 7.00 m - destructured very pale brown CALCARENITE composed of sandy very silty gravel. Clasts are very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	6.00 6.10 6.10 6.10 6.30 6.70	 23.9 21.4																		0.04[d] 0.24[a] 0.37[a]			
RC09	From 7.00 m to 8.25 m - destructured very pale brown CALCARENITE composed of gravelly very silty sand. Clasts are extremely weak very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	7.00 7.25	 22.6																					
W01	From 10.00 m to 10.95 m - destructured very pale brown calcareous CALCARENITE composed of sandy very silty gravel. Clasts are extremely weak to very weak very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	10.00 10.55	 22.6		20.8	17.0																		
W02	From 12.50 m to 13.45 m - calcareous reworked very pale brown (10YR 8/3) CALCARENITE composed of silty sandy gravel. Clasts are very weak to weak very pale brown (10YR 8/3) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/3)	12.50 12.60 13.20	 26.1 19.5		19.5	15.4																		
W03	From 15.00 m to 15.20 m - calcareous reworked very pale brown (10YR 8/3) CALCARENITE composed of silty sandy gravel. Clasts are extremely weak to very weak very pale brown (10YR 8/3) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/3), with occasional brown (7.5YR 5/2) oxidation staining	15.00 15.05	 32.4		20.2	15.3																		
RC10	From 15.20 m to 15.45 m - calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of silty sandy gravel. Clasts are very weak to weak very pale brown (10YR 8/3) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/3) From 15.45 m to 16.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE with rare medium gravel-size bioclasts and occasional brown (7.5YR 5/2) oxidation stains (grain size is fine to coarse sand)	15.20 15.85 15.85 15.85	 25.6																		0.17[d] 0.17[a] 0.23[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
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O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
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UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH03

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC11	From 16.00 m to 16.45 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE (grain size is fine to medium sand) From 16.45 m to 16.75 m - calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/3) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/3) From 16.75 m to 17.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE (grain size is fine to medium sand)	16.00 16.15 16.15 16.15 16.45	 28.9 21.6		18.1 21.9	14.1 18.0														0.20[a] 0.21[a] 0.22[d]			
RC12	From 17.00 m to 18.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE (grain size is fine sand to fine gravel) From 17.10 m to 17.30 m - frequent brown oxidation stains	17.00 17.30 17.50 17.80 17.80 17.80	 24.2 18.2 16.8		 21.2	 18.2														0.97[a]	 0.14 0.33	0.56	
RC13	From 18.00 m to 18.30 m - calcareous weak to moderately weak partially weathered white (10YR 8/1) CALCARENITE (grain size is fine to medium sand) At 18.05 m - a thick lamina of white (10YR 8/1) slightly sandy silt From 18.30 m to 19.00 m - calcareous extremely weak to weak partially weathered to distinctly weathered light yellowish brown (10YR 6/4) CALCARENITE with very closely to closely spaced thick lamina to very thin bed of very pale brown (10YR 8/4) slightly sandy silt (grain size is silt to fine sand (possibly calcisiltite))	18.00 18.15 18.60 18.75	 9.6 29.1 30.8																0.03[a]			
RC14	From 19.10 m to 20.10 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE with occasional brown oxidation staining (grain size is fine to medium sand) From 19.00 m to 19.30 m - very weak to weak From 19.90 m to 20.00 m - very weak to weak	19.00 19.25 19.45	 11.5																0.57[d]			

Notes

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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
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UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH03-a

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.15 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of limestone and various lithologies	0.00																						
		0.25	6.5																		3.95[a]			
		0.75	8.8																		1.94[a]			
	From 0.15 m to 1.00 m - calcareous weak to strong partially weathered light yellowish brown (10YR 6/4) CALCARENITE with frequent coarse sand-size to fine gravel-size bioclasts and numerous brown oxidation staining (grain-size is fine to medium sand-size)																							
RC02	From 1.00 m to 1.50 m - calcareous medium strong to strong partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional coarse sand-size to fine gravel-size bioclasts (grain size is fine to medium sand)	1.00	10.1																		2.63[a]			
		1.20	10.1		23.8	21.6																		1.89
		1.20																						1.74
		1.20																						1.34
		1.80	22.8																					
	From 1.50 m to 2.00 m - calcareous destructured yellow (10YR 8/6) becoming very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty gravel. Clasts are very weak to weak very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)																							

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
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10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH04

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.10 m - multi-coloured subangular to subrounded medium to coarse GRAVEL with rare medium gravel-size shell fragments	0.00 0.10 0.30	13.3	21.9	20.5	18.1															0.90[a]			
	From 0.10 m to 0.75 m - calcareous weak to moderately weak partially weathered to distinctly weathered white (10YR 8/1) CALCARENITE	0.40 0.55																			0.16[a] 0.16[a]			
	From 0.60 m to 0.70 m - extremely weak	0.60	26.3	19.5																				
RC02	From 0.80 m to 1.10 m - calcareous moderately weak partially weathered to distinctly weathered white (10YR 8/1) CALCARENITE with occasional yellow (10YR 8/8) staining	0.80 0.95	27.3	19.3																				
RC03	no recovery	1.80																						
RC04	no recovery	2.80																						
RC05	no recovery	3.30																						
W01	no recovery	3.50																						
RC06	From 3.50 m to 3.80 m - calcareous weak to moderately weak partially weathered to distinctly weathered white (10YR 8/1) CALCARENITE with occasional brownish yellow (10YR 6/8) staining	3.50 3.55 3.80	12.5 32.2	22.1 18.7	21.6	19.2				77.2	1.8										0.39[a]			
	From 3.80 m to 3.90 m - calcareous destructured white (10YR 8/1) CALCARENITE composed of slightly sandy slightly gravelly silt. Clasts are angular to subrounded fine. Matrix is white (10YR 8/1) with thickly laminated brownish yellow (10YR 6/8) and thinly laminated yellowish red (5YR 5/8))																							
	From 3.90 m to 4.00 m - calcareous weak to moderately weak partially weathered to distinctly weathered white (10YR 8/1) CALCARENITE																							
RC07	From 4.00 m to 4.15 m - calcareous moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	4.00 4.10 4.25	13.7	21.8																	0.16[a]			
	From 4.15 m to 4.55 m - calcareous extremely weak to very weak partially weathered to distinctly weathered very pale brown (10YR 8/2) CALCARENITE with occasional brownish yellow (10YR 6/8) staining	4.30 4.50	27.3	19.4																	0.26[a]			

Notes

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γ-w : Unit weight derived from water content
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
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Fines : Mass percentage of material passing 63 µm or 75 µm sieve
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10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH04

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC08	From 5.00 m to 5.70 m - calcareous very weak to weak partially weathered to distinctly weathered very pale brown (10YR 8/2) CALCARENITE with rare brownish yellow (10YR 6/8) staining	5.00 5.40 5.45 5.45 5.55	27.1	19.4																	0.18[d] 0.28[a] 0.23[d]			
RC09	From 6.00 m to 6.85 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with rare brownish yellow (10YR 6/8) staining	6.00 6.35 6.45 6.65	26.8 17.8	19.4 20.9	23.1	19.6															0.49[a]			
RC10	From 7.00 m to 8.05 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional brownish yellow (10YR 6/8) staining (grain size is fine to coarse sand) From 7.60 m to 7.80 m - partially weathered pink (7.5YR 8/3)	7.00 7.25 7.40 7.90	19.8 24.5	20.6 19.8	21.8	18.2															0.39[a]			
RC11	From 8.20 m to 9.05 m - calcareous moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE From 9.05 m to 9.20 m - calcareous destructured pink (7.5YR 8/3) to very pale brown (10YR 8/3) CALCARENITE (composed of sandy very silty gravel. Clasts are extremely weak very pale brown (10YR 8/3) to pink (7.5YR 8/3) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/3) to pink (7.5YR 8/3).) From 9.20 m to 9.30 m - calcareous very weak distinctly weathered pink (7.5YR 8/3) CALCARENITE (grain size is medium sand to fine gravel)	8.20 8.30 8.40 8.50 8.60 8.60 8.60 8.80	22.8 23.4	20.0 19.9	19.4 21.8	15.8 17.7															0.25[a] 0.24[a] 0.22[d] 0.20[a] 0.22[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
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Ir : Irregular lump
10[r] : r refers to test on remoulded soil
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10[s] : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH04

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC12	From 9.70 m to 11.00 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE with coarse sand-size to medium gravel-size bioclasts (grain size is medium sand to fine gravel) From 11.00 m to 11.15 m - calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of silty sandy gravel. Clasts are weak very pale brown (10YR 8/3) subangular to subrounded coarse. Matrix is very pale brown (10YR 8/3)	9.70 9.80 10.00 10.00 10.00 10.50	25.4 27.4	19.6 19.3																	0.26^{d} 0.35^{a} 0.31^{a} 0.29^{a}			
RC13	From 11.20 m to 12.70 m - calcareous weak partially weathered very pale brown (10YR 8/2) CALCARENITE with rare fine gravel-size bioclasts (grain size is fine to coarse sand) From 12.25 m to 12.45 m - very weak	11.20 11.30 11.30 11.30 12.45 12.45 12.45	22.2 19.8 	20.1 20.6 																	0.34^{d} 0.31^{a} 0.30^{a} 0.09^{d} 0.15^{a} 0.25^{a}			
RC14	From 12.70 m to 14.10 m - calcareous weak partially weathered to distinctly weathered very pale brown (10YR 8/2) to pink (5YR 7/4) CALCARENITE with frequent coarse sand-size to fine gravel-size bioclasts (grain size is fine to coarse sand)	12.70 12.70 13.95 13.95	24.0	19.8																	0.37^{a} 0.14^{d} 1.88^{d} 3.73^{a}			
RC15	From 14.20 m to 14.60 m - calcareous medium strong partially weathered to distinctly weathered white (10YR 8/1) CALCISILTITE with frequent medium sand-size to fine gravel-size bioclasts and occasional brown (10YR 4/3) oxidation staining From 14.60 m to 15.15 m - calcareous weak partially weathered to distinctly weathered very pale brown (10YR 8/2) CALCARENITE with abundant medium sand-size to fine gravel-size bioclasts (grain size is medium to coarse sand) From 14.65 m to 14.70 m - destructured thinly bedded very pale brown (10YR 8/2) composed of gravelly silty sand. Clasts are extremely weak very pale brown (10YR 8/4) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/2)	14.20 14.95	25.9	19.6						93.1	2.5										0.17^{a}			

Notes

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γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
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CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
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10^{r} : r refers to test on remoulded soil
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10^{s} : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH04

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC16	From 15.70 m to 16.70 m - calcareous weak partially weathered to distinctly weathered very pale brown (10YR 8/2) CALCARENITE with abundant medium sand-size to fine gravel-size bioclasts (grain size is medium to coarse sand)	15.70 16.45 16.45	29.0	19.1																	0.09[d] 0.14[a]			
RC17	From 16.70 m to 17.00 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE with numerous medium to coarse sand-size bioclasts (grain size is fine to coarse sand)	16.70 16.80 16.80 16.80	25.4	19.6																	0.19[d] 0.21[a] 0.24[a]			
RC18	From 17.20 m to 18.25 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE with closely spaced very thin beds of very pale brown (10YR 8/2) very silty sand and with frequent fine to medium sand-size bioclasts and occasional brown (10YR 4/3) oxidation stains (grain size is fine to coarse sand) From 18.25 m to 18.60 m - calcareous very weak to weak partially weathered to distinctly weathered pink (5YR 8/4) CALCARENITE with occasional coarse sand-size to fine gravel-size bioclasts and occasional brown (10YR 4/3) oxidation staining (grain size is fine to coarse sand) From 18.25 m to 18.35 m - destructured to reworked	17.20 17.25 18.35 18.35	23.0	20.0																	0.06[a] 0.23[d] 0.27[a]			
RC19	From 18.70 m to 20.00 m - calcareous weak to moderately weak partially weathered to distinctly weathered pink (5YR 8/3) CALCARENITE with abundant medium sand-size to fine gravel-size bioclasts and frequent brown (10YR 4/3) oxidation staining (grain size is fine to coarse sand)	18.70 18.95 18.95 18.95 19.30 19.35 19.80	15.4 13.9 9.7	21.4 21.7 22.8	22.0	19.1															 0.26[a] 1.68[d]			0.67 1.30 0.90

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH07

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
W01	From 1.50 m to 2.35 m - calcareous very weak partially weathered pink (7.5YR 8/3) CALCARENITE locally with reddish yellow (5YR 7/6) staining	1.50 1.85	29.7	19.0																				
W02	From 4.00 m to 4.90 m - calcareous extremely weak partially weathered pink (7.5YR 8/3) CALCARENITE locally with reddish yellow (5YR 7/6) staining	4.00 4.50	24.6	19.7																				
W03	no recovery	6.50																						
RC01	From 6.60 m to 7.20 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 8/3) becoming light red (2.5YR 7/6) CALCARENITE with frequent fine gravel-size bioclasts and occasional brown (7YR 4/2) oxidation staining (grain size is fine to coarse sand)	6.60 6.85 6.95	16.3	21.2																	1.28[a]			
RC02	From 7.50 m to 8.00 m - calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of sandy very silty gravel. Clasts are extremely weak very pale brown (10YR 8/4) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/3) with occasional brown (7YR 4/2) oxidation staining and light red (2.5YR 6/6) staining From 8.00 m to 8.50 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/3) becoming light red (2.5YR 7/6) CALCARENITE with frequent fine to medium gravel-size bioclasts and occasional brown (7YR 4/2) oxidation staining (grain size is fine to coarse sand)	7.50 7.65 8.15 8.15 8.15 8.25	21.4 21.4	20.3 20.3																	0.04[d] 0.09[a] 0.28[a]			
RC03	From 8.50 m to 9.50 m - calcareous moderately weak partially weathered light red (2.5YR 7/6) to brownish yellow (10YR 6/8) CALCARENITE with occasional fine gravel-size bioclasts and brown (7YR 4/2) oxidation staining and frequent light red (2.5YR 6/6) staining (grain size is fine to coarse sand)	8.50 8.80 8.80 8.80	26.2	19.5																	0.42[d] 0.46[a] 0.57[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH07

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC04	From 9.50 m to 9.55 m - calcareous very weak partially weathered very pale brown (10YR 8/3) CALCARENITE with frequent fine gravel-size bioclasts and occasional light red (2.5YR 6/6) staining (grain size is fine to coarse sand) From 9.55 m to 10.15 m - calcareous destructured light red (2.5YR 7/6) CALCARENITE (composed of sandy very silty gravel. Clasts are extremely weak light red (2.5YR 7/6) to very pale brown (10YR 8/2) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/3) to light red (2.5YR 7/6) with frequent light red stains From 10.15 m to 10.50 m - calcareous very weak to weak partially weathered pink (5YR 7/4) CALCARENITE with occasional brown (75YR 5/2) oxidation staining and frequent light red (2.5YR 6/6) staining (grain size is fine to coarse sand)	9.50 9.90 10.40 10.50	 19.8 23.4 20.9	 20.6 19.9 20.4																0.04[a]			
RC05	From 10.50 m to 11.90 m - calcareous very weak to moderately weak partially weathered pink (5YR 7/4) CALCARENITE (grain size is fine to coarse sand)	10.50 10.60 10.60 11.20	 24.5	 19.8						93.1	0.8									0.59[d] 0.32[a]			
RC06	From 12.00 m to 12.35 m - calcareous very weak partially weathered pink (5YR 7/4) CALCARENITE with frequent light red (2.5YR 6/6) staining (grain size is fine to coarse sand) From 12.35 m to 13.00 m - calcareous destructured light red (2.5YR 7/6) becoming very pale brown (10YR 8/2) CALCARENITE (composed of silty very sandy gravel. Clasts are extremely weak light red (2.5YR 6/6) becoming very pale brown (10YR 8/2) subangular to subrounded fine to coarse. Matrix is light red (2.5YR 7/6) becoming very pale brown (10YR 8/2)) From 13.00 m to 13.50 m - calcareous moderately weak partially weathered pink (5YR 7/4) CALCARENITE with frequent fine gravel-size bioclasts (grain size is fine to coarse sand)	12.00 12.20 12.50	 24.1 20.9	 19.8 20.4																			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH07

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC07	From 13.50 m to 13.80 m - calcareous weak partially weathered pink (5YR 7/4) CALCARENITE with frequent fine to medium gravel-size bioclasts and rare brown (7YR 4/2) oxidation staining (grain size is fine to coarse sand) From 13.65 m to 13.80 m - very pale brown (10YR 8/4) with rare fine gravel-size bioclasts and frequent light red (2.5YR 6/6) staining (grain size is fine to coarse sand size) From 13.80 m to 14.05 m - calcareous destructured very pale brown (10YR 8/3) CALCARENITE composed of silty sandy gravel. Clasts are extremely weak very pale brown (10YR 8/3) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/3) with occasional light red (2.5YR 6/6) staining From 14.05 m to 14.80 m - calcareous weak to moderately weak partially weathered pink (5YR 7/4) CALCARENITE with rare fine gravel-size bioclasts (grain size is fine to coarse sand) From 14.40 m to 14.70 m - grain size is fine to coarse sand size with frequent to numerous fine to medium gravel-size bioclasts and occasional to frequent brown (7YR 4/2) oxidation staining and frequent light red (2.5YR 6/6) staining	13.50 13.90 14.50	 20.9 24.7	 20.4 19.7																0.02[d]			
RC08	From 15.00 m to 15.20 m - calcareous very weak partially weathered light reddish brown (2.5YR 7/4) CALCARENITE with rare fine gravel-size bioclasts (grain size is fine to coarse sand) From 15.20 m to 15.45 m - calcareous destructured light reddish brown (2.5YR 7/4) CALCARENITE composed of silty gravelly sand. Clasts are extremely weak light reddish brown (2.5YR 7/4) subangular to subrounded fine to medium. Matrix is light reddish brown (2.5YR 7/4) From 15.45 m to 16.10 m - calcareous very weak to weak partially weathered light red (2.5YR 7/6) CALCARENITE (grain size is fine to coarse sand with occasional to frequent fine gravel-size bioclasts and occasional to frequent light red stains)	15.00 15.30 15.80 15.80 15.80	 17.8 26.1	 20.9 19.5																0.24[d] 0.04[a] 0.05[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH07

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC09	From 16.50 m to 17.10 m - calcareous very weak to weak partially weathered pink (5YR 7/4) CALCARENITE with frequent to numerous fine to medium gravel-size bioclasts and occasional brown (7YR 4/2) oxidation staining and occasional light red (2.5YR 6/6) staining) (grain size is fine to coarse sand) From 17.10 m to 17.35 m - destructured to reworked very pale brown (10YR 8/3) CALCARENITE composed of silty gravelly sand. Clasts are extremely weak very pale brown (10YR 8/3) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/3) and occasional light red (2.5YR 6/6) staining From 17.35 m to 17.90 m - calcareous very weak to weak partially weathered pink (7.5YR 7/4) CALCARENITE with occasional fine to medium gravel-size bioclasts and occasional to frequent brown (7YR 4/2) oxidation staining and light red (2.5YR 6/6) staining (grain size is fine to coarse sand)	16.50 17.05 17.20 17.70	23.4 19.9 20.0	19.9 20.5 20.5																0.07[a]			
RC10	From 18.00 m to 19.40 m - calcareous very weak to weak partially weathered pink (7.5YR 7/4) CALCARENITE with rare to occasional fine gravel-size bioclasts and occasional brown (7YR 4/2) oxidation staining and occasional light red (2.5YR 6/6) staining (grain size is fine to coarse sand)	18.00 18.50 19.00 19.20	18.7 25.4	20.8 19.6																0.24[a] 0.24[a]			
RC11	From 19.50 m to 20.30 m - calcareous very weak to moderately weak partially weathered very pale brown (10YR 8/3) CALCARENITE with occasional fine gravel-size bioclasts and occasional to frequent brown (7YR 4/2) oxidation staining and light red (2.5YR 6/6) staining (grain size is fine to coarse sand)	19.50 20.10 20.10																		0.35[d] 0.26[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH08

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.05 m to 1.00 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	0.05																						
		0.05								93.1	3.6										1.58[a]			
		0.10	14.4	21.6																				
		0.15			20.9	18.3																		
		0.35			20.8	18.2																		
		0.60																			1.59[d]			
		0.60																			1.40[a]			
		0.60																			1.40[a]			
		0.65	15.1	21.5																				
		0.75			20.8	18.2																		
RC02	From 1.00 m to 1.70 m - moderately weak partially weathered to distinctly weathered pinkish white (7.5YR 8/2) CALCARENITE	1.00																						
		1.10	14.9	21.5																	0.37[d]			
		1.60	16.9	21.1																	0.11[a]			
	From 1.70 m to 2.00 m - moderately weak partially weathered reddish yellow (5YR 6/6) CALCARENITE																							
RC03	From 2.00 m to 2.50 m - moderately weak partially weathered reddish yellow (5YR 6/6) CALCARENITE	2.00	12.8	22.0																	0.07[a]			
		2.20	12.7	22.0																	2.11[a]			
	From 2.50 m to 3.00 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	2.60			21.0	17.5																		
		2.75	20.1	20.5																	1.13[d]			
		2.75																			0.93[a]			
		2.75																			0.94[a]			
RC04	From 3.00 m to 3.25 m - destructured pinkish white (7.5YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are weak to moderately weak pinkish white (7.5YR 8/2)) subangular to subrounded medium to coarse. Matrix is pinkish white (7.5YR 8/2)	3.00																						
		3.60			20.4	17.3																		
		3.65																					0.56	
		3.65																				0.20		
		3.65																				0.30		
	From 3.25 m to 4.35 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	3.80	17.7	21.0																	0.56[d]			
		3.80																			0.62[a]			
	From 4.35 m to 4.50 m - destructured pinkish white (7.5YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are weak to moderately weak very pale brown (75YR82) subangular to subrounded medium to coarse. Matrix is very pale brown (75YR82)	3.80																			0.61[a]			
		3.95	8.0	23.2																	2.66[d]			
		3.95																			2.96[a]			
		3.95																			3.49[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH08

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC05	From 4.50 m to 5.20 m - weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	4.50																			0.62[a]			
		4.55																						
		4.95	20.8	20.4																				
		5.05																			0.71[a]			
RC06	From 5.50 m to 5.60 m - weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE From 5.60 m to 6.20 m - destructured pinkish white CALCARENITE composed of silty slightly sandy gravel. Clasts are very weak to weak pinkish white subangular to subrounded fine to coarse. Matrix is pinkish white (7.5YR 8/2) (very closely to medium spaced thick laminae of silt between the clasts) From 6.20 m to 6.40 m - weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	5.50																						
		5.90	22.6	20.1																				
		6.20	20.2	20.5																				
		6.25																			0.54[a]			
RC07	From 6.50 m to 6.70 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE From 6.70 m to 7.20 m - destructured pinkish white (7.5YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are weak to moderately weak pinkish white (7.5YR 8/2) subangular to subrounded medium to coarse. Matrix is pinkish white (7.5YR 8/2) From 7.20 m to 7.50 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE (composed of very thin layers of sandy very silty coarse sand and fine gravels)	6.50																						
		6.60																			0.07[d]			
		6.90	18.0	20.9																				
		7.20	21.0	20.3																				
RC08	From 7.50 m to 8.40 m - weak to moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE From 7.95 m to 8.20 m - Joint is 70 degrees undulating rough on the weathering plane	7.50																						
		7.80	20.8	20.4																	0.82[a]			
		7.85																			0.86[d]			
		7.85																			0.99[a]			
		7.88																			0.86[a]			
		8.10	20.1	20.5																				

Notes

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γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
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I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
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10^r : r refers to test on remoulded soil
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10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH08

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC09	From 8.50 m to 9.50 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE From 9.05 m to 9.35 m - distinctly weathered	8.50																						
		8.75																			0.76[a]			
		8.80	19.1	20.7																				
		8.85																			0.89[a]			
		9.10	14.7	21.6																				
		9.35																			0.72[d]			
		9.35																			0.95[a]			
		9.35																			0.86[a]			
RC10	From 9.50 m to 11.00 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	9.50																						
		9.85																			0.98[a]			
		10.00																						0.30
		10.00																						0.18
		10.00																						0.50
		10.30	21.0	20.4																	0.52[d]			
		10.30																			0.54[a]			
		10.30																			0.88[a]			
RC11	From 11.00 m to 11.10 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	11.00																						
		11.10	19.5	20.6																				
	From 11.10 m to 12.35 m - moderately weak partially weathered to distinctly weathered pink (7.5YR 8/3) CALCARENITE	11.90																			0.37[d]			
		12.00	17.2	21.0																				
RC12	From 12.50 m to 13.70 m - moderately weak partially weathered pinkish white (7.5YR 8/2) CALCARENITE	12.50																						
		12.90	18.4	20.8																				
	From 13.70 m to 13.85 m - moderately weak partially weathered to distinctly weathered pink (7.5YR 8/4) CALCARENITE	13.80	21.7	20.2																				
RC13	From 14.00 m to 15.35 m - calcareous medium strong partially weathered pink (7.5YR 8/4) CALCARENITE From 15.00 m to 15.20 m - calcareous weak distinctly weathered pink (7.5YR 8/4)	14.00																						
		14.35																			1.96[d]			
		14.45	12.6	22.0																				
		14.70																			0.42[a]			
		15.00	23.7	19.9																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH08

Sample No	Ground Description	Depth BSF [m]	w [%]	Unit Weight [kN/m³] γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	Atterberg Limits w_P [%]	w_L [%]	I_P [%]	Fines [%]	Undrained Shear Strength PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	Is_{50} [MPa] O	A	D	Ir
RC14	From 15.50 m to 15.80 m - calcareous moderately weak partially weathered pink (7.5YR 8/3) CALCARENITE From 15.65 m to 15.75 m - clayey pinkish white (7.5YR 8/2) From 15.80 m to 16.80 m - calcareous moderately weak distinctly weathered pinkish white (7.5YR 8/2) to pink (7.5YR 8/4) CALCARENITE From 16.80 m to 17.00 m - calcareous moderately weak partially weathered pink (7.5YR 8/4) CALCARENITE	15.50 15.70 15.75 16.25 16.85	17.5 11.8 11.8	21.0 22.2 22.2																	0.64[a]			
RC15	From 17.00 m to 17.40 m - calcareous moderately weak partially weathered pink (7.5YR 8/4) CALCARENITE From 17.40 m to 17.70 m - destructured CALCARENITE composed of silty sandy gravel. Clasts are moderately weak to medium strong pink (75YR 8/4) subangular to angular fine to coarse. Matrix is very pale brown (10YR 8/4) From 17.70 m to 18.10 m - calcareous moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE	17.00 17.60 17.90 17.95	18.8 15.8	20.7 21.3																	0.23[d]			
RC16	From 18.50 m to 19.40 m - calcareous moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE	18.50 18.50 18.92 18.92 18.92 18.95 19.15	18.8 16.7	20.7 21.2																	0.65[d] 0.88[a] 0.50[d] 0.56[a] 0.64[a]			
RC17	From 19.50 m to 20.45 m - calcareous moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 19.55 m to 19.85 m - weak to moderately weak distinctly weathered very pale brown (10YR 8/4)	19.50 19.80 19.92 20.10 20.15 20.30	11.2 17.4	22.4 21.0																	0.45[a] 0.82[a] 0.68[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH10

Sample		Depth		Unit Weight [kN/m³]							Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.55 m to 0.75 m - multi-coloured subrounded COBBLES of various lithologies (with few subrounded coarse gravels of various lithologies) From 0.75 m to 0.90 m - multi-coloured subangular fine to coarse GRAVEL of various lithologies From 0.90 m to 1.00 m - pale brown (10YR 6/3) very sandy calcareous medium to coarse GRAVEL with occasional coarse sand-size shells. Sand is subangular to subrounded fine to medium - with a thick lamina of greyish brown (10YR 5/2) sandy silt	0.55 0.90 0.95	 10.9	 22.8					2.70						18.9									
W01	no recovery	1.00																						
RC02	From 1.00 m to 1.20 m - multi-coloured subangular to subrounded coarse GRAVEL of various lithologies with a cobble From 1.20 m to 1.80 m - calcareous extremely weak reworked very pale brown (10YR 8/2) CALCARENITE (recovered as residual soil - matrix is silty fine to medium SAND) From 1.80 m to 2.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE (locally stained orange)	1.00 1.35 1.40 1.85	 21.3 18.5 20.3	 20.3 20.8 20.5	19.6	16.2																		
RC03	no recovery	2.00																						
RC04	From 2.50 m to 2.95 m - calcareous very weak to weak partially weathered white (10YR 8/1) CALCARENITE From 2.95 m to 3.20 m - calcareous extremely weak destructured white (10YR 8/1) CALCARENITE	2.50 2.65 3.15	 27.6 31.1	 19.3 18.8																				
W02	From 5.00 m to 5.95 m - calcareous extremely weak to very weak partially weathered white (10YR 8/1) CALCARENITE	5.00 5.50 5.60 5.60 5.60 5.80	 28.3 25.4	 19.2 19.6																	0.08[d] 0.13[a] 0.11[a]			
W03	From 7.50 m to 7.60 m - calcareous extremely weak destructured white (10YR 8/1) CALCARENITE	7.50																						

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH10

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC05	From 7.50 m to 8.20 m - calcareous extremely weak to very weak destructured white (10YR 8/1) CALCARENITE	7.50 7.85	27.8	19.3																				
W04	From 10.00 m to 10.90 m - calcareous very weak to moderately weak partially weathered white (10YR 8/1) CALCARENITE	10.00 10.25 10.25 10.25 10.25 10.60	29.1	19.1																	0.12[d] 0.22[d] 0.19[a] 0.19[a]			
W05	From 12.50 m to 13.35 m - calcareous very weak partially weathered white (10YR 8/1) CALCARENITE	12.50 13.00	27.0	19.4																				
RC06	From 15.00 m to 15.10 m - weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 15.10 m to 15.60 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of silty sandy gravel. Clasts are very weak subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) From 15.40 m to 15.50 m - pockets of yellow (10RY86) medium sand to fine gravels From 15.60 m to 15.70 m - weak partially weathered very pale brown (10YR 8/4) CALCARENITE	15.00 15.20 15.40	27.5 25.1	19.3 19.7						93.1	0.2													
RC07	From 16.50 m to 16.70 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of slightly gravelly silty sand. Clasts are extremely weak to very weak very pale brown (10YR 8/4) angular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) From 16.70 m to 16.90 m - weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 16.90 m to 17.50 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of gravelly very silty sand. Clasts are extremely weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	16.50 16.55 16.80 16.80 17.40	16.7 28.5 18.7	21.1 19.2 20.8																	0.12[d] 0.38[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH10

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC08	From 19.00 m to 19.75 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of silty sandy gravel. Clasts are extremely weak very pale brown (10YR 8/4) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4) From 19.75 m to 19.95 m - weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 19.95 m to 20.00 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of gravelly silty sandy gravel. Clasts are extremely weak very pale brown (10YR 8/4) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/4)	19.00 19.30 19.80 19.90 19.95	 21.7 30.3 24.2	 20.2 18.9 19.8																	0.25[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH11

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.15 m - multi-coloured subangular to subrounded COBBLES of various lithologies with a low subangular to subrounded medium to coarse gravel content From 0.15 m to 1.00 m - very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE	0.00 0.80	24.8	19.7																				
RC02	From 1.00 m to 1.40 m - very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE	1.00 1.10	29.4	19.1																				
RC03	From 2.00 m to 2.40 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of gravelly silty sand. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2) From 2.40 m to 3.10 m - weak becoming moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	2.00 2.20	18.2	20.9																				
RC04	From 3.60 m to 5.00 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	3.60 4.15 4.25 4.25 4.25 4.50 4.50 4.50	17.6 13.9 	21.0 21.7 	 22.5 	 19.1 															1.21[a] 1.72[d] 1.37[a] 1.60[a]			 0.97 0.85 0.59
RC05	From 5.00 m to 5.90 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 5.90 m to 6.10 m - destructured very pale brown CALCARENITE composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2) From 6.10 m to 6.50 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	5.00 5.35 6.35	11.2 13.0	22.4 22.0																				

Notes

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$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH11

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC06	From 6.50 m to 8.00 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	6.50																						
		6.90	12.0	22.2																				
	From 6.65 m to 6.80 m - distinctly weathered	7.35	14.6	21.6																	1.60[a]			
RC07	From 8.00 m to 9.50 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	8.00																						
		8.40	21.0	20.3																	0.20[d]			
		8.75			21.6	17.8																	0.16	
		8.75																				0.48		
		8.75																				0.07		
		9.35	23.6	19.9						93.1	2.9										0.60[d]			
		9.35																			0.35[a]			
		9.35																			0.29[a]			
RC08	From 9.50 m to 10.60 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	9.50																						
		9.60	25.6	19.6																	0.25[a]			
	From 10.25 m to 10.35 m - reworked	10.50	25.0	19.7																	0.25[a]			
RC09	From 11.00 m to 11.20 m - very pale brown (10YR 8/2) shelly calcareous medium to coarse SAND (likely cuttings from drilling process)	11.00																						
		11.40	25.4	19.6																	0.04[d]			
		11.40																			0.28[a]			
	From 11.20 m to 11.90 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	11.40																			0.32[a]			
		11.75	21.0	20.3																	0.31[a]			
RC10	From 12.00 m to 12.75 m - weak to moderately weak unweathered to partially weathered very pale brown (10YR 8/2) CALCARENITE	12.00																						
		12.05	25.6	19.6																	0.32[d]			
		12.05																			0.45[a]			
		12.05																			0.34[a]			
		12.50			19.2	15.3																	0.27	
		12.50																				0.20		
		12.50																				0.27		
RC11	From 13.00 m to 13.75 m - moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	13.00																						
		13.20			19.9	16.0																		
	From 13.75 m to 14.30 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	13.50			19.6	15.7																		
		13.90	24.7	19.7																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
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UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10[r] : r refers to test on remoulded soil
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10[s] : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results
BNO-OWF-BH11

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC12	From 14.50 m to 14.60 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	14.50																						
		15.15	24.5	19.8																				
	From 14.60 m to 15.20 m - destructured very pale brown CALCARENITE composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	15.20	27.6	19.3																				
		15.30	27.3	19.4																	0.31[d]			
	From 15.20 m to 15.50 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE																							
RC13	From 15.50 m to 16.70 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	15.50																						
		15.70	16.1	21.3																	0.91[a]			
		15.70																			1.47[a]			
		15.70																			1.01[d]			
		15.90			20.5	17.7																	0.10	
		15.90																				0.42		
		15.90																						0.42
		16.20	18.4	20.8																	0.53[d]			
		16.20																			0.71[a]			
		16.20																			0.36[a]			
RC14	From 16.80 m to 18.30 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 17.95 m to 18.05 m - destructured	16.80																						
		16.90	7.9	23.3																	1.20[d]			
		16.90																			1.03[a]			
		16.90																			4.07[a]			
		17.80	22.8	20.0																	0.80[d]			
		17.80																			0.51[a]			
		17.80																			1.04[a]			
RC15	From 18.30 m to 18.95 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	18.30																						
		18.35	25.9	19.6																	0.42[a]			
		18.50			20.6	16.4																		
	From 18.95 m to 19.40 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	19.20	19.3	20.6																	0.41[d]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10[r] : r refers to test on remoulded soil
10[d] : d refers to test on disturbed soil
10[s] : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH11

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC16	From 19.50 m to 19.65 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE	19.50 19.80 20.05	15.7	21.3																	0.05[d] 0.11[a]			
	From 19.65 m to 20.00 m - destructured very pale brown CALCARENITE composed of sandy very silty gravel. Clasts are very weak to weak very pale brown (10YR 8/2) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/2)	20.05 20.30	28.1	19.2																				
	From 20.00 m to 20.50 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE																							

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH12

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.40 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of quartz, limestone, flint, sandstone and various lithologies At 0.40 m - dark olive brown (2.5Y 3/3) subrounded cobble of igneous lithology	0.00																						
RC02	From 1.00 m to 1.10 m - calcareous extremely weak partially weathered very pale brown (10YR 8/4) CALCARENITE	1.00																						
RC03	From 3.00 m to 3.80 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE	3.00 3.20 3.40	 30.0																		0.05[a] 0.17[a]			
RC04	From 4.00 m to 4.85 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE	4.00 4.30 4.70 4.70 4.70	 31.5 28.9 																		 0.27[d] 0.33[a] 0.44[a]			
RC05	From 5.00 m to 6.00 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 5.20 m to 5.65 m - calcareous weak to moderately weak destructured very pale brown (10YR 8/4) calcarenite composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	5.00 5.40 5.75	 21.4 29.1																		 0.25[a]			
RC06	From 6.00 m to 6.50 m - calcareous very weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 6.50 m to 6.75 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE	6.00 6.05 6.65	 28.2 25.0																		 			
RC07	no recovery	7.00																						
RC08	From 8.00 m to 9.00 m - calcareous weak partially weathered very pale brown (10YR 8/2) CALCARENITE	8.00 8.70 8.70 8.90 8.90	 28.9 28.4 							90.8	<0.0										 0.18[d] 0.21[a] 0.34[a] 0.28[d]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH12

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC09	From 9.00 m to 10.50 m - calcareous weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 9.10 m to 9.50 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are extremely weak subrounded to subangular fine to coarse. Matrix is very pale brown (10YR 8/2) From 10.25 m to 10.40 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are extremely weak subangular to subrounded fine to coarse size. Matrix is very pale brown (10YR 8/2)	9.00 10.40	29.3																					
RC10	From 10.50 m to 12.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 10.75 m to 11.00 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are very weak to extremely weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	10.50 11.20 11.30 11.80 11.80 11.80	31.3 31.7																		0.24[a] 1.60[d] 0.29[a] 0.25[a]			
RC11	From 12.00 m to 13.40 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 12.25 m to 12.55 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of silty sandy gravel. Clasts are extremely weak very pale brown (10YR 8/2) subrounded to subangular fine to coarse. Matrix is very pale brown (10YR 8/2)	12.00 12.30 12.75 12.75 12.80 12.85 12.85 12.85 12.90 13.15 13.15 13.15	24.3 24.0 22.4		19.5	15.9															0.20[a] 0.13[a] 0.23[d] 0.24[a] 0.29[a]			0.23 0.21 0.05
RC12	From 13.50 m to 13.60 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 13.60 m to 14.45 m - very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE	13.50 13.70 13.70 14.00	31.7 29.7																		0.02[d] 0.82[a] 0.25[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH12

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC13	From 14.50 m to 15.40 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 14.75 m to 14.95 m - very thinly bedded very pale brown (10YR 8/2) (CALCARENITE composed of bioclastic beds with a coarse sand-size to fine gravel-size)	14.50 14.50 14.50 14.55 15.20	 30.5 31.8																		0.13[d] 0.22[a] 0.23[a] 0.22[a]			
RC14	From 15.50 m to 16.60 m - very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE	15.50 15.60 15.60 15.60 16.10	 25.7 26.4																		 0.34[d] 0.23[a] 0.26[a] 0.21[d]			
RC15	From 17.00 m to 17.90 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 17.50 m to 17.75 m - medium bedded (CALCARENITE composed of a bed with fine sand-size to fine gravel-size bioclasts)	17.00 17.10 17.65	 25.7 26.1																		0.13[d]			
RC16	From 18.00 m to 19.00 m - very weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 18.00 m to 18.25 m - drilling disturbed From 18.25 m to 18.50 m - destructured very pale brown (10YR 8/2) CALCARENITE composed of gravelly very silty sand. Clasts are extremely weak very pale brown (10YR 8/2) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/2)	18.00 18.55 18.55 18.55 18.90	 28.7		18.8	14.6															 0.31[a]			 0.10 0.10 0.13
RC17	From 19.00 m to 20.25 m - weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 20.05 m to 20.25 m - destructured very pale brown (10YR 8/3) CALCARENITE composed of silty very sandy gravel. Clasts are extremely weak very pale brown (10YR 8/2) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/2) From 20.25 m to 20.50 m - very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE	19.00 19.40 19.90 19.90 19.90	 27.6 24.4 																		 0.02[d] 0.27[a] 0.17[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH12-a

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.70 m - multi-coloured subangular to subrounded medium to coarse GRAVEL of limestone and various lithologies with a high subangular to subrounded cobble content of various lithologies From 0.70 m to 0.80 m - reworked very pale brown (10YR 8/2) CALCARENITE	0.00 0.70	16.1																					

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH13

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	no recovery	0.00																						
RC02	From 1.00 m to 1.10 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE	1.00																						
RC03	From 2.00 m to 2.15 m - calcareous extremely weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 2.15 m to 2.30 m - calcareous reworked very pale brown (10YR 8/4) CALCARENITE composed of silty gravelly sand. Clasts are extremely weak subangular medium. Matrix is very pale brown (10YR 8/4) From 2.30 m to 2.55 m - calcareous moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE	2.00 2.20	25.1	19.7																				
RC04	From 3.00 m to 3.35 m - calcareous extremely weak partially weathered very pale brown (10YR 8/4) CALCARENITE From 3.35 m to 3.50 m - calcareous reworked very pale brown (10YR 8/4) CALCARENITE composed of silty gravelly sand. Clasts are very weak very pale brown (10YR 8/4) subangular fine to coarse. Matrix is very pale brown (10YR 8/4) From 3.50 m to 3.65 m - calcareous extremely weak partially weathered very pale brown (10YR 8/4) CALCARENITE	3.00 3.20 3.40	24.6 20.2	19.8 20.5																				
RC05	From 5.50 m to 6.25 m - calcareous reworked very pale brown (10YR 8/2) CALCARENITE composed of very silty sand. Matrix is very pale brown (10YR 8/2) From 6.25 m to 6.40 m - weak partially weathered very pale brown (10YR 8/2) CALCARENITE	5.50 5.65 6.25	27.1 18.4	19.4 20.8																				
W01	no recovery	8.00																						

Notes

w : Water content
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γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
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O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH13

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC06	From 8.00 m to 9.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with extremely closely to medium spaced very thin beds of very pale brown (10YR 8/2) silt From 8.10 m to 8.20 m - calcareous very weak to weak distinctly weathered very pale brown (10YR 8/3) CALCISILTITE From 8.55 m to 8.70 m - calcareous destructured very pale brown (10YR 8/2) CALCARENITE composed of sandy very silty gravel. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	8.00 8.30 8.70 8.70 8.70	18.1 20.2	20.9 20.5																	0.29[a] 0.09[d] 0.14[a] 0.14[a]			
RC07	From 9.00 m to 9.15 m - calcareous extremely weak to very weak partially weathered very pale brown (10YR 8/2) CALCISILTITE with very closely spaced thin laminae of silt From 9.15 m to 9.65 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE From 9.15 m to 9.35 m - grain size is medium to coarse sand From 9.40 m to 9.60 m - calcareous destructured very pale brown (10YR 8/2) CALCARENITE composed of gravelly very silty sand. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	9.00 9.15 9.25	17.2 22.2	21.0 20.1																				
RC08	From 10.00 m to 10.40 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE (grain size is fine to medium) From 10.40 m to 10.75 m - calcareous destructured very pale brown CALCARENITE composed of gravelly sandy silt. Clasts are weak to moderately weak very pale brown (10YR 8/2) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/2)	10.00 10.50	29.9 18.7	19.0 20.8																	0.21[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH13

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
W02	From 13.50 m to 14.20 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE (grain size is fine to coarse sand)	13.50								93.1	0.2													
		13.65	23.2	20.0	21.8	17.7																	0.26	
		13.65																				0.06		
		13.65																				0.06		
		13.95	22.5	20.1																				
W03	no recovery	16.00																						
RC09	From 16.05 m to 17.00 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with rare crystal of glauconite (grain size is fine to coarse sand) From 16.15 m to 16.45 m - with frequent brown (7.5 YR 2) oxidation staining	16.05																						
		16.20	26.4	19.5																	0.09[d]			
		16.20																			0.19[a]			
		16.20																			0.18[a]			
		16.55	26.9	19.4																	0.13[a]			
		16.55																			0.15[a]			
		16.55																			0.08[a]			
		16.75			19.1	15.1																	0.07	
		16.75																				0.06		
		16.75																				0.07		
RC10	From 17.00 m to 17.85 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with rare glauconite crystals (grain size is fine sand to fine gravel) From 17.85 m to 18.00 m - calcareous destructured to reworked very pale brown CALCARENITE composed of gravelly very silty sand. Clasts are very weak to weak very pale brown (10YR 8/2) subangular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/2)	17.00																						
		17.10	28.8	19.1																	0.16[a]			
		17.60	20.3	20.5																	0.20[d]			
		17.60																			0.23[a]			
		17.60																			0.32[a]			
RC11	From 18.30 m to 18.50 m - calcareous moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with rare glauconite crystals (grain size is fine sand to medium gravel)	18.30																						
		18.30	20.5	20.4																	0.66[d]			
		18.30																			0.60[a]			
		18.30																			0.68[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH13

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC12	From 18.50 m to 18.60 m - calcareous very weak to weak partially weathered to distinctly weathered very pale brown (10YR 8/2) CALCARENITE (grain size is fine sand to fine gravel) From 18.60 m to 18.90 m - calcareous destructured very pale brown (10YR 8/2) CALCARENITE composed of gravelly silty sand. Clasts are extremely weak to very weak very pale brown (10YR 8/2) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/2)	18.50 18.75	19.0	20.7																				
W04	From 20.50 m to 21.10 m - calcareous extremely weak distinctly weathered very pale brown (10YR 8/2) CALCARENITE	20.50 20.80	25.7	19.6																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH15

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.35 m to 0.65 m - calcareous reworked dark yellowish brown (10YR 6/4) CALCARENITE composed of sandy slightly gravelly clay. Clasts are extremely weak dark yellowish brown (10YR 6/4) subangular to subrounded fine to medium. Matrix is very pale brown (10YR 8/4) (grain size is fine to coarse sand) At 0.45 m - with a subrounded cobble of granite	0.35																						
RC02	From 1.00 m to 1.50 m - calcareous very weak to moderately weak partially weathered to distinctly weathered light yellowish brown (10YR 6/4) CALCARENITE (grain size is fine to coarse sand)	1.00 1.20 1.30	 14.8	 21.6																	0.16[a]			
RC03	From 1.50 m to 2.25 m - calcareous moderately weak partially weathered to distinctly weathered light yellowish brown CALCARENITE with occasional medium to coarse gravel-size shells and shell fragments (grain size is fine to medium sand) From 2.25 m to 2.45 m - calcareous destructured light yellowish brown CALCARENITE composed of clayey sandy gravel. Clasts are very weak light yellowish brown (10YR 6/4) subangular to subrounded fine to coarse (grain size is fine to medium sand)	1.50 1.90 1.95 1.95 2.25	 10.8 32.1	 22.5 18.7																	 1.88[d] 0.86[a]			
RC04	no recovery	2.50																						
RC05	From 3.00 m to 3.10 m - calcareous weak partially weathered to distinctly weathered light yellowish brown CALCARENITE with occasional medium to coarse gravel-size shells and shell fragments (grain size is fine to coarse sand) From 3.10 m to 3.65 m - calcareous destructured light yellowish brown CALCARENITE composed of slightly gravelly sandy clay. Clasts are very weak light yellowish brown (10YR 6/4) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 6/4) (grain size is fine to coarse sand) From 3.65 m to 3.85 m - calcareous very weak partially weathered to distinctly weathered light yellowish brown CALCARENITE with occasional medium to coarse gravel-size shells and shell fragments (grain size is fine to coarse sand)	3.00 3.05 3.30 3.75	 8.5 17.4 30.6	 23.1 21.0 18.9																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH15

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC06	From 4.00 m to 4.20 m - calcareous moderately weak partially to distinctly weathered light yellowish brown CALCARENITE (grain size is fine to coarse sand) From 4.20 m to 4.50 m - calcareous moderately weak to medium strong unweathered very pale brown CALCARENITE with occasional medium gravel-size shells and shell fragments (grain size is fine to coarse sand)	4.00 4.05 4.15	28.6	19.2																0.36[a]			
RC07	From 4.50 m to 5.50 m - calcareous moderately weak partially weathered very pale brown CALCARENITE with occasional medium gravel-size shells and shell fragments (grain size is fine sand size to fine gravel)	4.50 4.75 4.75 4.75 4.75 5.20 5.20 5.40	6.0	23.8																	3.59[a] 3.28[d] 3.90[a]	 2.61 1.55	 2.49	
RC08	From 5.50 m to 6.90 m - calcareous moderately weak partially weathered very pale brown CALCARENITE with occasional medium gravel-size shells and shell fragments (grain size is fine to coarse sand) From 5.50 m to 5.60 m - clayey destructured to reworked very pale brown (10YR 8/4) From 6.00 m to 6.20 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty very clayey gravel. Clasts are extremely weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4) (grain size is fine to medium sand)	5.50 6.60	8.2	23.2																				
RC09	From 7.00 m to 8.50 m - calcareous moderately weak to medium strong partially weathered to distinctly weathered very pale brown CALCARENITE (grain size is fine to coarse sand) From 7.90 m to 8.10 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of very clayey very sandy gravel. Clasts are extremely weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4)	7.00 8.00 8.20	26.8	19.4																2.39[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH15

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC10	From 8.50 m to 9.40 m - calcareous weak to moderately weak partially weathered very pale brown CALCARENITE (grain size is fine to coarse sand) From 9.40 m to 10.00 m - destructured very pale brown (10YR 8/4) CALCARENITE composed of sand very silty gravel. Clasts are weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4) (grain size is fine to coarse sand)	8.50 8.80 8.80 8.80 8.95 9.55	 24.2 16.1	 19.8 21.3																0.23[a] 0.18[d] 0.30[a]			
RC11	From 10.00 m to 10.12 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of gravelly sandy clay with yellowish brown (5YR 5/3) stains. Clasts are extremely weak very pale brown (10YR 8/4) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) (grain size is fine to coarse sand) From 10.12 m to 10.75 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown CALCARENITE with occasional yellowish brown (5YR 5/3) stains (grain size is fine to medium sand)	10.00 10.10 10.60	 17.6 21.0	 21.0 20.3																			
RC12	From 11.00 m to 11.80 m - calcareous weak to moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE (grain size is coarse sand size to fine gravel)	11.00 11.15 11.15 11.15 11.25 11.45 11.45 11.45	 25.8 28.9	 19.6 19.1	 21.6	 16.8														0.11[d] 0.19[a] 0.34[a]	 0.50		0.45 0.18
RC13	From 12.00 m to 13.50 m - highly calcareous weak to moderately weak partially weathered to distinctly weathered very pale brown CALCARENITE From 13.10 m to 13.50 m - calcareous destructured very pale brown (10YR 8/4) composed of slightly gravelly sandy clay. Clasts are very weak very pale brown (10YR 8/4) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4)	12.00 12.10 12.20 12.35 12.75 13.10 13.20	 16.8 27.7	 21.1 19.3	 19.1	 16.4														0.20[a] 0.24[a] 0.23[a] 0.19[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10[r] : r refers to test on remoulded soil
10[d] : d refers to test on disturbed soil
10[s] : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH15

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC14	From 15.00 m to 15.60 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE composed of slightly gravelly sandy clay. Clasts are very weak very pale brown (10YR 8/4) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 8/4) From 15.60 m to 16.00 m - highly calcareous moderately weak partially weathered to distinctly weathered very pale brown CALCARENITE.	15.00																						
		15.20	16.3	21.2																				
		15.60	26.1	19.5																				
		15.65																			0.17[a]			
RC15	From 16.00 m to 17.50 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional medium gravel-size bioclasts (grain size is fine to coarse sand)	16.00																						
		16.10	21.7	20.2						95.3	0.3													
		16.65			19.3	15.9																	0.12	
		16.65																				0.14		
		16.65																						0.11
		17.20	27.5	19.3																	0.30[d]			
		17.20																			0.28[a]			
		17.20																			0.37[a]			
RC16	From 17.50 m to 17.70 m - calcareous weak to moderately weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional medium gravel-size bioclasts (grain size is fine to coarse sand)	17.50	27.4	19.3																	0.24[d]			
		17.50																			0.17[a]			
		17.50																			0.18[a]			
RC17	From 17.70 m to 18.70 m - calcareous weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional to frequent fine to medium gravel-size bioclasts (grain size is fine to coarse sand)	17.70																						
		17.80	25.7	19.6																	0.20[a]			
		17.80																			0.13[a]			
		17.80																			0.14[d]			
		18.30	28.0	19.3																	0.29[d]			
		18.30																			0.28[a]			
		18.30																			0.26[a]			
		18.45	27.9	19.3	19.3	15.1																		
RC18	From 18.70 m to 19.20 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/2) CALCARENITE with occasional fine to medium gravel-size bioclasts and brown oxidation staining and rare coarse sand-size glauconite (grain size is fine to coarse sand)	18.70																						
		18.75	26.7	19.4																				

Notes

w : Water content
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γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH17

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.00 m to 0.75 m - calcareous moderately weak to medium strong partially weathered to distinctly weathered pale brown (10YR 6/3) CALCARENITE with frequent brown (7.5YR 5/2) oxidation staining (grain size is fine to medium sand) From 0.40 m to 0.55 m - calcareous extremely weak to very weak distinctly weathered very pale brown (10YR 8/2)	0.00 0.10	9.7	22.8																				
RC02	From 1.00 m to 1.80 m - calcareous moderately weak to medium strong partially weathered to distinctly weathered pale brown (10YR 6/3) CALCARENITE frequent brown (7.5YR 5/2 oxidation staining (grain size is fine to medium sand) From 1.35 m to 1.55 m - calcareous extremely weak to very weak distinctly weathered to destructured brown (10YR 5/3) From 1.75 m to 1.80 m - calcareous extremely weak to very weak distinctly weathered to destructured brown (10YR 5/3)	1.00 1.15 1.75	 14.7 31.8	 21.6 18.7																				
RC03	From 2.00 m to 2.50 m - calcareous extremely weak to very weak distinctly weathered to destructured brown (7.5YR 5/2) CALCARENITE (grain size is fine sand) From 2.25 m to 2.50 m - very closely spaced thin beds of calcareous moderately weak to medium strong partially weathered light brownish grey calcarenite with frequent coarse sand to fine gravel-size bioclasts (grain size is fine to medium sand)	2.00 2.10	33.9	18.5																				
RC04	From 3.00 m to 4.00 m - calcareous extremely weak partially weathered to distinctly weathered brown (10YR 5/3) CALCARENITE (grain size is fine to coarse sand) From 3.90 m to 4.00 m - calcareous moderately weak partially weathered light brownish grey (10YR 6/2) (grain size is medium coarse sand)	3.00 3.20 3.50	 28.0 26.6	 19.3 19.5																				
RC05	From 4.00 m to 4.80 m - calcareous moderately weak to medium strong partially weathered to distinctly weathered very pale brown (10YR 8/2) to light grey (10YR 7/2) CALCARENITE (grain size is fine to medium sand)	4.00 4.60	15.1	21.5																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH17

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC06	From 5.00 m to 5.05 m - calcareous weak to moderately weak partially weathered light brownish grey (10YR 6/2) CALCARENITE (grain size is medium to coarse sand) From 5.05 m to 5.10 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 8/2) CALCARENITE (grain size is fine to medium sand)	5.00																						
RC07	From 6.00 m to 6.50 m - calcareous extremely weak to very weak partially weathered light grey (10YR 7/1) CALCARENITE with numerous coarse sand to fine gravel-size bioclasts (grain size is medium to coarse sand)	6.00 6.45	 26.4	 19.5																				
RC08	From 7.00 m to 7.15 m - calcareous extremely weak to very weak partially weathered light grey (10YR 7/1) CALCARENITE with numerous coarse sand to medium gravel-size bioclasts (grain size is medium to coarse sand) From 7.15 m to 7.45 m - calcareous extremely weak to weak partially weathered to distinctly weathered light grey (10YR 7/1) CALCARENITE (grain size is fine to coarse sand) From 7.45 m to 7.60 m - calcareous destructured grey CALCARENITE composed of silty sandy gravel. Clasts are extremely weak grey (10YR 6/1) subangular to subrounded fine to coarse. Matrix is grey (10YR 6/1)	7.00 7.40 7.50	 28.3 24.9	 19.2 19.7																				

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
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Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH17

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC09	From 8.00 m to 8.20 m - calcareous destructured white CALCARENITE composed of silty sandy gravel. Clasts are extremely weak grey (10YR 8/1) subangular to subrounded fine to coarse. Matrix is grey (10YR 8/1) From 8.20 m to 8.45 m - calcareous destructured light grey CALCARENITE composed of silty sandy gravel. Clasts are extremely weak grey (10YR 7/1) subangular to subrounded fine to coarse. Matrix is grey (10YR 6/1) From 8.45 m to 8.60 m - calcareous destructured to reworked white CALCARENITE composed of gravelly very silty sand. Matrix is grey (10YR 8/1) with a thick lamina of coarse sand to fine gravel From 8.60 m to 9.00 m - calcareous moderately weak to medium strong partially weathered light grey (10YR 7/1) CALCARENITE (grain size is fine to coarse sand sized)	8.00 8.30 8.60 8.60 8.60 8.80 8.85 8.95	17.1 21.6	21.1 20.2	21.9	18.0				88.5	4.2									0.60[a]	2.10 1.32	1.50	
RC10	From 9.00 m to 9.50 m - calcareous moderately weak to medium strong partially weathered grey (10YR 6/1) CALCARENITE (grain size is fine to coarse sand) From 9.50 m to 10.00 m - calcareous destructured light grey CALCARENITE composed of silty sandy gravel. Clasts are extremely weak light grey (10YR 7/1) subangular to subrounded fine to coarse. Matrix is light grey (10YR 7/1)	9.00 9.70	18.3	20.8																				
RC11	From 10.00 m to 10.10 m - calcareous destructured light grey CALCARENITE composed of gravelly very silty sand. Clasts are extremely weak light grey (10YR 7/1) subangular to subrounded fine to coarse. Matrix is light grey (10YR 7/1) From 10.10 m to 10.30 m - calcareous moderately weak to medium strong partially weathered light grey (10YR 7/1) CALCARENITE (grain size is fine to coarse sand)	10.00 10.10 10.10 10.10	25.3	19.7																0.15[d] 0.37[a] 0.29[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH17

Sample No	Ground Description	Depth BSF [m]	w [%]	Unit Weight [kN/m³] γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	Atterberg Limits w_P [%]	w_L [%]	I_P [%]	Fines [%]	Undrained Shear Strength PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	Is_{50} [MPa] O	A	D	Ir
RC12	From 10.30 m to 10.80 m - calcareous very weak to weak partially weathered light grey (10YR 7/1) CALCARENITE with very closely spaced very thin beds of greyish brown (10YR 5/2) sandy silt (grain size is fine to medium sand) From 10.80 m to 10.90 m - calcareous very weak to weak partially weathered white (10YR 8/1) CALCISILTITE From 10.90 m to 11.50 m - calcareous extremely weak to very weak partially weathered light grey (10YR 7/1) CALCARENITE with extremely closely to closely spaced very thick laminae of greyish brown (10YR 5/2) sandy silt (grain size is fine to medium sand)	10.30 10.80	14.9	21.5																				
RC13	From 11.50 m to 13.00 m - calcareous extremely weak partially weathered light brownish grey (10YR 6/2) CALCARENITE with extremely closely to closely spaced thin to thick laminae of pale brown (10YR 6/3) silt (grain size is fine to medium sand)	11.50 12.20 12.20 12.20 12.50 12.70	 29.1 23.2	 19.1 20.0	19.7 18.9	15.2 14.6																0.21		0.21 0.06
RC14	From 13.00 m to 13.20 m - calcareous extremely weak to very weak partially weathered greyish brown (10YR 5/2) CALCARENITE (grain size is fine to medium sand) From 13.20 m to 14.50 m - calcareous moderately weak to medium strong partially weathered light brownish grey (10YR 6/2) CALCARENITE (grain size is fine to coarse sand)	13.00 14.40	24.5 22.2	19.8 20.1																	0.12[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH17

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC15	From 14.50 m to 14.65 m - calcareous very weak to weak partially weathered light brownish grey (10YR 6/2) CALCARENITE with fine gravel-size fossil shell and shell fragments (composed of fine sand-size to fine gravel) From 14.65 m to 15.35 m - calcareous destructured grey CALCARENITE composed of silty sandy gravel. Clasts are extremely weak grey (10YR 6/1) subangular to subrounded fine to coarse. Matrix is grey (10YR 6/1) From 15.35 m to 15.50 m - calcareous extremely weak to weak partially weathered to distinctly weathered light brownish grey (10YR 6/2) CALCARENITE with coarse sand-sized to fine gravel-size fossil shell fragments (with fine sand to fine gravels)	14.50 14.80 15.50	 22.3 25.3	 20.1 19.6	 21.0	 17.2																		
RC16	From 15.50 m to 16.60 m - calcareous weak to moderately weak partially weathered to distinctly weathered light brownish grey (10YR 6/2) CALCARENITE with coarse sand-size to fine gravel-size fossil shell fragments and rare grey (10YR 5/1) staining (grain size is fine sand to fine gravel)	15.50 15.75 15.80 15.85 16.12	 23.6 25.3	 19.9 19.6	 19.5	 15.5															0.14[a] 0.16[a]			
RC17	From 17.00 m to 17.70 m - calcareous very weak to weak partially weathered to distinctly weathered white (10YR 8/1) CALCARENITE From 17.45 m to 18.00 m - calcareous partially weathered to destructured greyish brown (10YR 5/2) (grain size is fine sand to fine gravel) From 17.70 m to 18.00 m - calcareous destructured greyish brown (10YR 5/2) CALCARENITE composed of slightly sandy gravelly clay. Clasts are extremely weak greyish brown (10YR 5/2) subangular to subrounded fine to coarse. Matrix is greyish brown (10YR 5/2)	17.00 17.10 17.25 17.35 17.45 17.80	 24.3 22.1	 19.8 20.2																0.51[d] 0.38[a] 0.11[a]			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH17

Sample No	Ground Description	Depth BSF [m]	w [%]	Unit Weight [kN/m³] γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	Atterberg Limits w_P [%]	w_L [%]	I_P [%]	Fines [%]	Undrained Shear Strength PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	Is_{50} [MPa] O	A	D	Ir
RC18	From 18.00 m to 18.65 m - highly calcareous very weak to weak distinctly weathered light grey CALCARENITE with very closely spaced very thin beds of greyish brown (10YR 5/2) sandy silt and with rare fine to medium gravel-size impression fossils (grain size is fine to medium sand) From 18.65 m to 19.00 m - highly calcareous extremely weak to very weak partially weathered thinly laminated light olive brown CALCISILTITE with occasional fine to medium gravel-size impression fossils	18.00 18.15 18.40 18.65 18.65 18.65	20.3 30.0	20.5 19.0	19.9 20.0	16.6 15.4															0.51[a] 0.88[a]			 0.06 0.03 0.10
RC19	From 19.00 m to 19.70 m - calcareous weak to moderately weak partially weathered light grey (2.5Y 7/1) CALCARENITE (grain size is fine to medium sand) From 19.70 m to 20.05 m - calcareous extremely weak to very weak partially weathered thinly laminated light olive brown (2.5Y 5/3) CALCISILTITE with occasional fine to medium gravel-size fossil impression From 20.05 m to 20.20 m - calcareous moderately weak partially weathered light grey (2.5Y 7/2) CALCARENITE (grain size is fine to medium sand) From 20.20 m to 20.30 m - highly calcareous extremely weak to very weak partially weathered thinly laminated light olive brown CALCISILTITE with occasional fine to medium gravel-size impression fossils From 20.30 m to 20.50 m - calcareous weak to moderately weak partially weathered light olive brown (2.5Y 5/3) CALCARENITE	19.00 19.20 20.20	16.6 19.6	21.2 20.6	20.9	17.9																		

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH19

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC01	From 0.50 m to 0.75 m - multi-coloured subangular to subrounded coarse GRAVEL of limestone and various lithologies with subangular to subrounded cobbles From 0.75 m to 1.00 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	0.50 0.80	18.1	20.9																				
RC02	From 1.00 m to 1.05 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	1.00																						
W01	From 3.50 m to 3.95 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE	3.50 3.75	27.5	19.3						77.2	3.6													
RC03	From 4.50 m to 4.80 m - calcareous moderately weak to medium strong partially weathered very pale brown (10YR 8/4) CALCARENITE From 4.80 m to 5.50 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE From 5.00 m to 5.15 m - partially weathered	4.50 4.60 5.10	11.6 12.5	22.3 22.1																				
RC04	From 5.50 m to 5.80 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE From 5.80 m to 6.10 m - calcareous moderately weak destructured very pale brown (10YR 8/4) CALCARENITE	5.50 5.65 5.95	12.3 17.5	22.1 21.0																				
RC05	From 6.50 m to 7.00 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	6.50 6.58 6.80	20.6	20.4																	0.38[a]			
RC06	From 7.50 m to 8.15 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE From 8.15 m to 8.50 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) and light red (2.5YR 7/8) mottled CALCARENITE	7.50 7.65 7.80 7.90 8.30	17.7 29.1	20.9 19.1																	0.40[a] 0.36[a]			

Notes

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γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test

CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral

PP : Pocket penetrometer
TV : Torvane
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LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump

10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH19

Sample		Depth		Unit Weight [kN/m³]								Atterberg Limits				Undrained Shear Strength					Is$_{50}$ [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC07	From 8.50 m to 8.85 m - calcareous weak to moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE From 8.85 m to 9.25 m - calcareous moderately weak distinctly weathered to destructured very pale brown (10YR 8/4) CALCARENITE From 9.25 m to 9.35 m - calcareous very weak partially weathered very pale brown (10YR 8/4) CALCARENITE	8.50 8.95 9.15 9.30	 18.3 24.5	 20.8 19.8																0.11[d]			
RC08	From 9.50 m to 10.40 m - calcareous moderately weak partially weathered white (10YR 8/1) CALCARENITE	9.50 9.55 9.68 9.70 10.10	 25.4 14.7	 19.6 21.6																0.12[a] 0.14[a]			
RC09	From 11.00 m to 12.00 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/4) CALCARENITE	11.00 11.25 11.73 11.75	 13.5 16.3	 21.8 21.2																0.61[a]			
RC10	From 12.00 m to 13.00 m - calcareous very weak to weak partially weathered very pale brown (10YR 8/4) CALCARENITE with closely to medium spaced thick laminae of light grey marl	12.00 12.23 12.25 12.30 12.65 12.70	 19.6 	 20.6 																0.56[a] 0.11[a] 0.03[a] 0.53[a]			
RC11	From 13.00 m to 13.50 m - calcareous medium strong partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE From 13.50 m to 13.80 m - calcareous weak to moderately weak distinctly weathered very pale brown (10YR 8/4) CALCARENITE	13.00 13.30 13.50	 9.1 11.1	 22.9 22.4																			
RC12	From 14.50 m to 15.30 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	14.50 14.80 15.10	 15.5 22.8	 21.4 20.0																			

Notes

w : Water content
γ-w : Unit weight derived from water content
γ : Unit weight from volume mass calculation
$\gamma_{d,min}$: Minimum index dry unit weight
$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
FC : Fall cone
LV : Laboratory vane
UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10[r] : r refers to test on remoulded soil
10[d] : d refers to test on disturbed soil
10[s] : Residual undrained shear strength
BSF : Below seafloor
W : WIP
RC : Rock Core
Is(50) point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Laboratory Classification Test Results

BNO-OWF-BH19

Sample		Depth		Unit Weight [kN/m³]									Atterberg Limits				Undrained Shear Strength					Is_{50} [MPa]			
No	Ground Description	BSF [m]	w [%]	γ-w	γ	γ_d	$\gamma_{d,min}$	$\gamma_{d,max}$	ρ_s [Mg/m³]	CC [%]	OC [%]	w_P [%]	w_L [%]	I_P [%]	Fines [%]	PP [kPa]	TV [kPa]	FC [kPa]	LV [kPa]	UU [kPa]	O	A	D	Ir
RC13	From 15.50 m to 16.50 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	15.50																			0.18[a]			
		15.70																						
		15.90	18.6	20.8																				
		16.35	17.0	21.1	22.0	18.8																	0.59	
		16.35																				0.96		
		16.35																				1.09		
RC14	From 16.50 m to 16.80 m - calcareous moderately weak partially weathered to distinctly weathered very pale brown (10YR 8/4) CALCARENITE	16.50																						
		16.95	21.8	20.2																				
		17.30	28.4	19.2																	0.32[a]			
	From 16.80 m to 17.20 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE	17.35																			0.36[a]			
		17.45	29.0	19.1	17.6	13.7																		
	From 17.20 m to 17.55 m - calcareous medium strong partially weathered very pale brown (10YR 8/4) CALCARENITE																							
RC15	From 18.00 m to 18.30 m - calcareous moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE	18.00																						
		18.05	29.4	19.1																	0.18[a]			
		18.50	21.6	20.2																				
	From 18.30 m to 18.80 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE	18.85	21.5	20.3																				
	From 18.80 m to 18.95 m - calcareous moderately weak partially weathered very pale brown (10YR 8/4) CALCARENITE																							
RC16	From 19.00 m to 19.80 m - calcareous destructured very pale brown (10YR 8/4) CALCARENITE	19.00																						
		19.40	20.4	20.4																				
	From 19.80 m to 20.25 m - From 19.80 m to 20.50 m - calcareous destructured light yellowish brown (2.5Y 6/3) CALCARENITE	20.00	21.6	20.2																				

Notes

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γ : Unit weight from volume mass calculation
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$\gamma_{d,max}$: Maximum index dry unit weight
ρ_s : Particle density
A : Axial
O : Offshore point load test
CC : $CaCO_3$ content
OC : Organic content
w_P : Plastic limit
w_L : Liquid limit
I_P : Plasticity index
Fines : Mass percentage of material passing 63 µm or 75 µm sieve
D : Diametral
PP : Pocket penetrometer
TV : Torvane
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UU : Unconsolidated undrained triaxial
Ir : Irregular lump
10^r : r refers to test on remoulded soil
10^d : d refers to test on disturbed soil
10^s : Residual undrained shear strength
BSF: Below seafloor
W : WIP
RC : Rock Core
Is(50)point load test strength

Note that both Rock Core (RC) and WIPS (W) were used for this location and the numbering is a reflection of switching between the different sampling method

Test Report

Liquid Limit, Plastic Limit and Plasticity Index

ISO 17892-12:2018

UKAS TESTING 0919

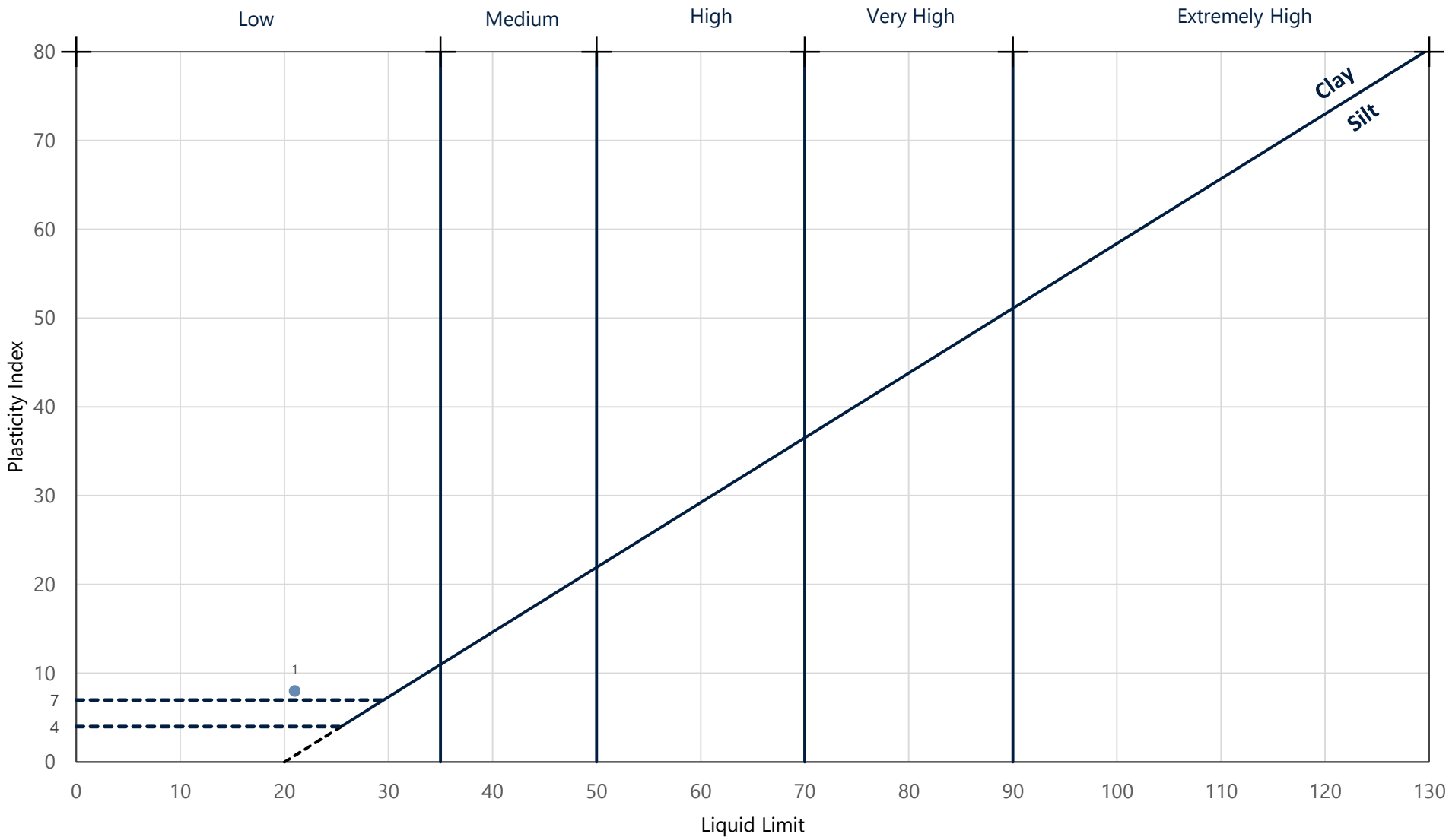
No.	Test Date	Location	Sample	Depth [m]	Preparation Method (% passing 0.425 mm)	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Laboratory
1	03/11/2025	BNO-OWF-BH01	05-2	3.50	Sieved (100)	21	13	8	A

Fall cone method with 4 points, 80 gr/30° cone used and increasing water content
NP=Non-plastic sample
Note: For sample descriptions, please refer to the report section presenting laboratory test results.

A: Wallingford, UK
F: Louvain-la-Neuve, Belgium

Approved by AF - 07/11/2025

Plasticity Chart



Location ID	Sample ID	Depth [m]	Percentage Soil Types					D10 [mm]	D30 [mm]	D50 [mm]	D60 [mm]	Cc [-]	Cu [-]
			Fines	Clay	Silt	Sand	Gravel						
BNO-OWF-BH01	05-2	3.50	50	16	34	36	14	-	0.005	0.065	0.192	-	-
BNO-OWF-BH10	01-3	0.90	19	6	13	33	48	0.008	0.277	1.626	4.338	2.2	550.4

Test method : ISO 17892-4 (2016)

TOPAZ / PSD Summary of particle size distribution test results with %Fines (FFSA) / 2026-02-16 13:58:27 +01:00

Summary of Particle Size Distribution Test Results

Test Report

Particle Size Distribution

ISO 17892-4: 2016 - 5.2 & 5.4 - Sieving & Sedimentation by Pipette Method

Test Identification			
Location	BNO-OWF-BH01	Depth [m]	3.50
Sample	05-2	Test start date	27/10/2025

Sieving

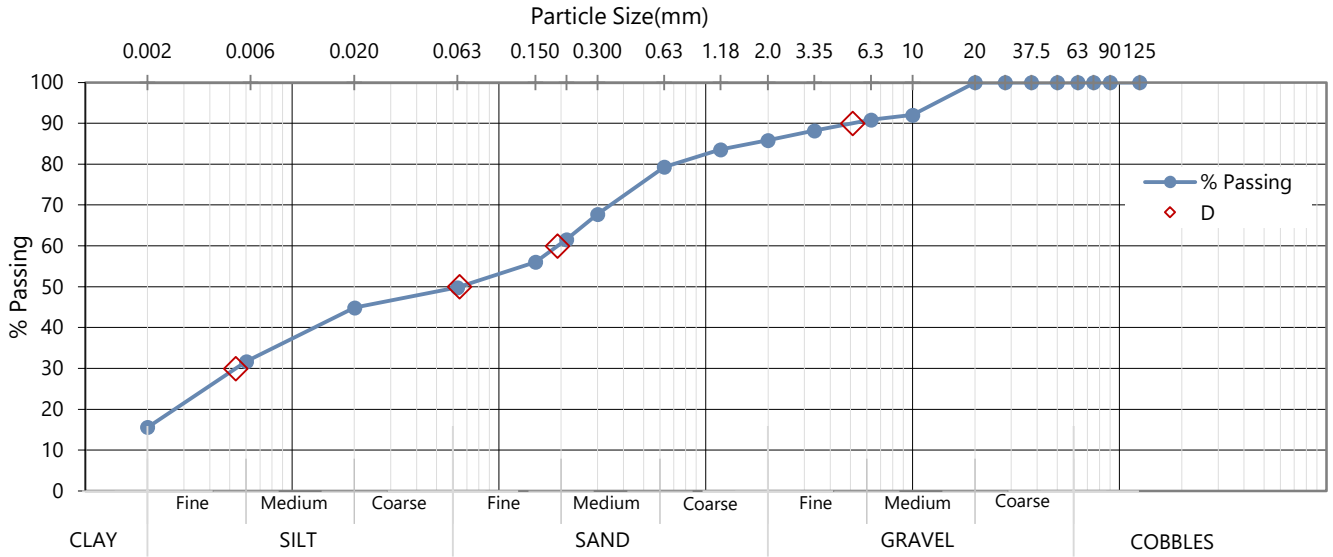
Particle Size [mm]	Passing [%]
125.0	100
90.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
10.0	92
6.3	91
3.35	88
2.00	86
1.18	84
0.630	79
0.300	68
0.212	62
0.150	56
0.063	50

Sedimentation

Particle Size [mm]	Passing [%]
0.0200	45
0.0060	32
0.0020	16

Curve Characteristics			
D_{90}	5.139 mm	Uniformity Coefficient	
D_{60}	0.192 mm	C_U	-
D_{50}	0.065 mm	Coefficient of Curvature	
D_{30}	0.005 mm	C_C	-
D_{10}	-		

Soil fractions [%]	
Cobbles	0
Gravel	14
Sand	36
Silt*	34
Clay	16



Note 1: For sample descriptions, please refer to the report section presenting laboratory test results.

Note 2: Particle density for sedimentation is assumed to be 2.70 Mg/m^3.

*** Where a sedimentation test was not carried out, this represents total fines, particles less than 0.063 mm.**

Project: 506718 - F255276 Laboratory: Louvain-la-Neuve Approved by: AF - 24/11/2025

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Test Report

Particle Size Distribution

ISO 17892-4: 2016 - 5.2 & 5.4 - Sieving & Sedimentation by Pipette Method

Test Identification			
Location	BNO-OWF-BH10	Depth [m]	0.90
Sample	01-3	Test start date	29/10/2025

Sieving

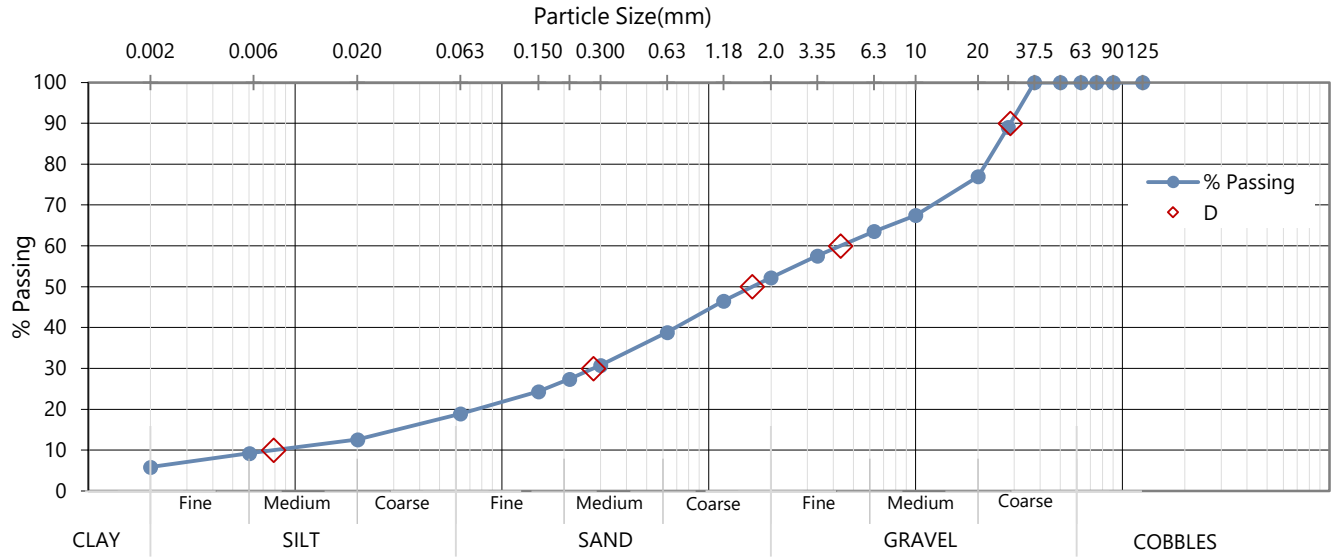
Particle Size [mm]	Passing [%]
125.0	100
90.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	89
20.0	77
10.0	67
6.3	64
3.35	58
2.00	52
1.18	47
0.630	39
0.300	31
0.212	27
0.150	24
0.063	19

Sedimentation

Particle Size [mm]	Passing [%]
0.0200	13
0.0060	9
0.0020	6

Curve Characteristics			
D_{90}	28.716 mm	Uniformity Coefficient	
D_{60}	4.338 mm	C_U	550.37
D_{50}	1.626 mm	Coefficient of Curvature	
D_{30}	0.277 mm	C_C	2.24
D_{10}	0.008 mm		

Soil fractions [%]	
Cobbles	0
Gravel	48
Sand	33
Silt*	13
Clay	6



Note 1: For sample descriptions, please refer to the report section presenting laboratory test results.

Note 2: Particle density for sedimentation is assumed to be 2.70 Mg/m^3.

*** Where a sedimentation test was not carried out, this represents total fines, particles less than 0.063 mm.**

Project: 506718 - F255276 Laboratory: Louvain-la-Neuve Approved by: AF - 24/11/2025

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Test Report
Particle Density
Fluid Pycnometer Method
ISO 17892-3:2015

UKAS TESTING
0919

No.	Test Date	Location	Sample	Depth [m]	Particle Density [Mg/m^3]	Laboratory
1	22/10/2025	BH01	05-2	3.50	2.72	F
2	22/10/2025	BH10	01-3	0.90	2.70	F

Note: For sample descriptions, please refer to the report section presenting laboratory test results.

Location	Sample ID	Depth BSF [m]	Test Type	Specimen Condition	Initial Conditions*							Consolidation Stage†							
					D [mm]	h [mm]	w [%]	ρ [Mg/m^3]	ρ_d [Mg/m^3]	e_0 [-]	S_r [%]	w [%]	ρ [Mg/m^3]	ρ_d [Mg/m^3]	e [-]	σ'_{rc} [kPa]	σ'_{vc} [kPa]	ε_{vol} [%]	ε_v [%]
BNO-OWF-BH01	05-3	3.65	CIUc	Undisturbed	70.1	140.1	14.1	2.24	1.96	0.379	101	14.1	2.24	1.96	0.377	86	86	0.13	0.06

Location	Sample ID	Depth BSF [m]	Test Type	Specimen Condition	Shear Stage				Final Conditions‡				Bender Element	
					q [kPa]	ε_{50} [%]	E_{50} [kPa]	ε_f [%]	w [%]	ρ [Mg/m^3]	ρ_d [Mg/m^3]	e [-]	v_s [m/s]	G_{max} [MPa]
BNO-OWF-BH01	05-3	3.65	CIUc	Undisturbed	1068	2.91	18358	10.00	14.1	2.24	1.96	0.377	-	-

Notes

BSF : Below seafloor
* : Specimen conditions after preparation and before saturation
† : Specimen conditions after last consolidation and before shearing
‡ : Specimen conditions after testing
CIU : Isotropically consolidated undrained
CAU : Anisotropically consolidated undrained
c/e : In compression/extension
BE : Bender element measurements

D : Diameter
h : Height
w : Water content
ρ : Bulk density
ρ_d : Dry density
e_0 : Initial void ratio
S_r : Degree of saturation
\- : not recorded/assigned

e : Void ratio
σ'_{rc} : Radial effective consolidation stress
σ'_{vc} : Vertical effective consolidation stress
ε_{vol} : Volumetric strain
ε_v : Vertical strain
q : Deviator stress at failure
ε_{50} : Axial strain at 50 % of q_{max}

E_{50} : Secant modulus at ε_{50}
ε_f : Axial strain at failure
v_s : Shear wave velocity after last consolidation
G_{max} : Small strain shear modulus after last consolidation

TOPAZ / CU Summary Table(Tabular data)(FF5A)_v2 / 2026-02-25 09:24:28 +01:00

Summary of Consolidated Undrained Triaxial Test Results

Test Report
Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

UKAS TESTING 0919

Test Identification	
Location	BNO-OWF-BH01
Sample	05-3
Depth [m]	3.65
Test number	CIU01

Specimen Visual Description
Very stiff ultra high strength light grey clayey CHALK

Initial Specimen Conditions	
Test start date	24/11/2025
Type of sample	Undisturbed
Diameter [mm]	70.1
Height [mm]	140.1
Water content [%]	14.2
Bulk density [Mg/m^3]	2.24
Dry density [Mg/m^3]	1.96
Void ratio [-]	0.379
Degree of saturation [%]	100
Particle density - Assumed [Mg/m^3]	2.70
Torvane [kPa]	-
Pocket penetrometer [kPa]	875
Type of drains	Radial (spiral) & one end only

Test Report
Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

UKAS TESTING 0919

Saturation	
Pressure increments applied [kPa]	100
Differential pressure used [kPa]	N/A
Cell pressure [kPa]	573
Base PWP [kPa]	504
Mid height PWP [kPa]	-
B value achieved [-]	0.97

Isotropic Consolidation	
Cell pressure [kPa]	590
Back pressure [kPa]	504
Base PWP [kPa]	504
Mid height PWP [kPa]	-
Effective radial pressure [kPa]	86
Effective axial pressure [kPa]	86
Deviator stress [kPa]	0
Volumetric strain [%]	0.13
Volumetric strain rate - end of stage [%/hr]	0.00
External axial strain [%]	0.06
Local axial strain [%]	-
Local radial strain [%]	-
Water content [%]	14.1
Bulk density [Mg/m^3]	2.24
Dry density [Mg/m^3]	1.96
Void ratio [-]	0.377
Degree of saturation [%]	100

Test Report
Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

Shearing Stage	
Initial effective radial pressure [kPa]	86
Initial effective axial pressure [kPa]	86
Rate of strain [%/hour]	0.30
At peak deviator stress	
Corrected deviator stress [kPa]	1187
Membrane correction applied [kPa]	11
Drain correction applied [kPa]	0
External axial strain [%]	19.93
Local axial strain [%]	-
Local radial strain [%]	-
Excess base PWP [kPa]	-370
Excess mid height PWP [kPa]	-
Effective radial pressure [kPa]	456
Effective axial pressure [kPa]	1643
Principal effective stress ratio [-]	3.60
ε_{50} [%]	3.34
Secant modulus (E_{50}) at ε_{50} [kPa]	17768
At peak principal effective stress ratio	
Corrected deviator stress [kPa]	271
Membrane correction applied [kPa]	1
Drain correction applied [kPa]	0
External axial strain [%]	1.47
Local axial strain [%]	-
Local radial strain [%]	-
Excess base PWP [kPa]	19
Excess mid height PWP [kPa]	-
Effective radial pressure [kPa]	67
Effective axial pressure [kPa]	338
Principal effective stress ratio [-]	5.05
At 10% external axial strain	
Corrected deviator stress [kPa]	1068
Membrane correction applied [kPa]	5
Drain correction applied [kPa]	0
External axial strain [%]	10.00
Excess base PWP [kPa]	-288
Excess mid height PWP [kPa]	-
Effective radial pressure [kPa]	374
Effective axial pressure [kPa]	1442
Principal effective stress ratio [-]	3.86
ε_{50} [%]	2.91
Secant modulus (E_{50}) at ε_{50} [kPa]	18360

Project: 506718 - F255276 Laboratory: Louvain-la-Neuve, Belgium Approved by: AF - 15/12/2025

UK-MLB-TCH-TP-706 Advanced Triaxial Testing_CIU

Test Report
Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

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Specimen Photographs

FINAL CONDITIONS

Water content [%]	14.1
Bulk density [Mg/m³]	2.24
Dry density [Mg/m³]	1.96
Void ratio [-]	0.377

Project: 506718 - F255276

Laboratory: Louvain-la-Neuve, Belgium

BNO-OWF-BH01_05-3_CIU01

Approved by: AF - 15/12/2025

Test Report

Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

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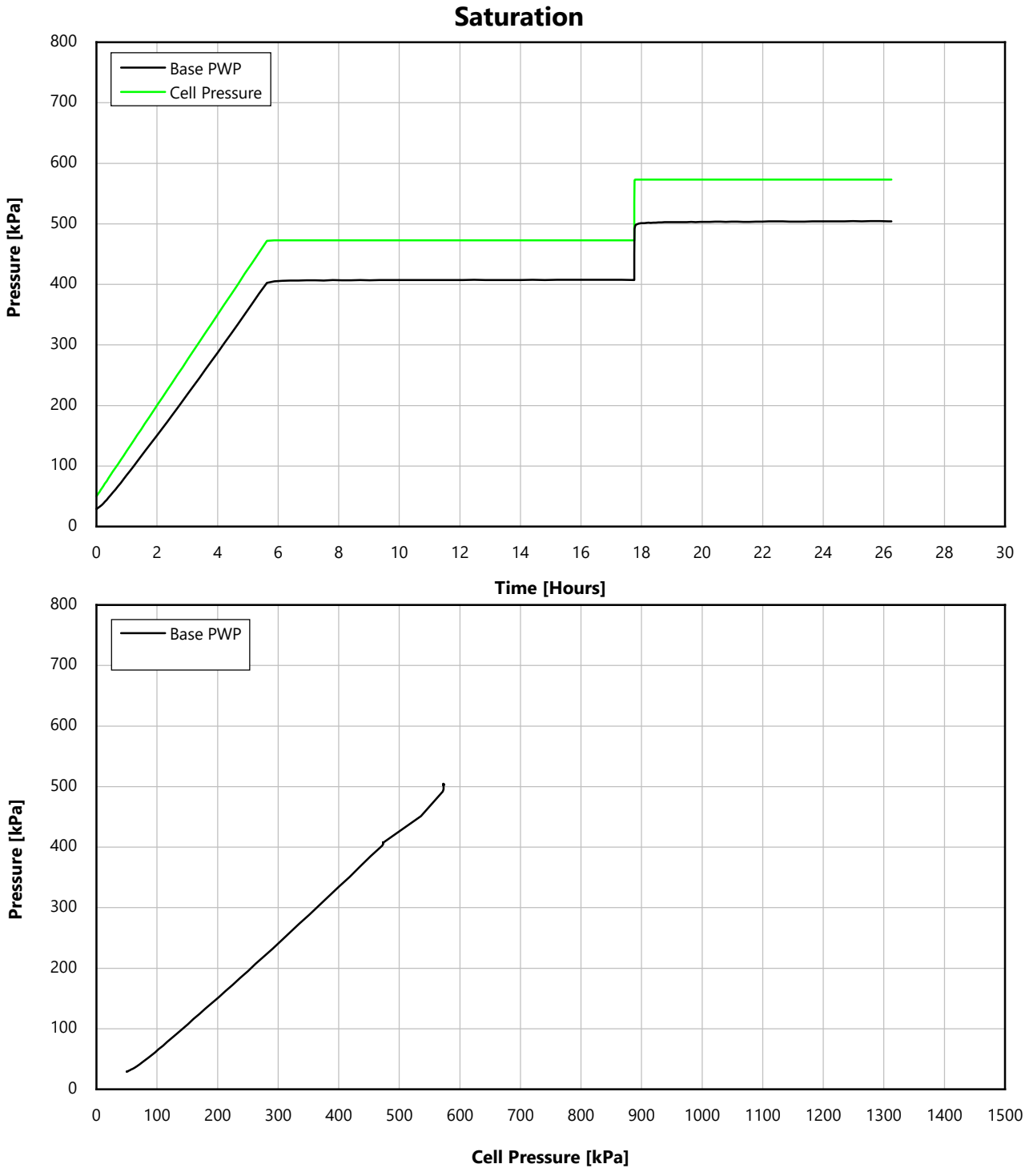

SATURATION	
B value : 0.97	Initial σ'_a : 21 kPa
	Final σ'_a : 69 kPa

Project: 506718 - F255276

Laboratory: Louvain-la-Neuve, Belgium
BNO-OWF-BH01_05-3_CIU01

Approved by: AF 15/12/2025

Test Report

Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

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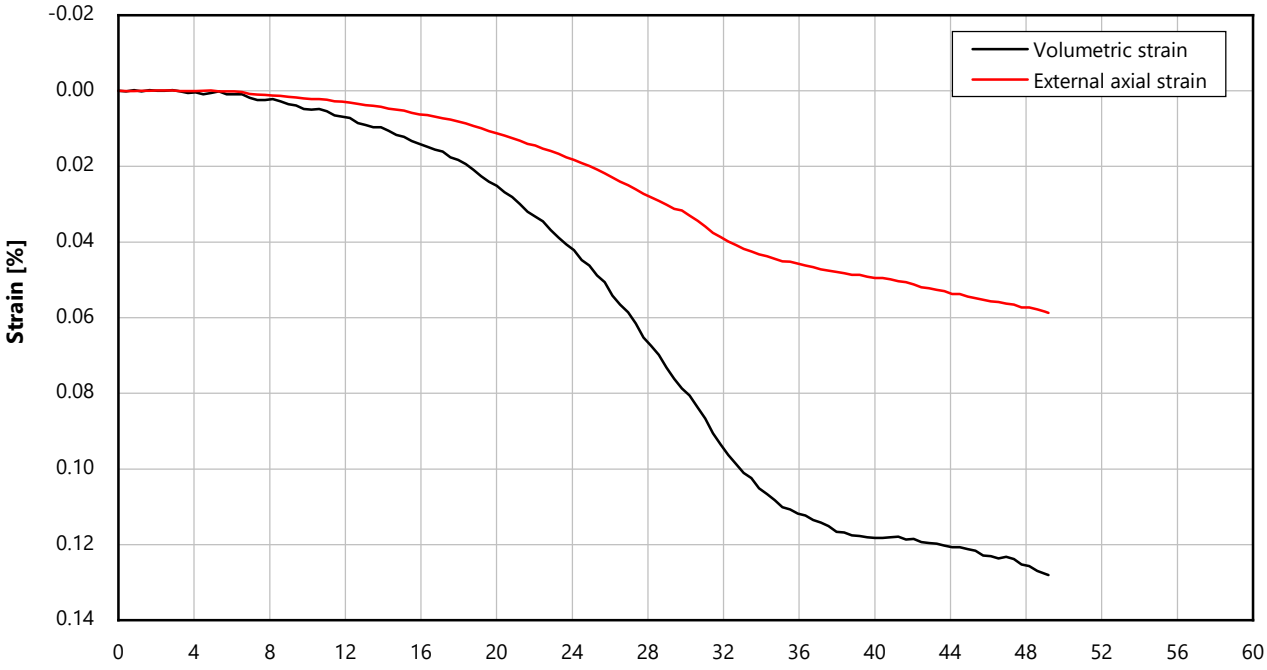
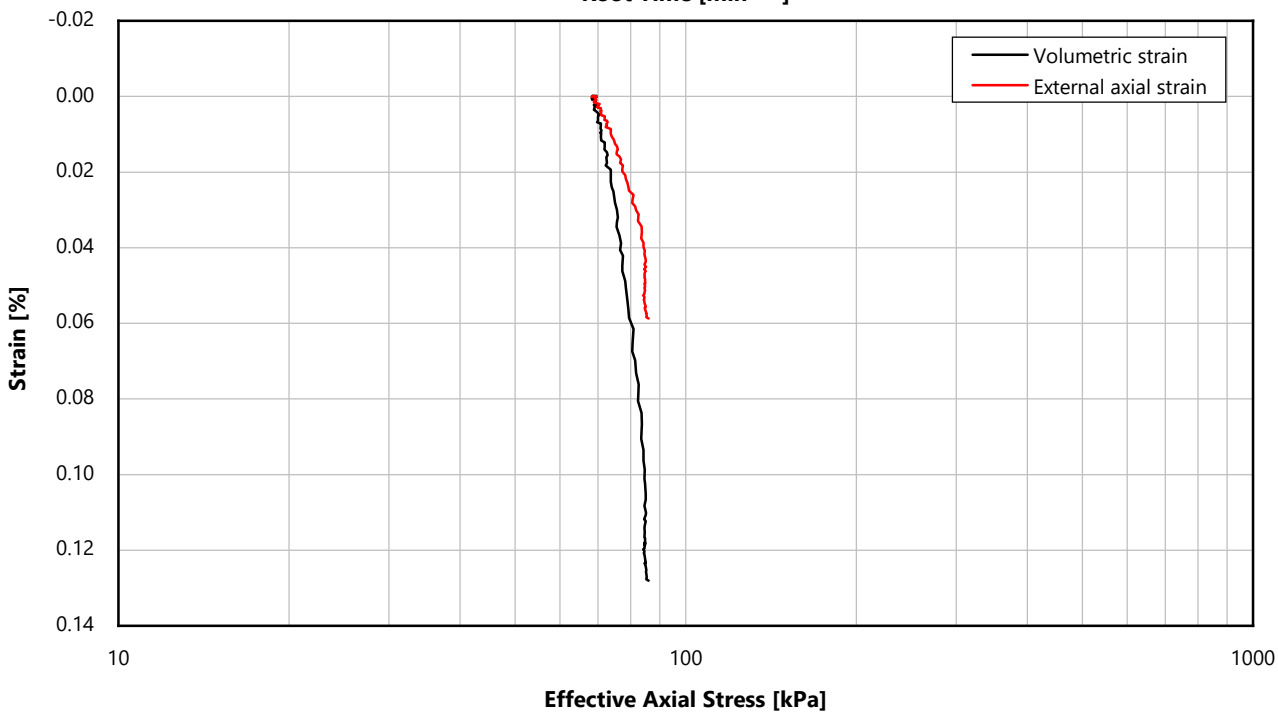
Consolidation





CONSOLIDATION
Stage 1 σ'_{rc} : 86 kPa
Stage 1 σ'_{ac} : 86 kPa

Project: 506718 - F255276

Laboratory: Louvain-la-Neuve, Belgium
BNO-OWF-BH01_05-3_CIU01

Approved by: AF 15/12/2025

Test Report

Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

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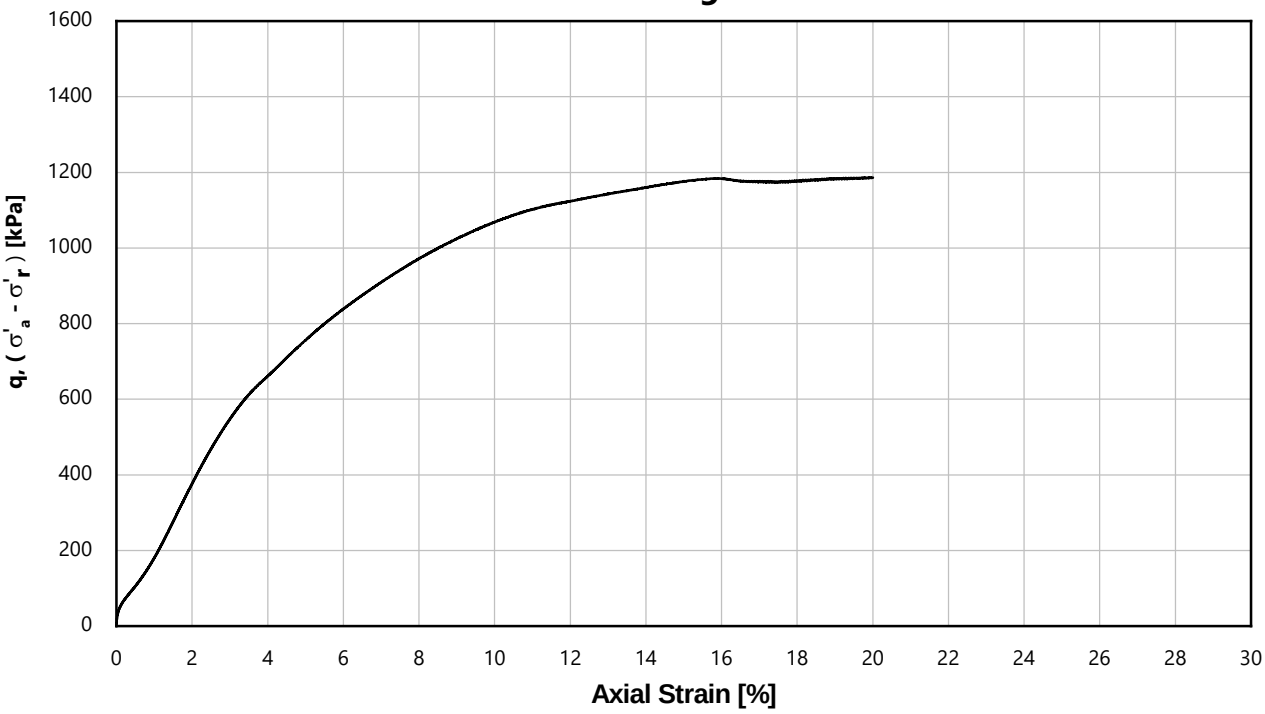
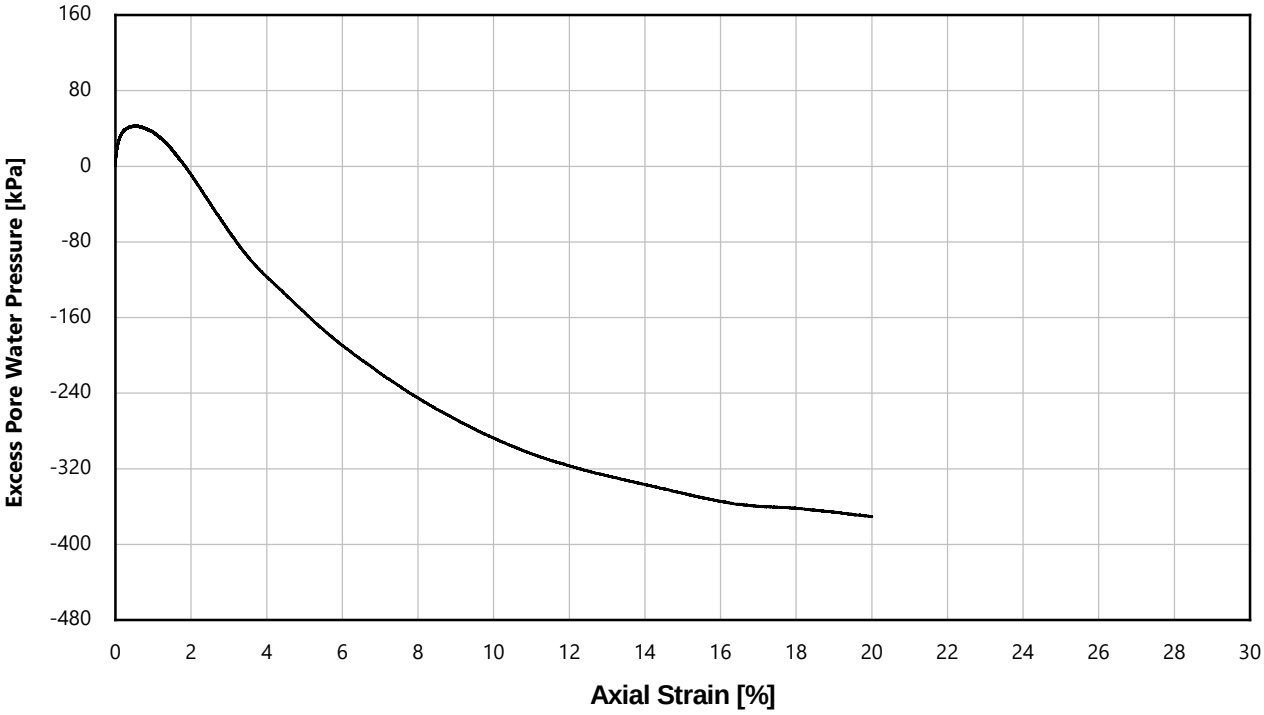
Shearing





SHEAR		
Initial σ'_r : 86 kPa	Rate of strain : 0.30 %/hour	q_{peak} : 1187 kPa
Initial σ'_a : 86 kPa	Ext. ε at q_{peak} : 19.93 %	

Project: 506718 - F255276

Laboratory: Louvain-la-Neuve, Belgium
BNO-OWF-BH01_05-3_CIU01

Approved by: AF 15/12/2025

Test Report

Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

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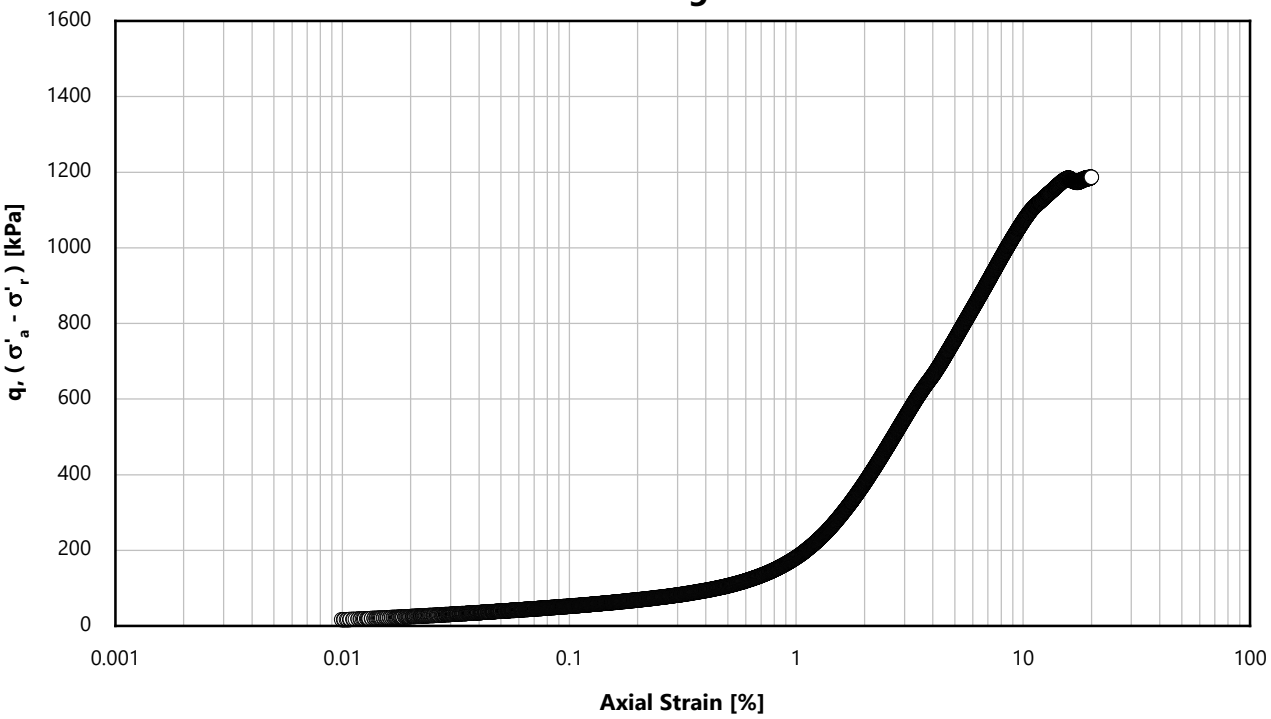
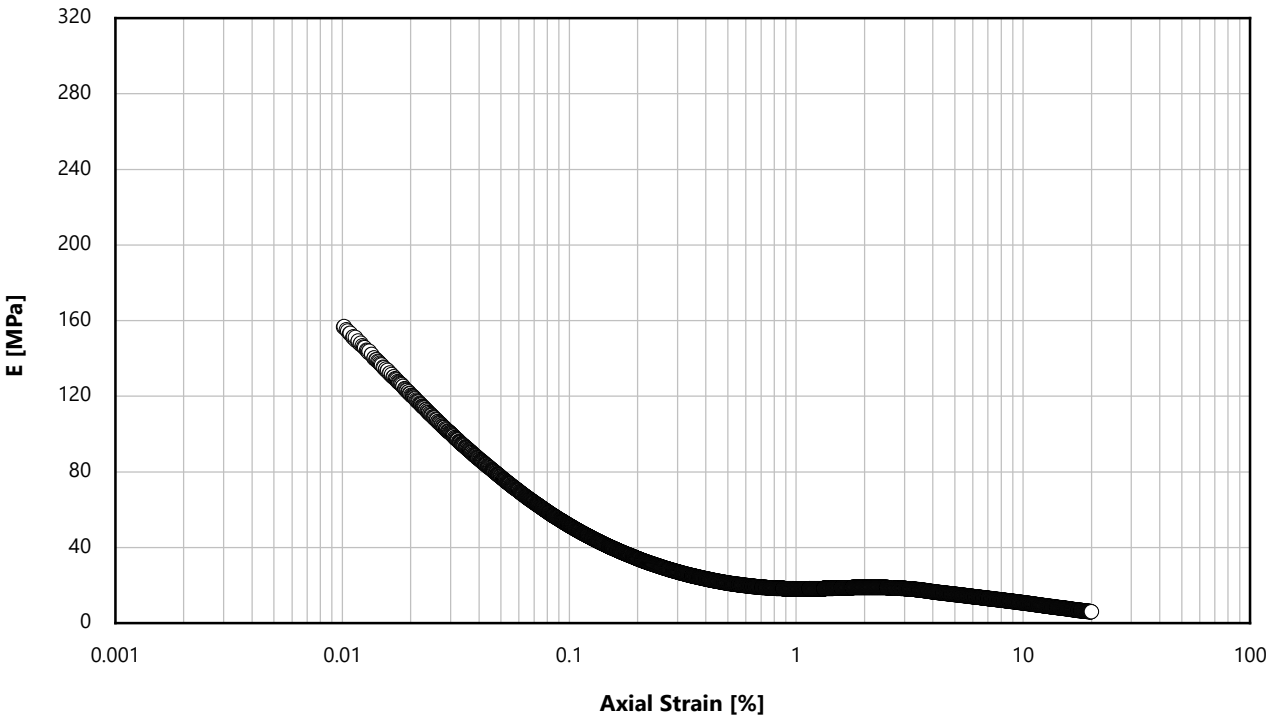
Shearing





SHEAR		
Initial σ'_r : 86 kPa	Rate of strain : 0.30 %/hour	q_{peak} : 1187 kPa
Initial σ'_a : 86 kPa	Ext. ε at q_{peak} : 19.93 %	

Project: 506718 - F255276

Laboratory: Louvain-la-Neuve, Belgium
BNO-OWF-BH01_05-3_CIU01

Approved by: AF 15/12/2025

Test Report

Consolidated Triaxial Compression Test On Water Saturated Soils Isotropic, Undrained (CIUc)

ISO 17892-9:2018

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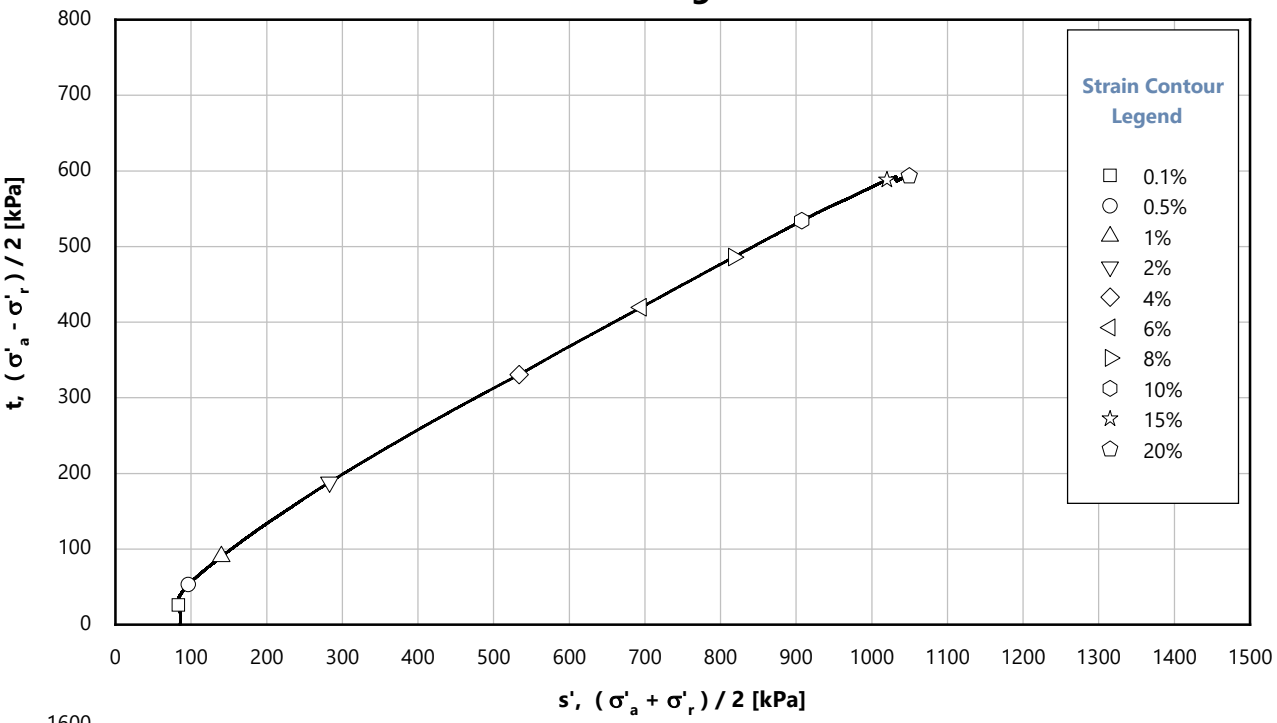
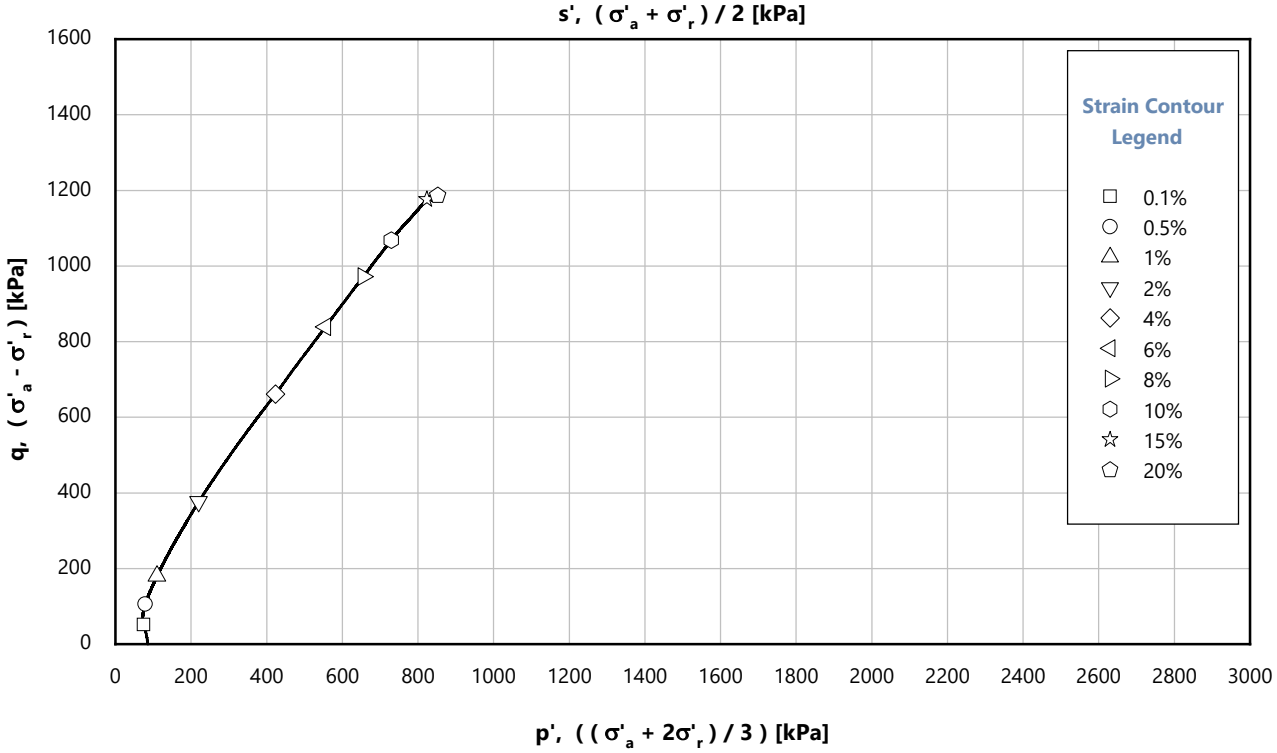
Shearing





SHEAR		
Initial σ'_r : 86 kPa	Rate of strain : 0.30 %/hour	q_{peak} : 1187 kPa
Initial σ'_a : 86 kPa	Ext. ε at q_{peak} : 19.93 %	

Project: 506718 - F255276

Laboratory: Louvain-la-Neuve, Belgium
BNO-OWF-BH01_05-3_CIU01

Approved by: AF 15/12/2025

PROJECT No.	:	F255276	
PROJECT TITLE	:	Bretagne Nord Ouest- Geotechnical Site Investigation	
CLIENT	:	DGEC	
Location	:	BNO-OWF-BH03	
Easting	:	431213.65	WGS84 UTM31N
Northing	:	5432684.6	
Water depth	:	84.50 m	LAT FR Bathyelli

SAMPLE IDENTIFICATION			AT SAMPLE COLLECTION			SAMPLE CHARACTERISTICS					MEASUREMENT CONDITIONS							THERMAL RESULTS					SAMPLE TEMPERATURE AT START [°C]		
BH name	Sample iD	Test depth [m BSB]	Date	Time	Ambient Temp. [°C]	Description	Condition	Moisture content [%]	Wet Unit Weight [kN/m^3]	Dry Unit Weight [kN/m^3]	Test No.	Date	Time	Kit Serial No.	Probe used	Probe Serial No.	Ambient Temp. [°C]	TC [W/(m.k)]	TR [(m.K)/W]	TR Mean value	Deviation	Error rate (r^2)	Temp	Mean value	Remarks
BNO-OWF-BH03	RC02	1.30	20/08/25	-	-	No recovery		-	-	-	-	-	-				-	-	-	-	-	-	-	-	
											-	-	-				-	-	-			-	-	-	
BNO-OWF-BH03	RC05	3.20	20/08/25	7:20	19.0	destructured to reworked very pale brown (10YR 8/4) CALCARENITE composed of sandy very silty gravel. Clasts are very weak very pale brown (10YR 8/4) angular to subrounded medium to coarse. Matrix is very pale brown (10YR 8/4) slightly sandy slightly gravelly silty CLAY.	Undisturbed	20.5	20.6	17.1	1	8/20/2025	7:34:00 AM	8905-0009	TR-3	01052	21	1.561	0.641			0.0015	19		
											2	8/20/2025	7:50:00 AM	8905-0009	TR-3	01052	21	1.580	0.633	0.637	1.2%	0.0018	20	19.4	

PROJECT No.	:	F255276	
PROJECT TITLE	:	Bretagne Nord Ouest- Geotechnical Site Investigation	
CLIENT	:	DGEC	
Location	:	BNO-OWF-BH10	
Easting	:	411963.32	WGS84 UTM31N
Northing	:	5415669.8	
Water depth	:	87.70 m	LAT FR Bathyelli

SAMPLE IDENTIFICATION			AT SAMPLE COLLECTION			SAMPLE CHARACTERISTICS					MEASUREMENT CONDITIONS							THERMAL RESULTS					SAMPLE TEMPERATURE AT START [°C]		
BH name	Sample iD	Test depth [m BSB]	Date	Time	Ambient Temp. [°C]	Description	Condition	Moisture content [%]	Wet Unit Weight [kN/m^3]	Dry Unit Weight [kN/m^3]	Test No.	Date	Time	Kit Serial No.	Probe used	Probe Serial No.	Ambient Temp. [°C]	TC [W/(m.k)]	TR [(m.K)/W]	TR Mean value	Deviation	Error rate (r^2)	Temp	Mean value	Remarks
BNO-OWF-BH10	RC02	1.70	14/08/25	21:20	17.0	calcareous extremely weak reworked very pale brown (10YR 8/2) CALCARENITE (recovered as residual soil - matrix is silty fine to medium SAND)	Undisturbed				1	14/08/25	21:20	8905-0009	TR-3	01052	17	1.686	0.593	0.583	3.4%	0.0014	21.6	21.6	
											2	14/08/25	21:32	8905-0009	TR-3	01052	17	1.745	0.573			0.0019	21.5		
BNO-OWF-BH10	RC04	3.20	14/08/25	22:40	-	calcareous extremely weak destructed white (10YR 8/1) CALCARENITE	Undisturbed				1	-	-				-	-	-	-	-	-	-	-	unsuitable, rock, test no performed
											2	-	-				-	-	-			-	-		

PROJECT No.	:	F255276	
PROJECT TITLE	:	Bretagne Nord Ouest- Geotechnical Site Investigation	
CLIENT	:	DGEC	
Location	:	BNO-OWF-BH13	
Easting	:	426180.89 m	WGS84 UTM31N
Northing	:	5425025.86 m	
Water depth	:	83.30 m	LAT FR Bathyelli

SAMPLE IDENTIFICATION			AT SAMPLE COLLECTION			SAMPLE CHARACTERISTICS					MEASUREMENT CONDITIONS							THERMAL RESULTS					SAMPLE TEMPERATURE AT START [°C]		
BH name	Sample iD	Test depth [m BSB]	Date	Time	Ambient Temp. [°C]	Description	Condition	Moisture content [%]	Wet Unit Weight [kN/m^3]	Dry Unit Weight [kN/m^3]	Test No.	Date	Time	Kit Serial No.	Probe used	Probe Serial No.	Ambient Temp. [°C]	TC [W/(m.k)]	TR [(m.K)/W]	TR Mean value	Deviation	Error rate (r^2)	Temp	Mean value	Remarks
BNO-OWF-BH13	RC04	3.50	18/05/25	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-			-	-		
											-	-	-	-	-	-	-	-	-	-	-	-	-	-	unsuitable, rock, test no performed
BNO-OWF-BH13	RC05	5.75	18/05/25	13:18	20	reworked very pale brown (10YR 8/2) CALCARENITE composed of very silty sand. Matrix is very pale brown (10YR 8/2)	Undisturbed				1	18/05/25	13:18	8905-0009	TR-3	01052	20	1.682	0.595			0.0010	18.4		
											2	18/05/25	13:28	8905-0009	TR-3	01052	20	1.702	0.588	0.592	1.2%	0.0012	18.8	18.6	

PROJECT No.	:	F255276	
PROJECT TITLE	:	Bretagne Nord Ouest- Geotechnical Site Investigation	
CLIENT	:	DGEC	
Location	:	BNO-OWF-BH15	
Easting	:	432314.68 m	WGS84 UTM31N
Northing	:	5429579.00 m	
Water depth	:	81.00 m	LAT FR Bathyelli

SAMPLE IDENTIFICATION			AT SAMPLE COLLECTION			SAMPLE CHARACTERISTICS					MEASUREMENT CONDITIONS							THERMAL RESULTS					SAMPLE TEMPERATURE AT START [°C]		
BH name	Sample iD	Test depth [m BSB]	Date	Time	Ambient Temp. [°C]	Description	Condition	Moisture content [%]	Wet Unit Weight [kN/m^3]	Dry Unit Weight [kN/m^3]	Test No.	Date	Time	Kit Serial No.	Probe used	Probe Serial No.	Ambient Temp. [°C]	TC [W/(m.k)]	TR [(m.K)/W]	TR Mean value	Deviation	Error rate (r^2)	Temp	Mean value	Remarks
BNO-OWF-BH15	RC02	1.45	21/08/2025	14:30	17.5	Calcareous very weak to moderately weak partially weathered to distinctly weathered light yellowish brown (10YR6/4) CALCARENITE	Undisturbed	-	-	-	-	-	-				-	-	-	-	-	-	-	-	Unsuitable rock, test not performed
											-	-	-				-	-	-			-	-	-	
BNO-OWF-BH15	RC05	3.45	21/08/25	5:20	17.5	calcareous destructured light yellowish brown CALCARENITE composed of slightly gravelly sandy clay. Clasts are very weak light yellowish brown (10YR 6/4) subangular to subrounded fine to coarse. Matrix is very pale brown (10YR 6/4)	Undisturbed				1	8/21/2025	5:43:00 AM	8905-0009	TR-3	01052	19	1.978	0.506	0.520	5.4%	0.0077	24.2	23.3	
											2	8/21/2025	5:54:00 AM	8905-0009	TR-3	01052	19	1.871	0.534			0.0028	22.4		

Test Report

Thermal Conductivity by Thermal Needle Probe Procedure

ASTM D5334-22

UKAS TESTING 0919

No.	Borehole	Sample*	Depth [m]	Soil Type	Sample Condition	Water Content [%]	Dry Density [Mg/m^3]	Void Ratio	Thermal Conductivity [W/m.K]		
									No.1	No.2	No.3
1	BNO-OWF-BH08	01-2	0.15	CALCARENITE	Wax	10.71	1.96	0.38	1.55	1.51	1.53

*** Detailed sample descriptions can be found in the "Summary of Laboratory Test Results" of the report.**

Project: 506718 - F255276 Location: Wallingford, UK Approved by ME 10/02/2026

Test Page 1 of 1

Test Report

Thermal Conductivity by Thermal Needle Probe

ASTM D5334-22a$^{\varepsilon 1}$

UKAS TESTING 0919

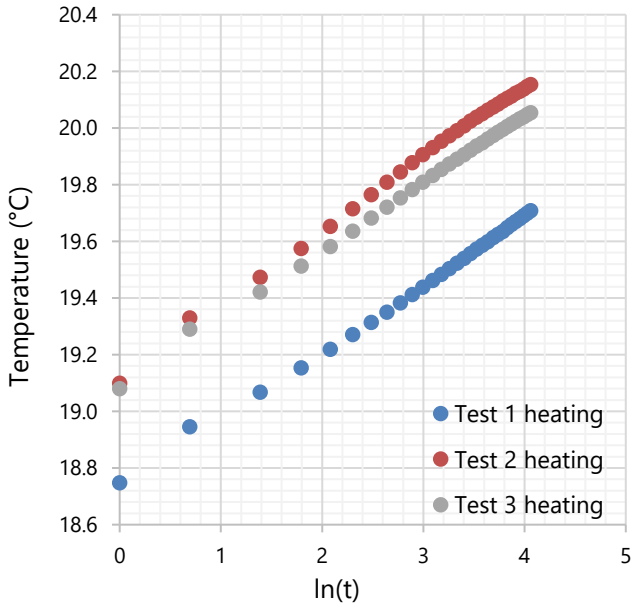
Test Identification			
Borehole	BNO-OWF-BH08	Sample Depth [m]	0.15
Sample	01-2	Test Depth [m]	0.15

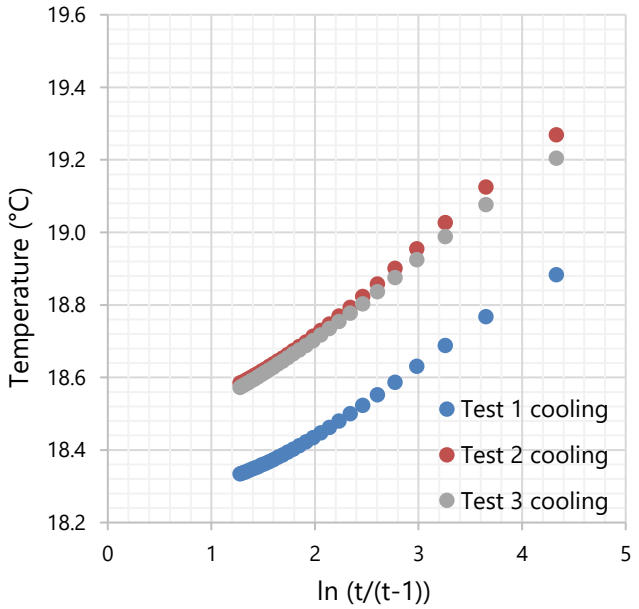
Visual Description
strong very pale brown fine to coarse grained bioclastic CALCARENITE. Fresh to slightly weathered

Specimen Conditions			
Sample condition	Wax	Water content [%]	10.7
Wet mass [g]	2789.6	Dry density [g/cm^3]	1.96
Diameter [mm]	98.5	Bulk density [g/cm^3]	2.17
Length [mm]	169.0	Target wet density [g/cm^3]	-

Test Conditions			
Room Temperature [°C]	21	Needle diameter [mm]	3.9
Needle	RK-3	Needle length [mm]	60
Heating time [min]	2.5	Insertion type	Pre-drilled*
Cooling time [min]	2.5	Calculation method	Inbuilt

Test Results	Test 1	Test 2	Test 3
Thermal Conductivity [W/mK]	1.55	1.51	1.53
Sample Temperature [°C]	18.12	18.44	18.43
Error	0.003	0.007	0.004
Power [W/m]	4.75	4.76	4.80





Project: 506718 - F255276 Location: Wallingford, UK Approved by ME 10/02/2026

Note(s): * High-Density Polysynthetic Silver Thermal Compound (Arctic Silver®) applied to probe

Test Page 1/1

Test Report

Carbonate Content of Soil by Rapid Titration

BS1377-3 : 2018, Section 8.3

No.	Location	Sample	Depth [m]	Carbonate Content 1 [% as CO_2]	Carbonate Content 2 [% as CO_3]	Carbonate Content 3 [% as $CaCO_3$]
1	BNO-OWF-BH01	05-4	3.85	35.00	-	79.45
2	BNO-OWF-BH01	10-1	8.50	34.00	-	77.18
3	BNO-OWF-BH01	16-5	18.40	37.00	-	83.99
4	BNO-OWF-BH02	02-1	1.00	41.00	-	93.07
5	BNO-OWF-BH03	04-3	2.70	40.00	-	90.80
6	BNO-OWF-BH04	06-2	3.80	34.00	-	77.18
7	BNO-OWF-BH04	15-2	14.20	41.00	-	93.07
8	BNO-OWF-BH07	05-3	11.20	41.00	-	93.07
9	BNO-OWF-BH08	01-1	0.05	41.00	-	93.07
10	BNO-OWF-BH10	06-1	15.00	41.00	-	93.07
11	BNO-OWF-BH11	07-3	9.35	41.00	-	93.07
12	BNO-OWF-BH12	08-3	8.90	40.00	-	90.80
13	BNO-OWF-BH13	02-1	13.50	41.00	-	93.07
14	BNO-OWF-BH15	15-2	16.10	42.00	-	95.34
15	BNO-OWF-BH17	09-5	8.85	39.00	-	88.53
16	BNO-OWF-BH19	01-1	3.50	34.00	-	77.18

Note: This test was not performed by Fugro and was subcontracted.

Project: 506718 - F255276 ZW - 09/03/2026
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Test Report

Organic Matter of Soil

BS1377-3 : 2018, Section 4 and 6

No.	Location	Sample	Depth [m]	Organic Matter [%]	Organic Matter - Loss On Ignition [%]
1	BNO-OWF-BH01	05-4	3.85	-	4.10
2	BNO-OWF-BH01	10-1	8.50	-	2.80
3	BNO-OWF-BH01	16-5	18.40	-	2.30
4	BNO-OWF-BH02	02-1	1.00	-	0.11
5	BNO-OWF-BH03	04-3	2.70	-	0.59
6	BNO-OWF-BH04	06-2	3.80	-	1.80
7	BNO-OWF-BH04	15-2	14.20	-	2.50
8	BNO-OWF-BH07	05-3	11.20	-	0.82
9	BNO-OWF-BH08	01-1	0.05	-	3.60
10	BNO-OWF-BH10	06-1	15.00	-	0.21
11	BNO-OWF-BH11	07-3	9.35	-	2.90
12	BNO-OWF-BH12	08-3	8.90	-	< 0.01
13	BNO-OWF-BH13	02-1	13.50	-	0.23
14	BNO-OWF-BH15	15-2	16.10	-	0.32
15	BNO-OWF-BH17	09-5	8.85	-	4.20
16	BNO-OWF-BH19	01-1	3.50	-	3.60

Note: This test was not performed by Fugro and was subcontracted.

Project: 506718 - F255276
Test Page 1 / 1

ZW - 09/03/2026

Test Report

Sulphate Aqueous Extract & Chloride Aqueous Extract

No.	Location	Sample	Depth [m]	Chloride Aqueous Extract [mg/l]	Sulphate Aqueous Extract [mg/l as SO4]
1	BNO-OWF-BH01	05-4	3.85	1300.00	740.00
2	BNO-OWF-BH01	10-1	8.50	1200.00	840.00
3	BNO-OWF-BH01	16-5	18.40	< 1.0	530.00
4	BNO-OWF-BH02	02-1	1.00	< 1.0	160.00
5	BNO-OWF-BH03	04-3	2.70	< 1.0	270.00
6	BNO-OWF-BH04	06-2	3.80	< 1.0	390.00
7	BNO-OWF-BH04	15-2	14.20	< 1.0	160.00
8	BNO-OWF-BH07	05-3	11.20	< 1.0	170.00
9	BNO-OWF-BH08	01-1	0.05	< 1.0	250.00
10	BNO-OWF-BH10	06-1	15.00	< 1.0	200.00
11	BNO-OWF-BH11	07-3	9.35	< 1.0	270.00
12	BNO-OWF-BH12	08-3	8.90	< 1.0	180.00
13	BNO-OWF-BH13	02-1	13.50	< 1.0	290.00
14	BNO-OWF-BH15	15-2	16.10	< 1.0	250.00
15	BNO-OWF-BH17	09-5	8.85	< 1.0	260.00
16	BNO-OWF-BH19	01-1	3.50	< 1.0	210.00

Note: This test was not performed by Fugro and was subcontracted. These results have been checked and supplied by DETS and Fugro is only re-issuing them for reporting and presentation consistency

Project: 506718 - F255276

DETS - 13/01/2026

Test Report

Total Acid Soluble Sulphate and pH

BS1377-3 : 2018, Section 7.5 and 12

No.	Location	Sample	Depth [m]	Total Acid Soluble Sulphate [% as SO4]	pH
1	BNO-OWF-BH01	05-4	3.85	0.30	8.50
2	BNO-OWF-BH01	10-1	8.50	0.02	8.50
3	BNO-OWF-BH01	16-5	18.40	0.13	8.80
4	BNO-OWF-BH02	02-1	1.00	0.07	9.20
5	BNO-OWF-BH03	04-3	2.70	0.14	9.00
6	BNO-OWF-BH04	06-2	3.80	0.10	8.80
7	BNO-OWF-BH04	15-2	14.20	0.09	9.30
8	BNO-OWF-BH07	05-3	11.20	0.11	9.10
9	BNO-OWF-BH08	01-1	0.05	0.12	8.70
10	BNO-OWF-BH10	06-1	15.00	0.11	9.10
11	BNO-OWF-BH11	07-3	9.35	0.14	9.20
12	BNO-OWF-BH12	08-3	8.90	0.08	9.10
13	BNO-OWF-BH13	02-1	13.50	0.13	9.30
14	BNO-OWF-BH15	15-2	16.10	0.10	9.10
15	BNO-OWF-BH17	09-5	8.85	0.11	8.70
16	BNO-OWF-BH19	01-1	3.50	0.10	8.20

Note: This test was not performed by Fugro and was subcontracted.

Project: 506718 - F255276
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ZW - 09/03/2026

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH01	Depth	:	3.60 m BSF
Sample No.	:	RC05	Date of test	:	19/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
Light Grey	No Visible Reaction	No Visible Reaction	Very Dark Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
10 - 100 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH01	Depth	:	6.50 m BSF
Sample No.	:	RC08	Date of test	:	19/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination

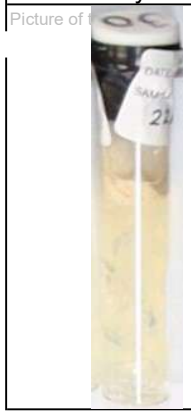
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH01	Depth	:	11.15 m BSF
Sample No.	:	RC11	Date of test	:	19/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	Light Grey	Light Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

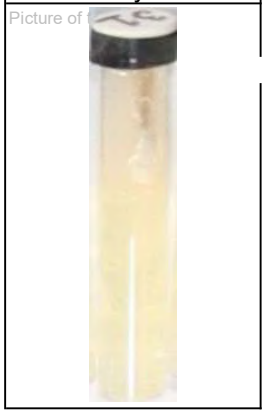
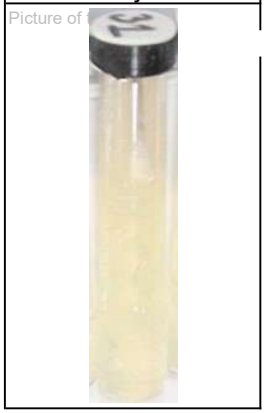
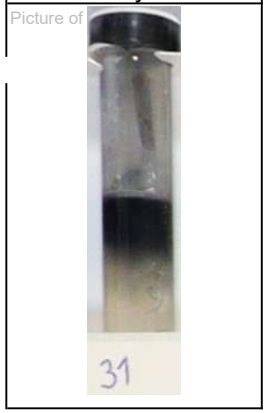
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH02	Depth	:	5.85 m BSF
Sample No.	:	RC06	Date of test	:	22/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Black	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

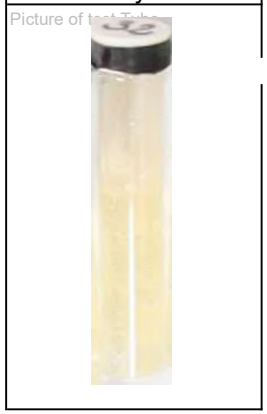
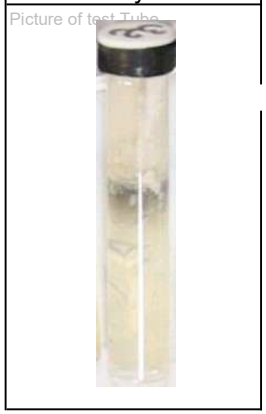
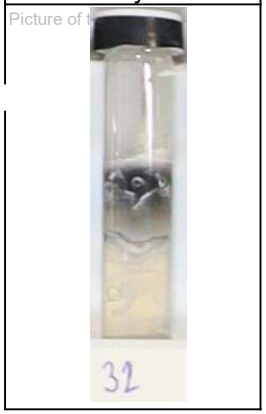
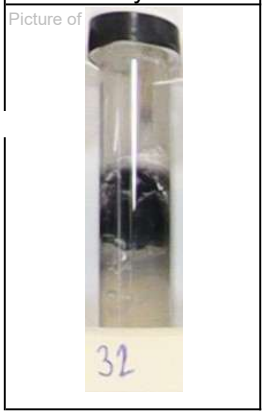
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH02	Depth	:	11.30 m BSF
Sample No.	:	RC15	Date of test	:	22/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH02	Depth	:	16.20 m BSF
Sample No.	:	RC19	Date of test	:	22/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Very Dark Grey	Very Dark Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	10000 - 100000 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH02	Depth	:	21.00 m BSF
Sample No.	:	RC22	Date of test	:	22/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

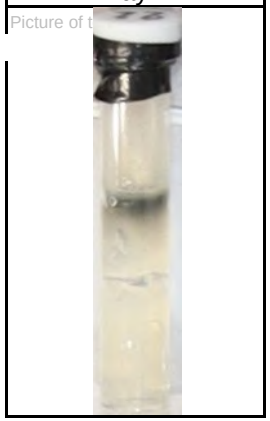
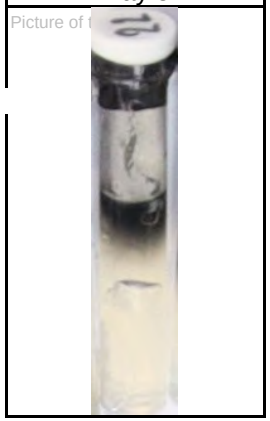
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH03	Depth	:	3.30 m BSF
Sample No.	:	RC05	Date of test	:	20/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Very Dark Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH03	Depth	:	7.80 m BSF
Sample No.	:	RC09	Date of test	:	20/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	Very Dark Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH03	Depth	:	10.80 m BSF
Sample No.	:	W01	Date of test	:	20/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	Light Grey	Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination	Moderate Contamination

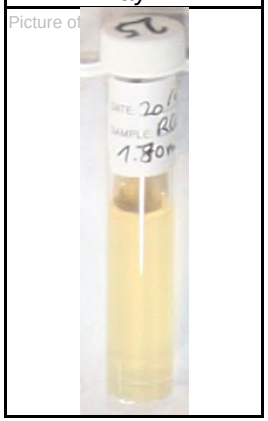
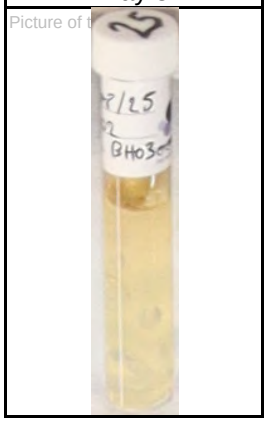
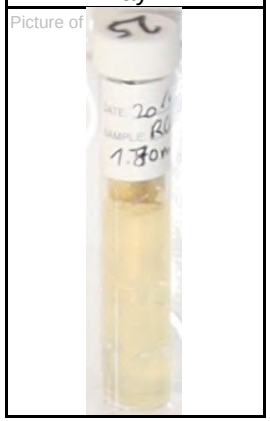
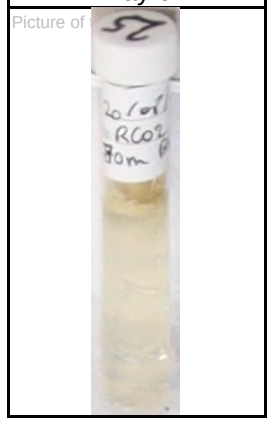
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH03	Depth	:	15.05 m BSF
Sample No.	:	W03	Date of test	:	20/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	Light Grey	Dark Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml	1000 -10000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination	Moderate Contamination

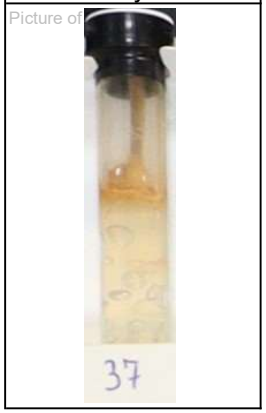
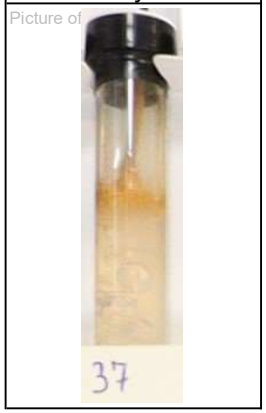
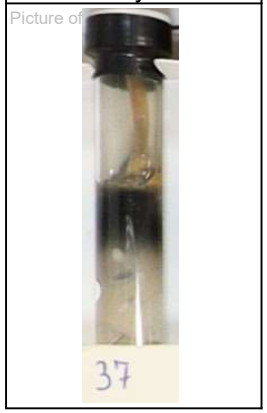
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH03-a	Depth	:	1.70 m BSF
Sample No.	:	RC02	Date of test	:	20/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	Light Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH04	Depth	:	3.85 m BSF
Sample No.	:	RC06	Date of test	:	25/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

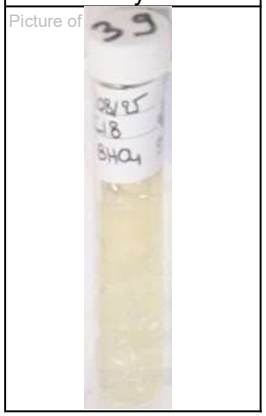
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH04	Depth	:	9.15 m BSF
Sample No.	:	RC11	Date of test	:	25/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH04	Depth	:	18.25 m BSF
Sample No.	:	RC18	Date of test	:	25/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	Grey	Black	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

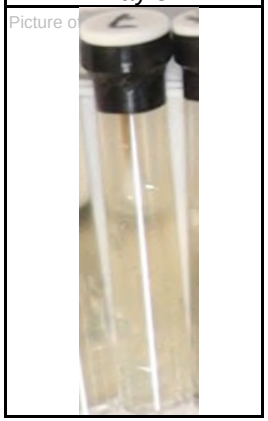
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH07	Depth	:	9.95 m BSF
Sample No.	:	RC04	Date of test	:	23/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

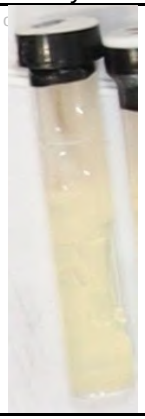
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH08	Depth	:	5.00 m BSF
Sample No.	:	RC05	Date of test	:	16/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH08	Depth	:	11.60 m BSF
Sample No.	:	RC11	Date of test	:	16/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	Light Grey	Grey	Dark Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml	1000 -10000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH10	Depth	:	0.80 m BSF
Sample No.	:	RC01	Date of test	:	8/15/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Light Grey	Light Grey	Light Grey	Very Dark Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	10000 - 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination	Heavy Contamination

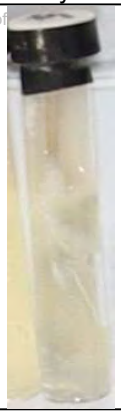
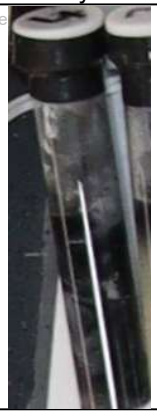
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH10	Depth	:	5.50 m BSF
Sample No.	:	W02	Date of test	:	8/15/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

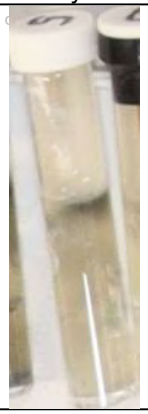
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH10	Depth	:	10.50 m BSF
Sample No.	:	W04	Date of test	:	8/15/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH10	Depth	:	15.25 m BSF
Sample No.	:	RC06	Date of test	:	8/15/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
Light Grey	Light Grey	Grey	Very Dark Grey	Very Dark Grey	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
10 - 100 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml	10000 - 100000 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

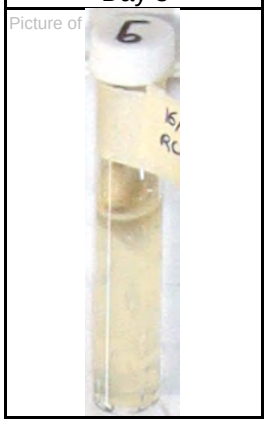
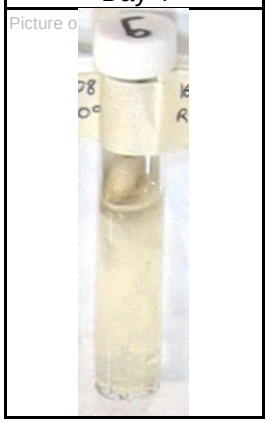
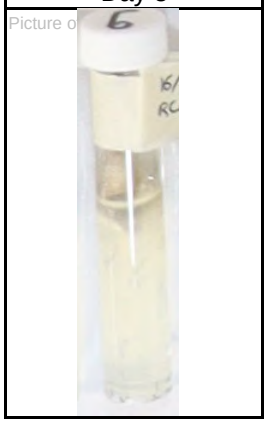
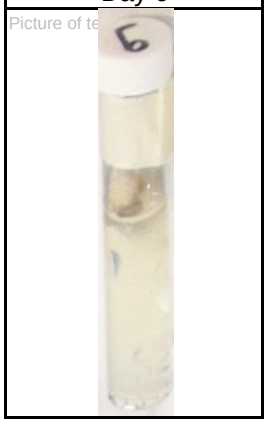
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH10	Depth	:	19.20 m BSF
Sample No.	:	RC08	Date of test	:	8/15/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	Light Grey	Light Grey	Grey	Dark Grey	Very Dark Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml	1000 -10000 SRB/ml	10000 - 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Moderate Contamination	Heavy Contamination

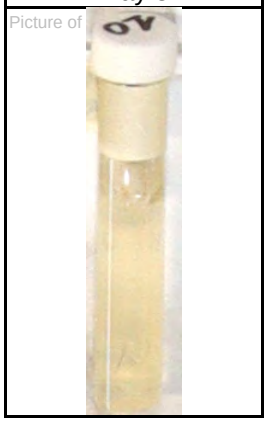
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH11	Depth	:	0.55 m BSF
Sample No.	:	RC01	Date of test	:	16/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
Light Grey	Light Grey	Grey	Grey	Grey	Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
10 - 100 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml	100 - 1000 SRB/ml	100 - 1000 SRB/ml	100 - 1000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Moderate Contamination	Moderate Contamination	Moderate Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH11	Depth	:	11.10 m BSF
Sample No.	:	RC09	Date of test	:	16/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
Light Grey	Light Grey	Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
10 - 100 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

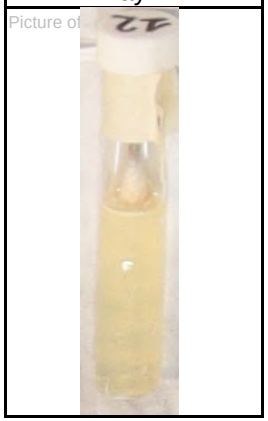
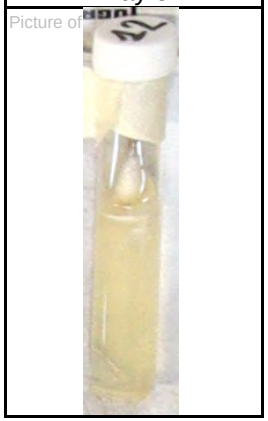
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH12	Depth	:	5.40 m BSF
Sample No.	:	RC05	Date of test	:	17/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Light Grey	Light Grey	Dark Grey	No Visible Reaction
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	1000 -10000 SRB/ml	< 10 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Light Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH12	Depth	:	9.30 m BSF
Sample No.	:	RC09	Date of test	:	17/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Light Grey	Light Grey	Light Grey	Light Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH13	Depth	:	2.20 m BSF
Sample No.	:	RC03	Date of test	:	18/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	Light Grey	No Visible Reaction	Dark Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	10 - 100 SRB/ml	< 10 SRB/ml	1000 -10000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

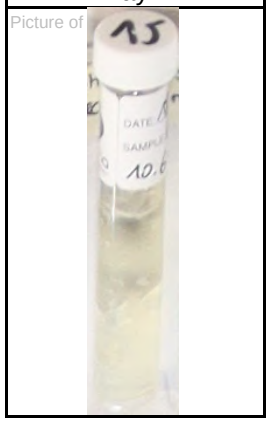
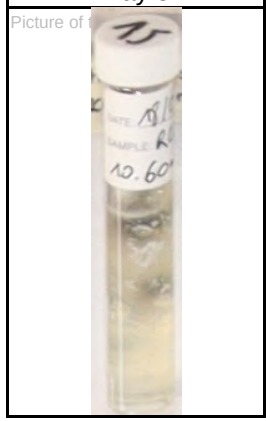
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH13	Depth	:	5.90 m BSF
Sample No.	:	RC05	Date of test	:	18/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	Light Grey	Light Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	10 - 100 SRB/ml	10 - 100 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH13	Depth	:	10.60 m BSF
Sample No.	:	RC08	Date of test	:	18/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Light Grey	Grey	Dark Grey	Very Dark Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	10 - 100 SRB/ml	100 - 1000 SRB/ml	1000 -10000 SRB/ml	10000 - 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Moderate Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH13	Depth	:	17.90 m BSF
Sample No.	:	RC10	Date of test	:	18/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction	No Visible Reaction
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination	Light Contamination

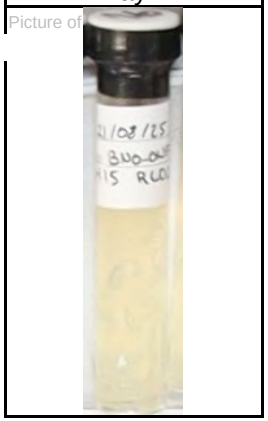
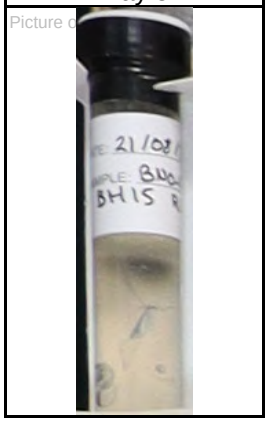
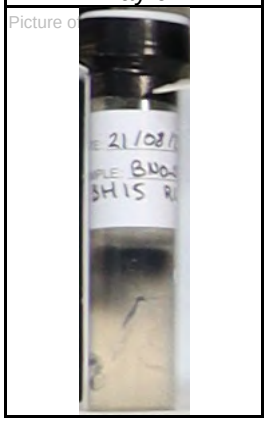
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH13	Depth	:	20.75 m BSF
Sample No.	:	W04	Date of test	:	18/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
Light Grey	Grey	Dark Grey	Very Dark Grey	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
10 - 100 SRB/ml	100 - 1000 SRB/ml	1000 -10000 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Moderate Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

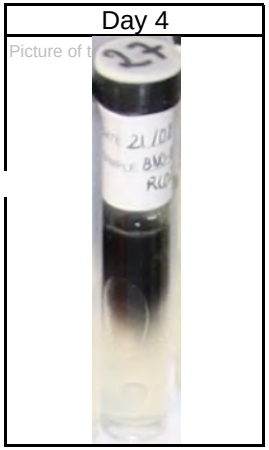
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH15	Depth	:	1.20 m BSF
Sample No.	:	RC02	Date of test	:	21/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	No Visible Reaction	Grey	Very Dark Grey	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	10000 - 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

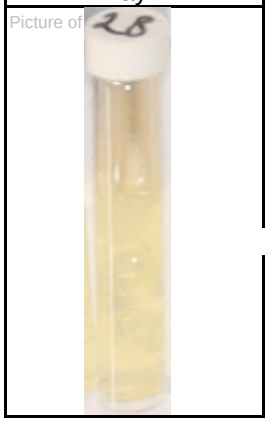
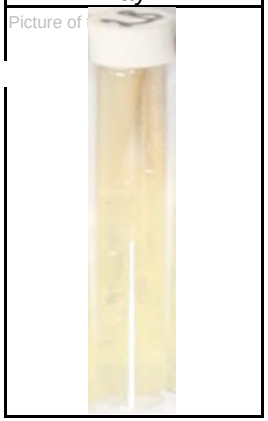
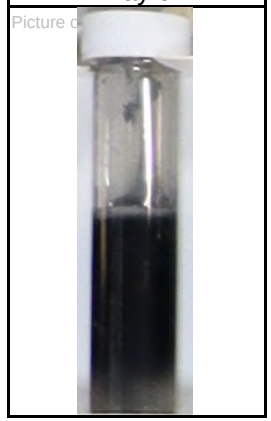
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH15	Depth	:	6.10 m BSF
Sample No.	:	RC08	Date of test	:	21/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Black	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH15	Depth	:	10.40 m BSF
Sample No.	:	RC11	Date of test	:	21/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Dark Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	1000 -10000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

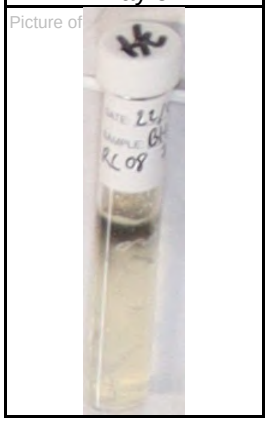
Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH15	Depth	:	15.45 m BSF
Sample No.	:	RC14	Date of test	:	21/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Dark Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	1000 -10000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH17	Depth	:	7.50 m BSF
Sample No.	:	RC08	Date of test	:	22/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
					
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Grey	Dark Grey	Very Dark Grey	Very Dark Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	1000 -10000 SRB/ml	10000 - 100000 SRB/ml	10000 - 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH17	Depth	:	15.40 m BSF
Sample No.	:	RC15	Date of test	:	23/08/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Grey	Black	Black	Black
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	100 - 1000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml	> 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination	Heavy Contamination

Sulphate-Reducing Bacteria (SRB) Test

Project No.	:	F255276			
Location	:	BNO-OWF-BH19	Depth	:	3.65 m BSF
Sample No.	:	W01	Date of test	:	8/14/2025
SRB Test Kit	:	Sig Sulphide®			

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Tube Appearance:	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**	**Tube Appearance:**
No Visible Reaction	No Visible Reaction	Dark Grey	Grey	Very Dark Grey	Very Dark Grey
SRB Concentration	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**	**SRB Concentration**
< 10 SRB/ml	< 10 SRB/ml	1000 -10000 SRB/ml	100 - 1000 SRB/ml	10000 - 100000 SRB/ml	10000 - 100000 SRB/ml
Qualitative Interpretation	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**	**Qualitative Interpretation**
Light Contamination	Light Contamination	Moderate Contamination	Moderate Contamination	Heavy Contamination	Heavy Contamination

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

POROSITY/DENSITY DETERMINATION USING SATURATION AND CALIPER/BUOYANCY TECHNIQUES

Sample details				Test results								
Borehole Ref.	Sample Ref.	Depth (m)	Description	Bulk Density (Mg/m³)	Dry Density (Mg/m³)	Sat Water Content (%)	Volume (cm³)	Method of volume calculation	App. Part. Density (Mg/m³)	D. Tested	(*) Pore Volume (cm³)	Porosity (%)
BNO-OWF-BH01	06-3	4.85	Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered	2.21	1.92	15	51.09	Buoyancy technique	2.71	19/01/26	14.93	29.22
BNO-OWF-BH01	12-6	12.65	Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered	2.30	2.06	12	62.01	Buoyancy technique	2.71	19/01/26	14.83	23.91
BNO-OWF-BH01	17-5	20.00	Weak to moderately weak grey fine to medium grained CALCARENITE. Slightly weathered	2.15	1.82	18	49.19	Buoyancy technique	2.70	20/01/26	16.03	32.59
BNO-OWF-BH02	02-3	1.45	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.25	1.98	14	85.55	Buoyancy technique	2.71	19/01/26	23.14	27.05
BNO-OWF-BH02	15-1	11.20	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.25	1.98	14	78.94	Buoyancy technique	2.73	19/01/26	21.74	27.54
BNO-OWF-BH03	10-3	15.70	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.15	1.82	18	46.08	Buoyancy technique	2.70	19/01/26	15.03	32.61
BNO-OWF-BH03-a	02-1	1.00	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.32	2.09	11	90.36	Buoyancy technique	2.70	19/01/26	20.34	22.51
BNO-OWF-BH04	02-1	0.80	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.12	1.79	19	47.59	Buoyancy technique	2.70	19/01/26	16.13	33.89
BNO-OWF-BH04	12-2	10.00	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.05	1.66	23	70.83	Buoyancy technique	2.71	20/01/26	27.55	38.90
BNO-OWF-BH04	18-2	17.25	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.30	2.05	12	35.86	Buoyancy technique	2.71	19/01/26	8.72	24.30

(*) Pore volume obtained by water saturation at 20º. Oven temperature: 105 ºC

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 22/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

POROSITY/DENSITY DETERMINATION USING SATURATION AND CALIPER/BUOYANCY TECHNIQUES

Sample details				Test results								
Borehole Ref.	Sample Ref.	Depth (m)	Description	Bulk Density (Mg/m³)	Dry Density (Mg/m³)	Sat Water Content (%)	Volume (cm³)	Method of volume calculation	App. Part. Density (Mg/m³)	D. Tested	(*) Pore Volume (cm³)	Porosity (%)
BNO-OWF-BH07	01-1	6.60	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.16	1.84	17	71.43	Buoyancy technique	2.71	20/01/26	22.94	32.12
BNO-OWF-BH07	11-1	19.50	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.17	1.87	16	67.22	Buoyancy technique	2.69	19/01/26	20.54	30.55
BNO-OWF-BH08	02-1	1.00	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.34	2.13	9.9	51.39	Buoyancy technique	2.70	20/01/26	10.82	21.05
BNO-OWF-BH08	06-3	6.20	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.12	1.78	19	69.93	Buoyancy technique	2.68	19/01/26	23.44	33.52
BNO-OWF-BH10	02-4	1.80	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.13	1.80	19	51.29	Buoyancy technique	2.70	19/01/26	17.13	33.40
BNO-OWF-BH10	07-2	16.70	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	1.99	1.57	26	50.89	Buoyancy technique	2.70	20/01/26	21.24	41.73
BNO-OWF-BH11	10-1	12.00	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.03	1.64	24	99.48	Buoyancy technique	2.70	19/01/26	39.17	39.38
BNO-OWF-BH11	15-2	18.35	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.05	1.66	23	56.10	Buoyancy technique	2.70	19/01/26	21.64	38.57
BNO-OWF-BH12	11-2	12.75	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.07	1.69	22	71.93	Buoyancy technique	2.71	20/01/26	26.95	37.47
BNO-OWF-BH12	16-3	18.90	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.01	1.58	27	52.09	Buoyancy technique	2.76	20/01/26	22.24	42.69

(*) Pore volume obtained by water saturation at 20º. Oven temperature: 105 ºC

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 22/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

POROSITY/DENSITY DETERMINATION USING SATURATION AND CALIPER/BUOYANCY TECHNIQUES

Sample details				Test results								
Borehole Ref.	Sample Ref.	Depth (m)	Description	Bulk Density (Mg/m³)	Dry Density (Mg/m³)	Sat Water Content (%)	Volume (cm³)	Method of volume calculation	App. Part. Density (Mg/m³)	D. Tested	(*) Pore Volume (cm³)	Porosity (%)
BNO-OWF-BH13	03-3	2.30	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.26	2.00	13	45.78	Buoyancy technique	2.71	19/01/26	12.02	26.26
BNO-OWF-BH13	09-1	16.05	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.08	1.72	21	56.20	Buoyancy technique	2.71	19/01/26	20.54	36.54
BNO-OWF-BH15	06-1	4.00	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	1.96	1.53	29	55.00	Buoyancy technique	2.71	19/01/26	24.04	43.72
BNO-OWF-BH15	15-4	17.20	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	1.99	1.57	27	105.09	Buoyancy technique	2.72	19/01/26	44.48	42.33
BNO-OWF-BH17	02-3	1.55	Weak to moderately weak grey fine to medium grained CALCARENITE. Slightly weathered	2.31	2.08	11	46.88	Buoyancy technique	2.71	19/01/26	10.82	23.08
BNO-OWF-BH17	13-5	12.70	Weak to moderately weak grey fine to medium grained CALCARENITE. Slightly weathered	2.18	1.87	16	83.85	Buoyancy technique	2.70	19/01/26	25.65	30.59
BNO-OWF-BH19	03-1	4.50	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	2.22	1.96	14	63.41	Buoyancy technique	2.67	19/01/26	16.93	26.70
BNO-OWF-BH19	08-1	9.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.02	1.62	24	73.23	Buoyancy technique	2.69	20/01/26	29.05	39.67
BNO-OWF-BH19	15-1	18.60	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	2.03	1.62	25	84.25	Buoyancy technique	2.72	19/01/26	33.86	40.19

(*) Pore volume obtained by water saturation at 20º. Oven temperature: 105 ºC

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 22/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

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UKAS TESTING 1982

BS1377: Part 2:1990 / BS EN ISO 17892-3 : 2015

PARTICLE DENSITY

Location	Depth (m)	Sample Ref	Sample Type	Description	Particle Density Mg/m³	Test Method
BNO-OWF-BH01	4.85	06-3	Bag	Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered.	2.72	2
BNO-OWF-BH01	12.65	12-6	Bag	Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered.	2.72	2
BNO-OWF-BH01	20.00	17-5	Bag	Weak to moderately weak grey fine to medium grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH02	1.45	02-3	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH02	11.20	15-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH03	15.70	10-3	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.73	2
BNO-OWF-BH03-a	1.00	02-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH04	0.80	02-1	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH04	10.00	12-2	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH04	17.25	18-2	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH07	6.60	01-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH07	19.50	11-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH08	1.00	02-1	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH08	6.20	06-3	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH10	1.80	02-4	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.68	2

Notes

Test Method

1. Gas jar : BS1377 : Part 2 : 1990 Clause 8.2
2. Pycnometer : BS EN ISO 17892-3:2015 (UKAS Accredited)

Checked and Approved by:

I Tablos - Laboratory Manager
16/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

GEOLABS

1128 - Particle Density Summary - 44072.XLSM

BS1377: Part 2:1990 / BS EN ISO 17892-3 : 2015

PARTICLE DENSITY

Location	Depth (m)	Sample Ref	Sample Type	Description	Particle Density Mg/m³	Test Method
BNO-OWF-BH10	16.70	07-2	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.72	2
BNO-OWF-BH11	12.00	10-1	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH11	18.35	15-2	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.69	2
BNO-OWF-BH12	12.75	11-2	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.69	2
BNO-OWF-BH12	18.90	16-3	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.66	2
BNO-OWF-BH13	2.30	03-3	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH13	16.05	09-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.69	2
BNO-OWF-BH15	4.00	06-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH15	17.20	15-4	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH17	1.55	02-3	Bag	Weak to moderately weak grey fine to medium grained CALCARENITE. Slightly weathered.	2.69	2
BNO-OWF-BH17	12.70	13-5	Bag	Weak to moderately weak grey fine to medium grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH19	4.50	03-1	Bag	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2
BNO-OWF-BH19	9.50	08-1	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.71	2
BNO-OWF-BH19	18.60	15-1	Bag	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered.	2.70	2

Notes

Test Method

1. Gas jar : BS1377 : Part 2 : 1990 Clause 8.2
2. Pycnometer : BS EN ISO 17892-3:2015 (UKAS Accredited)

GL Version 00.991230-1128

Checked and Approved by:

I Tabios - Laboratory Manager
16/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

GEOLABS

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH01	07	5.20	Axial	pd	-	94.0	69.0	0.9	0.106	1.308	0.139
BNO-OWF-BH01	07	5.65	Diametral	pl	165.0	-	85.0	0.9	0.118	1.296	0.153
BNO-OWF-BH01	09	7.20	Diametral	pl	103.0	-	84.5	3.0	0.370	1.300	0.481
BNO-OWF-BH01	09	7.20	Axial	pd	-	98.0	49.0	2.2	0.355	1.223	0.434
BNO-OWF-BH01	09	7.20	Axial	pd	-	98.0	36.0	2.0	0.441	1.141	0.503
BNO-OWF-BH01	09	7.50	Diametral	pl	134.0	-	88.0	0.5	0.061	1.312	0.081
BNO-OWF-BH01	09	7.50	Axial	pd	-	99.0	51.0	0.3	0.047	1.237	0.059
BNO-OWF-BH01	09	7.50	Axial	pd	-	99.0	42.0	1.0	0.198	1.184	0.234
BNO-OWF-BH01	10	8.50	Axial	pd	-	96.0	67.0	0.7	0.081	1.306	0.106
BNO-OWF-BH01	11	10.05	Diametral	pl	110.0	88.0	88.0	0.5	0.058	1.306	0.076
BNO-OWF-BH01	11	10.05	Axial	pd	-	99.0	48.0	1.3	0.214	1.220	0.261
BNO-OWF-BH01	11	11.25	Axial	pd	-	97.0	32.0	1.0	0.246	1.109	0.272
BNO-OWF-BH01	13	13.10	Diametral	pl	120.0	-	83.0	0.8	0.108	1.282	0.139
BNO-OWF-BH01	13	13.10	Axial	pd	-	98.0	62.0	1.0	0.130	1.289	0.168
BNO-OWF-BH01	13	14.20	Diametral	pl	110.0	-	80.0	2.4	0.336	1.269	0.426
BNO-OWF-BH01	13	14.20	Axial	pd	-	97.0	46.0	2.6	0.456	1.203	0.548
BNO-OWF-BH01	14	15.00	Diametral	pl	110.0	-	90.0	1.0	0.111	1.319	0.147
BNO-OWF-BH01	14	15.00	Axial	pd	-	97.0	57.0	3.6	0.508	1.262	0.642
BNO-OWF-BH01	15	16.20	Diametral	pl	105.0	-	86.0	1.6	0.198	1.305	0.259
BNO-OWF-BH01	16	17.50	Diametral	pl	120.0	-	84.0	17.5	2.187	1.298	2.839
BNO-OWF-BH01	16	18.40	Diametral	pl	140.0	-	85.0	0.2	0.032	1.293	0.041
BNO-OWF-BH01	16	18.40	Axial	pd	-	98.0	29.0	0.4	0.100	1.087	0.109
BNO-OWF-BH01	17	20.00	Axial	pd	-	100.0	45.0	3.6	0.631	1.205	0.761
BNO-OWF-BH01	17	20.00	Axial	pd	-	100.0	43.0	2.9	0.536	1.193	0.639
BNO-OWF-BH02	01	0.60	Diametral	pl	115.0	-	85.0	9.6	1.201	1.299	1.560
BNO-OWF-BH02	01	0.60	Axial	pd	-	100.0	37.0	3.6	0.760	1.153	0.876
BNO-OWF-BH02	01	0.80	Axial	pd	-	100.0	42.0	18.5	3.461	1.187	4.107
BNO-OWF-BH02	01	0.80	Axial	pd	-	100.0	38.0	11.5	2.381	1.160	2.762
BNO-OWF-BH02	03	2.20	Axial	pd	-	92.0	50.0	5.5	0.946	1.211	1.146
BNO-OWF-BH02	03	2.20	Axial	pd	-	92.0	51.0	5.4	0.896	1.217	1.090
BNO-OWF-BH02	11	8.60	Axial	pd	-	90.0	24.5	1.0	0.366	1.026	0.376
BNO-OWF-BH02	11	8.70	Axial	pd	-	92.0	45.0	2.2	0.408	1.183	0.483
BNO-OWF-BH02	16	12.10	Axial	pd	-	98.0	38.0	3.2	0.679	1.155	0.784
BNO-OWF-BH02	16	12.10	Diametral	pl	110.0	-	71.0	4.3	0.672	1.238	0.832
BNO-OWF-BH02	17	13.00	Diametral	pl	140.0	-	73.0	2.5	0.368	1.247	0.459
BNO-OWF-BH02	17	13.00	Axial	pd	-	97.0	43.5	1.8	0.340	1.188	0.404
BNO-OWF-BH02	17	13.00	Axial	pd	-	95.0	48.0	2.8	0.482	1.209	0.583
BNO-OWF-BH02	18	14.05	Diametral	pl	100.0	-	70.5	1.6	0.261	1.227	0.320
BNO-OWF-BH02	18	14.05	Axial	pd	-	94.0	63.0	0.7	0.098	1.282	0.126
BNO-OWF-BH02	18	14.05	Axial	pd	-	92.0	26.0	0.9	0.309	1.045	0.324
BNO-OWF-BH02	19	15.30	Axial	pd	-	98.0	50.0	1.8	0.284	1.228	0.349
BNO-OWF-BH02	19	15.75	Axial	pd	-	90.0	63.0	1.9	0.264	1.269	0.335
BNO-OWF-BH02	20	16.75	Axial	pd	-	91.0	51.0	1.6	0.264	1.214	0.321
BNO-OWF-BH02	20	17.65	Axial	pd	-	98.0	42.0	0.9	0.178	1.181	0.210
BNO-OWF-BH02	20	17.65	Axial	pd	-	98.0	25.5	1.0	0.323	1.056	0.341
BNO-OWF-BH02	21	18.60	Axial	pd	-	100.0	44.5	3.7	0.659	1.202	0.792
BNO-OWF-BH02	21	19.30	Axial	pd	-	96.0	61.0	2.2	0.289	1.279	0.369
BNO-OWF-BH02	22	19.60	Axial	pd	-	96.0	58.0	2.0	0.277	1.264	0.350

Notes

BSF : Below seafloor
pd : perpendicular
Is : Point load strength
pl : parallel
Is_{50} : Point Load strength normalized to a cylindrical specimen of 50 mm
r : random

Summary of Point Load Test Results

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH03	06	4.30	Axial	pd	-	89.0	72.5	1.6	0.197	1.307	0.257
BNO-OWF-BH03	07	5.20	Axial	pd	-	99.0	63.0	0.2	0.026	1.297	0.034
BNO-OWF-BH03	08	6.10	Diametral	pl	110.0	-	85.0	0.3	0.034	1.289	0.044
BNO-OWF-BH03	08	6.10	Axial	pd	-	96.0	58.0	1.3	0.188	1.264	0.238
BNO-OWF-BH03	08	6.10	Axial	pd	-	96.0	24.0	1.0	0.357	1.037	0.370
BNO-OWF-BH03	10	15.85	Diametral	pl	165.0	-	83.0	1.0	0.134	1.282	0.171
BNO-OWF-BH03	10	15.85	Axial	pd	-	99.0	58.0	1.0	0.130	1.273	0.166
BNO-OWF-BH03	10	15.85	Axial	pd	-	97.0	74.0	1.6	0.175	1.339	0.234
BNO-OWF-BH03	11	16.15	Axial	pd	-	99.0	35.0	0.8	0.173	1.136	0.196
BNO-OWF-BH03	11	16.15	Axial	pd	-	95.0	61.0	1.2	0.165	1.276	0.211
BNO-OWF-BH03	11	16.15	Diametral	pl	118.0	-	81.0	1.3	0.173	1.275	0.221
BNO-OWF-BH03	12	17.50	Axial	pd	-	99.0	70.0	6.4	0.727	1.328	0.966
BNO-OWF-BH03	13	18.60	Axial	pd	-	101.0	50.0	0.1	0.021	1.237	0.026
BNO-OWF-BH03	14	19.45	Diametral	pl	187.0	-	88.0	3.6	0.433	1.312	0.568
BNO-OWF-BH03-a	01	0.25	Axial	pd	-	101.0	65.0	25.2	3.009	1.312	3.948
BNO-OWF-BH03-a	01	0.75	Axial	pd	-	96.0	81.0	14.1	1.427	1.363	1.945
BNO-OWF-BH03-a	02	1.00	Axial	pd	-	100.0	80.0	19.5	1.918	1.372	2.631
BNO-OWF-BH04	01	0.30	Axial	pd	-	99.0	45.0	4.2	0.745	1.202	0.896
BNO-OWF-BH04	01	0.40	Axial	pd	-	100.0	54.5	0.9	0.129	1.258	0.162
BNO-OWF-BH04	01	0.55	Axial	pd	-	99.0	48.0	0.8	0.132	1.220	0.161
BNO-OWF-BH04	06	3.55	Axial	pd	-	97.0	79.0	2.8	0.285	1.358	0.387
BNO-OWF-BH04	07	4.25	Axial	pd	-	92.0	26.0	0.5	0.156	1.045	0.163
BNO-OWF-BH04	07	4.30	Axial	pd	-	92.0	47.0	1.2	0.218	1.194	0.260
BNO-OWF-BH04	08	5.45	Diametral	pl	90.0	-	71.0	0.9	0.146	1.211	0.177
BNO-OWF-BH04	08	5.45	Axial	pd	-	85.0	27.5	0.8	0.269	1.040	0.279
BNO-OWF-BH04	08	5.55	Diametral	pl	88.0	-	72.5	1.1	0.187	1.214	0.227
BNO-OWF-BH04	09	6.45	Axial	pd	-	93.0	47.0	2.3	0.407	1.197	0.487
BNO-OWF-BH04	10	7.40	Axial	pd	-	99.0	69.0	2.6	0.293	1.324	0.388
BNO-OWF-BH04	11	8.30	Axial	pd	-	98.0	70.0	1.6	0.187	1.325	0.248
BNO-OWF-BH04	11	8.50	Axial	pd	-	92.0	76.0	1.6	0.178	1.331	0.236
BNO-OWF-BH04	11	8.60	Diametral	pl	97.0	-	73.0	1.1	0.181	1.227	0.222
BNO-OWF-BH04	11	8.60	Axial	pd	-	90.0	33.5	0.7	0.184	1.101	0.202
BNO-OWF-BH04	11	8.60	Axial	pd	-	90.0	31.5	0.7	0.200	1.086	0.218
BNO-OWF-BH04	12	10.00	Diametral	pl	136.0	-	74.0	1.4	0.210	1.237	0.260
BNO-OWF-BH04	12	10.00	Axial	pd	-	91.0	42.0	1.5	0.305	1.162	0.355
BNO-OWF-BH04	12	10.00	Axial	pd	-	96.0	47.0	1.5	0.255	1.206	0.308
BNO-OWF-BH04	12	10.50	Axial	pd	-	90.0	80.0	2.0	0.218	1.340	0.292
BNO-OWF-BH04	13	11.30	Diametral	pl	112.0	-	79.0	1.9	0.268	1.262	0.338
BNO-OWF-BH04	13	11.30	Axial	pd	-	97.0	40.0	1.3	0.266	1.166	0.310
BNO-OWF-BH04	13	11.30	Axial	pd	-	98.0	44.0	1.4	0.250	1.194	0.298
BNO-OWF-BH04	13	12.45	Diametral	pl	113.0	-	88.0	0.6	0.067	1.306	0.088
BNO-OWF-BH04	13	12.45	Axial	pd	-	96.0	52.0	0.8	0.120	1.234	0.148
BNO-OWF-BH04	13	12.45	Axial	pd	-	98.0	23.0	0.7	0.239	1.032	0.246
BNO-OWF-BH04	14	12.70	Axial	pd	-	97.0	42.0	1.6	0.312	1.178	0.368
BNO-OWF-BH04	14	12.70	Diametral	pl	130.0	-	77.0	0.8	0.106	1.288	0.137
BNO-OWF-BH04	14	13.95	Diametral	pl	133.0	-	86.0	11.7	1.447	1.302	1.885
BNO-OWF-BH04	14	13.95	Axial	pd	-	100.0	55.0	20.7	2.958	1.261	3.730
BNO-OWF-BH04	15	14.95	Axial	pd	-	100.0	50.0	0.9	0.141	1.234	0.173

Notes

BSF : Below seafloor
pd : perpendicular
Is : Point load strength
pl : parallel
Is_{50} : Point Load strength normalized to a cylindrical specimen of 50 mm
r : random

Summary of Point Load Test Results

TOPAZ / Summary of Point Load Test (FFSA) / 2025-12-09 11:32:09 +01:00

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH04	16	16.45	Diametral	pl	131.0	-	81.0	0.5	0.070	1.275	0.089
BNO-OWF-BH04	16	16.45	Axial	pd	-	98.0	42.0	0.6	0.116	1.181	0.137
BNO-OWF-BH04	17	16.80	Diametral	pl	111.0	-	80.0	1.1	0.153	1.269	0.195
BNO-OWF-BH04	17	16.80	Axial	pd	-	98.0	35.0	0.8	0.187	1.134	0.213
BNO-OWF-BH04	17	16.80	Axial	pd	-	98.0	33.0	0.9	0.217	1.119	0.243
BNO-OWF-BH04	18	17.25	Axial	pd	-	100.0	62.0	0.3	0.043	1.295	0.056
BNO-OWF-BH04	18	18.35	Diametral	pd	129.0	-	79.0	1.3	0.181	1.271	0.230
BNO-OWF-BH04	18	18.35	Axial	pd	-	99.0	41.0	1.2	0.228	1.178	0.269
BNO-OWF-BH04	19	19.30	Axial	pd	-	102.0	67.0	1.7	0.195	1.324	0.258
BNO-OWF-BH04	19	19.80	Diametral	pl	146.0	-	77.0	9.6	1.317	1.273	1.677
BNO-OWF-BH07	01	6.85	Axial	pd	-	98.0	42.0	5.7	1.081	1.181	1.277
BNO-OWF-BH07	02	8.15	Diametral	pl	140.0	-	88.0	0.2	0.029	1.296	0.037
BNO-OWF-BH07	02	8.15	Axial	pd	-	100.0	49.0	0.5	0.076	1.228	0.094
BNO-OWF-BH07	02	8.15	Axial	pd	-	100.0	52.5	1.5	0.228	1.248	0.284
BNO-OWF-BH07	03	8.80	Diametral	pl	140.0	-	76.5	2.3	0.337	1.256	0.424
BNO-OWF-BH07	03	8.80	Axial	pd	-	98.0	44.5	2.2	0.387	1.197	0.464
BNO-OWF-BH07	03	8.80	Axial	pd	-	98.0	51.0	2.9	0.461	1.234	0.569
BNO-OWF-BH07	04	10.40	Axial	pd	-	100.0	72.0	0.3	0.029	1.340	0.039
BNO-OWF-BH07	05	10.60	Diametral	pl	105.0	-	76.5	3.2	0.471	1.250	0.588
BNO-OWF-BH07	05	10.60	Axial	pd	-	95.0	40.0	1.3	0.272	1.160	0.315
BNO-OWF-BH07	07	14.50	Diametral	pl	139.0	-	87.0	0.1	0.017	1.296	0.022
BNO-OWF-BH07	08	15.80	Diametral	pl	125.0	-	85.0	1.5	0.188	1.299	0.245
BNO-OWF-BH07	08	15.80	Axial	pd	-	98.0	64.0	0.3	0.033	1.299	0.043
BNO-OWF-BH07	08	15.80	Axial	pd	-	98.0	30.0	0.2	0.046	1.095	0.050
BNO-OWF-BH07	09	17.05	Axial	pd	-	98.0	60.0	0.4	0.051	1.280	0.065
BNO-OWF-BH07	10	18.50	Axial	pd	-	95.0	49.0	1.2	0.196	1.214	0.238
BNO-OWF-BH07	10	19.00	Axial	pd	-	98.0	35.0	0.9	0.209	1.134	0.237
BNO-OWF-BH07	11	20.10	Diametral	pl	158.0	-	83.0	2.1	0.271	1.289	0.350
BNO-OWF-BH07	11	20.10	Axial	pd	-	99.0	57.0	1.5	0.204	1.268	0.259
BNO-OWF-BH08	01	0.05	Axial	pd	-	100.0	64.0	9.9	1.213	1.305	1.582
BNO-OWF-BH08	01	0.60	Diametral	pl	120.0	-	81.0	9.3	1.241	1.282	1.591
BNO-OWF-BH08	01	0.60	Axial	pd	-	100.0	35.0	5.5	1.226	1.139	1.397
BNO-OWF-BH08	01	0.60	Axial	pd	-	100.0	51.0	7.3	1.126	1.240	1.396
BNO-OWF-BH08	02	1.10	Diametral	pl	165.0	-	89.0	2.4	0.279	1.315	0.367
BNO-OWF-BH08	02	1.60	Axial	pd	-	96.0	84.0	0.8	0.078	1.374	0.107
BNO-OWF-BH08	03	2.00	Axial	pd	-	98.0	75.0	0.5	0.055	1.346	0.074
BNO-OWF-BH08	03	2.20	Axial	pd	-	100.0	76.0	15.0	1.554	1.356	2.108
BNO-OWF-BH08	03	2.75	Diametral	pl	158.0	-	80.0	6.7	0.877	1.284	1.126
BNO-OWF-BH08	03	2.75	Axial	pd	-	101.0	47.0	4.6	0.762	1.220	0.930
BNO-OWF-BH08	03	2.75	Axial	pd	-	100.0	42.0	4.2	0.794	1.187	0.942
BNO-OWF-BH08	04	3.80	Diametral	pl	139.0	-	83.0	3.4	0.437	1.289	0.563
BNO-OWF-BH08	04	3.80	Axial	pd	-	98.0	58.0	3.6	0.492	1.270	0.625
BNO-OWF-BH08	04	3.80	Axial	pd	-	100.0	53.0	3.3	0.491	1.250	0.614
BNO-OWF-BH08	04	3.95	Diametral	pl	128.0	-	85.0	16.5	2.042	1.302	2.658
BNO-OWF-BH08	04	3.95	Axial	pd	-	101.0	48.0	14.9	2.418	1.226	2.964
BNO-OWF-BH08	04	3.95	Axial	pd	-	99.0	51.0	18.1	2.823	1.237	3.491
BNO-OWF-BH08	05	4.55	Axial	pd	-	98.0	56.0	3.4	0.490	1.260	0.618
BNO-OWF-BH08	05	5.05	Axial	pd	-	99.0	73.0	4.9	0.528	1.341	0.707

Notes

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Is_{50} : Point Load strength normalized to a cylindrical specimen of 50 mm
r : random

Summary of Point Load Test Results

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH08	06	6.25	Axial	pd	-	95.0	36.0	2.1	0.477	1.133	0.540
BNO-OWF-BH08	07	6.60	Diametral	pl	105.0	-	85.0	0.4	0.051	1.291	0.066
BNO-OWF-BH08	08	7.80	Axial	pd	-	98.0	72.0	5.5	0.617	1.334	0.822
BNO-OWF-BH08	08	7.85	Diametral	pl	115.0	-	75.0	4.7	0.691	1.250	0.864
BNO-OWF-BH08	08	7.85	Axial	pd	-	90.0	40.0	4.0	0.864	1.146	0.990
BNO-OWF-BH08	08	7.88	Axial	pd	-	90.0	40.5	3.5	0.751	1.149	0.863
BNO-OWF-BH08	09	8.75	Axial	pd	-	95.0	55.0	4.1	0.610	1.246	0.760
BNO-OWF-BH08	09	8.85	Axial	pd	-	95.0	60.5	5.1	0.702	1.273	0.895
BNO-OWF-BH08	09	9.35	Diametral	pd	140.0	-	75.0	3.8	0.578	1.241	0.717
BNO-OWF-BH08	09	9.35	Axial	pd	-	87.0	51.0	4.5	0.789	1.201	0.947
BNO-OWF-BH08	09	9.35	Axial	pd	-	87.0	59.5	4.6	0.693	1.244	0.862
BNO-OWF-BH08	10	9.85	Axial	pd	-	98.0	50.5	5.0	0.795	1.231	0.978
BNO-OWF-BH08	10	10.30	Diametral	pl	115.0	-	81.0	3.1	0.407	1.282	0.522
BNO-OWF-BH08	10	10.30	Axial	pd	-	93.0	42.0	2.3	0.459	1.167	0.536
BNO-OWF-BH08	10	10.30	Axial	pd	-	93.0	33.0	3.1	0.799	1.106	0.884
BNO-OWF-BH08	11	11.90	Diametral	pl	135.0	-	85.0	2.3	0.284	1.299	0.368
BNO-OWF-BH08	13	14.35	Diametral	pl	105.0	-	84.0	12.1	1.505	1.300	1.956
BNO-OWF-BH08	13	14.70	Axial	pd	-	99.0	57.5	2.4	0.331	1.271	0.421
BNO-OWF-BH08	14	15.75	Axial	pd	-	98.0	49.5	3.2	0.521	1.226	0.638
BNO-OWF-BH08	15	17.95	Diametral	pl	110.0	-	84.0	1.4	0.181	1.283	0.233
BNO-OWF-BH08	16	18.50	Diametral	pl	105.0	-	79.0	3.7	0.514	1.265	0.650
BNO-OWF-BH08	16	18.50	Axial	pd	-	94.0	37.0	3.4	0.770	1.137	0.875
BNO-OWF-BH08	16	18.92	Diametral	pl	115.0	-	76.5	2.7	0.398	1.254	0.499
BNO-OWF-BH08	16	18.92	Axial	pd	-	95.0	45.0	2.6	0.469	1.191	0.558
BNO-OWF-BH08	16	18.92	Axial	pd	-	95.0	46.5	3.0	0.531	1.200	0.638
BNO-OWF-BH08	17	19.92	Axial	pd	-	94.0	60.5	2.6	0.355	1.270	0.451
BNO-OWF-BH08	17	20.15	Axial	pd	-	94.0	65.0	5.0	0.636	1.291	0.822
BNO-OWF-BH08	17	20.30	Axial	pd	-	94.0	67.0	4.2	0.522	1.300	0.679
BNO-OWF-BH10	02	5.60	Diametral	pl	75.0	-	38.0	0.1	0.084	0.904	0.075
BNO-OWF-BH10	02	5.60	Axial	pd	-	42.0	30.5	0.2	0.140	0.908	0.127
BNO-OWF-BH10	02	5.60	Axial	pd	-	42.0	25.0	0.2	0.128	0.869	0.111
BNO-OWF-BH10	04	10.25	Diametral	pl	195.0	-	38.5	0.2	0.127	0.911	0.115
BNO-OWF-BH10	04	10.25	Diametral	pl	89.0	-	38.5	0.4	0.237	0.925	0.219
BNO-OWF-BH10	04	10.25	Axial	pd	-	46.0	34.0	0.4	0.201	0.950	0.191
BNO-OWF-BH10	04	10.25	Axial	pd	-	46.0	36.5	0.4	0.196	0.965	0.189
BNO-OWF-BH10	07	16.80	Diametral	pl	100.0	-	87.0	0.7	0.093	1.299	0.121
BNO-OWF-BH10	07	16.80	Axial	pd	-	100.0	48.0	1.9	0.308	1.223	0.377
BNO-OWF-BH10	08	19.90	Axial	pd	-	96.0	52.0	1.3	0.207	1.234	0.255
BNO-OWF-BH11	04	4.15	Axial	pd	-	97.0	74.0	8.3	0.906	1.339	1.213
BNO-OWF-BH11	04	4.50	Diametral	pl	108.0	-	78.0	9.6	1.364	1.262	1.721
BNO-OWF-BH11	04	4.50	Axial	pd	-	96.0	40.0	5.8	1.180	1.163	1.372
BNO-OWF-BH11	04	4.50	Axial	pd	-	98.0	37.0	6.4	1.394	1.148	1.600
BNO-OWF-BH11	06	7.35	Axial	pd	-	97.0	54.0	8.6	1.285	1.247	1.602
BNO-OWF-BH11	07	8.40	Diametral	pl	149.0	-	85.0	1.2	0.152	1.296	0.197
BNO-OWF-BH11	07	9.35	Diametral	pl	116.0	-	74.0	3.2	0.482	1.247	0.601
BNO-OWF-BH11	07	9.35	Axial	pd	-	99.0	44.0	1.6	0.292	1.196	0.349
BNO-OWF-BH11	07	9.35	Axial	pd	-	99.0	33.0	1.1	0.261	1.121	0.293
BNO-OWF-BH11	08	9.60	Axial	pd	-	100.0	68.0	1.6	0.189	1.322	0.250

Notes

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Summary of Point Load Test Results

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH11	08	10.50	Axial	pd	-	96.0	54.0	1.3	0.202	1.244	0.251
BNO-OWF-BH11	09	11.40	Diametral	pl	149.0	-	85.0	0.2	0.030	1.289	0.038
BNO-OWF-BH11	09	11.40	Axial	pd	-	98.0	64.0	1.8	0.219	1.299	0.285
BNO-OWF-BH11	09	11.40	Axial	pd	-	100.0	32.0	1.2	0.285	1.116	0.318
BNO-OWF-BH11	09	11.75	Axial	pd	-	100.0	60.0	1.8	0.242	1.286	0.311
BNO-OWF-BH11	10	12.05	Diametral	pl	138.0	-	81.0	1.9	0.253	1.275	0.323
BNO-OWF-BH11	10	12.05	Axial	pd	-	99.0	44.0	2.1	0.374	1.196	0.448
BNO-OWF-BH11	10	12.05	Axial	pd	-	100.0	54.0	1.9	0.271	1.256	0.341
BNO-OWF-BH11	12	15.30	Diametral	pl	107.0	-	75.0	1.6	0.248	1.241	0.308
BNO-OWF-BH11	13	15.70	Axial	pd	-	101.0	50.0	4.7	0.734	1.237	0.908
BNO-OWF-BH11	13	15.70	Axial	pd	-	101.0	40.0	6.4	1.251	1.176	1.472
BNO-OWF-BH11	13	15.70	Diametral	pl	116.0	-	86.0	6.3	0.776	1.305	1.013
BNO-OWF-BH11	13	16.20	Diametral	pl	100.0	-	83.0	3.2	0.410	1.292	0.530
BNO-OWF-BH11	13	16.20	Axial	pd	-	99.0	30.0	2.4	0.644	1.098	0.707
BNO-OWF-BH11	13	16.20	Axial	pd	-	101.0	34.0	1.4	0.318	1.134	0.360
BNO-OWF-BH11	14	16.90	Diametral	pl	126.0	-	90.0	7.8	0.911	1.319	1.201
BNO-OWF-BH11	14	16.90	Axial	pd	-	101.0	69.0	6.9	0.772	1.330	1.027
BNO-OWF-BH11	14	16.90	Axial	pd	-	101.0	25.0	12.4	3.844	1.058	4.067
BNO-OWF-BH11	14	17.80	Diametral	pl	144.0	-	81.0	4.7	0.620	1.285	0.797
BNO-OWF-BH11	14	17.80	Axial	pd	-	100.0	42.0	2.3	0.427	1.187	0.507
BNO-OWF-BH11	14	17.80	Axial	pd	-	99.0	48.0	5.2	0.856	1.220	1.044
BNO-OWF-BH11	15	18.35	Axial	pd	-	96.0	62.0	2.5	0.327	1.283	0.419
BNO-OWF-BH11	15	19.20	Diametral	pl	139.0	-	83.0	2.5	0.317	1.292	0.410
BNO-OWF-BH11	16	20.05	Diametral	pl	125.0	-	89.5	0.3	0.038	1.319	0.050
BNO-OWF-BH11	16	20.05	Axial	pd	-	99.0	57.0	0.6	0.087	1.268	0.111
BNO-OWF-BH12	03	3.20	Axial	pd	-	92.0	64.0	0.3	0.036	1.280	0.046
BNO-OWF-BH12	03	3.40	Axial	pd	-	98.0	74.5	1.1	0.123	1.344	0.165
BNO-OWF-BH12	04	4.70	Diametral	pl	90.0	-	70.5	1.3	0.223	1.213	0.271
BNO-OWF-BH12	04	4.70	Axial	pd	-	83.5	40.0	1.2	0.291	1.127	0.328
BNO-OWF-BH12	04	4.70	Axial	pd	-	83.5	24.0	1.1	0.440	1.005	0.442
BNO-OWF-BH12	05	5.75	Axial	pd	-	94.0	41.5	1.1	0.219	1.167	0.255
BNO-OWF-BH12	08	8.70	Diametral	pl	100.0	-	76.0	1.0	0.146	1.241	0.181
BNO-OWF-BH12	08	8.70	Axial	pd	-	94.0	35.0	0.8	0.186	1.123	0.209
BNO-OWF-BH12	08	8.90	Axial	pd	-	94.0	34.0	1.2	0.304	1.116	0.339
BNO-OWF-BH12	08	8.90	Diametral	pl	90.0	-	75.0	1.4	0.227	1.234	0.280
BNO-OWF-BH12	10	11.20	Axial	pd	-	91.0	44.0	1.0	0.202	1.174	0.237
BNO-OWF-BH12	10	11.80	Diametral	pl	134.0	-	72.0	7.6	1.322	1.207	1.595
BNO-OWF-BH12	10	11.80	Axial	pd	-	93.0	44.0	1.3	0.249	1.180	0.293
BNO-OWF-BH12	10	11.80	Axial	pd	-	93.0	51.0	1.2	0.205	1.219	0.250
BNO-OWF-BH12	11	12.75	Axial	pd	-	100.0	71.0	1.4	0.152	1.335	0.203
BNO-OWF-BH12	11	12.75	Axial	pd	-	100.0	33.0	0.5	0.117	1.124	0.131
BNO-OWF-BH12	11	12.85	Diametral	pl	0.0	-	81.0	1.3	0.182	1.269	0.231
BNO-OWF-BH12	11	12.85	Axial	pd	-	95.0	63.0	1.4	0.185	1.285	0.238
BNO-OWF-BH12	11	12.85	Axial	pd	-	95.0	37.0	1.1	0.251	1.140	0.286
BNO-OWF-BH12	12	13.70	Diametral	pl	130.0	-	89.0	0.1	0.012	1.300	0.015
BNO-OWF-BH12	12	13.70	Axial	pd	-	98.0	28.0	2.7	0.763	1.078	0.823
BNO-OWF-BH12	12	14.00	Axial	pd	-	99.0	34.0	0.9	0.218	1.129	0.246
BNO-OWF-BH12	13	14.50	Diametral	pl	125.0	-	79.0	0.7	0.106	1.262	0.133

Notes

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Summary of Point Load Test Results

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH12	13	14.50	Axial	pd	-	95.0	33.0	0.8	0.196	1.111	0.217
BNO-OWF-BH12	13	14.50	Axial	pd	-	95.0	45.0	1.0	0.189	1.191	0.225
BNO-OWF-BH12	13	15.20	Axial	pd	-	96.0	63.0	1.3	0.168	1.288	0.217
BNO-OWF-BH12	14	15.60	Diametral	pl	98.0	-	80.0	1.9	0.264	1.269	0.336
BNO-OWF-BH12	14	15.60	Axial	pd	-	99.0	28.0	0.7	0.210	1.081	0.227
BNO-OWF-BH12	14	15.60	Axial	pd	-	99.0	45.0	1.2	0.215	1.202	0.258
BNO-OWF-BH12	14	16.10	Diametral	pl	120.0	-	80.0	1.1	0.164	1.259	0.207
BNO-OWF-BH12	15	17.10	Diametral	pl	110.0	-	82.0	0.7	0.100	1.279	0.127
BNO-OWF-BH12	16	18.90	Axial	pd	-	90.0	63.0	1.8	0.245	1.269	0.311
BNO-OWF-BH12	17	19.90	Diametral	pl	115.0	-	82.0	0.1	0.013	1.266	0.017
BNO-OWF-BH12	17	19.90	Axial	pd	-	93.0	57.0	1.4	0.214	1.250	0.268
BNO-OWF-BH12	17	19.90	Axial	pd	-	93.0	38.0	0.7	0.152	1.141	0.174
BNO-OWF-BH13	06	8.30	Axial	pd	-	99.0	69.0	1.9	0.217	1.324	0.287
BNO-OWF-BH13	06	8.70	Diametral	pl	126.0	-	83.0	0.5	0.068	1.282	0.087
BNO-OWF-BH13	06	8.70	Axial	pl	-	100.0	56.0	0.8	0.109	1.266	0.139
BNO-OWF-BH13	06	8.70	Axial	pd	-	99.0	47.0	0.7	0.116	1.214	0.140
BNO-OWF-BH13	08	10.00	Axial	pd	-	97.0	52.0	1.1	0.169	1.236	0.209
BNO-OWF-BH13	09	16.20	Diametral	pl	106.0	-	82.0	0.5	0.073	1.273	0.093
BNO-OWF-BH13	09	16.20	Axial	pd	-	97.0	26.0	0.6	0.184	1.058	0.194
BNO-OWF-BH13	09	16.20	Axial	pd	-	98.0	50.0	0.9	0.150	1.228	0.184
BNO-OWF-BH13	09	16.55	Axial	pd	-	98.0	39.0	0.6	0.113	1.162	0.132
BNO-OWF-BH13	09	16.55	Axial	pd	-	97.0	49.0	0.7	0.120	1.220	0.146
BNO-OWF-BH13	09	16.55	Axial	pl	-	105.0	81.0	0.6	0.055	1.391	0.076
BNO-OWF-BH13	10	17.10	Axial	pd	-	94.0	75.0	1.1	0.121	1.333	0.161
BNO-OWF-BH13	10	17.60	Diametral	pl	112.0	-	83.0	1.2	0.159	1.282	0.204
BNO-OWF-BH13	10	17.60	Axial	pd	-	97.0	46.0	1.1	0.188	1.203	0.226
BNO-OWF-BH13	10	17.60	Axial	pd	-	98.0	33.0	1.2	0.287	1.119	0.321
BNO-OWF-BH13	11	18.30	Diametral	pl	133.0	-	78.0	3.7	0.520	1.265	0.658
BNO-OWF-BH13	11	18.30	Axial	pd	-	98.0	37.0	2.4	0.520	1.148	0.597
BNO-OWF-BH13	11	18.30	Axial	pd	-	98.0	55.0	3.7	0.538	1.255	0.676
BNO-OWF-BH15	02	1.20	Axial	pd	-	100.0	70.0	1.1	0.122	1.331	0.162
BNO-OWF-BH15	03	1.95	Diametral	pl	130.0	-	89.0	12.1	1.430	1.315	1.881
BNO-OWF-BH15	03	1.95	Axial	pd	-	95.0	61.0	5.0	0.676	1.276	0.863
BNO-OWF-BH15	06	4.05	Axial	pd	-	91.0	66.0	2.1	0.279	1.286	0.359
BNO-OWF-BH15	07	4.75	Axial	pd	-	99.0	38.0	14.9	3.101	1.158	3.589
BNO-OWF-BH15	07	5.20	Diametral	pl	190.0	-	84.0	20.2	2.527	1.298	3.281
BNO-OWF-BH15	07	5.20	Axial	pd	-	95.0	70.0	25.1	2.962	1.316	3.897
BNO-OWF-BH15	09	8.20	Axial	pd	-	99.0	45.0	11.3	1.987	1.202	2.389
BNO-OWF-BH15	10	8.80	Axial	pd	-	98.0	35.0	0.9	0.201	1.134	0.227
BNO-OWF-BH15	10	8.80	Diametral	pl	130.0	-	85.0	1.1	0.142	1.291	0.183
BNO-OWF-BH15	10	8.80	Axial	pd	-	98.0	55.5	1.6	0.236	1.258	0.297
BNO-OWF-BH15	12	11.15	Diametral	pl	155.0	-	83.5	0.6	0.084	1.281	0.107
BNO-OWF-BH15	12	11.15	Axial	pd	-	96.0	72.0	1.2	0.141	1.327	0.187
BNO-OWF-BH15	12	11.15	Axial	pd	-	96.0	53.0	1.8	0.273	1.239	0.339
BNO-OWF-BH15	13	12.10	Axial	pd	-	93.0	71.5	1.3	0.148	1.316	0.195
BNO-OWF-BH15	13	12.20	Axial	pd	-	95.0	59.0	1.4	0.193	1.266	0.245
BNO-OWF-BH15	13	12.75	Axial	pd	-	95.0	44.5	1.0	0.195	1.188	0.231
BNO-OWF-BH15	13	13.10	Axial	pd	-	92.0	38.5	0.7	0.165	1.142	0.188

Notes

BSF : Below seafloor
pd : perpendicular
Is : Point load strength
pl : parallel
Is_{50} : Point Load strength normalized to a cylindrical specimen of 50 mm
r : random

Summary of Point Load Test Results

TOPAZ / Summary of Point Load Test (FFSA) / 2025-12-09 11:32:09 +01:00

Location	Sample	Depth BSF	Test type	Direction	Initial Conditions		Failure Conditions		Point Load Strength		
					Length	*Width*	*Distance between plattens*	*Failure load*	*Is*	*Correction factor*	Is_{50}
	ID	[m]			[mm]	[mm]	[mm]	[kN]	[MPa]	[-]	[MPa]
BNO-OWF-BH15	14	15.65	Axial	pd	-	91.0	43.5	0.7	0.147	1.171	0.173
BNO-OWF-BH15	15	17.20	Diametral	pl	114.0	-	77.0	1.6	0.236	1.258	0.297
BNO-OWF-BH15	15	17.20	Axial	pd	-	100.0	51.0	1.4	0.223	1.240	0.276
BNO-OWF-BH15	15	17.20	Axial	pd	-	100.0	45.0	1.8	0.306	1.205	0.368
BNO-OWF-BH15	16	17.50	Diametral	pl	105.0	-	79.0	1.4	0.190	1.265	0.241
BNO-OWF-BH15	16	17.50	Axial	pd	-	99.0	49.0	0.9	0.142	1.226	0.174
BNO-OWF-BH15	16	17.50	Axial	pd	-	99.0	39.0	0.7	0.151	1.164	0.175
BNO-OWF-BH15	17	17.80	Axial	pd	-	94.0	50.0	1.0	0.164	1.217	0.199
BNO-OWF-BH15	17	17.80	Axial	pd	-	94.0	44.0	0.6	0.110	1.182	0.130
BNO-OWF-BH15	17	17.80	Diametral	pl	113.0	-	77.0	0.8	0.116	1.242	0.144
BNO-OWF-BH15	17	18.30	Diametral	pl	113.0	-	72.0	1.5	0.232	1.245	0.289
BNO-OWF-BH15	17	18.30	Axial	pd	-	99.0	42.0	1.3	0.237	1.184	0.281
BNO-OWF-BH15	17	18.30	Axial	pd	-	99.0	44.0	1.2	0.216	1.196	0.259
BNO-OWF-BH17	09	8.95	Axial	pd	-	99.0	30.0	2.1	0.544	1.098	0.597
BNO-OWF-BH17	11	10.10	Diametral	pl	110.0	-	84.0	0.9	0.118	1.289	0.152
BNO-OWF-BH17	11	10.10	Axial	pd	-	99.0	34.0	1.4	0.324	1.129	0.366
BNO-OWF-BH17	11	10.10	Axial	pd	-	101.0	45.0	1.4	0.240	1.208	0.290
BNO-OWF-BH17	14	14.40	Axial	pd	-	99.0	72.0	0.8	0.090	1.337	0.121
BNO-OWF-BH17	16	15.75	Axial	pd	-	95.0	28.5	0.5	0.133	1.075	0.142
BNO-OWF-BH17	16	15.85	Axial	pd	-	95.0	46.5	0.7	0.132	1.200	0.158
BNO-OWF-BH17	17	17.10	Diametral	pl	110.0	-	79.0	2.9	0.397	1.274	0.505
BNO-OWF-BH17	17	17.25	Axial	pd	-	95.0	73.0	2.5	0.282	1.328	0.375
BNO-OWF-BH17	17	17.45	Axial	pd	-	99.0	29.0	0.4	0.104	1.089	0.113
BNO-OWF-BH17	18	18.15	Axial	pd	-	97.0	56.0	2.8	0.407	1.257	0.512
BNO-OWF-BH17	18	18.40	Axial	pd	-	98.0	68.0	5.7	0.666	1.316	0.877
BNO-OWF-BH19	05	6.58	Axial	pd	-	94.0	54.0	2.0	0.303	1.238	0.376
BNO-OWF-BH19	06	7.65	Axial	pd	-	96.0	32.5	1.4	0.364	1.110	0.404
BNO-OWF-BH19	06	7.90	Axial	pd	-	96.0	63.0	2.2	0.282	1.288	0.363
BNO-OWF-BH19	07	8.95	Diametral	pl	130.0	-	83.0	0.6	0.085	1.286	0.109
BNO-OWF-BH19	08	9.55	Axial	pd	-	98.0	56.0	0.7	0.098	1.260	0.124
BNO-OWF-BH19	08	9.68	Axial	pd	-	98.0	65.0	0.9	0.110	1.303	0.144
BNO-OWF-BH19	09	11.73	Axial	pd	-	96.0	75.0	4.2	0.453	1.340	0.607
BNO-OWF-BH19	10	12.23	Axial	pd	-	99.0	34.0	2.1	0.493	1.129	0.557
BNO-OWF-BH19	10	12.30	Axial	pd	-	99.0	40.0	0.5	0.098	1.171	0.115
BNO-OWF-BH19	10	12.65	Axial	pd	-	99.0	37.0	0.1	0.024	1.151	0.028
BNO-OWF-BH19	10	12.70	Axial	pd	-	99.0	59.0	3.1	0.412	1.278	0.527
BNO-OWF-BH19	13	15.70	Axial	pd	-	99.0	28.0	0.6	0.167	1.081	0.181
BNO-OWF-BH19	14	17.30	Axial	pd	-	96.0	50.5	1.6	0.259	1.226	0.318
BNO-OWF-BH19	14	17.35	Axial	pd	-	96.0	43.0	1.6	0.308	1.182	0.364
BNO-OWF-BH19	15	18.05	Axial	pd	-	93.0	47.0	0.8	0.147	1.197	0.176

Notes

BSF : Below seafloor
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Is : Point load strength
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Is_{50} : Point Load strength normalized to a cylindrical specimen of 50 mm
r : random

TOPAZ / Summary of Point Load Test (FFSA) / 2025-12-09 11:32:09 +01:00

Summary of Point Load Test Results

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH01	06-2	4.65	Extremely weak to very weak greenish grey CALCISILTITE. Fresh to slightly weathered	28/01/26	I	U	94.2	68.6	67.7		90.1	0.32	0.04	1.30	0.05
			Determination 2	28/01/26	I	U	102.2	98.2	92.3		109.6	0.32	0.03	1.42	0.04
			Determination 3	28/01/26	A	U	96.8	38.7	36.0		66.6	0.83	0.19	1.14	0.22
BNO-OWF-BH01	12-3	12.00	Extremely weak to very weak greenish grey CALCISILTITE. Fresh to slightly weathered	28/01/26	D	U	99.2	98.1	96.0		97.0	0.34	0.04	1.35	0.05
			Determination 2	28/01/26	A	U	99.2	44.9	39.2		70.4	0.29	0.06	1.17	0.07
			Determination 3	28/01/26	A	U	99.8	47.2	40.2		71.5	0.88	0.17	1.17	0.2
BNO-OWF-BH01	15-6	17.10	Weak to moderately weak grey medium to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	D	U	100.7	100.0	95.8		97.9	4.01	0.42	1.35	0.57
			Determination 2	28/01/26	I	U	99.9	98.8	93.9		109.3	4.58	0.38	1.42	0.54
			Determination 3	28/01/26	A	U	101.1	62.2	58.3		86.6	4.95	0.66	1.28	0.85
BNO-OWF-BH01	17-3	19.40	Weak to moderately weak light grey CALCISILTITE. Fresh to slightly weathered	22/01/26	D	U	101.2	96.5	95.4		95.9	3.15	0.34	1.34	0.46

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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IT

I Tabios (Head of Department)

Date: 03/02/2026

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GEO / 44072

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506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test												
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH01	17-3	19.40	Determination 2	22/01/26	I	U	44.8	26.7	26.0		38.5	1.14	0.77	0.89	0.68
			Determination 3	22/01/26	I	U	100.9	60.7	59.4		87.4	4.36	0.57	1.29	0.73
BNO-OWF-BH02	17-2	12.70	Extremely weak to very weak cream fine to medium grained CALCARENITE. Fresh to slightly weathered	28/01/26	I	U	97.2	68.9	60.5		86.5	1.12	0.15	1.28	0.19
			Determination 2	28/01/26	I	U	90.8	50.8	47.8		74.3	0.16	0.03	1.20	0.04
			Determination 3	28/01/26	I	U	97.6	75.1	67.5		91.6	0.78	0.09	1.31	0.12
BNO-OWF-BH03	12-4	17.80	Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	27/01/26	D	U	100.1	95.6	93.8		94.7	3.77	0.42	1.33	0.56
			Determination 2	27/01/26	A	U	98.8	83.4	81.1		101.0	1.06	0.10	1.37	0.14
			Determination 3	27/01/26	A	U	101.6	60.8	59.2		87.5	1.97	0.26	1.29	0.33
BNO-OWF-BH03-a	02-2	1.20	Medium strong cream fine to medium grained CALCARENITE. Fresh to slightly weathered	22/01/26	I	U	75.8	30.6	29.8		53.6	5.26	1.83	1.03	1.89
			Determination 2	22/01/26	I	U	90.3	64.4	63.0		85.1	9.92	1.37	1.27	1.74

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test												
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH03-a	02-2	1.20	Determination 3	22/01/26	I	U	68.0	27.8	27.1		48.4	3.18	1.36	0.99	1.34
BNO-OWF-BH04	19-2	18.95	Moderately weak to medium strong cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	29/01/26	I	U	100.0	46.1	42.5		73.6	3.05	0.56	1.19	0.67
			Determination 2	29/01/26	I	U	100.1	57.1	55.1		83.8	7.20	1.03	1.26	1.3
			Determination 3	29/01/26	I	U	100.1	47.7	43.3		74.3	4.12	0.75	1.20	0.9
BNO-OWF-BH08	10-2	10.00	Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	I	U	97.6	66.3	64.1		89.3	1.84	0.23	1.30	0.3
			Determination 2	28/01/26	I	U	98.5	47.4	46.2		76.1	0.89	0.15	1.21	0.18
			Determination 3	28/01/26	I	U	92.1	43.1	39.3		67.9	2.01	0.44	1.15	0.5
BNO-OWF-BH11	04-2	4.25	Moderately weak cream fine to medium grained CALCARENITE. Fresh to slightly weathered	22/01/26	I	U	98.9	41.3	40.5		71.4	4.23	0.83	1.17	0.97
			Determination 2	22/01/26	I	U	95.2	63.2	62.5		87.0	5.03	0.66	1.28	0.85
			Determination 3	22/01/26	I	U	57.9	28.5	27.7		45.2	1.26	0.62	0.96	0.59

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De² (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH11	07-2	8.75	Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	D	U	99.2	97.6	96.5		97.0	1.11	0.12	1.35	0.16
			Determination 2	28/01/26	A	U	98.2	44.5	38.6		69.5	1.98	0.41	1.16	0.48
			Determination 3	28/01/26	A	U	97.4	69.0	64.8		89.6	0.39	0.05	1.30	0.07
BNO-OWF-BH11	10-3	12.50	Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	22/01/26	D	U	98.5	95.9	94.9		95.4	1.81	0.20	1.34	0.27
			Determination 2	22/01/26	A	U	98.9	56.9	56.0		84.0	1.16	0.16	1.26	0.2
			Determination 3	22/01/26	A	U	99.9	41.0	39.3		70.7	1.15	0.23	1.17	0.27
BNO-OWF-BH11	13-3	15.90	Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	22/01/26	D	U	99.7	99.7	99.0		99.3	0.66	0.07	1.36	0.1
			Determination 2	22/01/26	A	U	99.7	38.9	38.5		69.9	1.78	0.36	1.16	0.42
			Determination 3	22/01/26	I	U	78.2	60.1	58.9		76.6	2.05	0.35	1.21	0.42
BNO-OWF-BH12	11-3	13.15	Extremely weak to very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	I	U	99.0	47.3	43.8		74.3	1.07	0.19	1.20	0.23

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test												
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De² (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH12	11-3	13.15	Determination 2	28/01/26	I	U	74.8	52.2	49.1		68.4	0.82	0.18	1.15	0.21
			Determination 3	28/01/26	I	U	92.6	57.2	52.4		78.6	0.22	0.04	1.23	0.05
BNO-OWF-BH12	16-2	18.55	Very weak cream and bluish grey medium to coarse grained CALCARENITE. Fresh to slightly weathered	22/01/26	I	U	85.8	46.0	45.4		70.4	0.47	0.09	1.17	0.1
			Determination 2	22/01/26	I	U	85.1	40.6	39.5		65.4	0.40	0.09	1.13	0.1
			Determination 3	22/01/26	I	U	86.5	33.8	32.6		59.9	0.44	0.12	1.08	0.13
BNO-OWF-BH13	02-2	13.65	Very weak to weak cream and bluish grey medium to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	D	U	51.0	50.8	49.3		50.0	0.66	0.26	1.00	0.26
			Determination 2	28/01/26	A	U	50.1	24.6	22.1		37.5	0.10	0.07	0.88	0.06
			Determination 3	28/01/26	A	U	50.7	37.4	35.3		47.7	0.13	0.06	0.98	0.06
BNO-OWF-BH13	09-3	16.75	Very weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	27/01/26	D	U	94.6	94.4	90.3		92.3	0.44	0.05	1.32	0.07
			Determination 2	27/01/26	A	U	95.7	60.2	57.3		83.6	0.36	0.05	1.26	0.06

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test												
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De² (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH13	09-3	16.75	Determination 3	27/01/26	A	U	97.2	55.4	50.2		78.8	0.40	0.06	1.23	0.07
BNO-OWF-BH15	07-2	4.75	Medium strong to strong cream fine to medium grained CALCARENITE. Fresh to slightly weathered	22/01/26	D	U	98.9	90.2	88.6		89.4	15.37	1.92	1.30	2.49
			Determination 2	22/01/26	A	U	99.6	33.7	33.1		64.8	9.73	2.32	1.12	2.61
			Determination 3	22/01/26	A	U	98.8	43.7	43.3		73.8	7.08	1.30	1.19	1.55
BNO-OWF-BH15	12-3	11.45	Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	I	U	69.9	65.0	64.3		75.6	2.11	0.37	1.20	0.45
			Determination 2	28/01/26	I	U	97.2	53.4	50.2		78.8	0.93	0.15	1.23	0.18
			Determination 3	28/01/26	A	U	98.0	54.1	47.9		77.3	2.46	0.41	1.22	0.5
BNO-OWF-BH15	15-3	16.65	Very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	22/01/26	D	U	98.8	98.0	97.2		97.6	0.88	0.09	1.35	0.12
			Determination 2	22/01/26	A	U	97.3	53.2	51.9		80.2	0.72	0.11	1.24	0.14
			Determination 3	22/01/26	I	U	59.5	58.8	58.3		66.5	0.43	0.10	1.14	0.11

(*) Sample failed on weakness

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DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH17	09-4	8.60	Medium strong cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	22/01/26	D	U	99.4	86.4	84.2		85.3	8.61	1.18	1.27	1.5
			Determination 2	22/01/26	A	U	100.4	40.8	39.6		71.1	9.07	1.79	1.17	2.1
			Determination 3	22/01/26	A	U	99.9	43.5	42.5		73.5	6.02	1.11	1.19	1.32
BNO-OWF-BH17	13-3	12.20	Very weak greyish brown CALCISILTITE. Fresh to slightly weathered	22/01/26	A	U	98.4	40.7	39.8		70.6	0.87	0.18	1.17	0.21
			Determination 2	22/01/26	I	U	65.8	38.7	38.2		56.6	0.63	0.20	1.06	0.21
			Determination 3	22/01/26	I	U	45.0	32.2	31.6		42.6	0.10	0.06	0.93	0.06
BNO-OWF-BH17	18-3	18.65	Extremely weak to very weak greyish brown CALCISILTITE. Fresh to slightly weathered	28/01/26	I	U	93.2	48.7	45.5		73.5	0.25	0.05	1.19	0.06
			Determination 2	28/01/26	I	U	96.8	77.8	74.3		95.7	0.22	0.02	1.34	0.03
			Determination 3	28/01/26	I	U	67.9	43.3	41.9		60.2	0.33	0.09	1.09	0.1
BNO-OWF-BH19	13-1	16.35	Weak to moderately weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	22/01/26	D	U	98.0	96.7	96.0		96.3	4.13	0.44	1.34	0.59

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

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Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De² (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BNO-OWF-BH19	13-1	16.35	Determination 2	22/01/26	A	U	100.8	67.7	66.7		92.5	6.26	0.73	1.32	0.96
			Determination 3	22/01/26	A	U	100.2	73.7	72.7		96.3	7.54	0.81	1.34	1.09
BNO-OWF-BH08	04-2	3.65	Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	03/02/26	D	U	100.1	99.9	97.3		98.6	3.96	0.41	1.36	0.56
			Determination 2	03/02/26	A	U	98.9	61.4	59.2		86.3	1.18	0.16	1.28	0.2
			Determination 3	03/02/26	A	U	99.1	44.3	41.8		72.6	1.30	0.25	1.18	0.3

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

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GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details						Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
								Mean after prep.							
Borehole Ref.	Sample Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BNO-OWF-BH01	06-2	4.65	Extremely weak to very weak greenish grey CALCISILTITE. Fresh to slightly weathered	15	88.0	2.12	1.83	101.60	175.00	1.7	9.5	1.17		27/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (03:35 sec).
BNO-OWF-BH01	12-3	12.00	Extremely weak to very weak greenish grey CALCISILTITE. Fresh to slightly weathered	24	100	2.10	1.69	99.50	171.40	1.7	6.7	0.862		27/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (02:39 sec).
BNO-OWF-BH01	15-6	17.10	Weak to moderately weak grey medium to coarse grained CALCARENITE. Fresh to slightly weathered	17	100	2.21	1.88	99.40	161.40	1.6	23.9	3.08		28/01/26	
BNO-OWF-BH01	17-3	19.40	Weak to moderately weak light grey CALCISILTITE. Fresh to slightly weathered	21	100	2.13	1.76	100.30	212.90	2.1	35.2	4.46		20/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (12:09 sec).
BNO-OWF-BH02	17-2	12.70	Extremely weak to very weak cream fine to medium grained CALCARENITE. Fresh to slightly weathered	25	96.9	1.99	1.59	93.90	160.20	1.7	18.5	2.67		28/01/26	
BNO-OWF-BH03-a	02-2	1.20	Medium strong cream fine to medium grained CALCARENITE. Fresh to slightly weathered	8.7	97.7	2.37	2.18	100.40	251.50	2.5	165.5	20.9		21/01/26	Test Rate: 0.50 kN/s - 0.06 MPa/s (05:56 sec). Issues encountered with the transducers during test hence, unable to report stress-strain plot.
BNO-OWF-BH04	19-2	18.95	Moderately weak to medium strong cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	10	83.3	2.23	2.02	99.70	167.10	1.7	114.8	14.7		27/01/26	Test Rate: 0.30 kN/s - 0.04 MPa/s (06:48 sec).
BNO-OWF-BH08	08-1	7.50	Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	19	87.1	2.02	1.69	96.40	146.30	1.5	45.2	6.19		27/01/26	Test Rate: 0.10 kN/s - 0.01 MPa/s (07:57 sec).
BNO-OWF-BH08	10-2	10.00	Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	16	89.2	2.11	1.82	97.60	167.70	1.7	49.1	6.56		27/01/26	Test Rate: 0.10 kN/s - 0.01 MPa/s (08:36 sec).
BNO-OWF-BH11	04-2	4.25	Moderately weak cream fine to medium grained CALCARENITE. Fresh to slightly weathered	13	93.2	2.22	1.96	96.40	191.80	2.0	106.9	14.6		21/01/26	Test Rate: 0.30 kN/s - 0.04 MPa/s (06:21 sec).

Note: The dimensional requirements of flatness (<0.02 mm) and perpendicularity (<0.05 / 50 mm) are met but not straightness (0.3 mm deviation). Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

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506718-F255276

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details						Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
								Mean after prep.							
Borehole Ref.	Sample Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BNO-OWF-BH11	07-2	8.75	Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	16	70.8	1.94	1.67	98.70	180.00	1.8	26.1	3.41		28/01/26	Sample failed along weakness planes.
BNO-OWF-BH11	10-3	12.50	Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	17	81.8	2.02	1.73	99.40	195.00	2.0	9.2	1.19		21/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (03:29 sec).
BNO-OWF-BH11	13-3	15.90	Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	15	74.1	2.02	1.76	100.10	243.00	2.4	35.2	4.47		21/01/26	Sample failed along a weakness plane.
BNO-OWF-BH11	15-3	18.50	Very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	14	60.5	1.91	1.68	98.30	188.10	1.9	12.1	1.59		21/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (04:27 sec).
BNO-OWF-BH12	11-3	13.15	Extremely weak to very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	29	99.4	1.95	1.52	99.00	155.50	1.6	21.9	2.85		27/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (07:43 sec).
BNO-OWF-BH12	16-2	18.55	Very weak cream and bluish grey medium to coarse grained CALCARENITE. Fresh to slightly weathered	22	86.3	1.95	1.60	99.70	215.70	2.2	11.7	1.5		21/01/26	
BNO-OWF-BH13	02-2	13.65	Very weak to weak cream and bluish grey medium to coarse grained CALCARENITE. Fresh to slightly weathered	21	97.9	2.06	1.70	50.20	122.00	2.4	1.2	0.606		28/01/26	Test Rate: 0.05 kN/s - 0.03 MPa/s (00:49 sec).
BNO-OWF-BH15	07-2	4.75	Medium strong to strong cream fine to medium grained CALCARENITE. Fresh to slightly weathered	6.3	93.6	2.43	2.29	99.90	245.60	2.5	194.1	24.8		21/01/26	
BNO-OWF-BH15	12-3	11.45	Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	23	77.7	1.85	1.50	98.40	170.10	1.7	21.0	2.76		27/01/26	Test Rate: 0.05 kN/s - 0.01 MPa/s (07:25 sec).
BNO-OWF-BH15	15-3	16.65	Very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	23	97.8	2.02	1.64	97.10	186.30	1.9	16.3	2.2		21/01/26	

Note: The dimensional requirements of flatness (<0.02 mm) and perpendicularity (<0.05 / 50 mm) are met but not straightness (0.3 mm deviation). Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

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UKAS TESTING 1982

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details				Density				Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
								Mean after prep.							
Borehole Ref.	Sample Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BNO-OWF-BH17	09-4	8.60	Medium strong cream medium to coarse grained CALCARENITE. Fresh to slightly weathered	17	97.5	2.15	1.84	100.30	188.90	1.9	32.0	4.05		21/01/26	Test Rate: 0.10 kN/s - 0.01 MPa/s (05:45 sec).
BNO-OWF-BH17	13-3	12.20	Very weak greyish brown CALCISILTITE. Fresh to slightly weathered	26	100	2.02	1.60	99.20	225.30	2.3	2.2	0.285		21/01/26	
BNO-OWF-BH17	18-3	18.65	Extremely weak to very weak greyish brown CALCISILTITE. Fresh to slightly weathered	20	100	2.10	1.75	100.10	173.50	1.7	31.8	4.04		27/01/26	Test Rate: 0.08 kN/s - 0.01 MPa/s (07:03 sec).

Note: The dimensional requirements of flatness (<0.02 mm) and perpendicularity (<0.05 / 50 mm) are met but not straightness (0.3 mm deviation). Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	06-2
Depth (m):	4.65

Description:
Extremely weak to very weak greenish grey CALCISILTITE. Fresh to slightly weathered

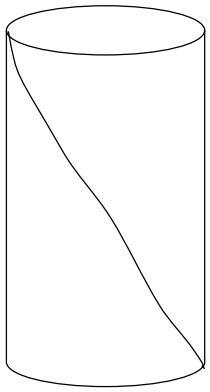
Diameter	101.60 mm
Height	175.00 mm
Bulk Density	2.12 Mg/m³
Dry Density	1.83 Mg/m³
Water Content	15 %

Degree of Saturation: 88.0 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 40°

Sample type	**WAX**

Date tested: 27/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 9.50	1.17 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (03:35 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	12-3
Depth (m):	12.00

Description:
Extremely weak to very weak greenish grey CALCISILTITE. Fresh to slightly weathered

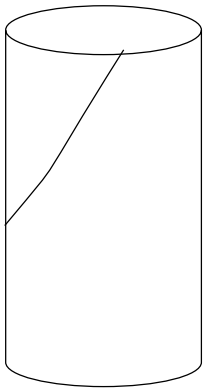
LF0879C (1000kN) compression frame used

Diameter	99.50 mm
Height	171.40 mm
Bulk Density	2.10 Mg/m³
Dry Density	1.69 Mg/m³
Water Content	24 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 51°

Sample type	**WAX**

Date tested: 27/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 6.70	0.862 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (02:39 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	15-6
Depth (m):	17.10

Description:
Weak to moderately weak grey medium to coarse grained CALCARENITE.
Fresh to slightly weathered

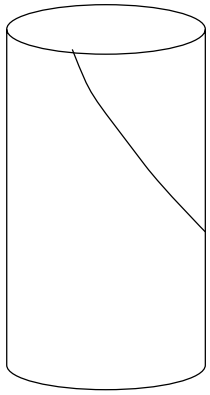
LF0879C (1000kN) compression frame used

Diameter	99.40 mm
Height	161.40 mm
Bulk Density	2.21 Mg/m³
Dry Density	1.88 Mg/m³
Water Content	17 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

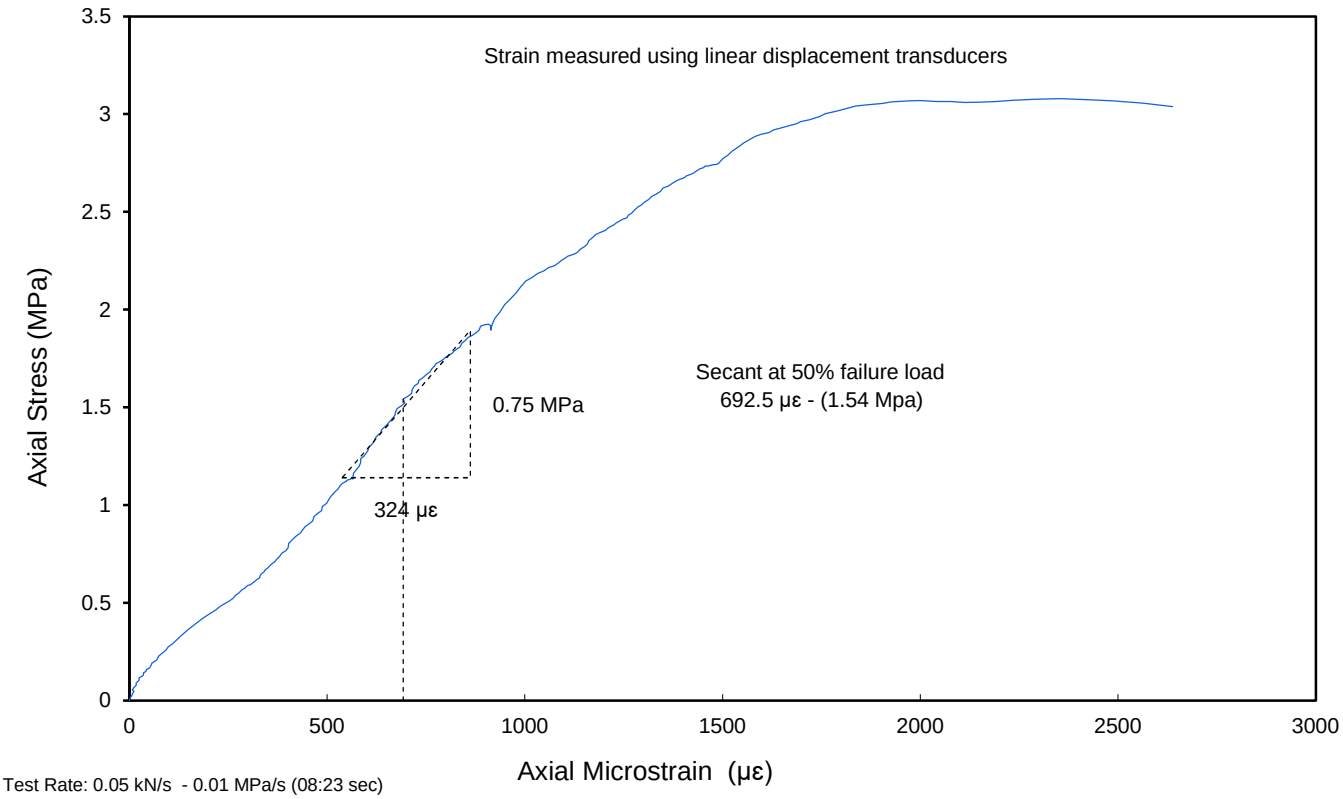
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 28º

Sample type	**WAX**

Date tested: 28/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 23.90	3.08 MPa
Young's Modulus (tangential at 50% failure load)	2.33 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	2.23 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.05 kN/s - 0.01 MPa/s (08:23 sec)

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	17-3
Depth (m):	19.40

Description:
Weak to moderately weak light grey CALCISILTITE. Fresh to slightly weathered

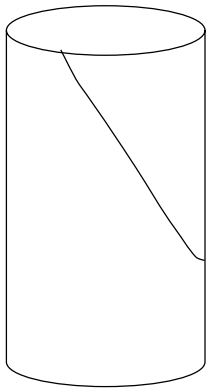
Diameter	100.30 mm
Height	212.90 mm
Bulk Density	2.13 Mg/m³
Dry Density	1.76 Mg/m³
Water Content	21 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 20/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 45º

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 35.20)	4.46 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (12:09 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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I Tabios (Head of Department)

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH02
Sample Ref.:	17-2
Depth (m):	12.70

Description:
Extremely weak to very weak cream fine to medium grained CALCARENITE.
Fresh to slightly weathered

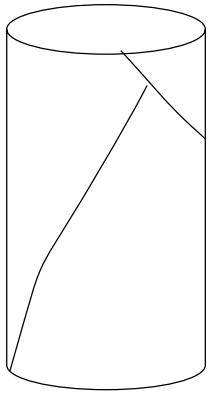
LF0879C (1000kN) compression frame used

Diameter	93.90 mm
Height	160.20 mm
Bulk Density	1.99 Mg/m³
Dry Density	1.59 Mg/m³
Water Content	25 %

Degree of Saturation: 96.9 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

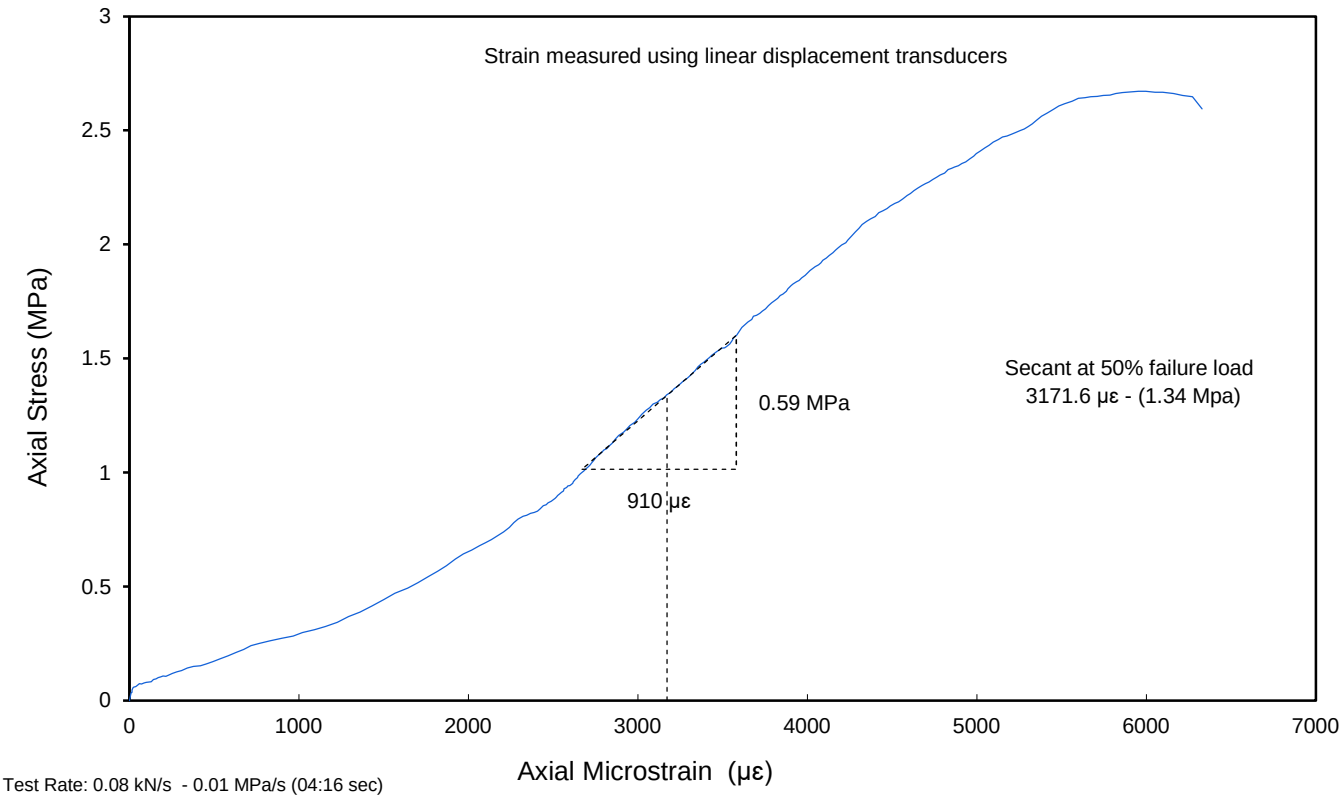
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 41°

Sample type	**WAX**

Date tested: 28/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 18.50	2.67 MPa
Young's Modulus (tangential at 50% failure load)	0.646 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	0.423 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.08 kN/s - 0.01 MPa/s (04:16 sec)

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH03-a
Sample Ref.:	02-2
Depth (m):	1.20

Description:
Medium strong cream fine to medium grained CALCARENITE. Fresh to slightly weathered

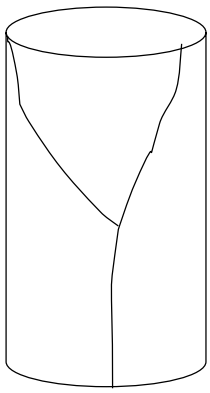
LF0879C (1000kN) compression frame used

Diameter	100.40 mm
Height	251.50 mm
Bulk Density	2.37 Mg/m³
Dry Density	2.18 Mg/m³
Water Content	8.7 %

Degree of Saturation: 97.7 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Y-Shaped



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 21/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 16°

Sample type	**WAX**

Test results

Unconfined Compressive Strength Maximum load (kN): 165.50	20.9 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.50 kN/s - 0.06 MPa/s (05:56 sec). Issues encountered with the transducers during test hence, unable to report stress-strain plot.
Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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Date: 30/01/2026

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH04
Sample Ref.:	19-2
Depth (m):	18.95

Description:
Moderately weak to medium strong cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

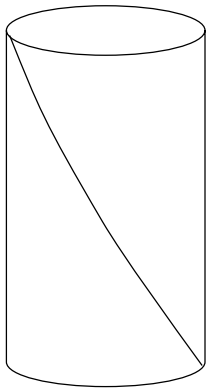
Diameter	99.70 mm
Height	167.10 mm
Bulk Density	2.23 Mg/m³
Dry Density	2.02 Mg/m³
Water Content	10 %

Degree of Saturation: 83.3 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 47°

Sample type	**WAX**

Date tested: 27/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 114.80	14.7 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.30 kN/s - 0.04 MPa/s (06:48 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH08
Sample Ref.:	08-1
Depth (m):	7.50

Description:
Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

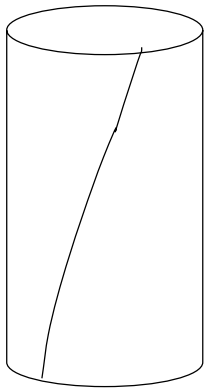
LF0879C (1000kN) compression frame used

Diameter	96.40 mm
Height	146.30 mm
Bulk Density	2.02 Mg/m³
Dry Density	1.69 Mg/m³
Water Content	19 %

Degree of Saturation: 87.1 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 27/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 29º

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 45.20)	6.19 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.10 kN/s - 0.01 MPa/s (07:57 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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Date: 30/01/2026

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH08
Sample Ref.:	10-2
Depth (m):	10.00

Description:
Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

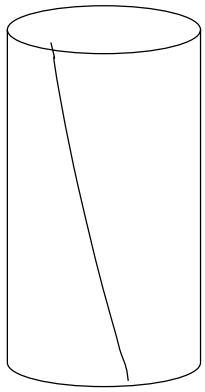
LF0879C (1000kN) compression frame used

Diameter	97.60 mm
Height	167.70 mm
Bulk Density	2.11 Mg/m³
Dry Density	1.82 Mg/m³
Water Content	16 %

Degree of Saturation: 89.2 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 27/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 19º

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 49.10)	6.56 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.10 kN/s - 0.01 MPa/s (08:36 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	04-2
Depth (m):	4.25

Description:
Moderately weak cream fine to medium grained CALCARENITE. Fresh to slightly weathered

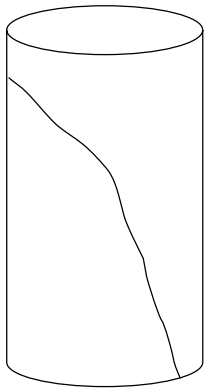
LF0879C (1000kN) compression frame used

Diameter	96.40 mm
Height	191.80 mm
Bulk Density	2.22 Mg/m³
Dry Density	1.96 Mg/m³
Water Content	13 %

Degree of Saturation: 93.2 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 21/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 37°

Sample type	**WAX**

Test results

Unconfined Compressive Strength Maximum load (kN): 106.90	14.6 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.30 kN/s - 0.04 MPa/s (06:21 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	07-2
Depth (m):	8.75

Description:
Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered

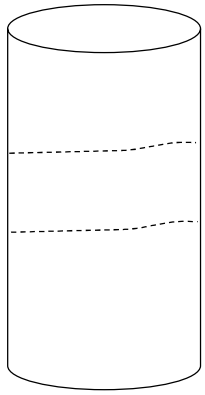
LF0879C (1000kN) compression frame used

Diameter	98.70 mm
Height	180.00 mm
Bulk Density	1.94 Mg/m³
Dry Density	1.67 Mg/m³
Water Content	16 %

Degree of Saturation: 70.8 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Along foliation



Solid lines for material failures.
Dashed lines for apparent weakness failure.

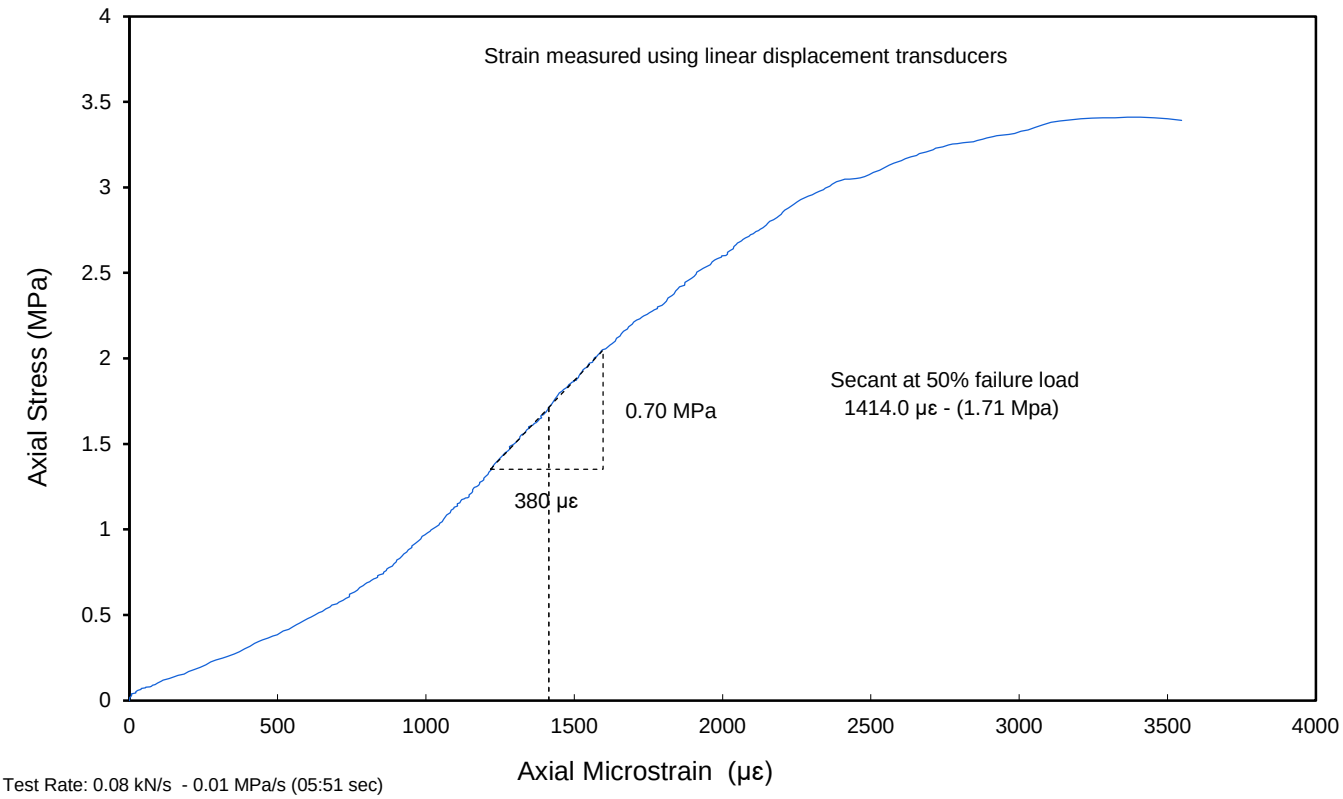
Date tested: 28/01/2026

Angle of foliation/Axis of loading: 10°
Angle of shear plane/Axis of loading: n/a

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 26.10)	3.41 MPa
Young's Modulus (tangential at 50% failure load)	1.84 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	1.21 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.08 kN/s - 0.01 MPa/s (05:51 sec)

Remarks: Sample failed along weakness planes.

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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I Tabios (Head of Department)

Date: 30/01/2026

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	10-3
Depth (m):	12.50

Description:
Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered

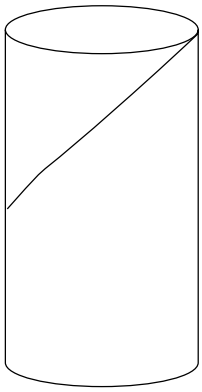
LF0879C (1000kN) compression frame used

Diameter	99.40 mm
Height	195.00 mm
Bulk Density	2.02 Mg/m³
Dry Density	1.73 Mg/m³
Water Content	17 %

Degree of Saturation: 81.8 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 21/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 25º

Sample type	**WAX**

Test results

Unconfined Compressive Strength Maximum load (kN): 9.20	1.19 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (03:29 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	13-3
Depth (m):	15.90

Description:
Very weak to weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

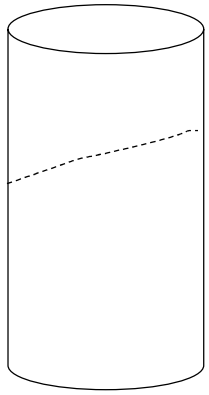
LF0879C (1000kN) compression frame used

Diameter	100.10 mm
Height	243.00 mm
Bulk Density	2.02 Mg/m³
Dry Density	1.76 Mg/m³
Water Content	15 %

Degree of Saturation: 74.1 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Along foliation



Solid lines for material failures.
Dashed lines for apparent weakness failure.

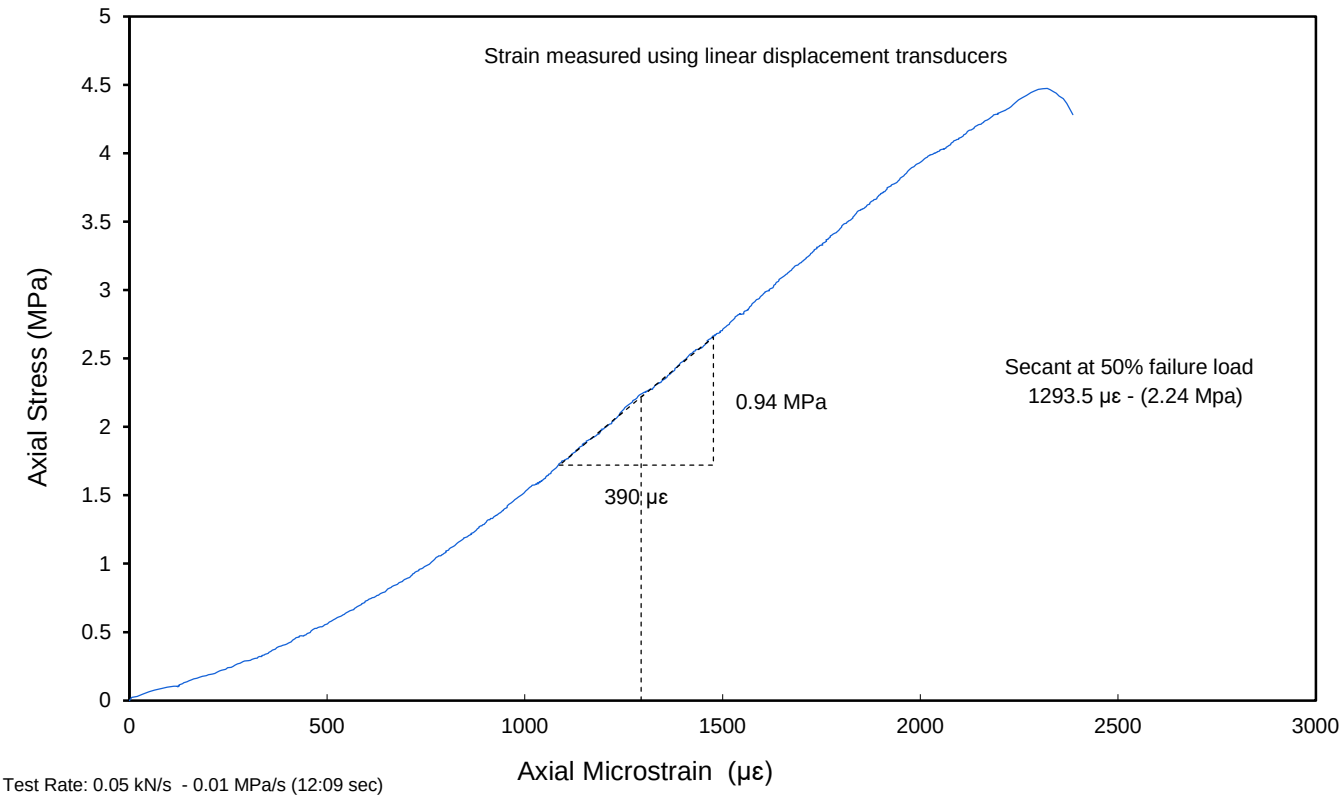
Angle of foliation/Axis of loading: 34°
Angle of shear plane/Axis of loading: n/a

Date tested: 21/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 35.20	4.47 MPa
Young's Modulus (tangential at 50% failure load)	2.4 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	1.73 GPa
Poisson's Ratio (secant at 50% failure load)	n/a

Sample type	**WAX**



Test Rate: 0.05 kN/s - 0.01 MPa/s (12:09 sec)

Remarks: Sample failed along a weakness plane.

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	15-3
Depth (m):	18.50

Description:
Very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered

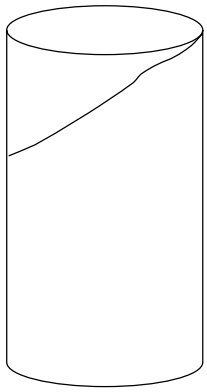
LF0879C (1000kN) compression frame used

Diameter	98.30 mm
Height	188.10 mm
Bulk Density	1.91 Mg/m³
Dry Density	1.68 Mg/m³
Water Content	14 %

Degree of Saturation: 60.5 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 21/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 50°

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 12.10)	1.59 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (04:27 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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Date: 30/01/2026

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH12
Sample Ref.:	11-3
Depth (m):	13.15

Description:
Extremely weak to very weak cream medium to coarse grained CALCARENITE.
Fresh to slightly weathered

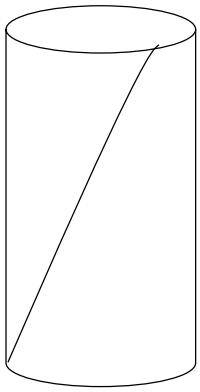
LF0879C (1000kN) compression frame used

Diameter	99.00 mm
Height	155.50 mm
Bulk Density	1.95 Mg/m³
Dry Density	1.52 Mg/m³
Water Content	29 %

Degree of Saturation: 99.4 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 27/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 37°

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 21.90)	2.85 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (07:43 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH12
Sample Ref.:	16-2
Depth (m):	18.55

Description:
Very weak cream and bluish grey medium to coarse grained CALCARENITE.
Fresh to slightly weathered

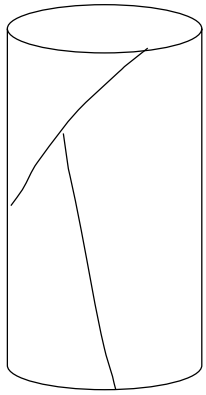
LF0879C (1000kN) compression frame used

Diameter	99.70 mm
Height	215.70 mm
Bulk Density	1.95 Mg/m³
Dry Density	1.60 Mg/m³
Water Content	22 %

Degree of Saturation: 86.3 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

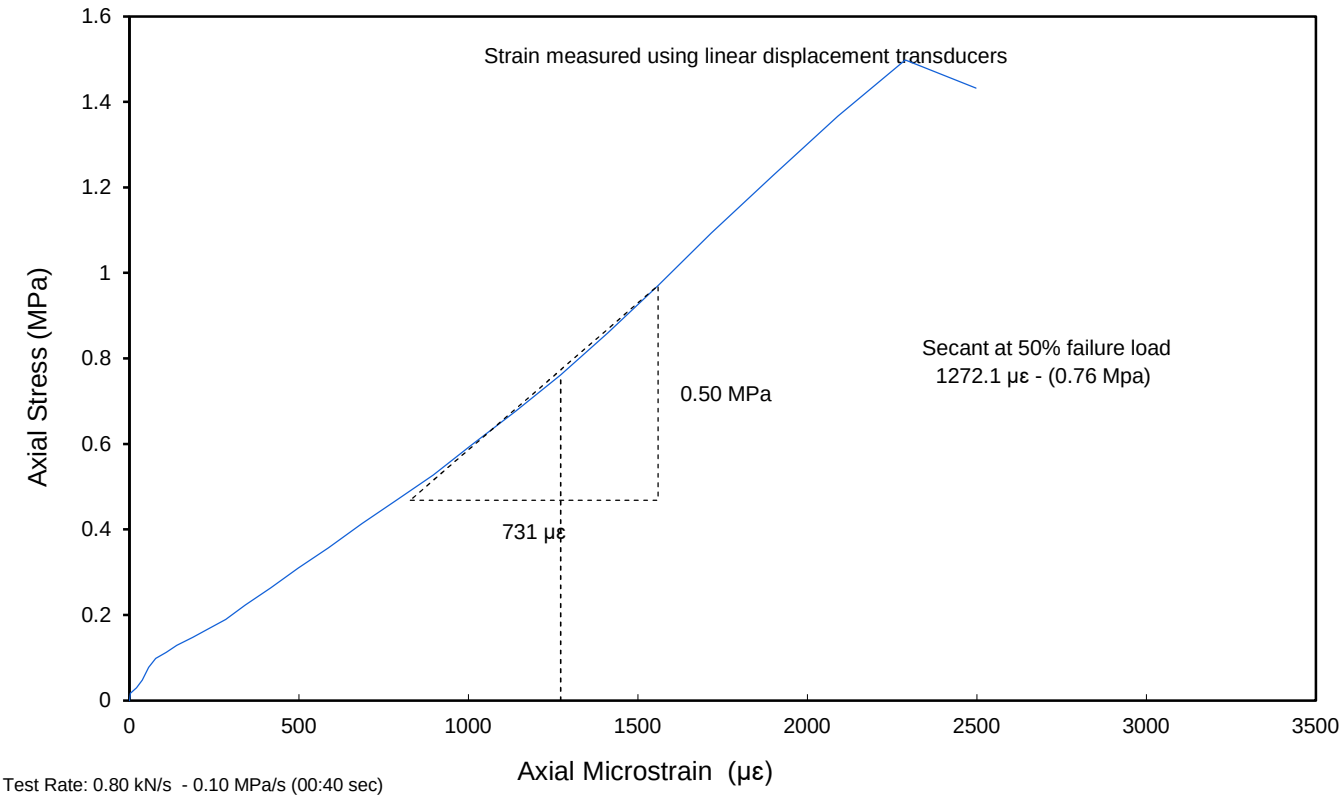
Date tested: 21/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 32º

Sample type	WAX

Test results

Unconfined Compressive Strength (Maximum load (kN): 11.70)	1.5 MPa
Young's Modulus (tangential at 50% failure load)	0.687 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	0.599 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.80 kN/s - 0.10 MPa/s (00:40 sec)

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH13
Sample Ref.:	02-2
Depth (m):	13.65

Description:
Very weak to weak cream and bluish grey medium to coarse grained CALCARENITE. Fresh to slightly weathered

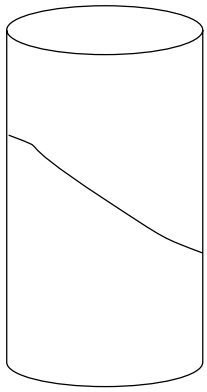
LF0879C (1000kN) compression frame used

Diameter	50.20 mm
Height	122.00 mm
Bulk Density	2.06 Mg/m³
Dry Density	1.70 Mg/m³
Water Content	21 %

Degree of Saturation: 97.9 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 28/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 28º

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 1.20)	0.606 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.03 MPa/s (00:49 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	07-2
Depth (m):	4.75

Description:
Medium strong to strong cream fine to medium grained CALCARENITE. Fresh to slightly weathered

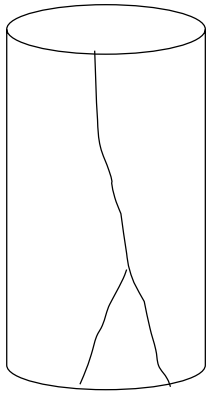
LF0879C (1000kN) compression frame used

Diameter	99.90 mm
Height	245.60 mm
Bulk Density	2.43 Mg/m³
Dry Density	2.29 Mg/m³
Water Content	6.3 %

Degree of Saturation: 93.6 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

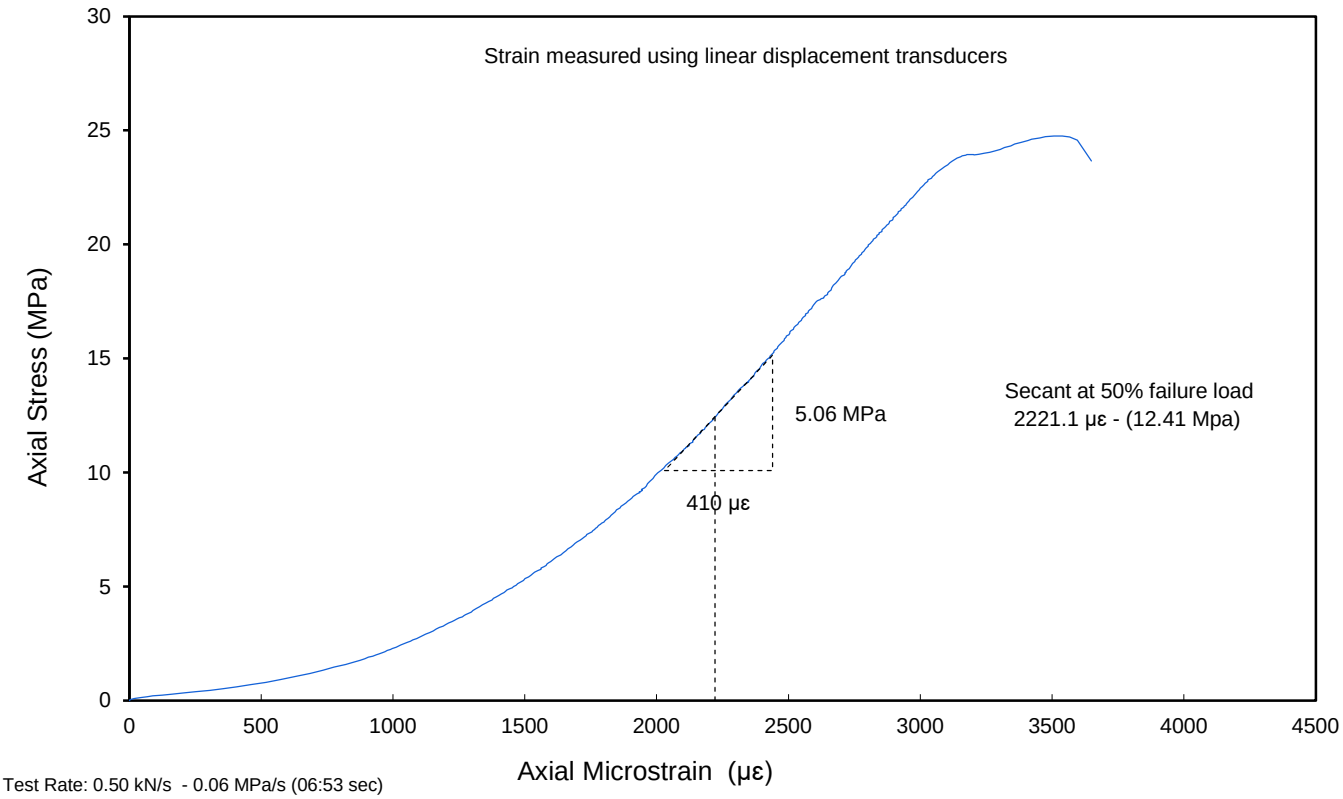
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 21°

Sample type	**WAX**

Date tested: 21/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 194.10	24.8 MPa
Young's Modulus (tangential at 50% failure load)	12.4 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	5.59 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.50 kN/s - 0.06 MPa/s (06:53 sec)

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

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506718-F255276

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	12-3
Depth (m):	11.45

Description:
Very weak to weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered

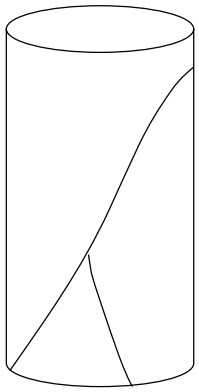
LF0879C (1000kN) compression frame used

Diameter	98.40 mm
Height	170.10 mm
Bulk Density	1.85 Mg/m³
Dry Density	1.50 Mg/m³
Water Content	23 %

Degree of Saturation: 77.7 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 27/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 18º

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 21.00)	2.76 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.05 kN/s - 0.01 MPa/s (07:25 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	15-3
Depth (m):	16.65

Description:
Very weak cream medium to coarse grained CALCARENITE. Fresh to slightly weathered

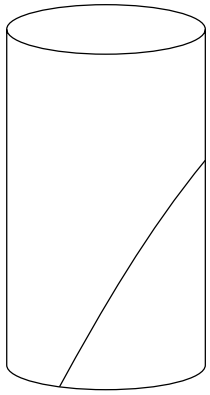
LF0879C (1000kN) compression frame used

Diameter	97.10 mm
Height	186.30 mm
Bulk Density	2.02 Mg/m³
Dry Density	1.64 Mg/m³
Water Content	23 %

Degree of Saturation: 97.8 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

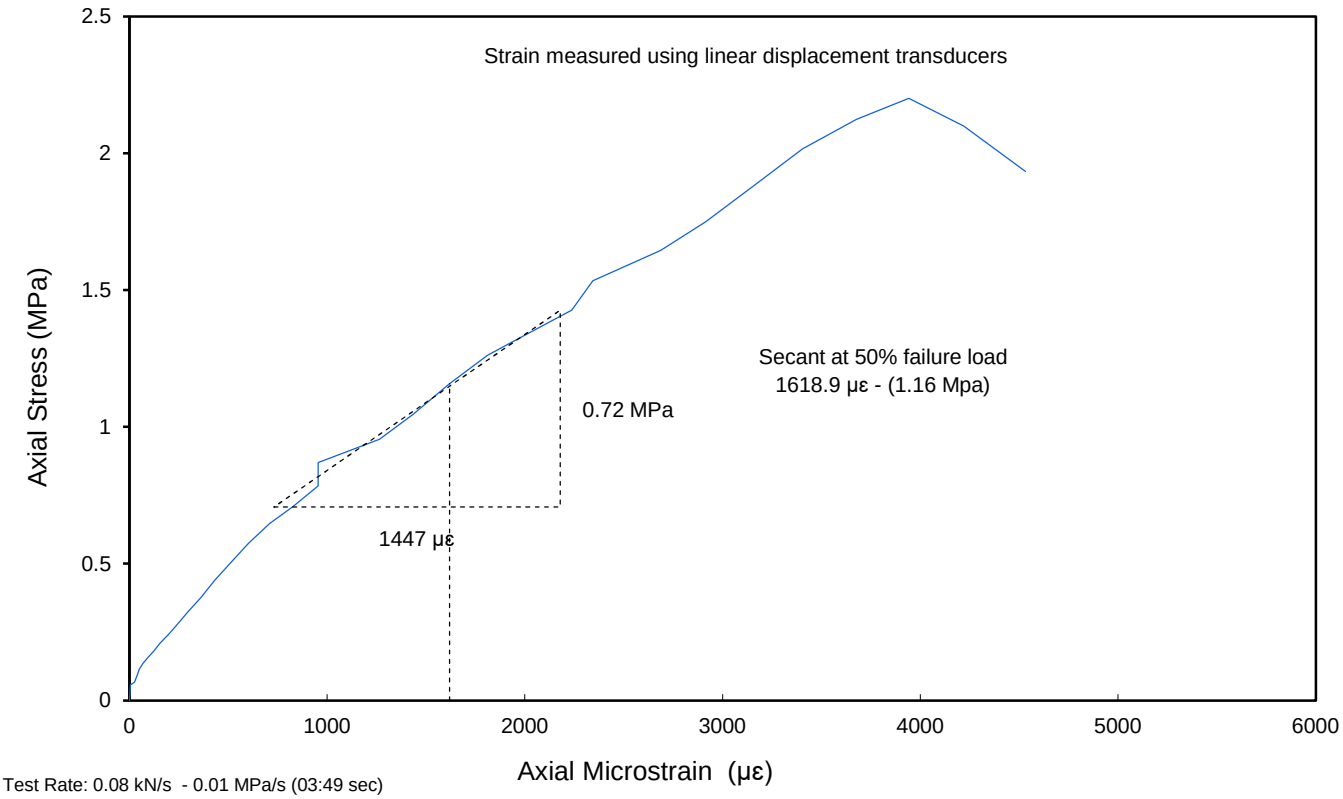
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 42º

Sample type	WAX

Date tested: 21/01/2026

Test results

Unconfined Compressive Strength Maximum load (kN): 16.30	2.2 MPa
Young's Modulus (tangential at 50% failure load)	0.497 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	0.715 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.08 kN/s - 0.01 MPa/s (03:49 sec)

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH17
Sample Ref.:	09-4
Depth (m):	8.60

Description:
Medium strong cream medium to coarse grained CALCARENITE. Fresh to slightly weathered

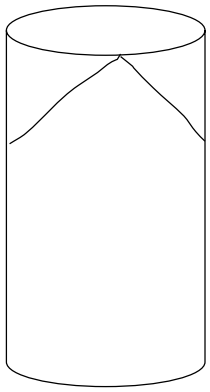
LF0879C (1000kN) compression frame used

Diameter	100.30 mm
Height	188.90 mm
Bulk Density	2.15 Mg/m³
Dry Density	1.84 Mg/m³
Water Content	17 %

Degree of Saturation: 97.5 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 21/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 30º

Sample type	**WAX**

Test results

Unconfined Compressive Strength (Maximum load (kN): 32.00)	4.05 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.10 kN/s - 0.01 MPa/s (05:45 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BNO-OWF-BH17
Sample Ref.:	13-3
Depth (m):	12.20

Description:
Very weak greyish brown CALCISILTITE. Fresh to slightly weathered

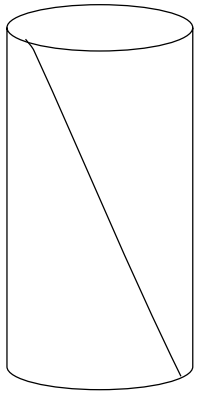
LF0879C (1000kN) compression frame used

Diameter	99.20 mm
Height	225.30 mm
Bulk Density	2.02 Mg/m³
Dry Density	1.60 Mg/m³
Water Content	26 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

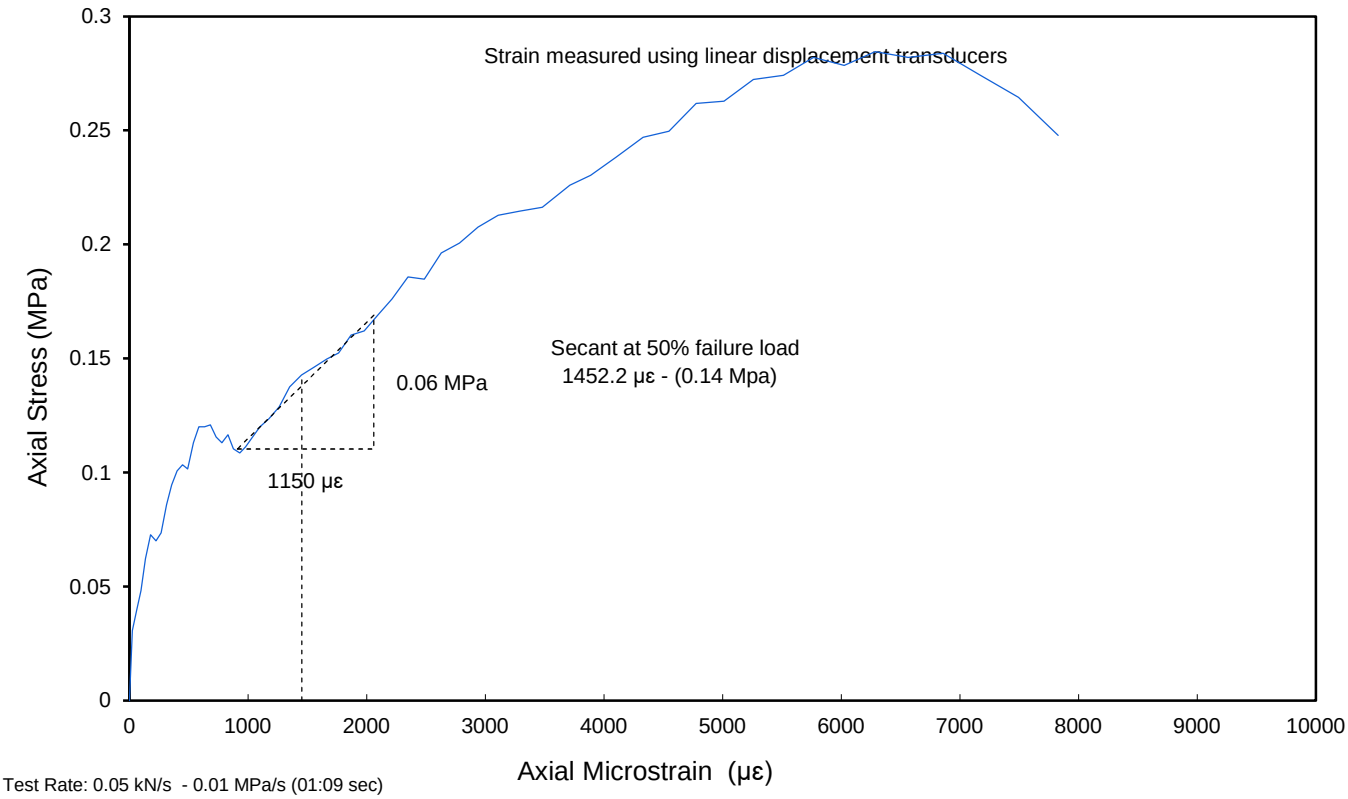
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 40°

Sample type	WAX

Date tested: 21/01/2026

Test results

Unconfined Compressive Strength (Maximum load (kN): 2.20)	0.285 MPa
Young's Modulus (tangential at 50% failure load)	0.051 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	0.0983 GPa
Poisson's Ratio (secant at 50% failure load)	n/a



Test Rate: 0.05 kN/s - 0.01 MPa/s (01:09 sec)

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

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IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

DGEC BRETAGNE NORD-OUEST

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Borehole Ref.:	BNO-OWF-BH17
Sample Ref.:	18-3
Depth (m):	18.65

Description:
Extremely weak to very weak greyish brown CALCISILTITE. Fresh to slightly weathered

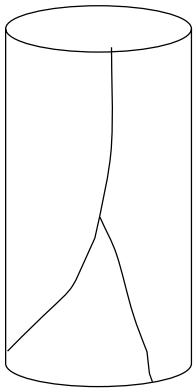
LF0879C (1000kN) compression frame used

Diameter	100.10 mm
Height	173.50 mm
Bulk Density	2.10 Mg/m³
Dry Density	1.75 Mg/m³
Water Content	20 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 27/01/2026

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: 36º

Sample type	**WAX**

Test results

Unconfined Compressive Strength Maximum load (kN): 31.80	4.04 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 50% failure load)	n/a
Poisson's Ratio (secant at 50% failure load)	n/a

Remarks: Test Rate: 0.08 kN/s - 0.01 MPa/s (07:03 sec).

Note: The dimensional requirements of Flatness (<0.02 mm) and Perpendicularity (<0.05 / 50 mm) are met but not Straightness (0.3 mm deviation).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Sample details				Indirect Tensile Strength test (LF0879C (1000kN) compression frame used)											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Sample Diameter (mm)	Sample Width (mm)	Degree of Saturation (%)	Water Content (%)	Specific Gravity* (Mg/m³)	Stress Rate (N/s)	Test Duration (min:sec)	Failure Sketch	Failure Load (kN)	Tensile Strength (MPa)	Remarks
BNO-OWF-BH01	07-2	5.40	Weak bluish grey and grey CALCISILTITE / fine grained CALCARENITE. Fresh to slightly weathered	21/01/26	99.60	49.80	99.3	12.1	2.70 (a)	200	00:37		7.40	0.949	
BNO-OWF-BH01	17-1	19.00	Weak greyish brown fine to coarse grained CALCARENITE with numerous fine gravel size shell fragments. Fresh to slightly weathered	21/01/26	99.90	47.70	104.9	11.2	2.70 (a)	200	00:51		10.20	1.36	
BNO-OWF-BH02	20-2	16.60	Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	21/01/26	96.60	47.40	88.6	25.1	2.70 (a)	200	00:09		1.70	0.236	
BNO-OWF-BH03	11-1	16.00	Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	21/01/26	96.10	48.20	90.9	25.3	2.70 (a)	200	00:10		1.90	0.261	
BNO-OWF-BH04	09-2	6.65	Moderately weak cream fine to coarse grained CALCARENITE with occasional up to coarse gravel size shell fragments. Slightly weathered	21/01/26	99.70	49.40	93.0	12.8	2.70 (a)	200	01:22		16.30	2.1	
BNO-OWF-BH08	01-3	0.35	Moderately weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	21/01/26	99.00	47.70	81.5	13.6	2.70 (a)	200	00:51		10.20	1.37	
BNO-OWF-BH08	10-3	10.55	Weak cream fine to coarse grained CALCARENITE with abundant fine gravel size shell fragments. Fresh to slightly weathered	21/01/26	98.00	48.60	95.4	19.1	2.70 (a)	200	00:33		6.60	0.881	
BNO-OWF-BH11	11-2	13.00	Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	21/01/26	98.90	50.10	87.5	24.6	2.70 (a)	200	00:19		3.80	0.488	
BNO-OWF-BH13	02-3	13.95	Extremely weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	28/01/26	50.40	25.10	67.4	14.6	2.70 (a)	200	00:02		0.30	0.151	
BNO-OWF-BH15	06-3	4.30	Moderately weak cream fine to coarse grained CALCARENITE with rare up to coarse gravel size shell fragments. Slightly weathered	21/01/26	98.90	49.40	91.6	6.7	2.70 (a)	200	02:03		24.70	3.22	

* Specific Gravity: (a) assumed or (m) measured/supplied by client.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

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506718-F255276

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Sample details				Indirect Tensile Strength test (LF0879C (1000kN) compression frame used)											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Sample Diameter (mm)	Sample Width (mm)	Degree of Saturation (%)	Water Content (%)	Specific Gravity* (Mg/m³)	Stress Rate (N/s)	Test Duration (min:sec)	Failure Sketch	Failure Load (kN)	Tensile Strength (MPa)	Remarks
BNO-OWF-BH15	17-4	18.45	Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	21/01/26	98.20	49.20	95.5	25.9	2.70 (a)	200	00:11		2.10	0.276	
BNO-OWF-BH17	13-4	12.50	Extremely weak brown and light grey CALCISILTITE. Fresh to slightly weathered	21/01/26	99.70	48.20	99.0	26.1	2.70 (a)	200	00:04		0.70	0.0926	
BNO-OWF-BH17	18-2	18.40	Weak greyish brown fine to coarse grained CALCARENITE with numerous fine gravel size shell fragments. Fresh to slightly weathered	21/01/26	99.90	51.00	97.8	19.5	2.70 (a)	200	00:11		2.10	0.262	
BNO-OWF-BH19	10-1	12.15	Moderately weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered	21/01/26	100.50	49.40	88.3	9.9	2.70 (a)	200	02:04		24.80	3.18	

* Specific Gravity: (a) assumed or (m) measured/supplied by client.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	07-2
Depth (m):	5.40

Description:
Weak bluish grey and grey CALCISILTITE / fine grained CALCARENITE.
Fresh to slightly weathered

Sample Details

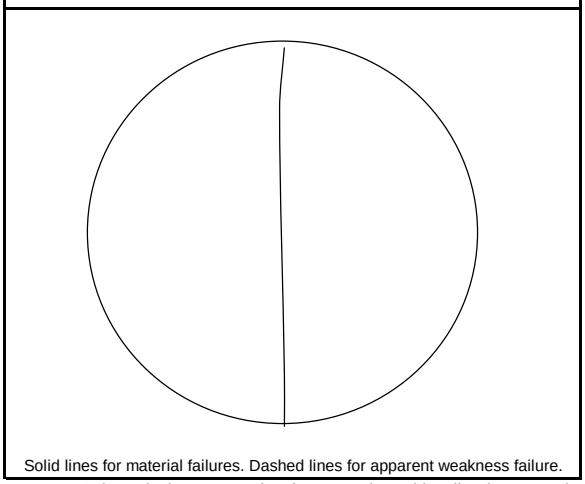
Diameter	99.60 mm
Thickness	49.80 mm
Thickness / Diameter Ratio	0.50
Bulk Density	2.28 Mg/m³
Dry Density	2.03 Mg/m³
Water Content	12.1 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	99.3 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:37 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
7.40 kN

Tensile Strength
0.949 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

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UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	17-1
Depth (m):	19.00

Description:
Weak greyish brown fine to coarse grained CALCARENITE with numerous fine gravel size shell fragments. Fresh to slightly weathered

Sample Details

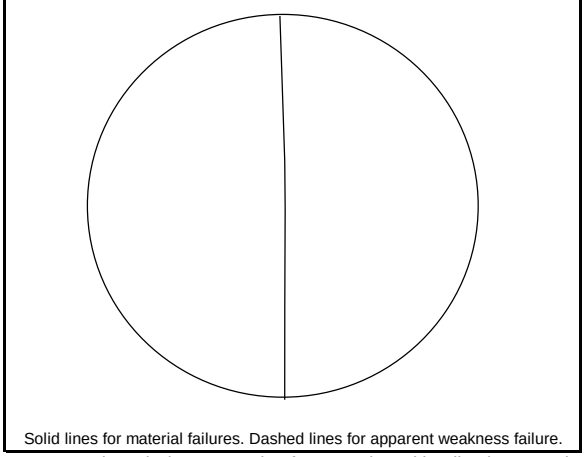
Diameter	99.90 mm
Thickness	47.70 mm
Thickness / Diameter Ratio	0.48
Bulk Density	2.33 Mg/m³
Dry Density	2.10 Mg/m³
Water Content	11.2 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	104.9 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:51 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
10.20 kN

Tensile Strength
1.36 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

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506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH02
Sample Ref.:	20-2
Depth (m):	16.60

Description:
Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

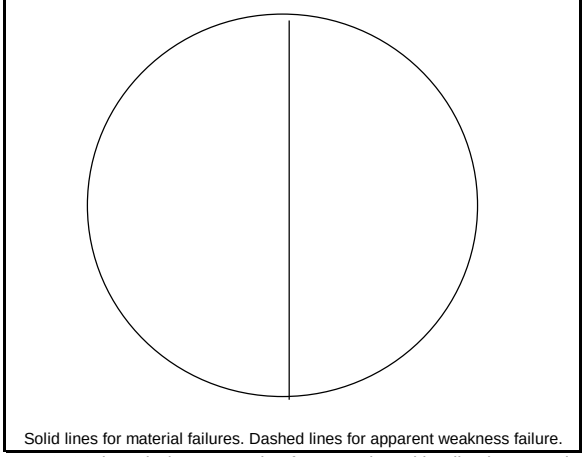
Diameter	96.60 mm
Thickness	47.40 mm
Thickness / Diameter Ratio	0.49
Bulk Density	1.91 Mg/m³
Dry Density	1.53 Mg/m³
Water Content	25.1 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	88.6 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:09 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
1.70 kN

Tensile Strength
0.236 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST

506718-F255276

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH03
Sample Ref.:	11-1
Depth (m):	16.00

Description:
Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

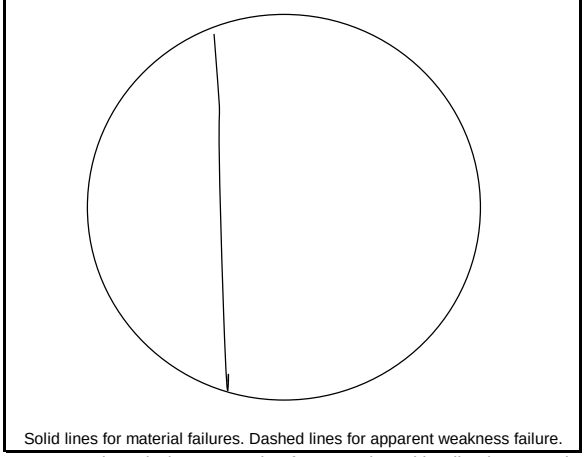
Diameter	96.10 mm
Thickness	48.20 mm
Thickness / Diameter Ratio	0.50
Bulk Density	1.93 Mg/m³
Dry Density	1.54 Mg/m³
Water Content	25.3 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	90.9 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:10 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Curved Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
1.90 kN

Tensile Strength
0.261 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH04
Sample Ref.:	09-2
Depth (m):	6.65

Description:
Moderately weak cream fine to coarse grained CALCARENITE with occasional up to coarse gravel size shell fragments. Slightly weathered

Sample Details

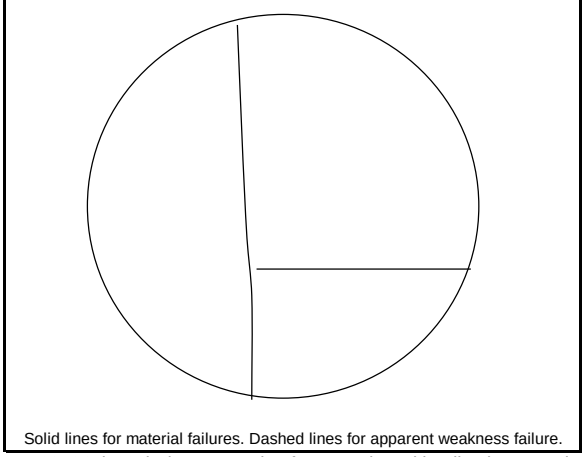
Diameter	99.70 mm
Thickness	49.40 mm
Thickness / Diameter Ratio	0.50
Bulk Density	2.22 Mg/m³
Dry Density	1.97 Mg/m³
Water Content	12.8 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	93.0 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	01:22 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Wedge fracture



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
16.30 kN

Tensile Strength
2.1 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH08
Sample Ref.:	01-3
Depth (m):	0.35

Description:
Moderately weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

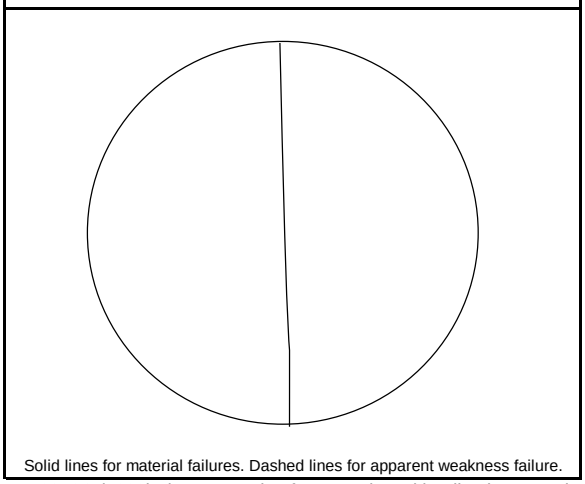
Diameter	99.00 mm
Thickness	47.70 mm
Thickness / Diameter Ratio	0.48
Bulk Density	2.11 Mg/m³
Dry Density	1.86 Mg/m³
Water Content	13.6 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	81.5 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:51 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
10.20 kN

Tensile Strength
1.37 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH08
Sample Ref.:	10-3
Depth (m):	10.55

Description:
Weak cream fine to coarse grained CALCARENITE with abundant fine gravel size shell fragments. Fresh to slightly weathered

Sample Details

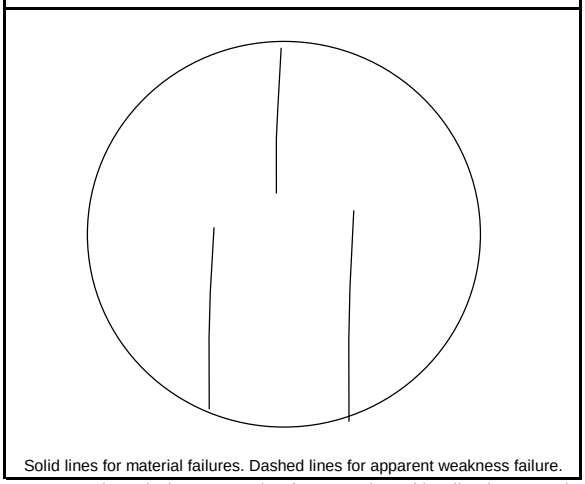
Diameter	98.00 mm
Thickness	48.60 mm
Thickness / Diameter Ratio	0.50
Bulk Density	2.09 Mg/m³
Dry Density	1.75 Mg/m³
Water Content	19.1 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	95.4 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:33 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Multiple fracture



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
6.60 kN

Tensile Strength
0.881 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	11-2
Depth (m):	13.00

Description:
Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

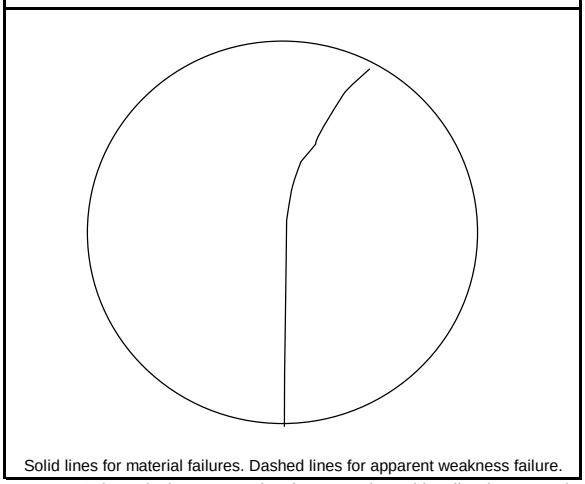
Diameter	98.90 mm
Thickness	50.10 mm
Thickness / Diameter Ratio	0.51
Bulk Density	1.91 Mg/m³
Dry Density	1.53 Mg/m³
Water Content	24.6 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	87.5 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:19 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Curved Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
3.80 kN

Tensile Strength
0.488 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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I Tabios (Head of Department)

Date: 30/01/2026

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH13
Sample Ref.:	02-3
Depth (m):	13.95

Description:
Extremely weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

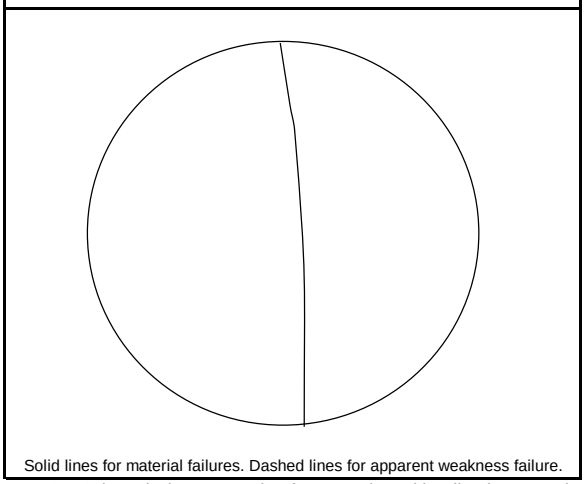
Diameter	50.40 mm
Thickness	25.10 mm
Thickness / Diameter Ratio	0.50
Bulk Density	1.95 Mg/m³
Dry Density	1.70 Mg/m³
Water Content	14.6 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	67.4 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:02 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 28/01/2026

Failure Load
0.30 kN

Tensile Strength
0.151 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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Project Name:

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	06-3
Depth (m):	4.30

Description:
Moderately weak cream fine to coarse grained CALCARENITE with rare up to coarse gravel size shell fragments. Slightly weathered

Sample Details

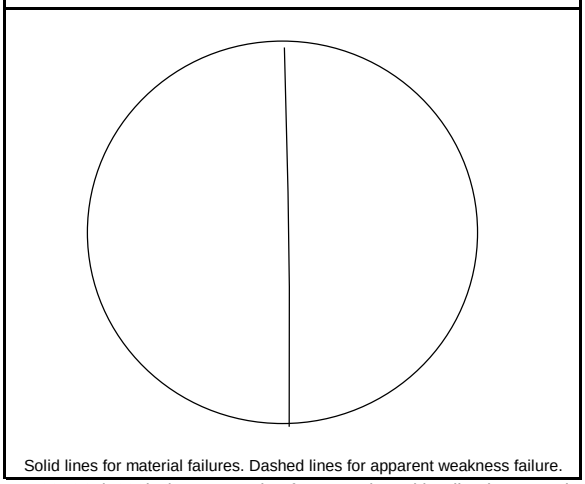
Diameter	98.90 mm
Thickness	49.40 mm
Thickness / Diameter Ratio	0.50
Bulk Density	2.41 Mg/m³
Dry Density	2.26 Mg/m³
Water Content	6.7 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	91.6 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	02:03 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
24.70 kN

Tensile Strength
3.22 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

Checked and Approved by

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	17-4
Depth (m):	18.45

Description:
Weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

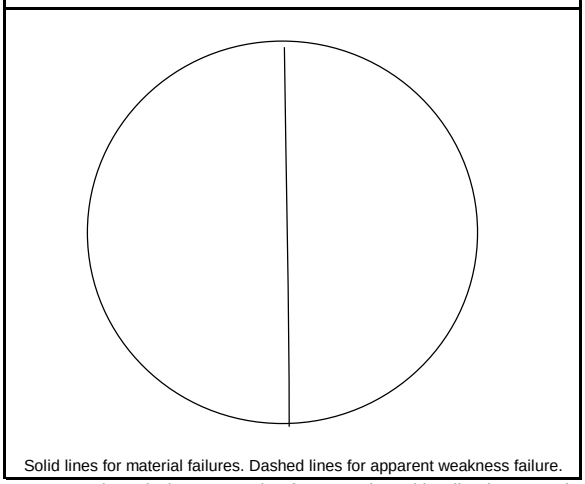
Diameter	98.20 mm
Thickness	49.20 mm
Thickness / Diameter Ratio	0.50
Bulk Density	1.96 Mg/m³
Dry Density	1.56 Mg/m³
Water Content	25.9 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	95.5 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:11 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
2.10 kN

Tensile Strength
0.276 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

Checked and Approved by

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I Tabios (Head of Department)

Date: 30/01/2026

Project Number:

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH17
Sample Ref.:	13-4
Depth (m):	12.50

Description:
Extremely weak brown and light grey CALCISILTITE. Fresh to slightly weathered

Sample Details

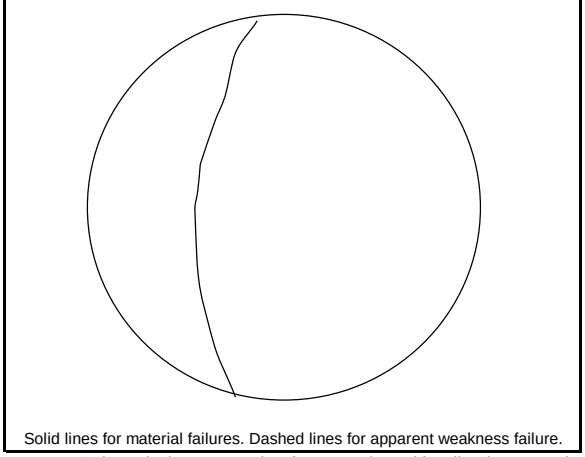
Diameter	99.70 mm
Thickness	48.20 mm
Thickness / Diameter Ratio	0.48
Bulk Density	1.99 Mg/m³
Dry Density	1.58 Mg/m³
Water Content	26.1 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	99.0 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:04 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Curved Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
0.70 kN

Tensile Strength
0.0926 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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I Tabios (Head of Department)

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH17
Sample Ref.:	18-2
Depth (m):	18.40

Description:
Weak greyish brown fine to coarse grained CALCARENITE with numerous fine gravel size shell fragments. Fresh to slightly weathered

Sample Details

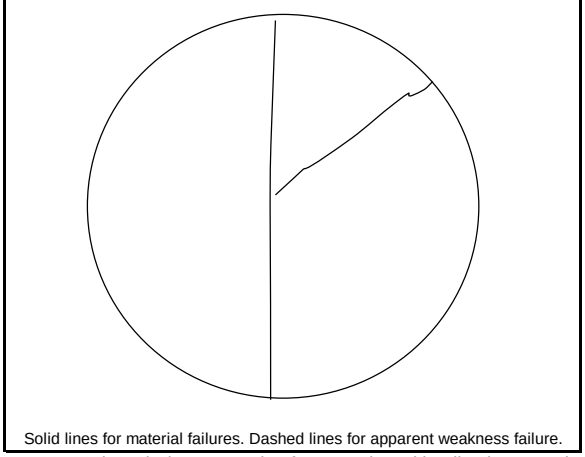
Diameter	99.90 mm
Thickness	51.00 mm
Thickness / Diameter Ratio	0.51
Bulk Density	2.10 Mg/m³
Dry Density	1.76 Mg/m³
Water Content	19.5 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	97.8 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	00:11 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Wedge fracture



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
2.10 kN

Tensile Strength
0.262 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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Date: 30/01/2026

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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.:	BNO-OWF-BH19
Sample Ref.:	10-1
Depth (m):	12.15

Description:
Moderately weak cream fine to coarse grained CALCARENITE. Fresh to slightly weathered

Sample Details

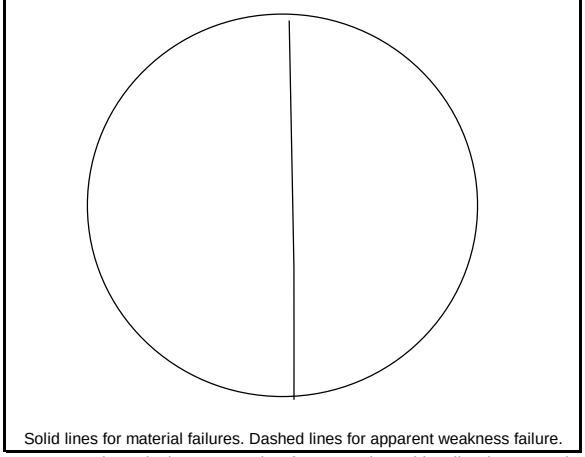
Diameter	100.50 mm
Thickness	49.40 mm
Thickness / Diameter Ratio	0.49
Bulk Density	2.28 Mg/m³
Dry Density	2.07 Mg/m³
Water Content	9.9 %
Specific Gravity (Assumed)	2.70 Mg/m³
Degree of Saturation	88.3 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	02:04 min:sec
Angle of loading with respect to anisotropy	90 º

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 21/01/2026

Failure Load
24.80 kN

Tensile Strength
3.18 MPa

Sample type: Wax

Remarks:

Note: The dimensional requirements of Flatness (<0.25 mm) and Perpendicularity (to within 0.25º) are met but not irregularities across thickness (< 0.025 mm).

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CERCHAR ABRASIVITY

Sample details				Cerchar Abrasivity									
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Water Content (%)	Max Grain Size (mm)	Direction of Stylus	Specimen Condition as tested	As measured readings d (0.01 mm)	Standard Deviation of CAI	CAI Mean pin wear (mm)	Surface condition (correction)	CAI mean index	Abrasivity Classification
BNO-OWF-BH01	13-1	13.00	Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered	20/01/26	As received	2.00	No weakness	As received	4,4,6,7,6	0.13	0.05	Rough Sample No correction needed	**0.5**	**Very Low**
BNO-OWF-BH01	17-4	19.65	Weak to moderately weak light brown mottled cream fine to coarse grained CALCARENITE. Slightly weathered	20/01/26	As received	1.00	No weakness	As received	7,7,6,7,6	0.05	0.07	Rough Sample No correction needed	**0.7**	**Very Low**
BNO-OWF-BH02	01-2	0.40	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	14/01/26	As received	1.50	No weakness	As received	10,9,10,9,9	0.05	0.09	Rough Sample No correction needed	**0.9**	**Very Low**
BNO-OWF-BH02	10-1	7.70	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	21/01/26	As received	2.00	No weakness	As received	6,3,5,2,4	0.16	0.04	Rough Sample No correction needed	**0.4**	**Extremely Low**
BNO-OWF-BH03	11-2	16.15	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20/01/26	As received	2.00	No weakness	As received	6,6,6,6,7	0.04	0.06	Rough Sample No correction needed	**0.6**	**Very Low**
BNO-OWF-BH03-a	01-2	0.15	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	21/01/26	As received	2.00	No weakness	As received	6,6,6,7,6	0.04	0.06	Rough Sample No correction needed	**0.6**	**Very Low**
BNO-OWF-BH04	06-1	3.50	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	19/01/26	As received	1.00	No weakness	As received	3,3,4,4,4	0.05	0.04	Rough Sample No correction needed	**0.4**	**Extremely Low**
BNO-OWF-BH04	18-3	18.35	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	21/01/26	As received	2.00	No weakness	As received	5,6,6,5,6	0.05	0.06	Rough Sample No correction needed	**0.6**	**Very Low**
BNO-OWF-BH07	02-1	4.00	Weak to moderately weak light brown fine to coarse grained CALCARENITE. Slightly weathered	14/01/26	As received	2.50	No weakness	As received	7,8,6,7,8	0.08	0.07	Rough Sample No correction needed	**0.7**	**Very Low**
BNO-OWF-BH07	11-2	19.90	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	19/01/26	As received	2.50	No weakness	As received	8,8,7,7,8	0.05	0.08	Rough Sample No correction needed	**0.8**	**Very Low**

Notes: Stylus Rockwell Hardness and tip shape: 55 ± 1 conical. CERCHAR Apparatus: Type 2 (West). Measurement method: Side and/or Top view under microscope > 50x magnification

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I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 2007 - 2014

CERCHAR ABRASIVITY

Sample details				Cerchar Abrasivity									
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Water Content (%)	Max Grain Size (mm)	Direction of Stylus	Specimen Condition as tested	As measured readings d (0.01 mm)	Standard Deviation of CAI	CAI Mean pin wear (mm)	Surface condition (correction)	CAI mean index	Abrasivity Classification
BNO-OWF-BH08	01-4	0.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	19/01/26	As received	2.00	No weakness	As received	9,9,8,8,9	0.05	0.09	Rough Sample No correction needed	**0.9**	**Very Low**
BNO-OWF-BH10	04-1	2.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	14/01/26	As received	1.50	No weakness	As received	8,7,7,7,7	0.04	0.07	Rough Sample No correction needed	**0.7**	**Very Low**
BNO-OWF-BH10	07-2	16.70	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	19/01/26	As received	1.00	No weakness	As received	7,6,6,6,6	0.04	0.06	Rough Sample No correction needed	**0.6**	**Very Low**
BNO-OWF-BH11	10-2	12.30	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20/01/26	As received	1.50	No weakness	As received	5,7,5,5,4	0.11	0.05	Rough Sample No correction needed	**0.5**	**Very Low**
BNO-OWF-BH11	15-4	19.20	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20/01/26	As received	2.00	No weakness	As received	7,6,8,7,7	0.07	0.07	Rough Sample No correction needed	**0.7**	**Very Low**
BNO-OWF-BH12	11-2	12.75	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	21/01/26	As received	2.00	No weakness	As received	3,2,3,4,4	0.08	0.03	Rough Sample No correction needed	**0.3**	**Extremely Low**
BNO-OWF-BH13	09-1	16.05	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20/01/26	As received	1.50	No weakness	As received	7,7,7,7,6	0.04	0.07	Rough Sample No correction needed	**0.7**	**Very Low**
BNO-OWF-BH15	06-1	4.00	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	14/01/26	As received	1.50	No weakness	As received	4,6,7,8,6	0.15	0.06	Rough Sample No correction needed	**0.6**	**Very Low**
BNO-OWF-BH15	16-1	17.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	14/01/26	As received	1.50	No weakness	As received	8,8,9,7,6	0.11	0.08	Rough Sample No correction needed	**0.8**	**Very Low**
BNO-OWF-BH17	13-4	12.50	Extremely weak brown and light grey CALCISILTITE. Fresh to slightly weathered	28/01/26	As received	<1	No weakness	As received	6,6,6,5,5	0.05	0.06	Rough Sample No correction needed	**0.6**	**Very Low**

Notes: Stylus Rockwell Hardness and tip shape: 55 ± 1 conical. CERCHAR Apparatus: Type 2 (West). Measurement method: Side and/or Top view under microscope > 50x magnification

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	13-1
Depth (m):	13.00

Description:
Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.01*	*0.03*	*0.06*	*0.07*	*0.06*
Measurement d_2	*mm*	*0.04*	*0.04*	*0.05*	*0.08*	*0.05*
Measurement d_3	*mm*	*0.04*	*0.04*	*0.05*	*0.05*	*0.06*
Measurement d_4	*mm*	*0.05*	*0.05*	*0.06*	*0.06*	*0.06*
Mean reading d_M	*mm*	0.04	0.04	0.06	0.07	0.06
Mean pin wear	*mm*					0.05
CERCHAR-Abrasivity-Index (**CAI**)						0.54
Standard deviation of **CAI**						*0.13*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 20 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH01
Sample Ref.:	17-4
Depth (m):	19.65

Description:
Weak to moderately weak light brown mottled cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.06*	*0.05*	*0.08*	*0.05*
Measurement d_2	*mm*	*0.08*	*0.06*	*0.07*	*0.07*	*0.06*
Measurement d_3	*mm*	*0.06*	*0.07*	*0.06*	*0.07*	*0.05*
Measurement d_4	*mm*	*0.06*	*0.07*	*0.05*	*0.06*	*0.07*
Mean reading d_M	*mm*	0.07	0.07	0.06	0.07	0.06
Mean pin wear	*mm*					0.07
CERCHAR-Abrasivity-Index (**CAI**)						0.66
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 20 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH02
Sample Ref.:	01-2
Depth (m):	0.40

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.08*	*0.10*	*0.09*	*0.09*	*0.10*
Measurement d_2	*mm*	*0.09*	*0.09*	*0.10*	*0.08*	*0.08*
Measurement d_3	*mm*	*0.11*	*0.07*	*0.10*	*0.07*	*0.08*
Measurement d_4	*mm*	*0.12*	*0.09*	*0.10*	*0.10*	*0.09*
Mean reading d_M	*mm*	0.10	0.09	0.10	0.09	0.09
Mean pin wear	*mm*					0.09
CERCHAR-Abrasivity-Index (**CAI**)						0.94
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 14 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH02
Sample Ref.:	10-1
Depth (m):	7.70

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.04*	*0.03*	*0.03*	*0.01*	*0.03*
Measurement d_2	*mm*	*0.05*	*0.04*	*0.06*	*0.02*	*0.04*
Measurement d_3	*mm*	*0.07*	*0.02*	*0.05*	*0.02*	*0.04*
Measurement d_4	*mm*	*0.06*	*0.03*	*0.05*	*0.04*	*0.03*
Mean reading d_M	*mm*	0.06	0.03	0.05	0.02	0.04
Mean pin wear	*mm*					0.04
CERCHAR-Abrasivity-Index (**CAI**)						0.40
Standard deviation of **CAI**						*0.16*
Classification of **CAI**						**Extremely Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 21 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH03
Sample Ref.:	11-2
Depth (m):	16.15

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.08*	*0.05*	*0.05*	*0.07*
Measurement d_2	*mm*	*0.05*	*0.06*	*0.06*	*0.06*	*0.07*
Measurement d_3	*mm*	*0.06*	*0.05*	*0.06*	*0.07*	*0.06*
Measurement d_4	*mm*	*0.06*	*0.06*	*0.07*	*0.07*	*0.06*
Mean reading d_M	*mm*	0.06	0.06	0.06	0.06	0.07
Mean pin wear	*mm*					0.06
CERCHAR-Abrasivity-Index (**CAI**)						0.62
Standard deviation of **CAI**						*0.04*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 20 January 2026

Photograph

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH03-a
Sample Ref.:	01-2
Depth (m):	0.15

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.05*	*0.06*	*0.05*	*0.06*	*0.06*
Measurement d_2	*mm*	*0.07*	*0.06*	*0.07*	*0.08*	*0.07*
Measurement d_3	*mm*	*0.07*	*0.06*	*0.06*	*0.07*	*0.05*
Measurement d_4	*mm*	*0.06*	*0.06*	*0.05*	*0.07*	*0.05*
Mean reading d_M	*mm*	0.06	0.06	0.06	0.07	0.06
Mean pin wear	*mm*					0.06
CERCHAR-Abrasivity-Index (**CAI**)						0.62
Standard deviation of **CAI**						*0.04*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 21 January 2026

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH04
Sample Ref.:	06-1
Depth (m):	3.50

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.03*	*0.02*	*0.04*	*0.04*	*0.03*
Measurement d_2	*mm*	*0.02*	*0.03*	*0.03*	*0.05*	*0.03*
Measurement d_3	*mm*	*0.03*	*0.03*	*0.04*	*0.03*	*0.03*
Measurement d_4	*mm*	*0.04*	*0.03*	*0.04*	*0.03*	*0.05*
Mean reading d_M	*mm*	0.03	0.03	0.04	0.04	0.04
Mean pin wear	*mm*					0.04
CERCHAR-Abrasivity-Index (**CAI**)						0.36
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Extremely Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 19 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH04
Sample Ref.:	18-3
Depth (m):	18.35

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.05*	*0.06*	*0.07*	*0.04*	*0.07*
Measurement d_2	*mm*	*0.04*	*0.06*	*0.06*	*0.05*	*0.07*
Measurement d_3	*mm*	*0.06*	*0.06*	*0.06*	*0.05*	*0.06*
Measurement d_4	*mm*	*0.05*	*0.05*	*0.06*	*0.06*	*0.05*
Mean reading d_M	*mm*	0.05	0.06	0.06	0.05	0.06
Mean pin wear	*mm*					0.06
CERCHAR-Abrasivity-Index (**CAI**)						0.56
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 21 January 2026

Photograph

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH07
Sample Ref.:	02-1
Depth (m):	4.00

Description:
Weak to moderately weak light brown fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.08*	*0.08*	*0.06*	*0.06*	*0.08*
Measurement d_2	*mm*	*0.06*	*0.08*	*0.06*	*0.08*	*0.08*
Measurement d_3	*mm*	*0.07*	*0.07*	*0.07*	*0.06*	*0.06*
Measurement d_4	*mm*	*0.07*	*0.07*	*0.06*	*0.06*	*0.08*
Mean reading d_M	*mm*	0.07	0.08	0.06	0.07	0.08
Mean pin wear	*mm*					0.07
CERCHAR-Abrasivity-Index (**CAI**)						0.72
Standard deviation of **CAI**						*0.08*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 14 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH07
Sample Ref.:	11-2
Depth (m):	19.90

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.08*	*0.08*	*0.08*	*0.06*	*0.08*
Measurement d_2	*mm*	*0.07*	*0.07*	*0.07*	*0.07*	*0.08*
Measurement d_3	*mm*	*0.07*	*0.08*	*0.07*	*0.07*	*0.08*
Measurement d_4	*mm*	*0.08*	*0.08*	*0.06*	*0.08*	*0.07*
Mean reading d_M	*mm*	0.08	0.08	0.07	0.07	0.08
Mean pin wear	*mm*					0.08
CERCHAR-Abrasivity-Index (**CAI**)						0.76
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 19 January 2026

Photograph

Not required

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH08
Sample Ref.:	01-4
Depth (m):	0.50

Description:
Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.08*	*0.08*	*0.08*	*0.07*	*0.09*
Measurement d_2	*mm*	*0.08*	*0.10*	*0.10*	*0.08*	*0.08*
Measurement d_3	*mm*	*0.10*	*0.10*	*0.08*	*0.09*	*0.07*
Measurement d_4	*mm*	*0.09*	*0.08*	*0.06*	*0.09*	*0.10*
Mean reading d_M	*mm*	0.09	0.09	0.08	0.08	0.09
Mean pin wear	*mm*					0.09
CERCHAR-Abrasivity-Index (**CAI**)						0.86
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 19 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH10
Sample Ref.:	04-1
Depth (m):	2.50

Description:
Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.08*	*0.07*	*0.07*	*0.07*	*0.06*
Measurement d_2	*mm*	*0.07*	*0.07*	*0.09*	*0.07*	*0.09*
Measurement d_3	*mm*	*0.08*	*0.08*	*0.06*	*0.07*	*0.07*
Measurement d_4	*mm*	*0.07*	*0.07*	*0.05*	*0.07*	*0.07*
Mean reading d_M	*mm*	0.08	0.07	0.07	0.07	0.07
Mean pin wear	*mm*					0.07
CERCHAR-Abrasivity-Index (**CAI**)						0.72
Standard deviation of **CAI**						*0.04*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 14 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

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Project Name:

DGEC BRETAGNE NORD-OUEST
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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH10
Sample Ref.:	07-2
Depth (m):	16.70

Description:
Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.06*	*0.07*	*0.05*	*0.06*
Measurement d_2	*mm*	*0.06*	*0.05*	*0.06*	*0.06*	*0.06*
Measurement d_3	*mm*	*0.08*	*0.06*	*0.06*	*0.06*	*0.07*
Measurement d_4	*mm*	*0.07*	*0.06*	*0.05*	*0.05*	*0.05*
Mean reading d_M	*mm*	0.07	0.06	0.06	0.06	0.06
Mean pin wear	*mm*					0.06
CERCHAR-Abrasivity-Index (**CAI**)						0.62
Standard deviation of **CAI**						*0.04*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 19 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	10-2
Depth (m):	12.30

Description:
Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.07*	*0.05*	*0.05*	*0.05*
Measurement d_2	*mm*	*0.05*	*0.07*	*0.05*	*0.06*	*0.05*
Measurement d_3	*mm*	*0.04*	*0.07*	*0.04*	*0.05*	*0.02*
Measurement d_4	*mm*	*0.04*	*0.06*	*0.05*	*0.05*	*0.03*
Mean reading d_M	*mm*	0.05	0.07	0.05	0.05	0.04
Mean pin wear	*mm*					0.05
CERCHAR-Abrasivity-Index (**CAI**)						0.52
Standard deviation of **CAI**						*0.11*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 20 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH11
Sample Ref.:	15-4
Depth (m):	19.20

Description:
Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.07*	*0.07*	*0.08*	*0.08*
Measurement d_2	*mm*	*0.08*	*0.06*	*0.09*	*0.06*	*0.07*
Measurement d_3	*mm*	*0.08*	*0.06*	*0.07*	*0.07*	*0.06*
Measurement d_4	*mm*	*0.06*	*0.06*	*0.07*	*0.07*	*0.06*
Mean reading d_M	*mm*	0.07	0.06	0.08	0.07	0.07
Mean pin wear	*mm*					0.07
CERCHAR-Abrasivity-Index (**CAI**)						0.70
Standard deviation of **CAI**						*0.07*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 20 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH12
Sample Ref.:	11-2
Depth (m):	12.75

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	2
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.02*	*0.02*	*0.04*	*0.03*	*0.05*
Measurement d_2	*mm*	*0.02*	*0.01*	*0.03*	*0.03*	*0.04*
Measurement d_3	*mm*	*0.04*	*0.02*	*0.02*	*0.04*	*0.03*
Measurement d_4	*mm*	*0.04*	*0.01*	*0.02*	*0.04*	*0.03*
Mean reading d_M	*mm*	0.03	0.02	0.03	0.04	0.04
Mean pin wear	*mm*					0.03
CERCHAR-Abrasivity-Index (**CAI**)						0.32
Standard deviation of **CAI**						*0.08*
Classification of **CAI**						**Extremely Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 21 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

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Project Name:

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH13
Sample Ref.:	09-1
Depth (m):	16.05

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.07*	*0.08*	*0.08*	*0.08*
Measurement d_2	*mm*	*0.09*	*0.07*	*0.10*	*0.07*	*0.06*
Measurement d_3	*mm*	*0.08*	*0.07*	*0.05*	*0.06*	*0.05*
Measurement d_4	*mm*	*0.06*	*0.07*	*0.06*	*0.08*	*0.06*
Mean reading d_M	*mm*	0.07	0.07	0.07	0.07	0.06
Mean pin wear	*mm*					0.07
CERCHAR-Abrasivity-Index (**CAI**)						0.68
Standard deviation of **CAI**						*0.04*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 20 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	06-1
Depth (m):	4.00

Description:
Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.04*	*0.06*	*0.08*	*0.08*	*0.07*
Measurement d_2	*mm*	*0.02*	*0.04*	*0.07*	*0.09*	*0.07*
Measurement d_3	*mm*	*0.05*	*0.08*	*0.08*	*0.08*	*0.06*
Measurement d_4	*mm*	*0.04*	0.05	*0.06*	*0.07*	*0.05*
Mean reading d_M	*mm*	0.04	0.06	0.07	0.08	0.06
Mean pin wear	*mm*					0.06
CERCHAR-Abrasivity-Index (**CAI**)						0.62
Standard deviation of **CAI**						*0.15*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 14 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH15
Sample Ref.:	16-1
Depth (m):	17.50

Description:
Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered

Sample details

Maximum grain size (mm)	1.5
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.08*	*0.08*	*0.08*	*0.07*	*0.07*
Measurement d_2	*mm*	*0.08*	*0.09*	*0.09*	*0.07*	*0.06*
Measurement d_3	*mm*	*0.09*	*0.07*	*0.10*	*0.06*	*0.06*
Measurement d_4	*mm*	*0.07*	*0.07*	*0.08*	*0.08*	*0.05*
Mean reading d_M	*mm*	0.08	0.08	0.09	0.07	0.06
Mean pin wear	*mm*					0.08
CERCHAR-Abrasivity-Index (**CAI**)						0.76
Standard deviation of **CAI**						*0.11*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 14 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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CERCHAR ABRASIVITY

Borehole Ref.:	BNO-OWF-BH17
Sample Ref.:	13-4
Depth (m):	12.50

Description:
Extremely weak brown and light grey CALCISILTITE. Fresh to slightly weathered

Sample details

Maximum grain size (mm)	<1
Condition as tested	As received
Planes of weakness	
Direction of stylus	No weakness
Surface condition (correction)	Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus : Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d_1	*mm*	*0.06*	*0.06*	*0.07*	*0.06*	*0.05*
Measurement d_2	*mm*	*0.06*	*0.06*	*0.06*	*0.05*	*0.07*
Measurement d_3	*mm*	*0.08*	*0.05*	*0.06*	*0.06*	*0.05*
Measurement d_4	*mm*	*0.05*	*0.05*	*0.05*	*0.04*	*0.04*
Mean reading d_M	*mm*	0.06	0.06	0.06	0.05	0.05
Mean pin wear	*mm*					0.06
CERCHAR-Abrasivity-Index (**CAI**)						0.56
Standard deviation of **CAI**						*0.05*
Classification of **CAI**						**Very Low abrasiveness**

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI	
0.1-0.4	Extremely low
0.5-0.9	Very low
1.0-1.9	Low
2.0-2.9	Medium
3.0-3.9	High
4.0-4.9	Very high
≥5	Extremely high

Date tested: 28 January 2026

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 03/02/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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DETERMINATION OF THE SLAKE-DURABILITY INDEX

Sample details				Slaking Fluid Temp. (ºC)	Appearance of fragments after 2nd cycle	Natural Water Content (%)	1st Cycle	2nd Cycle
Borehole Ref.	Sample Ref.	Depth (m)	Description				Slake Durability Index $I_{d(1)}$	Slake Durability Index $I_{d(2)}$
BNO-OWF-BH01	13-1	13.00	Weak to moderately weak light grey fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	17	**73.6**	**67.1**
BNO-OWF-BH01	17-4	19.65	Weak to moderately weak light brown mottled cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	19	**88.6**	**84.3**
BNO-OWF-BH02	01-2	0.40	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	10	**95.2**	**93.8**
BNO-OWF-BH02	10-1	7.70	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	26	**81.0**	**72.6**
BNO-OWF-BH03	11-2	16.15	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	26	**70.5**	**56.9**
BNO-OWF-BH03-a	01-2	0.15	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	10.0	**96.8**	**95.9**
BNO-OWF-BH04	06-1	3.50	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	12	**94.8**	**92.4**
BNO-OWF-BH04	12-3	10.50	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	25	**78.9**	**67.7**
BNO-OWF-BH04	18-3	18.35	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	23	**68.0**	**53.6**
BNO-OWF-BH07	02-1	4.00	Weak to moderately weak light brown fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	25	**76.4**	**65.6**

Note: Tap water used as slaking fluid.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 22/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

DETERMINATION OF THE SLAKE-DURABILITY INDEX

Sample details				Slaking Fluid Temp. (ºC)	Appearance of fragments after 2nd cycle	Natural Water Content (%)	1st Cycle	2nd Cycle
Borehole Ref.	Sample Ref.	Depth (m)	Description				Slake Durability Index $I_{d(1)}$	Slake Durability Index $I_{d(2)}$
BNO-OWF-BH07	11-2	19.90	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	14	**89.1**	**86.3**
BNO-OWF-BH08	01-4	0.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	13	**94.3**	**92.3**
BNO-OWF-BH10	04-1	2.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	21	**82.7**	**78.7**
BNO-OWF-BH10	07-2	16.70	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	21	**79.8**	**73.0**
BNO-OWF-BH11	10-2	12.30	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	23	**68.1**	**54.2**
BNO-OWF-BH11	15-4	19.20	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: Silt and sand size chippings.	20	**89.0**	**85.6**
BNO-OWF-BH12	11-2	12.75	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	20	**68.7**	**57.8**
BNO-OWF-BH12	17-2	19.35	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	24	**68.2**	**49.5**
BNO-OWF-BH13	09-1	16.05	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	24	**53.6**	**35.0**
BNO-OWF-BH15	06-1	4.00	Weak to moderately weak cream fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	27	**78.1**	**68.2**

Note: Tap water used as slaking fluid.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 22/01/2026

Project Number:

GEO / 44072

Project Name:

DGEC BRETAGNE NORD-OUEST
506718-F255276

GEOLABS

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

DETERMINATION OF THE SLAKE-DURABILITY INDEX

Sample details				Slaking Fluid Temp. (ºC)	Appearance of fragments after 2nd cycle	Natural Water Content (%)	1st Cycle	2nd Cycle
Borehole Ref.	Sample Ref.	Depth (m)	Description				Slake Durability Index $I_{d(1)}$	Slake Durability Index $I_{d(2)}$
BNO-OWF-BH15	16-1	17.50	Weak to moderately weak white fine to coarse grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	16	**68.2**	**54.6**
BNO-OWF-BH17	13-2	11.60	Weak to moderately weak light grey fine grained CALCARENITE. Slightly weathered	20 ± 2	Retained: Retained specimen consist of large and small fragments. Passing: Silt and sand size chippings.	25	**84.4**	**75.2**

Note: Tap water used as slaking fluid.

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Appendix A

Guidelines on Use of Report

A.1 Guidelines on Use of Report

This report (the 'Report') was prepared as part of the services (the 'Services') provided by Fugro France S.A.S ('Fugro') for its client (the 'Client') under the terms of the relevant contract between the two parties (the 'Contract'). The Services were performed by Fugro based on the requirements of the Client set out in the Contract or otherwise made known by the Client to Fugro at the time.

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Appendix B

Cone Penetration Tests

B.1 Cone Penetration Test Definitions

This section details the cone penetration test equipment, procedures and applicable equations.

Description	Document Number
Cone Penetration Test	FNLM-GEO-APP-001
Geotechnical Parameter Values	FNLM-GEO-APP-012

Cone Penetration Test

Introduction

The cone penetration test (CPT) involves the measurement of the resistance of ground to steady and continuous penetration of a cone penetrometer equipped with internal sensors. The measurements comprise penetration depth, cone resistance, sleeve friction and, optionally, pore pressure and inclination from vertical. These measurements permit interpretation of ground conditions.

CPT apparatus and procedures adopted by Fugro are in general accordance ISSMGE (1999), ASTM D5778-20, ISO 22476-1:2022, and ISO 19901-8:2014. General agreement also applies to Eurocode 7 (CEN, 2007).

Fugro offers CPT systems operated from (1) ground surface and seafloor (non-drilling deployment mode) and (2) downhole in a borehole (drilling deployment mode).

CPT Apparatus

General

CPT apparatus includes various parts as described below:

- Thrust machine: apparatus providing thrust to the push rods so that the recommended rate of penetration (20 mm/s) is controlled;
- Reaction equipment: reaction for the thrust machine;
- Push rod: thick-walled cylindrical tube used for advancing the penetrometer to the required test depth. Push rods may also consist of drill pipe;
- Friction-cone penetrometer (CPT): cylindrical terminal body mounted on the lower end of the push rods, including a cone, a friction sleeve and internal sensing devices for the measurement of cone resistance, sleeve friction and, optionally, inclination;
- Piezocone penetrometer (CPTU or PCPT): cylindrical terminal body mounted on the lower end of the push rods, including a cone, a friction sleeve, a filter and internal sensing devices for the measurement of cone resistance, sleeve friction, pressure and, optionally, inclination and temperature;
- Measuring system: apparatus and software, including sensors, data transmission apparatus, recording apparatus and data processing apparatus.

Deployment from Ground Surface or Seafloor

Specific additional apparatus for CPT deployment from ground surface and seafloor (non-drilling deployment) can include:

- Push rod casing: guide for the part of the push rods protruding above the soil, and for the push rod length exposed in water or soil, to prevent buckling when the required penetration pressure increases beyond the safe limit for the exposed upstanding length of push rods;
- Friction reducer to reduce soil friction acting on the push rods: (1) ring or special projections fixed on the outside of the push rods, with an outside diameter larger than the base of the cone and/or (2) injection of low-friction fluid from the push rod at a fixed distance above the cone penetrometer.

Downhole Borehole Deployment

Downhole CPT systems latch into a bottom hole assembly at the lower end of a drill pipe. System options are:

1. Operation of a downhole thrust machine by applying mud pressure in the borehole;
2. Remote control of a downhole thrust machine by hydraulic pressure transmitted through an umbilical cable connected to a surface-based pump unit, together with;
3. Application of thrust to drill rods where CPT apparatus and a short push rod are latched in the bottom hole assembly; the thrust machine is at ground surface or seafloor.

Downhole CPTs require drilling apparatus for advancing the borehole. The maximum CPT stroke is generally 1.5 m or 3 m.

Data recording can be surface-based and/or downhole.

Cone Penetrometer

Typical features of Fugro penetrometers (Figure 1) include:

- Cone base areas of 500 mm^2, 1000 mm^2 or 1500 mm^2;
- Cone and friction sleeve sensors placed in series, i.e. subtraction-type penetrometers;
- Pore pressure measurements either at the face of the cone (u_1 location) or at the cylindrical extension of the cone (u_2 location). Multiple-sensor penetrometers (u_1, u_2 and u_3 locations) are also available. The u_3 location is immediately above the friction sleeve;
- Inclinometer;
- Temperature sensor, e.g. for cone penetrometer class 0 specified in ISO 22476-1:2022;
- Storage of signals from the penetrometer in digital form for subsequent computer-based processing and presentation.

Apparatus for Additional Measurements

Add-on apparatus (and procedures) can apply to specific additional measurements, refer to section 'Additional Measurements' below.

Procedure

General

Figure 2 summarises the test procedure. The procedure includes several stages. The stage of Additional Measurements is optional.

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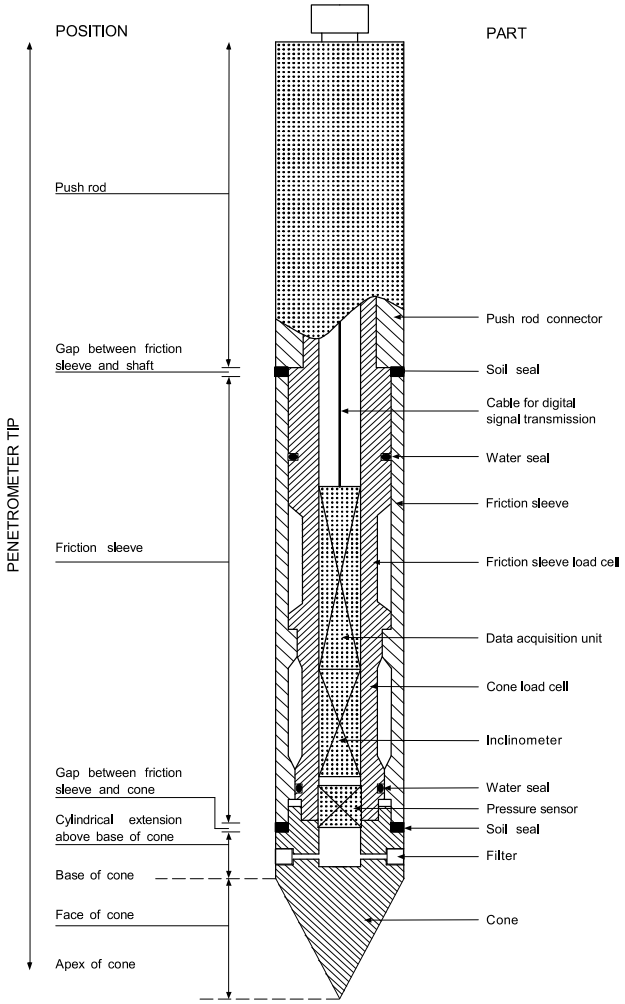

Figure 1: Piezocone penetrometer

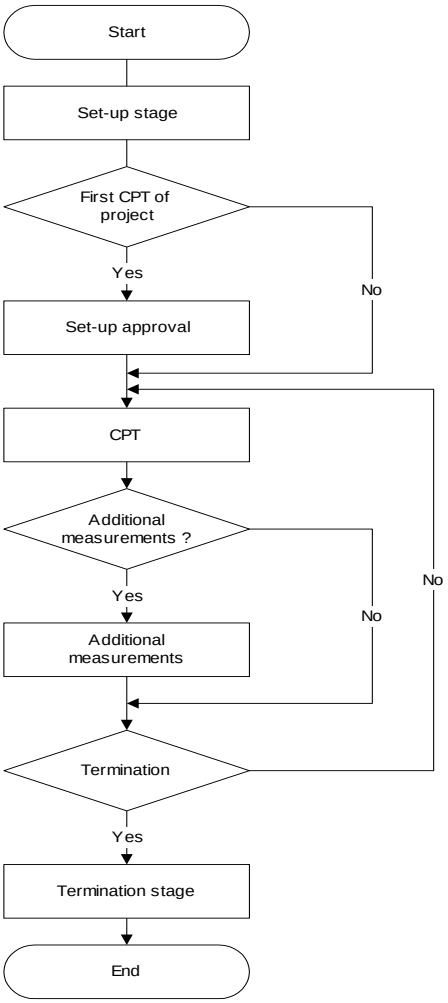

Figure 2: Flow chart

Set-up Stage and Termination Stage

The set-up stage is at discretion of the equipment operator, particularly considering suitability of expected ground type(s), accessibility, risk of damage to equipment and safety of persons.

Set-up requires a reasonably flat, accessible, ground surface with a slope of 5° or less. Most onshore thrust machines have levelling facilities allowing a vertical start of penetration. Seabed frames used for offshore CPT activities have no levelling facilities, i.e. start of penetration may not be vertical.

For over-water (marine/ offshore activities), additional accessibility considerations include:

- Minimum water depth for the selected pontoon, jack-up or vessel and the selected test equipment;
- Maximum water depth for the selected pontoon, jack-up or vessel;
- Maximum depth below water (sea) level of selected test equipment;
- Metocean conditions, particularly wind, waves, currents.

The set-up stage typically includes selection of equipment and procedures according to a required type of cone penetrometer, application class, cone penetrometer class, test category and data processing/ submission.

The set-up stage or the termination stage includes the location survey, i.e. the determination of the coordinates and the ground surface elevation (or the water depth).

The set-up stage and the termination stage for a downhole CPT include lowering of the CPT apparatus into the borehole and lifting respectively. Most projects require multiple downhole tests in a single borehole.

For piezocone testing, the set-up stage also includes the following steps:

- Office-based or site-based: de-airing of the filter in glycerine by application of 24-hour vacuum and storage in a glycerine-filled container;
- On-site: glycerine filling of hollow space in the cone penetrometer and subsequent mounting of the filter;
- On-site: application of a flexible membrane around the filter to prevent loss of saturating fluid prior to the start of a test.

Land-based tests may include specific measures to help retention of filter saturation during penetration of partially saturated zones. Relaxation of requirements typically applies to offshore tests where water pressures will force entrapped air into solution.

Criteria for test termination are as follows, unless specifically agreed otherwise:

- As instructed by client;
- Reaching target penetration;
- Reaching maximum capacity of the thrust machine, reaction equipment, push rods and/or measuring sensors;

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- Sudden increase in penetrometer inclination;
- Risk of damage to apparatus or safety of persons, at discretion of equipment operator or as determined by software algorithms;

whichever occurs first and as applicable. Note that ASTM and ISO standards provide no specific requirements for maximum penetrometer inclination from vertical. A value of 15° is commonly considered.

Application Classes – ISO 19901-8:2014

Table 1 summarises application classes specified in ISO 19901-8:2014 for offshore and nearshore CPTs. The allowable minimum accuracy of a measured parameter is the larger value of the two quoted. A percentage value applies to the measured value and not to the measuring range.

Table 1: Application classes (ISO 19901-8:2014)

Application Class	Parameter	Allowable Minimum Accuracy
1	Cone resistance	35 kPa or 5 %
	Sleeve friction	5 kPa or 10 %
	Pore pressure	25 kPa or 5 %
2	Cone resistance	100 kPa or 5 %
	Sleeve friction	15 kPa or 15 %
	Pore pressure	50 kPa or 5 %
3	Cone Resistance	200 kPa or 5 %
	Sleeve friction	25 kPa or 15 %
	Pore pressure	100 kPa or 5 %

The concept of application classes considers intended soil conditions for selection of an application class. For example, Application Class 1 of ISO 19901-8:2014 can be selected for 'very soft to soft soil deposits', which is approximately equivalent to $q_c < 0.5$ to $q_c < 1$ MPa. In other words, Application Class 1 should not apply to 'mixed bedded soil profiles with weak to strong layers'.

The accuracy values apply to seafloor as reference. They are uncoupled from uncertainty of spatial position below ground surface or seafloor.

Historically, the concept of application classes was based on an international reference test procedure (ISSMGE, 1999), which specifies 'performance' criteria for cone penetration test measurements. The test results should meet the requirements of one of the application classes.

The following comments apply:

- Accuracy is the 'closeness of a measurement to the true value of the quantity being measured'. It is the accuracy as a whole that is ultimately important not the individual parts. Precision is the 'closeness of each set of measurements to each other'. The resolution of a measuring system is the 'minimum size of the change in the value of a quantity that it can detect'. It will influence the accuracy and precision of a measurement.
- Application Class 3 typically represents industry practice. They are approximately equivalent to the more implicit requirements of ASTM International. Class 3 applies, unless specifically agreed otherwise.

Differences in interpretation about compliance with the ISO box values for accuracy became apparent after publication of a predecessor of ISO 22476-1:2022 and, subsequently, publication of ISO 19901-8:2014. Unfortunately, the interpretational challenges emerged from contractual disputes, unnecessary re-work and CPT results assigned higher confidence than actual (e.g. Peuchen and Parasie, 2019).

The zero drift of a measured parameter can be compared with the allowable minimum accuracy according to the selected application class, per test. This comparison considers the maximum range of values of q_c, f_s and, where applicable, u_1 or u_2 for calculation of the percentage box values (Table 1: Application classes (ISO 19901-8:2014)). Zero drift' of a measured parameter is an approximate performance indicator for the measuring system (Peuchen and Terwindt, 2014). Zero drift is the absolute difference of the zero readings, reference readings or zero reference reading of a measuring system between the start and completion of the cone penetration test. The reference readings can be taken at (1) atmospheric pressure at ground surface or above water level or (2) under hydrostatic water pressure close to seafloor.

ISO 19901-8:2014 is under revision (2023). The revision will probably lead to replacement of the application classes by a prescriptive approach similar to that specified in ISO 22476-1:2022, i.e. method-based requirements and cone penetrometer classes.

Cone Penetrometer Classes and Test Categories – ISO 22476-1:2022

The applicability of ISO 22476-1:2022 is onshore and nearshore. The standard allows selection of cone penetrometer classes and test categories, i.e. method-based criteria. Compliance with a particular cone penetrometer class and test category then provides some indication for uncertainty of CPT results.

Cone penetrometer classes rely on results of detailed laboratory calibration and verification of cone penetrometers. The results determine compliance of a cone penetrometer with one of four cone penetrometer classes (Table 2). A cone penetrometer can conform to more than one cone penetrometer class, for the case of multiple intervals for calibration.

Input criteria for the cone penetrometer classes include:

- Minimum measurands per cone penetrometer class (Table 2);
- Laboratory cone resistance and sleeve friction: (1) selected uncertainty components for axial force, (2) resolution and output stability, (3) verification values of ambient temperature stability, transient temperature stability and bending influence;
- Laboratory pore pressure: (1) selected uncertainty components for water (or gas) pressure, (2) resolution and output stability, (3) verification values of ambient temperature stability, transient temperature stability and bending influence;
- Inclination: expanded measurement uncertainty for inclination values determined in a calibration laboratory.

Table 2: Required measurands per cone penetrometer class (ISO 22476-1:2022)

Cone Penetrometer Class	q_c	f_s	u_2	T
0	√	√	√	√
1	√	√	√	
2	√	√		
3	√	√		

Notes
q_c = cone resistance
f_s = sleeve friction
u_2 = pore pressure (and/or u_1)
T = temperature

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Test categories consider requirements for (1) cone penetrometer class and (2) reference readings and output stability of a cone penetrometer recorded just before the cone penetrometer penetrates the ground and just after the cone penetrometer leaves the ground (Table 3). The requirements for pore pressure u_2 (or u_1) apply according to cone penetrometer class (Table 2).

Table 3: Requirements for test categories (ISO 22476-1:2022)

Test Category	Reference Readings [kPa]	Output Stability [kPa]	Cone Penetrometer Class
A	$\Delta q_{c;0} \leq 15$	$2\hat{u}_{qc} \leq 1$	0
	$\Delta f_{s;0} \leq 5$	$2\hat{u}_{fs} \leq 0.5$	
	$\Delta u_{2;0} \leq 3$	$2\hat{u}_{u2} \leq 0.5$	
B	$\Delta q_{c;0} \leq 35$	$2\hat{u}_{qc} \leq 5$	0 or 1
	$\Delta f_{s;0} \leq 5$	$2\hat{u}_{fs} \leq 1.5$	
	$\Delta u_{2;0} \leq 10$	$2\hat{u}_{u2} \leq 3$	
C	$\Delta q_{c;0} \leq 100$	$2\hat{u}_{qc} \leq 11$	0, 1, or 2
	$\Delta f_{s;0} \leq 15$	$2\hat{u}_{fs} \leq 3$	
	$\Delta u_{2;0} \leq 25$	$2\hat{u}_{u2} \leq 8$	
D	$\Delta q_{c;0} \leq 200$	$2\hat{u}_{qc} \leq 33$	0, 1, 2, or 3
	$\Delta f_{s;0} \leq 25$	$2\hat{u}_{fs} \leq 5$	
	$\Delta u_{2;0} \leq 50$	$2\hat{u}_{u2} \leq 16$	

Notes
$\Delta q_{c;0}$ = difference in reference readings for cone resistance q_c
$\Delta f_{s;0}$ = difference in reference readings for sleeve friction f_s
$\Delta u_{2;0}$ = difference in reference readings for pore pressure u_2 (or u_1)
$2\hat{u}_{qc}$ = output stability for q_c
$2\hat{u}_{fs}$ = output stability for f_s
$2\hat{u}_{u2}$ = output stability for u_2 (or u_1)

The difference in reference readings (e.g. $\Delta q_{c;0}$) of a sensor is calculated from sensor output recorded at a frequency of ≥1 Hz, as follows:

- Subtracting the mean value of reference readings of a particular sensor (e.g. sensor for q_c), for a period of one minute shortly before the penetration phase from the mean value of reference readings for a period of one minute shortly after the extraction phase, expressed as an absolute value;
- Cone penetrometer is vertical and under no load, atmospheric or selected ambient water pressure;
- Cone penetrometer is under temperature conditions close to ground temperature.

Calculation of output stability (peak-to-peak) of a sensor (e.g. $2\hat{u}_{qc}$) makes use of reference readings as described above. The calculation considers the larger value of subtracting the maximum and minimum sensor values for a period of one minute shortly before the penetration phase and for a period of one minute shortly after the extraction phase.

Results

CPT Parameters

Presentation of results from cone penetration tests typically includes:

- CPT parameters q_c, f_s and R_f versus depth below ground surface or versus elevation;
- Additional CPTU parameters u_1 or u_2 and, optionally, q_t, q_n, B_q, Q_t, Q_{tn}, F_r, I_c, I_B and CD for tests with pore pressure measurements;
- Inclination i for tests with inclination measurements;
- Standard graphical format and digital (tabular) ASCII or AGS formats.

Presentation of temperature T versus depth only applies to test results meeting the requirements of both cone penetrometer class 0 of Table 2 and test category A of Table 4.

Most standards specify scales for graphical presentation as follows:

- Axis for penetration depth z: 1 scale unit = 1 m;
- Axis for cone resistance q_c, corrected cone resistance q_t and net cone resistance q_n: 1 scale unit = 2 MPa or 0.5 MPa;
- Axis for sleeve friction f_s: 1 scale unit = 50 kPa;
- Axis for friction ratio R_f: 1 scale unit = 2 %;
- Axis for pore pressure u: 1 scale unit = 0.2 MPa or 0.02 MPa;
- Axis for pore pressure ratio B_q: 1 scale unit = 0.5.

Graphical presentation aims for these scale units and scale ratios, where suitable and practicable.

The reference level of a test is (1) the ground surface for onshore tests, (2) the seafloor for nearshore and offshore tests. Data processing presumes a hydrostatic pore pressure profile relative to seafloor, unless specifically indicated otherwise. The definition of CPT parameters is as follows:

z = penetration depth relative to ground surface or seafloor, corrected for inclination from vertical (i) where a test includes inclination measurements, as follows:

$$z = \int_0^l \cos\, i \cdot \mathrm{d}l$$

where:

- z = penetration depth for the conical base of the cone penetrometer
- l = recorded penetration length
- i = recorded inclination from vertical

q_c = cone resistance relative to the reference level of the test.

f_s = sleeve friction relative to the reference level of the test. A calculated depth correction applies so that the presented sleeve friction corresponds with the cone depth.

f_t = corrected sleeve friction relative to the reference level of the test. Sleeve friction is corrected for pore pressures acting on the end areas of the friction sleeve

$$f_t = f_s - \frac{(u_2 * A_{sb} - u_3 * A_{st})}{A_s}$$

or simplified to:

$$f_t = f_s - u_2 \frac{(A_{sb} - A_{st})}{A_s} \quad \text{or}$$

$$f_t = f_s - (u_2 * a_{fs})$$

where:

- A_{sb} = cross sectional area in the gap between the friction sleeve and the cone
- A_{st} = cross sectional area in the gap above the friction sleeve
- A_s = surface area of the friction sleeve
- a_{fs} = net area ratio of the friction sleeve $(A_{sb} - A_{st})/A_s$

R_f = ratio of sleeve friction to cone resistance (f_s / q_c). This calculated ratio is for the cone depth.

R_{ft} = corrected friction ratio (f_s / q_t). The ratio f_t/q_t applies if f_t is known.

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u_1 = pore pressure at the face of the cone, relative to the reference level of the test.

u_2 = pore pressure at the cylindrical extension above the base of the cone or in the gap between the friction sleeve and the cone, relative to the reference level of the test.

u_3 = pore pressure immediately above the friction sleeve or in the gap above the friction sleeve, relative to the reference level of the test.

Commonly, no measurement of u_3 applies. An estimate can be obtained using $u_3 = 0.7\ (u_2 - u_0) + u_0$ according to SGI (1991). This estimate is independent of positive or negative values of $u_2 - u_0$.

u_0 = hydrostatic pore pressure at the cone, relative to the phreatic surface or the seafloor. This is a calculated value.

q_t = corrected cone resistance (also called total cone resistance). This includes corrections for hydrostatic and transient pore pressures, and cone construction. The corrected cone resistance is relative to ground surface or seafloor:

$q_t = q_c + (1\text{-}a)u_2$ or

$q_t = q_c + (1\text{-}a)[K(u_1 - u_0) + u_0]$

Historically, equations for downhole tests were:

$q_t = q_c + (1\text{-}a)u_2 + u_{0i}$ or

$q_t = q_c + (1\text{-}a)[K(u_1 + u_{0i} - u_0) + u_0] + a * u_{0i}$

where:

a = net area ratio of the cross-sectional steel area at the gap between cone and friction sleeve to the cone base area. This ratio is penetrometer-type dependent. The a-factor indicates the effect of pore pressure on unequal cross-sectional areas of the cone.

u_{0i} = hydrostatic pore pressure at the bottom of the borehole, relative to seafloor. This is a calculated value.

K = adjustment factor for the ratio of pore pressure at the cylindrical extension above the base of the cone to pore pressure on the cone face $K = (u_2 - u_0)/(u_1 - u_0)$

The term $u_2 - u_0$ refers to excess pore pressure (with respect to hydrostatic pore pressure). Common symbols for excess pore pressure are du_2 and Δu_2. Similarly, du_1 and Δu_1 can represent the term $u_1 - u_0$.

The K-factor is only of interest for processing of CPTU results with pore pressure measurement at the cone face (u_1). The factor depends on soil characteristics such as fabric, overconsolidation ratio, compressibility and crushability. The K-factor (Peuchen et al., 2010) can be estimated from:

$$K = 0.91\mathrm{e}^{-0.09{Q_t}^{0.47}}\left(\frac{1}{1+F_r(0.17+0.061(Q_t-21.6)^{1/3})} - \mathrm{e}^{-2F_r}\right)$$

q_n = $q_t - \sigma_{vo}$ = net cone resistance. This includes corrections for hydrostatic and transient pore pressures, in situ stress, and cone construction. The symbol for q_n may also be q_{net}.

where:

σ_{vo} = total in situ vertical stress at the cone base, relative to ground surface or seafloor. This is a calculated value.

B_q = pore pressure ratio $B_q = (u_2 - u_0)/q_n$ or

$B_q = K(u_1 - u_0)/q_n$

Q_t = q_n/σ'_{v0} = normalized cone resistance

where:

σ'_{v0} = effective in situ vertical stress at the cone base, relative to ground surface or seafloor. This is a calculated value.

Q_{tn} = normalized cone resistance with variable stress exponent n, where:

$$Q_{tn} = [(q_t - \sigma_{v0})/P_a](P_a/\sigma'_{v0})^n$$

$$n = 0.381\ (I_c) + 0.05\ (\sigma'_{vo}\ /\ P_a) - 0.15 \quad \text{and} \quad n \le 1$$

(Zhang et al., 2002)

where:

P_a = atmospheric pressure

F_r = f_t/q_n = normalized friction ratio

U_2 = normalized excess pore pressure $(u_2 - u_0)/\sigma'_{v0}$

I_B = soil behaviour type index (Robertson, 2016)

$I_B = 100(Q_{tn} + 10)/(70 + Q_{tn}F_r)$

I_c = soil behaviour type index (Robertson and Wride,1998)

$I_c = [(3.47 - \log Q_{tn})^2 + (\log F_r + 1.22)^2]^{0.5}$

I_{SBT} = soil behaviour type index (Robertson, 2010)

$I_{SBT} = [(3.47 - \log (q_c/P_a))^2 + (\log R_f + 1.22)^2]^{0.5}$

CD = contractive-dilative boundary (Robertson, 2016)

$CD = (Q_{tn} - 11)(1 + 0.06F_r)^{17}$

Presented values for u_2, q_t, q_n and B_q may be denoted by u_2^*, q_t^*, q_n^*, B_q^*, Q_t^* and F_r^* if u_2 is derived rather than measured, for example if derived by applying a K-factor.

Pore pressure u_2 at the cylindrical extension is commonly assumed equal to u_{2g} in the gap. The assumption $u_2 = u_{2g}$ is probably reasonable for deepwater CPTs and associated high values of ambient pressure that promote saturated conditions in the gap. A similar comment applies to u_3. Note that CPTU saturation procedures apply to the pore pressure measuring system only. These procedures exclude the gaps below and above the friction sleeve.

Some deployment systems allow monitoring of CPT parameters in reverse mode, i.e. upon retraction of the cone penetrometer. This optional feature presents additional information that can improve interpretation of ground behaviour, for example strength sensitivity of fine-grained soil.

Metrological Confirmation

CPT results include information on metrological confirmation. Examples covered by CPT standards include reporting of application class, cone penetrometer class, test category and reference readings.

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The ISO standard on metrological confirmation (ISO 10012:2003) provides the general framework for assessment of performance compliance.

Cone penetration test standards can follow a 'prescriptive' approach, whereby specific detailed measures provided a 'deemed to comply' practice. ASTM D5778-20 and ISO 22476-1:2022 provide examples of this approach.

The level of detail required by standards can be high. For example, ISO 22476-1:2022 includes detailed procedures for calibration and verification of CPT systems, with normative references to ISO/IEC 17025:2017. Fugro's calibration laboratory holds formal accreditation for cone penetrometer calibration and verification according to ISO/IEC 17025:2017.

Peuchen and Terwindt (2014, 2015) provide guidance on uncertainty estimation for cone penetration test results. The calculation model for uncertainty estimates for q_c, f_s and u considers the following uncertainty contributions, where applicable: (1) force and pressure sensors, (2) geometry of the cone penetrometer, (3) effects from ambient and transient temperature, (4) non-axial force on cone penetrometer (bending moment), (5) ambient fluid pressure in soil and (6) zero offsets for q_c, f_s and u relative to seafloor.

Temperature Stability of Cone Penetrometer

Uncertainty considerations for strongly layered soils should allow for heat flux phenomena. Heat flux gives an apparent shift in cone resistance. For example, friction in dense sand causes a cone to heat by about 1°C/MPa cone resistance. Resulting heat flux changes cone resistance by an apparent shift in the order of 100 kPa to 200 kPa for a penetrating probe going from dense sand into clay. This is a temporary change lasting about 5 minutes. Penetration interruption can serve as mitigation measure for transient temperature effects. The incorporation of one or more add-on temperature sensors in a cone penetrometer, and associated data algorithms, can reduce the effects from ambient and transient temperature fluctuations (Peuchen et al. 2020).

Pore Pressures

A CPTU pore pressure measuring system is intended for use in water-saturated uncemented fine-grained soil. Pore pressure measurements (u) are commonly assumed to represent pore water pressures. This assumption is reasonable for soils saturated under in situ stress conditions and remaining saturated during penetration of the cone penetrometer.

Pore pressure results obtained for ground conditions such as partially saturated soils, very dense sands and cemented soils may not be representative and/or repeatable. For example, stiffness differences between the steel components of the cone penetrometer and the piezocone filter can affect results for very dense sands.

Loss of saturation of the pore pressure measuring system can occur during a test (Peuchen et al. 2020). Loss of saturation usually causes a sluggish pore pressure response during penetration of ground below the zone causing desaturation of the pore pressure measuring system. Reasons for loss of saturation include:

- Penetration of partially saturated ground, for example ground containing significant amounts of gas;
- Reduction of pore pressure to below in situ pore pressure, causing gas in solution to become free gas;
- Penetration interruption for a stationary in situ test or for add-on of a push rod, that will cause:
  - Abrupt cone penetrometer deceleration and acceleration, with a possibility of upward movement of the cone penetrometer
  - Change of stress conditions around the cone penetrometer, including pore pressure and gas migration where applicable
  - Small volume change of the gaps below and above the friction sleeve of the cone penetrometer
- For u_2 filter position: proximity of gap between cone tip and friction sleeve, i.e. net area ratio $a < 1$. This gap may not be water-saturated, which in turn can lead to (1) substantial, local (undesired) pore pressure gradients and (2) loss of saturation of the u_2 filter itself;
- Measurement of negative pore pressures such that cavitation occurs; for example, this is not uncommon for a piezocone filter located at the cylindrical extension above the base of the cone (u_2 location), at the time of penetration of dense sand or overconsolidated clay layers.

Re-saturation of a pore pressure measurement system can take place upon further penetration into soil. Particularly, re-saturation may take place in saturated low-permeability soils (clays) that are normally consolidated or lightly overconsolidated and where the gap can become saturated by adequate supply of water and/or water pressure.

Measured pore pressures affected by desaturation of the pore pressure measurement system may not be representative of soil behaviour. Consequently, derived parameter values that use pore pressure may also not be representative.

Shallow Penetration

Shallow penetration will affect CPT measurements. Values of q_c, f_s and u for initial penetration of a cone penetrometer below ground surface, seafloor or bottom of a borehole will differ from a fully embedded cone penetrometer. As a general guide, initial penetration effects can be expected for a distance of about 8 times the diameter of the cone penetrometer for q_c, u_1 and u_2, and for a distance of about 15 times the diameter of the cone penetrometer for f_s. Initial penetration effects can be deeper for downhole borehole deployment. This is because of (1) complex ground stress conditions immediately below the required borehole and (2) borehole-induced ground disturbance that cannot be avoided.

Use of reaction equipment will affect stress conditions for shallow penetration. Particularly, offshore conditions may include extremely soft ground at seafloor. Soil disturbance, pore pressure build-up and consolidation of near-surface soft soil may take place.

Penetration Rate

CPT standards typically provide limits of ± 5 mm/s for a nominal penetration rate of 20 mm/s. Considerations include:

- A typical thrust machine provides a push speed with an uncertainty within ± 5 mm/s under favourable conditions. Under adverse conditions, penetration rates may be outside these limits, for example with strongly varying thrust and towards the thrust limit of a thrust machine;
- The penetration rate is not necessarily equal to the push speed because of inevitable vertical movements of the thrust machine and length variation and bending of the push-rod string.

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Penetration Interruption

A penetration interruption may be unavoidable, for example to add a push rod or to perform a pore pressure dissipation test. This will affect test results.

Consolidation of low-permeability soil around a cone tip is of particular interest. A stationary cone penetrometer can apply local stresses that approach failure conditions, i.e. about 9 times the undrained shear strength or about 2 times the in situ mean effective stress. Pore pressure re-distribution and dissipation occur, resulting in a local increase in undrained shear strength and hence cone (bearing) resistance. A doubling of cone resistance may not be unreasonable for 100 % consolidation. Supplementary considerations include:

- Small downward movement of a penetrometer (order of millimetres) during a test can contribute to maintaining local stresses approaching failure conditions;
- Soil consolidation around a cone penetrometer may lead to soil/penetrometer adhesion that is sufficient to give an increase in 'cone' diameter. Resumption of penetration will lead to loss of adhered soil, usually within an equivalent distance of a few times the cone diameter;
- A low B_q value may imply partially drained penetration conditions. It is likely that any steady-state penetration conditions will not apply instantaneously upon resumption of penetration;
- Measuring sensors in a probe generate heat, but this is probably not significant for any stationary measurement. Fugro's strain-gauge load sensors are compensated for ambient temperature fluctuations.

Depth Measurement for Offshore Conditions

Table 4 presents depth accuracy classes according to ISO 19901-8:2014. The type of uncertainty is undefined (e.g. combined standard uncertainty or expanded measurement uncertainty with a coverage factor $k = 2$).

Peuchen and Wemmenhove (2020) present a probabilistic approach to depth uncertainty assessment for in situ testing data points, with reference to these accuracy classes.

Offshore definition of the seafloor (ground surface) is difficult for extremely soft ground at seafloor (ISO 19901-8:2014). Penetration of the reaction equipment into a near-fluid zone of the seabed may take place unnoticed. Such settlement affects the start of penetration depth z. Also, settlement may continue at the time of testing.

Downhole CPT systems rely on depth control applicable to borehole drilling. Depth control according to Z2 of Table 4 is typically feasible for drilling systems deployed from a fixed platform, for example a jack-up. This value excludes uncertainty associated with determination of seafloor level. Drilling control from floating equipment, for example a geotechnical survey vessel, may be subject to the additional influence of waves and tides. Z2 is typically feasible for favourable conditions. Z3 or Z4 may apply for adverse conditions.

Table 4: Depth accuracy classes (ISO 19901-8:2014)

Depth Accuracy Class	Maximum Data Point Depth Uncertainty [m]
Z1	0.1
Z2	0.5
Z3	1.0
Z4	2.0
Z5	> 2.0

Zero-Correction for Offshore Conditions

Water pressures generate significant values of cone resistance and pore pressure. The standardised practice is to correct these reference readings to zero at seafloor. CPT systems for non-drilling mode and for seafloor drilling mode allow zero-correction to hydrostatic conditions prior to the start of a test, typically with a zero-correction uncertainty approaching the resolution of the CPT system. Downhole borehole CPT systems latch into the lower end of a drill pipe. The pressure conditions in the drill pipe may not be in full equilibrium with the surrounding ground water pressure and zero-correction will be subject to increased uncertainty, i.e. uncertainty for pore pressure in the order of 100 kPa for deepwater tests (Peuchen, 2000). This uncertainty depends on factors such as the free-flow and viscosity of drill fluid between the drill bit and the seafloor. The uncertainty typically decreases with decreasing depth of the drill bit below sea level and below seafloor. Uncertainty for the zero-correction of cone resistance is approximately equivalent, but by a factor representing the net area ratio effect.

Deepwater Tests

A deepwater environment presents some favourable conditions for cone penetration tests, notably temperature. Ambient temperature conditions are practically constant and the measuring system has ample time to adjust to these temperatures. In addition, transient heat flow phenomena in a cone penetrometer are usually not applicable. This is because a cone penetrometer accumulates negligible (frictional) heat when penetrating the generally prevalent soils of very soft consistency.

Deepwater (piezocone) pore pressure measurements are essentially similar to shallow-water measurements, with the exception of an increased measuring range for pore pressure leading to some reduction in sensor accuracy. Saturation of a pore pressure measuring system is excellent for a deepwater environment, as the high pressures will force any gas bubbles into solution.

Currently available evidence indicates that a high-quality subtraction-type cone penetrometer is adequate for very soft soil characterisation to a water depth of 3000 metres and probably beyond.

Additional Measurements

Friction-cone and piezocone penetrometers allow specific additional measurements, such as friction set-up tests, pore pressure dissipation tests and measurements of ground water pressure. These additional measurements require a penetration interruption or may be feasible at the end of a test. It is also common to add other in situ test devices to a cone penetrometer. Table 5 presents the more common types.

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Table 5: Probes for additional in situ tests

Type of Probe	Properties	Units
Electrical Conductivity Penetrometer (ECPT)	Electrical conductivity, K	S/m
Temperature Cone Penetrometer (TCPT)	Temperature T, thermal conductivity k, volumetric heat capacity C	K, W/(m·K), MJ/m^{3}K
Seismic Cone Penetrometer (SCPT)	S-wave velocity v_s	m/s
Cone Pressuremeter (CPMT)	Stress-strain-time response σ, ε, t	MPa, -, s
Natural Gamma Penetrometer (GCPT)	Natural gamma ray γ	CPS
Cone Magnetometer (CMMT)	Magnetic flux density B, magnetic field horizontal angle θ, vertical angle ϕ	µT, °, °
Hydraulic Profiling Tool (HPT)	Permeability k	m/s
Notes S = Siemens m = metre K = Kelvin (or °C) W = Watt J = Joule	 s = second Pa = Pascal CPS = counts per second T = Tesla	

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Geotechnical Parameter Values

Scope

This document presents a summary of interpretation methods for derived values of geotechnical parameters. The definition of derived value is according to CEN (2009), CEN (2010), and ISO (2023): 'value of a geotechnical parameter obtained from test results by theory, correlation or empiricism'.

Figure 1 illustrates geotechnical parameter values in the context of structure design or structure (re)assessment (e.g. ISO, 2015), where GP refers to geotechnical parameter values, GM refers to ground model, and SC to wider site characterisation.

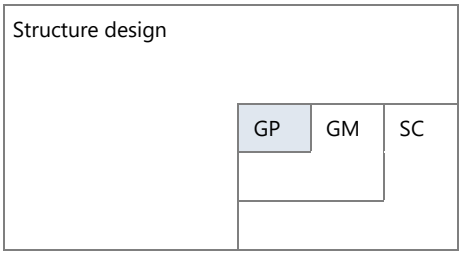

Figure 1: General context for geotechnical parameter values

The focus of this document is on:

- Mechanical properties of in situ soil, notably soil behaviour type and stress-strain-time dependent parameters (properties);
- Common data sources, i.e. ground intrusive technologies, particularly in situ testing, borehole geophysical logging, and laboratory testing;
- Methods that can provide parameter values by a transformation model and/or by empiricism, such as interpretation methods for cone penetration test (CPT) results.

This focus implies limited coverage of mechanical properties derived from (1) methods dedicated to obtaining derived values for a specific parameter, such as deriving undrained shear strength from an unconsolidated undrained triaxial compression test and (2) non-intrusive technologies (requiring no in-ground deployment of equipment), e.g. seismic reflection and seismic refraction.

Some of the presented methods suit computer-based interpretation of data records, machine learning and artificial intelligence.

The project-specific selection of methods and level of data integration depends on the agreed project requirements.

Procedure

Figure 2 outlines the procedure for development of geotechnical parameter values. Comments are given in 'Parameter Interpretation', below.

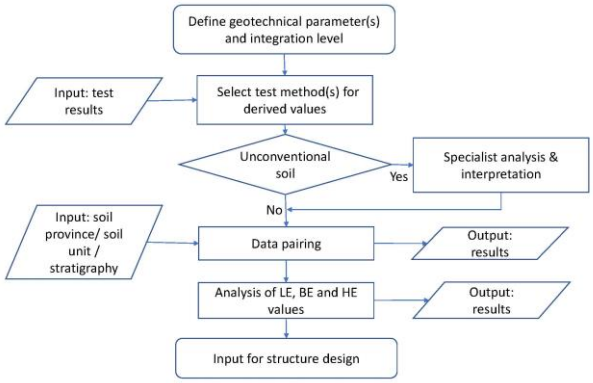

Figure 2: General procedure

Parameter Interpretation

Input for Structure Design

Derived values typically provide input for selection of characteristic values (e.g. CEN, 2009) and representative values (e.g. ISO, 2019) for geotechnical calculation models.

Conventional models are typically based on plasticity theory for ultimate limit states, and on elasticity theory and consolidation theory for serviceability limit states. Features of these geotechnical models are:

- Analysis of either drained (sand model) behaviour or undrained (clay model) behaviour for plasticity models;
- Analysis for the ultimate limit state differs from that for the serviceability limit state.

Data transformation may also be required for interpretation methods that apply to 'conventional' sands (drained soil behaviour) and clays (undrained soil behaviour). Drained or undrained behaviour (strain rate dependence) for the geotechnical analysis at hand may or may not coincide with respectively drained or undrained behaviour for a particular test method.

Reference Parameter and Transformation

This document uses the term reference parameter (or reference) for a precisely defined parameter. An example of a reference parameter is undrained shear strength s_u derived from a laboratory single-stage undrained triaxial compression test on an undisturbed clay specimen obtained by means of thin-walled push sampling, anisotropically consolidated to estimated in situ vertical and radial effective stress conditions, monotonically sheared at 20 °C, and s_u calculated by maximum value of principal stress ratio within an axial strain range of 0 to 15 %. A parameter such as 'triaxial undrained shear strength s_{uTXC} according to ISO 17892-9:2018 (ISO, 2018)' can render a wide range of results, for example because of lumping multiple methods of sampling (and associated sampling disturbance) and s_u values calculated according to distinctly different failure criteria.

Values of parameters defined differently from the reference parameter may not be directly comparable. Consideration can be given to transformation of such values to value estimates that would be reasonably appropriate for the reference parameter. Transformation (or data transformation) provides an equivalent change in parameter value or parameter equation (or correlation or transformation model) resulting from substitution of one set of parameter values by another. The change can be characterised by transformation uncertainty (ISO, 2015).

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Integrated Geosciences

Project-specific integration levels for parameter interpretation can range from (1) a basic scope covering geodata processing and presentation of relevant, site-specific data and comments on any apparent data anomalies to (2) integrated use of multidisciplinary (e.g. geotechnical and geophysical) data that include representative ground profiles of derived values of geotechnical parameters.

This document excludes details of advanced methods for integrated use of multidisciplinary data.

Applicability of Methods

Parameter interpretation typically considers applicability of methods for data acquisition and for data analysis. If a method is applied outside of the intended applicability, then parameter values can be obtained that are uncertain, incorrect and/or anomalous. In practice, the following approaches are taken for parameter values outside of intended applicability:

- Present the parameter values and apply appropriate judgement when using the results;
- Remove data by intervention (manually or by algorithms), such as by data clipping;
- Provide (approximate) corrections to parameter values, e.g. by post-processing.

Examples are given below.

A particular method may not be appropriate for silts, sand/clay/gravel mixtures, varved or layered soils, gassy soils, underconsolidated soils, peats, carbonate soils, cemented soils, and residual soils. These unconventional soils can require specialist analysis and interpretation. ISO (2023) includes a list of unconventional soils and potential difficulties.

Most methods for data acquisition and parameter interpretation consider applicability in terms of lower and upper limits of stress, strain and temperature. Such limits are typically given or implied for a particular test method. Parameter values outside of these ranges can be subject to high uncertainty.

Results of a cone penetration test depend on a standardised penetration rate. Inevitably, the penetration rate will (shortly) differ from the standardised penetration rate at the start of a test and at the end of a test or planned interruption of penetration. In some cases, data are clipped to remove sections with a non-standard penetration rate.

A transformation model can include assumptions about soil (un)disturbance and ambient stress conditions. This can mean that laboratory test results for a soil sample taken immediately below ground surface or immediately below the bottom of the borehole may be outside of the applicability of a transformation model. Similarly, a short section of cone penetration data immediately below ground surface or immediately below the bottom of the borehole can cause a situation of no or limited applicability.

Data Pairing

Data pairing can be required for obtaining derived values for some of the geotechnical parameters. For example, correlation of CPT net cone resistance q_n and laboratory undrained shear strength s_u for clays requires:

- Derived values for q_n;
- Derived values for s_u;
- Pairing of q_n data points and laboratory s_u data points applicable to a nearby, but not the same, location in space;
- A correlation equation such as $N_{kt} = q_n/s_u$, where N_{kt} is a cone factor.

Considerations for data pairing typically include:

- Definition of reference parameters and decisions on use of data acquired by methods other than those for the reference parameters;
- Decision rules and engineering judgement for screening of datasets for retention or removal of data, data checks, data detrending and data enhancement by integrated geosciences, see above;
- Applicability of methods, including undrained, partially drained or drained conditions;
- Uncertainties of the parameter values (source geodata) for data pairing, including any transformation uncertainties;
- Representativeness of soil specimens and/or in situ test zone, e.g. bias may be introduced by selecting laboratory test specimens from the more cohesive, homogeneous parts of samples, particularly where soil conditions are not uniform;
- Geo-spatial proximity between data points selected for pairing, particularly with respect to soil homogeneity and soil correlation length;
- Use of specific weight factors for e.g. data assessed of higher or lower quality or importance.

Low Estimate, Best Estimate, High Estimate Values

The project requirements can include assessment of *low estimate* (LE), *best estimate* (BE) and *high estimate* (HE) values for derived values.

Analysis of derived values for LE, BE and HE values can be performed and enhanced by one or more of the following methods:

- Application of statistical methods,
- Data pairing, including geodata from multiple sources;
- Use of relevant prior information, including public domain information;
- Judgement and opinion.

This document excludes further details of possible methods for geotechnical analysis on this topic.

CPT-based Interpretation Methods

CPT interpretation methods are mostly based on empirical correlations with limited theoretical backing. Data integration with other, complementary investigation techniques (such as geological analysis, borehole/sample logging and laboratory testing) can improve confidence levels.

CPT-based interpretation techniques discussed below are subject to limitations such as:

- CPT measurements, including measurement uncertainty (Peuchen & Terwindt, 2014 and 2015) and effects resulting from deployment method, initial embedment of a cone penetrometer, penetration interruption and inevitable loss of saturation of a pore pressure measuring system;
- CPT interpretation techniques can be indirect, i.e. requiring estimates of various other parameters. This is consistent with an integrated geotechnical investigation approach. Inevitably, this approach also includes some redundancy of data;
- Empirical correlations can rely on data pairing, for example pairing of CPT net cone resistance at a point in space with laboratory undrained shear strength applicable to another,

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nearby spatial position. Data pairing uncertainty can be limited by applying judgement;
- Empirical correlations should use reference parameters. The reference parameter may not be appropriate for the selected geotechnical model, and transformation may be necessary;
- The cone penetration test offers limited direct information on serviceability limit states (deformation), as the penetration process imposes large strains in the surrounding soil. In comparison to ultimate limit states, better complementary data will usually be required;
- The interpretations typically apply to conditions as encountered at the time of the geotechnical investigation. Geological, environmental, and construction/operational factors may alter as-found conditions.

Laboratory Test Methods

Laboratory test standards often specify procedures for obtaining derived values, particularly where it is possible to obtain a derived value by means of a conversion model or theory. Such derived values are thus part of the laboratory test report. An example is the unconsolidated undrained triaxial compression test. Normalised load and displacement data are the basic measured values. The measured values and the use of theory allow the calculation of a derived value of undrained shear strength by consideration of principal stress conditions and a theoretical deformation model.

A project-specific scope design for laboratory test results can be of a confirmatory nature. An example would be a limited scope that targets confirmation of CPT-based methods rather than detailed site-specific integration and correlation of data.

Non-intrusive Technologies

Results of non-intrusive technologies can serve as important input data for deriving geotechnical parameter values for semi-continuous profiles along a geophysical survey line (2D) and for voxel (3D) models (e.g. ISO, 2021; Nauroy et al., 1998; Carpentier et al., 2021). Key features of this approach typically include (1) general input from an initial ground model, (2) a training data set of non-intrusive data (e.g. seismic reflection data) and ground-truthing data (e.g. CPTs), (3) machine learning and (4) correlation of geotechnical parameter values for spatial positions with non-intrusive data points.

The training phase typically includes validation of derived geotechnical parameter values (e.g. CPT cone resistance or shear modulus at small strain) at control locations. The validation results at the control locations allow comparison of accuracy of the derived values at non-intrusive data points with derived values of the ground truthing data.

CPT Penetration Behaviour

Soil behaviour during cone penetration testing shows large displacements in the immediate vicinity of the penetrometer, and small elastic displacements further away from the penetrometer. Density/structure, stiffness and in situ stress conditions significantly affect the measured parameters.

The measured cone resistance (q_c) includes hydrostatic water pressures as well as induced pore pressures resulting from stresses and strains related to the penetration process. The induced pore pressures are usually negligible for clean sand because the ratio of effective stress to pore pressure is high. This ratio can be low for penetration into normally consolidated and slightly overconsolidated clays. Knowledge of pore pressures around the penetrometer can thus be important. CPT parameters that take account of pore pressure effects include corrected cone resistance (q_t), net cone resistance (q_n) and pore pressure ratio (B_q). These parameters can be calculated if piezocone penetration test (PCPT or CPTU) data are available. The influence of pore pressures on sleeve friction f_s is relatively small. It is common to ignore this influence. Calculation of friction ratio R_f (defined as f_s/q_c) includes no allowance for pore pressure effects.

The penetration rate with respect to soil permeability determines whether soil behaviour is primarily undrained, drained, or partially drained. Partial drainage may also be denoted as partial consolidation. In general, soil behaviour during cone penetration testing is:

- Drained in clean sand, i.e. no measurable pore pressures because of (1) soil displacements and (2) soil volume change depending on dilative/contractive soil behaviour;
- Undrained in clay, i.e. no significant soil volume change immediately around the cone penetrometer and pore pressure change depending on dilative/contractive soil behaviour;
- Partially drained in soils with intermediate permeability, such as sandy silt, i.e. potential for (1) some soil volume change depending on dilative/contractive soil behaviour and (2) potential for pore pressure change depending on dilative/ contractive soil behaviour.

Results of a pore pressure dissipation test can provide indications for partial drainage conditions. Particularly, partial drainage conditions should be considered when t_{50} is less than about 100 s (DeJong & Randolph, 2012). The term t_{50} represents the time for 50 % dissipation of excess pore pressure at the u_2 location of a cone penetrometer.

CPT parameters can be influenced by the presence of thin (< 0.2 m thick) layers in a ground profile. Boulanger and DeJong (2018) proposed a method that provides estimates of corrected q_c and f_s values based on an inverse filtering procedure that accounts for thin layer and transitional effects during cone penetration.

The following sections mostly consider interpretation of drained soil behaviour (sand) and undrained soil behaviour (clay).

CPT-based Soil Behaviour Type Identification

Figures 3, 4 and 5 show soil behaviour type identification according to procedures given by Robertson (2009), representing an update of Robertson (1990) and Robertson (1991) respectively by exchange of Q_t with Q_{tn}. The procedures consider a normalised soil behaviour classification that provides general guidance on likely soil type (silty sand for example) and a preliminary indication of parameters such as angle of internal friction φ', overconsolidation ratio (OCR) and clay sensitivity (S_t). Classification is in general possible for $1 \leq Q_{tn} \leq 1000$, $0.1 \leq F_r \leq 10$ and $-0.5 \leq B_q \leq 1.4$, with exceptions for classification using a Q_{tn}-B_q chart for the areas where no classification is presented.

Classification charts use following soil behaviour type zones:

1. Sensitive, fine grained
2. Organic soils – peats
3. Clays – clay to silty clay
4. Silt mixtures – clayey silt to silty clay
5. Sand mixtures – silty sand to sandy silt
6. Sands – clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand*
9. Very stiff, fine grained*

(*) Heavily overconsolidated or cemented

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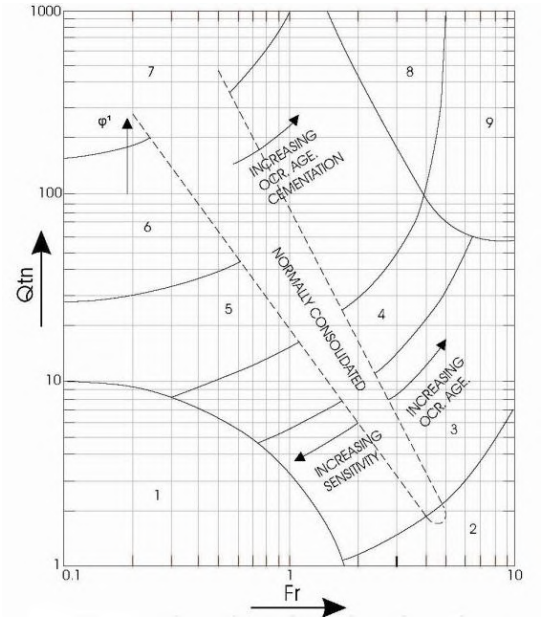

Figure 3: Classification chart Robertson (1990) with exchange of Q_t with Q_{tn}

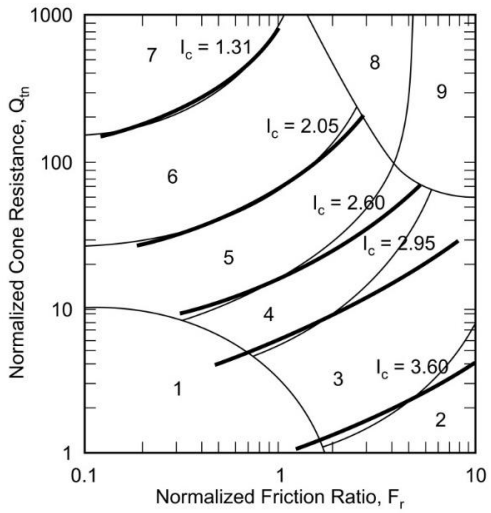

Figure 4: Soil behaviour type index I_c superimposed on Robertson (2009) classification chart

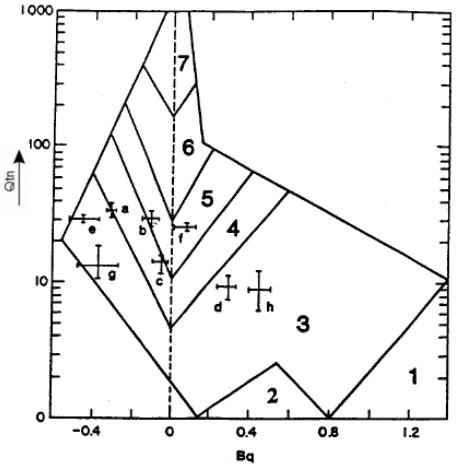

Figure 5: Classification chart Robertson (1991) with exchange of Q_t with Q_{tn}

The procedures require piezocone test data:

$$Q_{tn} = [(q_t - \sigma_{v0})/P_a](P_a/\sigma'_{v0})^n \qquad Q_t = \frac{q_t - \sigma_{vo}}{\sigma'_{vo}}$$

$$F_r \text{ or } nR_f = \frac{f_s}{q_t - \sigma_{vo}} 100\% \qquad B_q = \frac{u - u_0}{q_t - \sigma_{vo}}$$

where:

B_q = pore pressure ratio
F_r = normalised friction ratio
Q_{tn} = normalised cone resistance with variable stress exponent
Q_t = normalised cone resistance
q_t = corrected cone resistance
σ_{vo} = total in situ vertical stress
σ'_{vo} = effective in situ vertical stress
P_a = atmospheric pressure
n = stress exponent
f_s = measured sleeve friction
u = measured pore pressure
u_0 = theoretical hydrostatic pore pressure.

The stress exponent n is according to Zhang et al. (2002):

$$n = 0.381\ (I_c) + 0.05\ (\sigma'_{vo}/P_a) - 0.15$$

where $n \leq 1$.

Robertson and Wride (1998) defined soil behaviour type index I_c as follows:

$$I_c = [(3.47 - \log Q_{tn})^2 + (\log F_r + 1.22)^2]^{0.5}$$

Soils with $I_c < 2.05$ are generally cohesionless, coarse grained, where cone penetration is generally drained and soils with $I_c > 2.60$ are generally cohesive, fine grained, where cone penetration is generally undrained (Robertson & Wride, 1998). Cone penetration in soils with $2.05 < I_c < 2.60$ is often partially drained.

Figure 6 presents a classification chart for friction cone data according to Robertson (2010). This procedure requires no pore pressure input. A non-normalised soil behaviour type index, I_{SBT} applies:

$$I_{SBT} = [(3.47 - \log (q_c/P_a))^2 + (\log R_f + 1.22)^2]^{0.5}$$

I_{SBT} is similar to I_c. Values for I_{SBT} and I_c are typically comparable for effective in situ vertical stress between 50 kPa and 150 kPa.

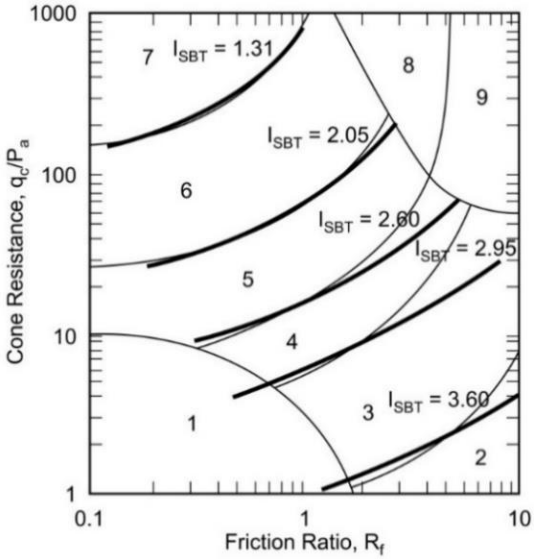

Figure 6: Robertson (2010) classification chart including I_{SBT}

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Figure 7 presents a classification chart focusing on contractive and dilative soil behaviour, according to Robertson (2016a). The equations for the contractive-dilative boundary (CD) and soil behaviour type index (I_B) are as follows:

$$CD = (Q_{tn} - 11)(1 + 0.06F_r)^{17} \text{ and}$$

$$I_B = 100(Q_{tn} + 10)/(70 + Q_{tn}F_r)$$

Suggested values of CD are $CD = 60$ (low value) and $CD = 70$ (high value). Suggested values for I_B are $I_B = 32$, representing a low value for sand-like soil behaviour types and $I_B = 22$ representing a high value for clay-like soil behaviour types. The region between $I_B = 32$ and $I_B = 22$ represents soils typically showing transitional or intermediate soil behaviour types.

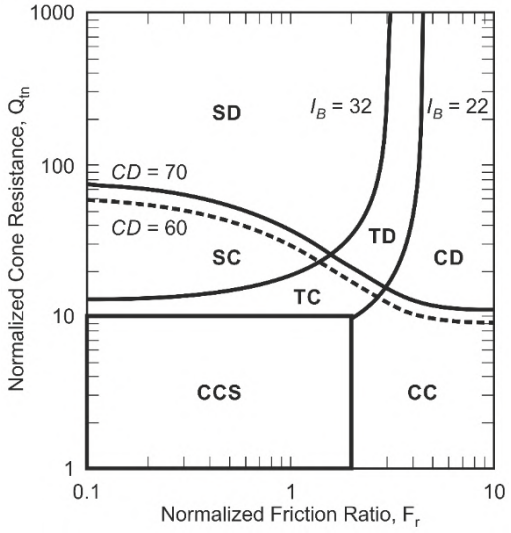

Figure 7: Classification chart according to Robertson (2016a)

CCS Clay-like – Contractive - Sensitive
CC Clay-like – Contractive
CD Clay-like – Dilative
TC Transitional – Contractive
TD Transitional – Dilative
SC Sand-like – Contractive
SD Sand-like – Dilative

Sand Model – CPT-based Methods

Unit Weight – Sand

Unit weight of uncemented (silica) sand, silt and clay soils may be derived according to Mayne et al. (2010):

$$\gamma = 1.95\gamma_w \left(\frac{\sigma'_{vo}}{P_a}\right)^{0.06} \left(\frac{f_t}{P_a}\right)^{0.06}$$

where total unit weight γ and unit weight of water γ_w are in kN/m^3 and effective in situ vertical stress σ'_{vo} is in kPa. The symbol f_t refers to sleeve friction corrected for pore pressures acting on the end areas of the friction sleeve, with units in kPa. Atmospheric pressure P_a is in kPa.

Unit weight may also be derived according to Lengkeek et al. (2018):

$$\gamma = \gamma_{ref} - \beta \cdot (\log(q_{t,ref}/q_t))/(\log(R_{f,ref}/R_f))$$

where γ_{ref} is a reference unit weight at which q_t is constant regardless of friction ratio R_f, β is a factor for unit weight contouring, $q_{t,ref}$ is a reference for total cone resistance q_t at which γ is constant regardless of R_f, and $R_{f,ref}$ is a reference friction ratio. The default values are: $\gamma_{ref} = 19$ kN/m^3, $\beta = 4.12$, $q_{t,ref} = 5$ MPa, and $R_{f,ref} = 30$ %. The correlation allows development of project-specific estimation of unit weight.

Shear Wave Velocity – Sand

If no in situ measurements of shear wave velocities (v_s) are available, then empirical correlation with CPT parameters may be considered. Hegazy and Mayne (2006) published a statistical correlation derived from 73 sites worldwide representing a range of soil types including sands, clays, soil mixtures and mine tailings (Figure 8). The correlation considers a normalized cone resistance (q_{c1N_hm}) and a soil behaviour type index (I_{c_hm}) as follows:

$$v_s = 0.0831 q_{c1N_hm} (\sigma'_{vo}/P_a)^{0.25} e^{(1.786 I_{c_hm})}$$

(Hegazy & Mayne, 2006)

where shear wave velocity v_s is in m/s and q_{c1N_hm} and I_{c_hm} are dimensionless. Calculations for q_{c1N_hm} and I_{c_hm} require iteration and consider cone resistance q_c or corrected cone resistance q_t, sleeve friction f_s, total in situ vertical stress σ_{vo}, effective in situ vertical stress σ'_{vo} and atmospheric pressure P_a.

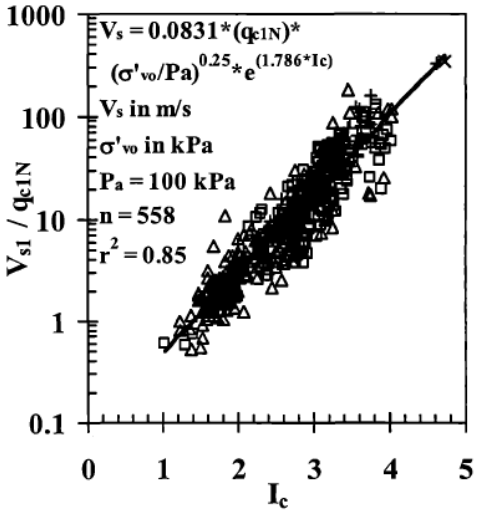

Figure 8: $v_s - q_c$ correlation according to Hegazy & Mayne (2006)

Robertson and Cabal (2015) present a v_s correlation incorporating net cone resistance q_n ($= q_t - \sigma_{vo}$) and soil behaviour type index (I_c) as defined by Robertson and Wride (1998):

$$v_s = [\alpha_{vs}(q_t - \sigma_{vo})/P_a]^{0.5} \text{ where } \alpha_{vs} = 10^{(0.55\, I_c + 1.68)}$$

(Robertson & Cabal, 2015)

where shear wave velocity v_s is in m/s and corrected cone resistance q_t, total in situ vertical stress σ_{vo} and atmospheric pressure P_a are in kPa. The method can be applied to a wide range of soil behaviour types, notably uncemented Holocene to Pleistocene age soils. Older deposits could have a higher shear wave velocity. Exceptions are Zones 1, 8 and 9 of Robertson (1990 and 2009).

Baldi et al. (1989) derived a correlation between shear wave velocity v_s and cone resistance q_c for uncemented silica sands. This correlation is based on data from CPT, cross-hole, and Seismic cone penetration tests (SCPTs) performed in quaternary deposits of the predominantly silica Po River sand and Gioia Tauro sand with gravel.

$$v_s = 277 q_c^{0.13} \sigma'^{0.27}_{vo}$$ (Baldi et al., 1989)

where shear wave velocity v_s is in m/s and cone resistance q_c and effective in situ vertical stress σ'_{vo} are in MPa.

Shear wave velocity may be normalised according to Robertson and Cabal (2015):

$$v_{s1} = v_s \cdot (P_a/\sigma'_{vo})^{0.25}$$ (Robertson & Cabal, 2015)

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In Situ Stress Conditions – Sand

A knowledge of in situ stress conditions is required for estimation of parameters such as relative density D_r and angle of internal friction of a sand deposit φ'. The effective in situ vertical stress σ'_{vo} can be calculated with a reasonable degree of accuracy but the effective in situ horizontal stress $\sigma'_{ho} = K_0 \cdot \sigma'_{vo}$ is generally a more approximate. Usually, it is necessary to consider a range of conditions for K_0 (coefficient of earth pressure at rest). The range can consider overconsolidation as inferred from a geological assessment, preconsolidation pressures of intermediate clay layers and/or theoretical limits of K_0.

Geological factors concerning overconsolidation include ice loading, soil loading and groundwater fluctuations (influence from desiccation). Possible subdivisions for these factors are mechanical, suction, cyclic and ageing consolidation.

The following approach can be applied for direct estimation of K_0 based on Agaiby and Mayne (2019):

$$K_0 = 0.45\sqrt{(OCR)}$$

using: $OCR = \frac{\sigma'_p}{\sigma'_{v0}}$ $\quad \sigma'_p = 0.33 \cdot q_n^{m'}$ $\quad m' = 1 - \frac{0.28}{1+\left(\frac{I_c}{2.64}\right)^{25}}$

where OCR is overconsolidation ratio, σ'_p is effective preconsolidation stress, σ'_{v0} is effective in situ vertical stress, q_n is net cone resistance in kPa and I_c is soil behaviour type index. Typical values for m' are 0.72, 0.8 and 0.85 for clean sands, silty sands, and silts respectively.

The $K_0 - OCR$ relationship represents a schematisation of $K_0 = (1 - sin\varphi') \cdot OCR^{sin\varphi'}$ proposed by Mayne and Kulhawy (1982). Mayne and Kulhawy (1982) investigated mechanical overconsolidation of reconstituted laboratory specimens for over 170 different soils. For many soil types (e.g. Mayne, 2020), it can be shown that the $K_0 = 0.45\sqrt{(OCR)}$ equation provides similar statistics to the Mayne and Kulhawy correlation using φ' (effective angle of internal friction):

$$K_0 = (1 - sin\varphi') \cdot OCR^{sin\varphi'}$$

Figure 9 presents an approximate CPT-based correlation for K_0 according to Robertson (2016b). K_0 limits are typically set to 0.5 and 2. Linear interpolation is applied for the region between $K_0 = 0.5$ and $K_0 = 2$.

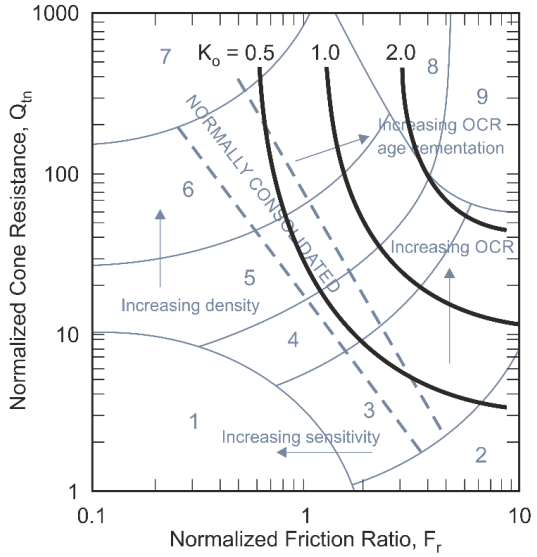

Figure 9: K_0 correlation according to Robertson (2016b)

No laboratory study can fully capture in situ behaviour. Particularly, K_0 may be underestimated if effects such as ageing and cyclic loading are relevant.

In general, in situ K_0 values are limited to the range $K_0 = 0.5$ to $K_0 = 1.5$. For many situations, K_o values are believed to be relatively low at greater depths (say $K_0 < 1$ for depths exceeding 50 m). Jamiolkowski et al. (2003) recommend using a limiting value $K_0 = 1$ in practice, for limit states where low values of soil resistance and soil stiffness are critical.

Relative Density – Sand

The relative density concept applies to sands with a percentage fines of less than about 15 %.

Relative density is defined as $D_r = (e_{max} - e)/(e_{max} - e_{min})$, where e_{max} is maximum index void ratio, e represents in situ void ratio and e_{min} is minimum index void ratio. Maximum and minimum index void ratios are defined by laboratory testing. Relative density can exceed 100 %, because in situ void ratio can be lower than laboratory values for minimum index void ratio.

Determination of laboratory minimum and maximum index void ratios forms the basis for the relative density concept (loose, dense sand, etc.). No internationally agreed procedure is available.

CPT-based correlations are commonly used for estimation of in situ relative density. These correlations rely on database results of CPTs carried out in sand samples reconstituted in laboratory calibration chamber tests. Use of such correlations implies dependence on, for example:

- soil type of database versus soil type in situ;
- reference laboratory test method for determination of index void ratios, particularly sensitivity to minimum index void ratio;
- range of stress levels and K_0 values for calibration testing;
- results applicable to reconstituted sand samples, sample preparation method and soil stress history simplifications.

Calibration chamber test results apply to a limited range of stress conditions, typically:

50 kPa	<	σ'_{vo}	<	400 kPa
0.4	<	K_0	<	1.5

Sample preparation for laboratory chamber tests is usually by means of dry pluviation. Soil stress history application is by mechanical overconsolidation.

Jamiolkowski et al. (2003) proposed the following relationship between q_c and D_r for normally and overconsolidated silica (dry) sands:

$$D_{r(dry)} = \frac{1}{2.96}\ln\left[\frac{\frac{q_c}{P_a}}{24.94\left(\frac{\sigma'_{vo}\left(\frac{1+2K_o}{3}\right)}{P_a}\right)^{0.46}}\right]$$

and for saturated sands:

$$D_{r(sat)} = \left(\frac{-1.87 + 2.32\ln\frac{q_c}{(P_a * \sigma'_{vo})^{0.5}}}{100} + 1\right)\frac{D_r(dry)}{100}$$

where relative density D_r is a fraction. The correlation for saturated sands results in relative densities that can be up to about 10 % higher compared to the correlation for dry sands.

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It is understood that Jamiolkowski et al. (2003) used results from one of the ASTM vibratory table methods for determination of minimum index void ratio. It is not clear which specific ASTM method was used, i.e. a vibratory table method requiring oven-dried soil or wet soil.

Kulhawy and Mayne (1990) proposed:

$$D_r^2 = Q_{tn*}/Q_f \qquad \text{where: } Q_{tn*} = \left(\frac{q_t}{P_a}\right)/\left(\frac{\sigma'_{v0}}{P_a}\right)^{0.5}$$

and q_t is corrected cone resistance, P_a is atmospheric pressure, σ'_{v0} is effective in situ vertical stress. Kulhawy and Mayne (1990) suggested using $Q_f = 280$ for highly compressible normally consolidated sands and $Q_f = 450$ for highly compressible overconsolidated sands (overconsolidation ratio of > 8) based on their dataset. Robertson and Cabal (2015) suggested $Q_f = 350$ for clean, uncemented, medium compressible quartz sands of about 1 000 years old. Values for Q_f can be closer to 300 for fine sands and closer to 400 for coarse sands. Furthermore, Q_f increases with age and increases significantly when age exceeds 10 000 years.

Krogh et al. (2021) consider an empirical correction for D_r estimates as obtained according to Jamiolkowski et al. (2003). The correction is for the upper few metres below ground surface ($\sigma'_{v0} < 50$ kPa). The equations are as follows:

$$D_{r(sat)} = \left(\frac{-1.87+2.32\ln\frac{q_c}{(P_a * \sigma'_{v0})^{0.5}}}{100} + 1\right)\frac{D_r(dry)}{100}$$

where $D_{r(dry)}$ is given by

$$D_{r(dry)} = \frac{1}{2.96}\ln\left[\frac{\frac{q_c}{P_a}}{24.94\left(\frac{\sigma'_{vo}\left(\frac{1+2K_o}{3}\right)}{P_a}\right)^{0.46}}\right]$$

and where q_c is cone resistance, P_a is atmospheric pressure, σ'_{v0} is effective in situ vertical stress and K_0 is coefficient of earth pressure at rest.

Effective Angle of Internal Friction – Sand

The effective shear strength parameter φ' is not a true constant. It depends on factors such as density, stress level, shearing mode and mineralogy. There is evidence that overconsolidation ratio, method of deposition and in situ stress anisotropy is less important.

Correlation of angle of internal friction φ' to cone resistance q_c may be done at various levels of sophistication. Simple procedures rely on a conservative assessment of soil behaviour classification. A more sophisticated empirical correlation consists of:

a. Estimation of in situ stress conditions σ'_{vo} and σ'_{ho}
b. Estimation of relative density D_r
c. Empirical correlation of angle of internal friction φ' with D_r, σ'_{vo} and σ'_{ho}.

Estimation of stress conditions and relative density has been discussed above.

The empirical procedure proposed by Bolton (1986 and 1987) is used for estimation of φ'. This correlation applies to clean sands and considers peak secant angle of internal friction in Isotropically Consolidated Drained triaxial compression (CID) of reconstituted sand. This procedure requires estimation of the dilatancy index and the critical state angle of internal friction.

Kulhawy and Mayne (1990) determined an equation based upon 20 data sets obtained from calibration chamber tests. This equation is almost identical to the empirical formula determined earlier by Trofimenkov (1974) which was based on mechanical cone data. Mayne (2007) validated the use of total cone resistance q_t instead of cone resistance q_c used in the equation from Kulhawy and Mayne (1990).

$$\varphi' = 17.6 + 11.0\log\left(\left(\frac{q_t}{P_a}\right)/\left(\frac{\sigma'_{vo}}{P_a}\right)^{0.5}\right) \qquad \text{(Mayne, 2007)}$$

Undrained Shear Strength – Sand

Kaltekis and Peuchen (2022) presented the following site-specific correlation between net cone resistance q_n and undrained shear strength s_u of sand and transitional soil (Figure 10):

$$\frac{s_u}{\sigma'_{v0}} = \begin{cases} 0.0096 \cdot \frac{q_n}{\sigma'_{v0}} - 0.4823 & \text{, for } \frac{q_n}{\sigma'_{v0}} \geq 124 \\ 0.703 & \text{, for } \frac{q_n}{\sigma'_{v0}} < 124 \end{cases}$$

where s_u, q_n and effective in situ vertical stress σ'_{v0} are in kPa.

The definition of s_u considers:

- Consolidated undrained triaxial test (ISO, 2018) as reference;
- Reconstituted specimens prepared by moist reconstitution and intact specimens;
- $(\sigma'_1/\sigma'_3)_{max}$ as failure criterion for undrained shear strength, where σ'_1 and σ'_3 are the effective principal stresses.

The applicability of this correlation to soils other than those of the source data (Southern North Sea) is unknown.

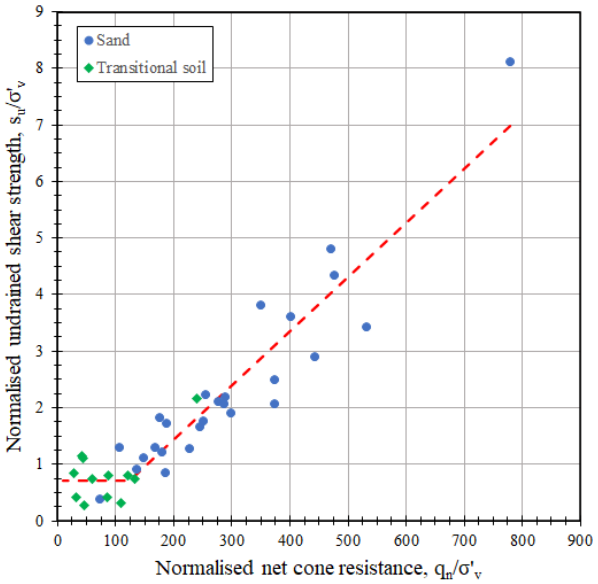

Figure 10: $s_u - q_n$ correlation according to Kaltekis and Peuchen (2022)

Constrained Modulus – Sand

Kulhawy and Mayne (1990) derived two formulas for the determination of the constrained modulus for both normally consolidated and overconsolidated sands by indicating that the modulus is a function of relative density. The determination of relative density can be done with, for example, the methods indicated above.

$$M = q_c * 10^{1.09-0.0075D_r}$$
(normally consolidated sands, Kulhawy & Mayne, 1990)

$$M = q_c * 10^{1.78-0.0122D_r}$$
(overconsolidated sands, Kulhawy & Mayne, 1990)

where D_r is in %, and q_c and M in kPa respectively.

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Young's Modulus – Sand

A common guideline is an empirical correlation given by Baldi et al. (1989). The correlation is for silica-based sand and considers cone resistance q_c, in situ stress conditions and secant Young's modulus for drained stress change E'. The ratio of E'/q_c typically ranges from about 3 to 5 for recently deposited normally consolidated sands up to about $E'/q_c = 6$ to $E'/q_c = 25$ for overconsolidated sands. The correlation has been inferred from laboratory conditions; including CPTs in a calibration chamber and conventional triaxial compression tests on reconstituted sand samples. It takes account of the degree of deformation and overconsolidation. In this regard, it is noted that secant deformation moduli are strongly dependent on strain level: the elastic modulus increases with decreasing strain to an upper limit at about 10^{-4} % strain.

Shear Modulus at Small Strain – Sand

For estimation of initial (small strain) or dynamic shear moduli, ratios of G_{max}/q_c of between about 4 and 20 can be considered, in accordance with Baldi et al. (1989). The basis for this correlation is similar to that of secant Young's modulus, except that laboratory resonant column tests serve as reference instead of triaxial compression tests. Results of limited in situ seismic cross-hole and downhole tests provide an approximate check of this correlation.

Interpretation of small strain shear modulus can also be estimated from a correlation proposed by Rix and Stokoe (1991) in which data from calibration test measurements is compared to the correlation obtained between G_{max} and q_c by Baldi et al. (1989).

$$G_{max} = 1634(q_c)^{0.25}(\sigma'_{vo})^{0.375}$$

(Rix & Stokoe, 1991)

where G_{max}, q_c and σ'_{vo} are in kPa.

Clay Model – CPT-based Methods

Unit Weight – Clay

Empirical correlation between unit weight of clay and CPT parameters is as described in 'Unit Weight – Sand' above.

Shear Wave Velocity – Clay

Hegazy and Mayne (2006) and Roberson and Cabal (2015) present empirical correlations between shear wave velocity and CPT parameters for a wide range of soils including clays, as described in 'Shear Wave Velocity v_s – Sand' above. The Hegazy and Mayne correlation is sensitive to use of q_c or q_t. It should be used with caution for soils showing undrained or partially drained CPT response.

Mayne and Rix (1995) derived a correlation between shear wave velocity v_s and cone resistance q_c for intact and fissured clays. A database from Mayne and Rix (1993) was used including 31 different clay sites.

$$v_s = 1.75{q_c}^{0.627}$$

(Mayne & Rix, 1995)

where shear wave velocity v_s is in m/s and cone resistance q_c is in kPa.

In Situ Stress Conditions – Clay

Similar to sand, a knowledge of in situ stress conditions is generally necessary for estimation of other parameters such as consistency (soft, stiff, etc.) of a clay deposit and compressibility. The effective in situ vertical stress σ'_{vo} can be calculated with a reasonable degree of accuracy but the effective in situ horizontal stress $\sigma'_{ho} = K_0 \cdot \sigma'_{vo}$ is generally more approximate.

The following approach can be applied for K_0 based on Agaiby and Mayne (2019):

$$K_0 = 0.45\sqrt{(OCR)}$$

using: $OCR = \frac{\sigma'_p}{\sigma'_{v0}}$ $\sigma'_p = 0.33 \cdot q_n^{m'}$ $m' = 1 - \frac{0.28}{1+\left(\frac{I_c}{2.64}\right)^{25}}$

where OCR is overconsolidation ratio, σ'_p is effective preconsolidation stress, σ'_{v0} is effective in situ vertical stress, q_n is net cone resistance in kPa and I_c is soil behaviour type index. Typical values for m' are 0.9, 1.0, and 1.1 for sensitive clays and organic clays, intact clays, and fissured clays respectively.

For normally consolidated clays and silts, K_{0nc} may be correlated with angle of internal friction, in accordance with Jaky (1944), or more simply, in accordance with Mayne and Kulhawy (1982). For many soil types (e.g. Mayne, 2020), it can be shown that the $K_0 = 0.45\sqrt{(OCR)}$ equation provides similar statistics to the Mayne and Kulhawy correlation using φ' (effective angle of internal friction):

$$K_0 = (1 - sin\varphi') \cdot OCR^{sin\varphi'}$$

The plasticity index together with OCR may also be used for preliminary estimates of K_{0oc} as indicated by Brooker and Ireland (1965).

No laboratory study can fully capture in situ behaviour. Particularly, K_0 may be underestimated if effects such as ageing and cyclic loading effects are relevant.

Overconsolidation Ratio – Clay

Overconsolidation ratio is defined as $OCR = \sigma'_p/\sigma'_{vo}$ where σ'_p is the effective preconsolidation stress considered to correspond with the maximum vertical effective stress to which the soil has been subjected in the past, and σ'_{vo} is the current effective in situ vertical stress. The effective preconsolidation stress approximates a stress level where relatively small strains are separated from relatively large strains occurring on the virgin compression stress range. The reference OCR is usually based on laboratory oedometer tests carried out on undisturbed samples. It may thus be influenced by factors such as sample disturbance, strain rate effects and interpretation procedure.

The following approach can be applied (Agaiby and Mayne, 2019):

$$OCR = \frac{\sigma'_p}{\sigma'_{v0}} \quad \sigma'_p = 0.33 \cdot q_n^{m'} \quad m' = 1 - \frac{0.28}{1+\left(\frac{I_c}{2.65}\right)^{25}}$$

where OCR is overconsolidation ratio, σ'_p is effective preconsolidation stress, σ'_{v0} is effective in situ vertical stress, q_n is net cone resistance in kPa and I_c is soil behaviour type index. Typical values for m' are 0.9, 1.0, and 1.1 for sensitive clays and organic clays, intact clays, and fissured clays respectively.

Chen and Mayne (1996) presented the following correlation for 205 clay sites around the world:

$$OCR = 0.317 \cdot Q_t$$

Overconsolidation ratio may also be inferred indirectly from a geological assessment and from undrained strength ratios. Geological factors concerning overconsolidation have been discussed under 'in situ stress conditions - sand'. An empirical procedure for estimation of OCR based on undrained strength ratio s_u/σ'_{vo} is given by Wroth (1984). The procedure uses the strength rebound parameter Λ. Guidance for selection of Λ and normally consolidated undrained strength ratio is given by

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Mayne (1988). Historically, much use has also been made of the Skempton (1957) relationship between normally consolidated undrained strength ratio and plasticity index I_P. This equation is useful for preliminary estimates, considering that I_P probably relates to φ' in some complex manner.

Undrained Shear Strength – Clay

No single undrained shear strength exists. The in situ undrained shear strength s_u depends on factors such as mode of failure, stress history, anisotropy, strain rate and temperature.

Various theoretical and empirical procedures are available to correlate q_c with s_u. Theoretical approaches use bearing capacity, cavity expansion or steady penetration solutions, all of which require several simplifying assumptions. Empirical approaches are more common in engineering practice because of difficulties in realistic soil modelling. An empirical correlation for soft to stiff, intact, and relatively homogeneous clays is given by Battaglio et al. (1986) as follows:

$$s_u = (q_c - \sigma_{vo})/N_c$$

where s_u, σ_{vo} and q_c are in kPa. N_c is an empirical factor that typically ranges between 10 and 25. The higher N_c factors typically apply to clays with a relatively low plasticity index and/or apply to heavily overconsolidated clays. Lower N_c factors are generally appropriate for normally consolidated and slightly overconsolidated clays. The reference undrained shear strength is that determined from in situ vane test results. The term σ_{vo} (total in situ vertical stress) becomes insignificant for stiff clays at shallow depth so that the equation reduces to $s_u = q_c/N_c$.

If piezocone test data are available, then improved correlations are feasible because of the pore pressure information. Empirical correlations of piezocone test results with laboratory undrained shear strengths are commonly used, as considered by Rad & Lunne (1988), expressed as follows:

$$s_u = q_n/N_{kt}$$

N_{kt} ranges typically between 8 and 30 with the higher N_{kt} factors applying to heavily overconsolidated clays.

Mayne and Peuchen (2022) account for N_{kt} variation according to B_q:

$$N_{kt} = 10.5 - 4.6 \cdot ln\,(B_q + 0.1)$$

where $B_q > -0.1$. The equation is based on 497 paired CPT and laboratory test results from 70 clay sites, particularly anisotropically consolidated triaxial compressive strength. Factoring of N_{kt} can be applied by multiplying the calculated N_{kt} factor by, for example, 0.85 and 1.2.

Mayne et al. (2015) recommend a mean $N_{kt} = 12$ with a standard deviation of 2.8 for correlation with laboratory anisotropically consolidated triaxial compressive strength. The recommendations are based on a study of 51 onshore and offshore clays and apply to normally consolidated to slightly overconsolidated clays with q_n values of typically less than 8 MPa. Slightly higher N_{kt} values can be expected for average laboratory undrained shear strength, defined as the average of laboratory triaxial compression, simple shear and triaxial extension.

Clay Sensitivity

The sensitivity of a clay (S_t) is the ratio of undisturbed undrained shear strength to remoulded undrained shear strength. Sensitivity may be assessed from the CPT friction ratio R_f, in accordance with Schmertmann (1978):

$$S_t = N_s/R_f$$

where N_s is a correlation factor typically ranging between 5 and 10. The correlation is expected to be inaccurate for sensitive clays where uncertainty in very low values for sleeve friction may dominate results.

The reference S_t value is often taken to be that determined from undisturbed and remoulded laboratory unconsolidated undrained triaxial tests. This reference S_t value may differ from that determined from other tests, for example laboratory miniature vane tests. This is partly related to the definition of sensitivity. For vane tests, several measurements of undrained shear strength are possible:

- Intact (I) = undisturbed undrained shear strength as measured on an intact/undisturbed specimen;
- Intact-Residual (I-R) = measured post peak during initial shearing of the intact specimen;
- Intact-Vane Remoulded (I-VR) = measured after multiple-quick rotations of the vane after completion of the intact test;
- Hand Remoulded (HR) = steady state (post-peak if exists) resistance of hand remoulded test specimen;
- Hand Remoulded – Vane Remoulded (HR-VR) = steady state resistance of hand remoulded specimen measured after applying multiple-quick vane rotations.

Skempton and Northey (1952) present a correlation of sensitivity and laboratory liquidity index I_L. This correlation may allow a check on CPT-based interpretation of sensitivity.

Effective Shear Strength Parameters – Clay

Measurement of pore water pressures during penetration testing has led to development of interpretation procedures for estimation of effective stress parameters of cohesive soils. Background information may be found in Sandven (1990). Currently available procedures are evaluated to be 'experimental' and are yet not commonly adopted.

In general, CPT interpretation of effective shear strength parameters for clay and silt relies on soil behaviour-type classification.

It is noted that significant silt and sand fractions in a clay deposit will increase φ', while a significant clay fraction in silt will decrease φ'.

Masood and Mitchell (1993) provide an equation for the determination of φ' by combining sleeve friction with the Rankine earth-pressure theory. The equation is based on the following assumptions:

- Unit adhesion between soil and sleeve is negligible;
- Friction angle between soil and sleeve = $\varphi'/3$;
- Lateral earth pressure coefficient during penetration is equal to the Rankine coefficient of lateral earth pressure under passive conditions.

$$\frac{f_s}{\sigma'_{vo}} = \tan^2(45° + \frac{\varphi'}{2})\tan(\frac{\varphi'}{3})$$

(Masood & Mitchell, 1993)

Mayne (2001) proposed an approximation of the Masood and Mitchell equation, as follows:

$$\varphi' = 30.8\left[\log(\frac{f_s}{\sigma'_{vo}}) + 1.26\right]$$ (Mayne, 2001)

Mayne (2001) also proposed the following approximation of friction angle φ' based on pore pressure ratio B_q and the cone resistance number N_m (Senneset, Sandven and Janbu, 1989):

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$$\varphi' = 29.5 B_q^{0.121}(0.256 + 0.336 B_q + \log N_m)$$

(Mayne, 2001)

where

$$N_m = \frac{q_t - \sigma_{vo}}{\sigma'_{vo} + a}$$

where the cone resistance number N_m is dimensionless, total cone resistance q_t, total in situ vertical stress σ_{vo} and effective in situ vertical stress σ'_{vo} are in kPa.

Senneset et al. (1989) use the attraction value a as a function of soil type. In general, the attraction value ranges from 5 to > 50 for both sands and clays and may be estimated directly from CPT results. The correlation is valid if the angle of plastification β is zero. In general, a plastification angle of zero applies to medium sands and silts, sensitive clays and highly compressible clays.

Constrained Modulus – Clay

Mitchell and Gardner (1976) present an approximate correlation of cone resistance with constrained modulus M (or coefficient of volume compressibility m_v, where $M = 1/m_v$). Typical ratios of M/q_c range between 1 and 8 for silts and clays. Refinements include q_c ranges and soil type (silt, clay, low plasticity, high plasticity, etc.). The correlation relies on the results of conventional laboratory oedometer tests carried out on undisturbed clay and silt samples.

Kulhawy and Mayne (1990) correlated constrained modulus M with net cone resistance data. This relationship is based on data from 12 (clay) test sites, with constrained moduli up to 60 MPa. The published standard deviation is 6.7 MPa.

$$M = 8.25\ q_n$$

(Kulhawy & Mayne, 1990)

Young's Modulus – Clay

Young's modulus E_u can be derived as follows:

- Estimation of undrained shear strength s_u from CPT data, as outlined above;
- Estimation of secant Young's moduli for undrained stress change in general accordance with correlations based on s_u, as presented by Ladd et al. (1977).

Laboratory undrained triaxial tests carried out on undisturbed clay specimen form the basis for the E_u versus s_u correlations. Typical E_u/s_u ratios at a shear stress ratio of 0.3 range between about 300 and 900 for normally consolidated clays and $E_u/s_u = 100$ to $E_u/s_u = 300$ for heavily overconsolidated clay. Higher E_u/s_u ratios would apply to lower shear stress ratios, and vice versa.

Shear Modulus at Small Strain – Clay

Mayne and Rix (1993) determined a relationship between G_{max} and q_c by studying 481 data sets from 31 sites all over the world. G_{max} ranged between about 0.7 MPa and 800 MPa.

$$G_{max} = 2.78\ {q_c}^{1.335}$$

(Mayne & Rix, 1993)

where G_{max} and q_c are in kPa.

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Appendix C

Geotechnical Classification Systems

C.1 Soil Classification Systems

Soil description and classification during the site investigation followed two standards:

- ISO 14688-1:2017 Geotechnical investigation and testing. Identification and classification of soil. Identification and description (ISO, 2017a);
- ISO 14688-2:2017 Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification (ISO, 2017b).

Based on these two standards, the consistency of cohesive soils was determined offshore as outlined in Table C.1.

Table C.1: Definitions of consistency used in soil descriptions

Consistency Term	Field Assessment
Very soft	Exudes between the fingers when squeezed in the hand
Soft	Can be moulded by light finger pressure
Firm	Cannot be moulded by the fingers but can be rolled in the hand to 3 mm thick threads without breaking or crumbling
Stiff	Crumbles and breaks when rolled to 3 mm thick threads but is still sufficiently moist to be moulded to a lump again
Very stiff	Soil has dried out and is mostly light coloured. Cannot be moulded but crumbles under pressure. Can be indented by the thumbnail

Undrained shear strength of fine soils is defined using the results of basic laboratory and field tests. Table C.2 explains the terms for characterising undrained shear strength. An additional range for ultra high strength soils is included to cover the full range of soil strengths.

Table C.2: Definitions of undrained shear strength of fine soils used in soil descriptions

Strength Term	Undrained Shear Strength [kPa]
Extremely low	< 10
Very low	10–20
Low	20–40
Medium	40–75
High	75–150
Very high	150–300
Extremely high	300–600
Ultra high	> 600

Table C.3 presents the ranges of relative density (Lambe & Whitman, 1969) on which the limits of consistency adopted in sand soils are based.

Table C.3: Definitions of relative density used in soil descriptions

Relative Density Term	Relative Density [%]
Very loose	0–15
Loose	15–35
Medium dense	35–65
Dense	65–85
Very dense	85–100

C.2 Rock Classification System

Table C.4 lists the limits of strength adopted for rock, based on ISO 14689:2017 (ISO, 2017c).

Table C.4: Ranges of strength for field assessment based on uniaxial compressive stress

Term	Definition for Field Use	Unconfined Compressive Strength [MPa]
Extremely weak	Can be indented by thumbnail. Gravel-sized lumps crush between finger and thumb	0.6–1
Very weak	Crumbles under firm blows with point of geological hammer. Can be peeled by a pocket knife	1–5
Weak	Can be peeled by a pocket knife with difficulty. Shallow indentations made by firm blow with the point of geological hammer	5–12.5
Moderately weak	Can be scratched with difficulty by pocket knife. Hand-held specimens can be broken with single firm blow of geological hammer	12.5–25
Medium strong	Cannot be scraped with pocket knife. Can be fractured with a single firm blow of geological hammer	25–50
Strong	Requires more than one blow of geological hammer to fracture	50–100
Very strong	Requires many blows of geological hammer to fracture	100–250
Extremely strong	Can only be chipped with geological hammer	> 250

Table C.5 presents the weathering classes and characteristics for soft rocks based on the approach 4 as proposed by the ISO 14689:2017 (ISO, 2017c).

Table C.5: Scale of weathering stages of rock mass (ISO 14689:2017)

Class	Classifier	Typical Characteristics
A	Unweathered	Original strength, colour, fracture spacing
B	Partially weathered	Slightly reduced strength, slightly closer fracture spacing, weathering penetrating in from fractures, brown oxidation
C	Distinctly weathered	Fractures weakened, much closer fracture spacing, grey reduction
D	Destructured	Greatly weakened, mottled, ordered lithorelicts in matrix becoming weakened and disordered, bedding disturbed

Class	Classifier	Typical Characteristics
E	Residual or Reworked	Matrix with occasional altered, random or 'apparent' lithorelicts, bedding destroyed. Classed as reworked when foreign inclusions are present as a result of transportation

For fracture state indices, Fugro follows BS 5930:2015+A1:2020 (BSI, 2015), shown in Table C.6. Total core recovery, solid core recovery, rock quality designation and fracture index are reported per core run. Fracture spacing is reported per stratum.

Table C.6: Definitions of fracture state indices

Index	Abbreviation	Unit	Description According to BS 5930:2015+A1:2020
Total core recovery	TCR	%	Ratio of core recovered (solid and non-intact) to length of core run
Solid core recovery	SCR	%	Ratio of solid core recovered to length of core run
Rock quality designation	RQD	%	Ratio of solid core pieces longer than 100 mm to length of core run
Fracture spacing	If	mm	Reported as minimum, average and maximum Reported offshore as spacing term per stratum Where core is non-intact in the ground, the abbreviation NI may be used
Notes n/a = Not applicable			

Appendix D

Laboratory Standards

D.1 Laboratory Testing Methods: Standards and Statements

Table D.1 lists the standards and procedures for laboratory tests performed by Fugro during this project. Non-standard laboratory test procedures (i.e. Fugro in-house testing procedures) are included; where tests were performed according to national or international standards, only the applicable standard number is referenced. Accredited tests are noted in the tables below. Tests performed offshore do not fall under the accreditation.

Table D.1: Laboratory method standards and statements

Laboratory Tests	Standard or Fugro Document Number
Classification Tests	
Bulk and dry density*	ISO 17892-2:2014 (ISO, 2014b)
Moisture content*	ISO 17892-1:2014 (ISO, 2014a)
Pocket penetrometer	MS-415
Particle density*	ISO 17892-3:2015 (ISO, 2015)
Liquid and plastic limits, plasticity index *	ISO 17892-12:2018 (ISO, 2018b)
Water content*	ISO 17892-1:2014 (ISO, 2014a)
Particle size distribution*	ISO 17892-4:2016 (ISO, 2016)
Conductivity Tests	
Thermal conductivity *	ASTM D5334-22 (ASTM International, 2022)
Shear Strength Tests – Effective Stress	
Consolidated triaxial compression on water saturated soils*	ISO 17892-9:2018 (ISO, 2018a)
Rock Tests	
Brazilian tensile strength*	ISRM 2007-2014 (Ulusay, 2015)
Slake durability index*	ISRM 1976-2006 (Ulusay & Hudson, 2007)
Porosity (including particle density)*	BS 1377-2:1990 (BSI, 1990), saturation moisture content
Point load test*	ISRM 1976-2006 (Ulusay & Hudson, 2007)
Uniaxial compressive strength*	ISRM 1976-2006 (Ulusay & Hudson, 2007)
CERCHAR abrasivity*	ISRM 2007-2014 (Ulusay, 2015)
Notes * = Accredited test	

Table D.2 lists additional tests that were subcontracted to a third-party laboratory and not performed by Fugro.

Table D.2: Subcontracted tests: method standards and statements

Laboratory Tests	Standard or Method Statement
Carbonate content of soil by rapid titration *	BS 1377-3:2021 (BSI, 2021)
Chloride content *	BS 1377-3:2021 (BSI, 2021)
Organic matter by loss on ignition *	BS 1377-3:2021 (BSI, 2021)

Laboratory Tests	Standard or Method Statement
pH value *	BS 1377-3:2021 (BSI, 2021)
Sulphate content *	BS 1377-3:2021 (BSI, 2021)
Notes * = Accredited test	

D.2 Laboratory Accreditations

Laboratory accreditations are provided in the below section for the following laboratories:

- Fugro GB Marine Limited (Wallingford laboratory);
- Fugro Belgium SRL (Louvain-la-Neuve Laboratory);
- Geolabs Limited ;
- Normec DETS.

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

0919

Accredited to ISO/IEC 17025:2017

Fugro GB Limited

Issue No: 049 **Issue date:** 01 February 2024

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E-Mail: r.failey@fugro.com
Website: www.fugro.com

Testing performed by the Organisation at the locations specified

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Fugro House Hithercroft Road Wallingford Oxon OX10 9RB	**Local contact:** Mr T Carrington Tel: +44 (0)1491 830825 Fax: +44 (01491 820899 Email: t.carrington@fugro.com Website: www.fugro.com	**Support Functions:** Quality System Quality Audit Administration **Construction:** Soils – Physical and Mechanical Testing	A
Address Victory House Unit 16 Trafalgar Wharf Hamilton Road Portchester Hampshire PO6 4PX	**Local contact:** Mr R Failey Tel: +44 (0)1491 820625 Fax: +44 (0)1491 820899 Email: r.failey@fugro.com Website: www.fugro.com	**Support Functions:** Quality System Quality Audit Administration **Sampling and Testing:** Sediment Physical Testing Water Testing	B
Address 1-9 The Curve 32 Research Avenue North Heriot-Watt Research Park Edinburgh EH14 4AP	**Local contact** Mr R Failey Tel: +44 (0)1491 820625 Fax: +44 (0)1491 820899 Email: r.failey@fugro.com Website: www.fugro.com	**Support Functions:** Quality System Quality Audit Administration **Chemical Testing:** Sediment Testing Soils Testing Water Testing	C
Address Fugro Belgium SRL, Rue du Bosquet 9 1348 Louvain-La-Neuve, Belgium	**Local contact** Mr R Failey Tel: +44 (0)1491 820625 Fax: +44 (0)1491 820899 Email: r.failey@fugro.com Website: www.fugro.com	**Support Functions:** Quality System Quality Audit Administration **Construction:** Soils – Physical and Mechanical Testing	F

Site activities performed away from location B listed above:

Location details	Activity	Location code
Premises including domestic, commercial and industrial	Sampling for Microbiological Testing	D
Customer Locations - Marine and transitional water environments	Sampling for macrofaunal taxonomy and Physio-chemical analysis of sediments and water	E

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS for civil engineering purposes	Moisture content - oven drying method	BS 1377:Part 2:1990	A
	Permeability in a triaxial cell	BS 1377:Part 6:1990	A
	Electrical Resistivity – Cylindrical Samples	BS 1377-3: 2018 Clause 13.3	A
	One-dimensional consolidation properties of saturated cohesive soils using controlled-strain loading	ASTM D4186-20	A, F
	Triaxial Extension Tests – Consolidated triaxial extension tests on water saturated soils: Isotropic tests	Documented in-house method UK-MLB-TCH-PR-711 Triaxial Extension Tests Issue 1.0 01/01/2023	A, F
	Triaxial Extension Tests – Consolidated triaxial extension tests on water saturated soils: Anisotropic tests;	Documented in-house method UK-MLB-TCH-PR-711 Triaxial Extension Tests Issue 1.0 01/01/2023	A, F
	Dry density/moisture content relationship (vibrating hammer)	Documented In-House Method No. UK-MLB-TCH-PR-499 DryDensity-MoistureContent Issue 2.0 05/01/2023	A
SOIL and SOFT ROCK	Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe	ASTM D5334-22	A
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil	Water content	BS EN ISO 17892-1:2014 DIN EN ISO 17892-1:2014	A, F
	Bulk density - linear measurement method	BS EN ISO 17892-2:2014 DIN EN ISO 17892-2:2014	A, F
	Particle density - fluid pycnometer method	BS EN ISO 17892-3:2015 DIN EN ISO 17892-3:2015	A, F

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil (cont'd)	Particle size distribution - sieving method	BS EN ISO 17892-4:2016 DIN EN ISO 17892-4:2016	A, F
	Particle size distribution - pipette method	BS EN ISO 17892-4:2016 DIN EN ISO 17892-4:2016	A, F
	Particle size distribution - hydrometer method	BS EN ISO 17892-4:2016 DIN EN ISO 17892-4:2016	F
	Incremental loading oedometer test	BS EN ISO 17892-5:2017 DIN EN ISO 17892-5:2017	A, F
	Unconsolidated undrained triaxial test	BS EN ISO 17892-8:2018 DIN EN ISO 17892-8:2018	A, F
	Consolidated triaxial compression tests on water saturated soils: Isotropic consolidation (CIU and CID)	BS EN ISO 17892-9:2018 Clause 6.4 DIN EN ISO 17892-9:2018 Clause 6.4	A, F
	Consolidated triaxial compression tests on water saturated soils: Anisotropic consolidation (CAU and CAD)	BS EN ISO 17892-9:2018 Clause 6.5 DIN EN ISO 17892-9:2018 Clause 6.5	A, F
	Direct shear – shear box test	BS EN ISO 17892-10:2018 DIN EN ISO 17892-10:2018	A, F
	Direct shear – ring shear test	BS EN ISO 17892-10:2018 DIN EN ISO 17892-10:2018	A, F
	Liquid limit by fall cone method: four-point test	BS EN ISO 17892-12:2018 DIN EN ISO 17892-12:2018	A, F
	Liquid limit by fall cone method; one-point test	BS EN ISO 17892-12:2018 DIN EN ISO 17892-12:2018	A, F
	Plastic limit	BS EN ISO 17892-12:2018 DIN EN ISO 17892-12:2018	A, F
	Plasticity index	BS EN ISO 17892-12:2018 DIN EN ISO 17892-12:2018	A, F

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SEDIMENTS - Marine and freshwater sediments	<u>Physical Tests</u> Particle size distribution	Documented In-House Methods UK-SED-TCH-WI-001 Particle Size Distribution based on NMBAQC's best practice guidance – Particle Size Analysis (PSA) for Supporting Biological Analysis 2022 using a dry sieving method UK-SED-TCH-WI-002 Particle Size Distribution based on BS 1377 Parts 1: 2016 and 2: 1990 using a dry sieving method	B
	Particle size distribution	UK-SED-TCH-WI-006 Particle Size Distribution by Laser Diffraction / 0.02um to 2000um by Laser Diffraction based on NMBAQC'S Best Practice Guidance – Particle Size Analysis (PSA) for Supporting Biological Analysis 2022 and BS ISO 13320:2020	B
WATERS - Saline and Freshwaters	Suspended solids (Glass fibre paper (1.2 µm) filtration method)	UK-SED-TCH-WI-010 – Total Suspended Solids based on HMSO Methods 1980 and BS 872:2005 using gravimetric weighing	B
SEDIMENTS - Sediments from Marine and Transitional Waters	<u>Ecological Tests</u> Marine soft-bottom sediment macrofaunal taxonomy	UK-BEN-TCH-WI-001 - Macrobenthic Sample Analysis	B

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Chemical Tests		
MARINE SEDIMENTS SOILS	Total Petroleum Hydrocarbons C_{10} to C_{40}	UK-CHM-TCH-WI-003 - Extraction and Clean-up of Aliphatic and Aromatic Hydrocarbons from Sediments and Soils UK-CHM-TCH-WI-005 - Analysis of Total and Aliphatic Hydrocarbons from Sediments, Soils and Waters	C
WATERS - Saline and Freshwaters	Total Petroleum Hydrocarbons C_{10} to C_{40}	UK-CHM-TCH-WI-004 - Extraction and Clean-up of Aliphatic and Aromatic Hydrocarbons from Water UK-CHM-TCH-WI-005 - Analysis of Total and Aliphatic Hydrocarbons from Sediments, Soils and Waters	C
SEDIMENTS (marine, estuarine etc.)	Metals: Aluminium; Barium; Iron Manganese; Phosphorus Titanium; Vanadium	UK-CHM-TCH-WI-032 Aqua Regia Microwave Digestion of Sediments and Soils UK-CHM-TCH-WI-033 ICP-OES Analysis of Major and Trace Elements in Sediments Soils after an Aqua Regia Digest	C
	Metals: Antimony; Arsenic; Cadmium Chromium; Cobalt; Copper; Lead; Lithium Mercury; Molybdenum Nickel; Silver; Strontium; Zinc	UK-CHM-TCH-WI-032 Aqua Regia Microwave Digestion of Sediments and Soils UK-CHM-TCH-WI-034 ICP-MS Analysis of Trace Elements in Sediments and Soils after an Aqua Regia Digest	C
WATERS	Sampling and subsequent analysis by an ISO/IEC 17025 accredited laboratory for	Documented In-House Methods	
RECREATIONAL - Swimming Pools/SPA's	Microbiological Testing	UK-WQS-TCH-WI-001 - Bacteriological Sampling	D

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Accredited to ISO/IEC 17025:2017

Fugro GB Limited

Issue No: 049 **Issue date:** 01 February 2024

Testing performed by the Organisation at the locations specified

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
POTABLE - Non-Regulatory sampling (Hot and cold water supply)	Microbiological Testing	UK-WQS-TCH-WI-001 - Bacteriological Sampling	D
SEDIMENTS	Sampling and subsequent analysis by an ISO/IEC 17025 accredited laboratory for	Documented In-House Methods	
Sediments from Marine and Transitional Waters	Macrofaunal taxonomy and to determine physio-chemical properties of the marine sediment collected by means of grab sampler or corer	UK-ESR-OPL-PR-001 - Ecology Group Survey Methods and Procedures (based on ISO 5667-19:2004 and BS EN ISO 16665:2013).	E
END			

Schedule of Accreditation

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United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

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Accredited to ISO/IEC 17025:2017

Geolabs Limited

Issue No: 029 **Issue date:** 27 March 2025

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Testing performed by the Organisation at the locations specified

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Bucknalls Lane Garston Watford Hertfordshire WD25 9XX	**Local contact** Mr J R Masters	Testing: Soils - mechanical tests & physical tests	Watford
Address Midlands Office Albany House Station Road Coleshill North Warwickshire B46 1HT.	**Local contact** Mr J Reynolds	Testing: Soils - mechanical tests & physical tests	Midlands

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil	Water content	BS EN ISO 17892-1:2014 +A1:2022	Watford Midlands
	Bulk density - linear measurement method	BS EN ISO 17892-2:2014	Watford Midlands
	Determination of bulk density – immersion in fluid method	BS EN ISO 17892-2:2014	Watford Midlands
	Determination of particle density – fluid pycnometer method	BS EN ISO 17892-3:2015	Watford Midlands
	Determination of particle size distribution -sieving method -pipette method	BS EN ISO 17892-4:2016	Watford Midlands
	Determination of particle size distribution -hydrometer method	BS EN ISO 17892-4:2016	Midlands
	Incremental loading oedometer test	BS EN ISO 17892-5: 2017	Watford Midlands
	Unconfined compression test	BS EN ISO 17892-7:2018	Watford Midlands
	Unconsolidated undrained triaxial test	BS EN ISO 17892-8:2018	Watford Midlands
	Isotropically consolidated triaxial compression tests on water saturated soils	BS EN ISO 17892-9:2018	Watford
	Consolidated triaxial compression tests on water saturated soils, Anisotropic consolidation (CAU and CAD tests)	BS EN ISO 17892-9:2018	Watford
	Direct Shear Tests – Small Shearbox	BS EN ISO 17892-10:2018	Watford

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil (cont'd)	Direct Shear Tests – Large Shearbox	BS EN ISO 17892-10:2018	Watford
	Direct Shear Tests – Ring Shear Test	BS EN ISO 17892-10:2018	Watford
	Permeability in a triaxial cell	BS EN ISO 17892-11 2019	Watford
	Determination of liquid limit by the fall cone method	BS EN ISO 17892-12 2018 +A2:2022	Watford Midlands
	Determination of plastic limit	BS EN ISO 17892-12 2018 +A2:2022	Watford Midlands
	Plasticity Index and Liquidity Index	BS EN ISO 17892-12 2018 +A2:2022	Watford Midlands
SOILS for civil engineering purposes	Moisture content - oven drying method	BS 1377- 2:1990 BS1377-2: 2022	Watford Midlands
	Liquid limit - cone penetrometer	BS 1377- 2:1990 BS1377-2: 2022	Watford Midlands
	Liquid limit - cone penetrometer - one point	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Plastic limit	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Plasticity index and liquidity index	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - wet sieving	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - dry sieving	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - sedimentation pipette method	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - sedimentation hydrometer method	BS 1377- 2:1990 BS1377- 2: 2022	Midlands

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS for civil engineering purposes (cont'd)	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Determination of Electrical Resistivity	BS 1377-3: 2018 + A1: 2021	Watford
	Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe	ASTM D5334 – 22A	Watford
	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	California Bearing Ratio (CBR)	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Measurement of swelling of soaked CBR specimen	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Moisture condition value – natural moisture content	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	MCV / moisture content relation	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Soil-steel interface (ICP) ring shear test	ICP design methods for driven piles in sands and clays' –Jardine et al 2005 (Appendix A)	Watford
	One-dimensional consolidation properties	BS 1377- 5:1990 BS1377- 2: 2022	Watford Midlands
	One Dimensional Consolidation Properties of Saturated Cohesive Soils using Controlled-Strain Loading	ASTM D4186 / D4186M - 20^{E1}	Watford
	Permeability in a triaxial cell	BS 1377- 6:1990 BS1377- 2: 2022	Watford
	Unconfined compressive strength - load frame method	BS 1377- 7:1990 BS1377- 2: 2022	Watford Midlands

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS for civil engineering purposes (cont'd)	Undrained shear strength – triaxial compression without measurement of pore pressure	BS 1377- 7:1990 BS1377- 2: 2022	Watford Midlands
	Undrained shear strength – triaxial compression with multistage loading and without measurement of pore pressure	BS 1377- 7:1990	Watford Midlands
	Shear strength - small shearbox	BS 1377- 7:1990 BS1377- 2: 2022	Watford
	Residual strength - small ring shear apparatus	BS 1377- 7:1990 BS1377- 2: 2022	Watford
	Shear strength – large shearbox	BS 1377- 7:1990 BS1377- 2: 2022	Watford
	Uniformity coefficient	Specification for Highway Works table 6/1 footnote 5	Watford Midlands
	Effective shear strength – consolidated-undrained triaxial compression test with measurement of pore pressure	BS 1377- 8:1990 BS1377- 2: 2022	Watford
	Effective shear strength – consolidated-drained triaxial compression test with measurement of volume change	BS 1377- 8:1990 BS1377- 2: 2022	Watford
	Effective shear strength – consolidated drained multistage triaxial compression test with measurement of volume change	Documented In-House Method Test Procedure 38	Watford
	Effective shear strength – consolidated undrained multistage triaxial compression test with measurement of pore pressure	Documented In-House Method Test Procedure 38	Watford

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
ROCK	Water Content.	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Porosity and density-by saturation and caliper techniques.	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Determination of point load strength and anisotropy indices (loads from 2 to 55kN).	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Unconfined Compressive Strength (loads from 10 to 2000kN)	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Slake durability index	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006	Watford
	Cerchar abrasivity test	The ISRM Suggested Methods for Rock Characterization Testing and Monitoring: 2007 – 2014	Watford
	Cerchar abrasivity test	ASTM D7625-10	Watford
	Preparation of rock cores for strength testing	ASTM D4543-08	Watford

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
ROCK (cont'd)	Determination of Indirect Tensile Strength – Brazil Test	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
AGGREGATES	Particle size distribution – sieving method	BS EN 933-1: 2012	Watford
	Particle density and water absorption – pyknometer method	BS EN 1097-6: 2013	Watford
END			

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
LEACHATES WATER, PROCESS WATER, SALINE/SEA WATER, WASTE WATER, NATURAL	<u>Analysis</u> pH value	Documented In-House Method No DETCS 2008 based on BS 1377:Part 3:1990	A
	Electrical Conductivity	Documented In-House Method No DETCS 2009	A
	Alkalinity	Documented In-House Method No DETSC 2030 based on Standing Committee of Analysts Methods (HMSO) ISBN 011 751 6015	A
	Chemical Oxygen Demand	Documented In-House Method No DETSC 2032 based on Standing Committee of Analysts Method (HMSO) ISBN 011 751 9154, 1986, by colorimetry	A
	Suspended Solids	Documented In-House Method No DETSC 2034 based on Standing Committee of Analysts Method (HMSO) ISBN 011 751 957 X, 1980	A
	Total Dissolved Solids	Documented In-House Method No DETSC 2035 based on Standing Committee of Analysts Method (HMSO) ISBN 011 751 957 X, 1980	A
	Chloride content	Documented In-House Method No DETSC 2006 based on BS 1377:Part 3:1990	A
LEACHATES, WATER, PROCESS, WATER, SALINE/SEA, WATER, WASTE, WATER, NATURAL, TRADE EFFLUENTS	Biochemical Oxygen Demand	Documented In-House Method No DETSC 2031 based on Standing Committee of Analysts Method (HMSO) ISBN 011 752 2120, 1988, by meter	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
LEACHATES WATER, PROCESS WATER, SALINE/SEA WATER, WASTE WATER, NATURAL	Analysis (cont'd)		
	Boron (soluble)	Documented In-House Method No DETSC 2123 by colorimetry	A
	Anions, comprising: Chloride Nitrate Nitrite Phosphate Sulphate	Documented In-House Method No DETSC 2055 by ion chromatography based on EPA 9056A (Rev 1 November 2000)	A
Clean water (non-regulatory) Surface (River) water, Sewage Influent and Sewage effluent	Mercury (Total and Dissolved)	Documented in house Method No DETSC 2324 by AFS	A
	Low level Total and Dissolved Metals Aluminium Phosphorous Chromium Iron Nickel Copper Zinc Cadmium Lead	Documented in house Method No DETSC 2306 by ICPMS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
Clean water (non-regulatory) River water, Groundwater, Trade effluent, prepared and Landfill leachate	Metals: Dissolved only: Aluminium Antimony Arsenic Barium Calcium Cadmium Cobalt Chromium Copper Iron Lead Mercury Potassium Magnesium Manganese Nickel Phosphorus Selenium Sodium Vanadium Zinc	Documented in house method No DETSC 2306 by ICP-MS	A
Clean water (non-regulatory) River water, Groundwater, prepared and Landfill leachate	Molybdenum		
Clean water (non-regulatory) River water, Groundwater, Trade effluent, prepared and Landfill leachate	Hardness by Calculation Calcium Hardness by Calculation	Documented in-House method DETSC 2303	A
	Elemental Sulphur	Documented In-House Method No DETSC 3049 by HPLC based on standing committee of Analysts Method (HMSO) ISBN 011 751 726 7	A
	Oil and Grease (Hexane extractable material) Cyclohexane Extractable Material Toluene Extractable Material	Documented In-House Method No DETSC 3002 by extraction/ gravimetry	A
	Thiocyanate	Documented In-House Method No DETSC 2130 by Skalar	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
Clean water (non-regulatory) River water, Groundwater, Trade effluent, prepared and Landfill leachate (cont'd)	Cyanide (total)	Documented In-House Method No DETSC 2130 by Skalar	A
	Cyanide (free)	Documented In-House Method No DETSC 2130 by Skalar	A
	Phenol (monohydric)	Documented In-House Method No DETSC 2130 by Skalar	A
	Low Level Cyanide (total)	Documented In-House Method No DETSC 2131 by Skalar	A
	Low Level Cyanide (free)	Documented In-House Method No DETSC 2131 by Skalar	A
	Low level Cyanide (Complex by Calculation)	Documented In-House Method No DETSC 2131 by Skalar	A
	Low Level Phenol (monohydric)	Documented In-House Method No DETSC 2131 by Skalar	A
	Volatile Organic Compounds (VOCs), specifically: Benzene Ethylbenzene Methyl-tert-butyl-ether (MTBE) Toluene o-Xylene (m+p)-Xylenes	Documented In-House Method No DETSC 3322 by GC-FID	A
	Extractable Petroleum Hydrocarbons (EPH) (C_{10}-C_{40})	Documented In-House Method No DETSC 3311 by GC-FID	
LEACHATES, TAP WATER (non-regulatory), RIVER WATER AND GROUNDWATER	Nitrite	Documented In-House Method No DETSC 2201 by KONELAB 60i	A
	TON	Documented In-House Method No DETSC 2202 by KONELAB 60i	A
	Hexavalent Chromium	Documented In-House Method No DETSC 2203 by KONELAB 60i	A
	Phosphorous (Soluble reactive)	Documented In-House Method No DETSC 2205 by KONELAB 60i	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
LEACHATES, TAP WATER (non-regulatory), RIVER WATER AND GROUNDWATER (cont'd)	High level Ammonia	Documented In-House Method No DETSC 2206 by KONELAB 60i	A
	Low Level Ammonia	Documented In-House Method No DETSC 2207 by KONELAB 60i	A
	Sulphide	Documented In-House Method No DETSC 2208 by KONELAB 60i	A
LEACHATES (from soils), TAP WATER (non-regulatory), RIVER WATER AND GROUNDWATER	Petroleum range hydrocarbons (PRO) including banding: Total PRO C_5-C_{10} PRO C_5-C_6 PRO C_6-C_8 PRO C_8-C_{10} Total Aliphatic C_5-C_{10} Aliphatic C_5-C_6 Aliphatic >C_6-C_8 Aliphatic >C_8-C_{10} Total Aromatic C_5-C_{10} Aromatic C_5-C_7 Aromatic >C_7-C_8 Aromatic >C_8-C_{10}	Documented in house method No DETSC 3322 using GC-FID	A
LEACHATES (from soils), TAP WATER (non-regulatory), EFFLUENT, RIVER WATER AND GROUNDWATER	Polycyclic Aromatic Hydrocarbons (PAH's) specifically: Naphthalene Acenaphthylene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benz[a]anthracene Chrysene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo[a]pyrene Dibenz[a,h]anthracene Indeno(123,cd) pyrene Benzo(ghi) perylene Total PAH (sum of EPA 16)	Documented in house method No DETSC 3304 using GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
LEACHATES (from soils), TAP WATER (non-regulatory), EFFLUENT, RIVER WATER AND GROUNDWATER (cont'd)	Polychlorinated Biphenyls (PCB's) specifically: PCB 28 / 31 PCB 52 PCB 101 PCB 118 + PCB 123 PCB 153 PCB 138 PCB 180 PCB 105 PCB 114 PCB 126 PCB 156 PCB 157 PCB 167 PCB 169 PCB 189 PCB 77 PCB 81	Documented in house method No DETSC 3402 using GC-MS	A
TAP WATER (non-regulatory), RIVER WATER, GROUNDWATER AND LEACHATE	Total Organic Carbon (TOC) Range - 3 - 30mg/l Range - 30 - 300mg/l	Documented In-House Method No DETSC 2033 by spectrophotometry	A
Surface Water, Groundwater, Effluent, Landfill Leachates and Leachates from Soils	Total Organic Carbon Dissolved Organic Carbon	Documented in house method DETSC 2085 by Infra-red TOC Analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
TAP WATER (non-regulatory) SURFACE (river) WATER, GROUNDWATER, TRADE EFFLUENT and PREPARED LEACHATE	Analysis (cont'd) Volatile Organic Compounds: Dichlorodifluoromethane Chloromethane vinyl chloride Bromomethane Chloroethane 1,1-dichloroethylene trans-1,2-dichloroethylene 1,1-dichloroethane cis 1,2-dichloroethylene Chloroform Bromochloromethane 1,1,1-trichloroethane 1,1-dichloropropene Carbon tetrachloride 1,2-dichloroethane Benzene 1,2-dichloropropane Dibromomethane Bromodichloromethane cis-1,3-dichloropropene Toluene trans-1,3-dichloropropene 1,1,2-trichloroethane Tetrachloroethylene 1,3-dichloropropane Dibromochloromethane 1,2-dibromoethane Chlorobenzene 1,1,1,2-tetrachloroethane Ethylbenzene m+p-Xylene o-Xylene Styrene Bromoform Isopropylbenzene 1,1,2,2-tetrachloroethane Bromobenzene 1,2,3-trichloropropane n-propylbenzene 2-chlorotoluene 1,3,5-trimethylbenzene 4-chlorotoluene Tert-butylbenzene	Documented in house method No DETSC 3432 by headspace GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
TAP WATER (non-regulatory) SURFACE (river) WATER, GROUNDWATER, TRADE EFFLUENT and PREPARED LEACHATE (cont'd)	Volatile Organic Compounds: (cont'd) 1,2,4-trimethylbenzene sec-butylbenzene p-isopropyltoluene 1,3-dichlorobenzene 1,4-dichlorobenzene n-butylbenzene 1,2-dichlorobenzene 1,2-dibromo-3-chloropropane 1,2,4-trichlorobenzene Hexachlorobutadiene Naphthalene 1,2,3-trichlorobenzene		A
TAP WATER (non-regulatory) SURFACE WATER, GROUNDWATER, TRADE EFFLUENT and PREPARED LEACHATE LANDFILL LEACHATE	Acid Herbicides: Mecoprop Bentazone MCPA Clopyralid Dicamba 2,3,6-trichlorobenzoic acid Dichloprop Bromoxynil Fenoprop MCPB 2,4,5-T Fluroxypyr 2,4-DB Ioxynil	Documented In-House Method No DETSC 3448 by LC-MS-MS	A
LEACHATES, RIVER WATER AND GROUNDWATER	pH	Documented In-House Method No DETSC 2008 by voltammetry	A
	Conductivity	Documented In-House Method No DETSC 2009 by **v**oltammetry	A
	Alkalinity	Documented In-House Method No DETSC 2030 by voltammetry	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS SEDIMENTS	<u>Chemical Analysis</u>		
	pH value	Documented In-House Method No DETSC 2008 based on BS 1377:Part 3:1990	A
	Electrical Conductivity	Documented In-House Method No DETSC 2009	A
	Organic Matter Content	Documented In-House Method No DETSC 2002 based on BS 1377:Part 3:1990	A
	Loss on Ignition	Documented In-House Method No DETSC 2003 based on BS 1377:Part 3:1990	A
	Sulphate content	Documented In-House Method No DETSC 2004 based on BS 1377:Part 3:1990	A
	Water Soluble Chloride content	Documented In-House Method No DETSC 2006 based on BS 1377:Part 3:1990	A
	Acid Soluble Chloride content	Documented In-House Method No DETSC 2007 based on BS 1377:Part 3:1990	A
	Anions, comprising: Chloride Fluoride Nitrate Nitrite Phosphate Sulphate	Method No DETSC 2055 by ion chromatography based on EPA 9056A (Rev 1 November 2000)	A
SOILS only	<u>Boron (water soluble)</u>	Documented In-House Method No DETSC 2311 by ICP-OES	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS SEDIMENTS (cont'd)	Chemical Analysis (cont'd)		
	Mercury	Documented In-House Method No DETSC 2325 by atomic fluorescence	A
SOILS only	Metals: Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Iron Lead Manganese Molybdenum Nickel Selenium Tin Vanadium Zinc	Documented In-House Method No DETSC 2301 by hotblock digestion and ICP-OES based on Standing Committee of Analysts Method (HMSO) ISBN 011 753 2444	A
	Sulphur (total)	Documented In-House Method No DETSC 2320 by hotblock digestion and ICP-OES	A
	Elemental Sulphur	Documented In-House Method No DETSC 3049 by HPLC based on standing committee of Analysts Method (HMSO) ISBN 011 751 726 7	A
	Volatile Organic Compounds (VOCs), specifically: Benzene Ethylbenzene Methyl-tert-butyl-ether (MTBE) Toluene o-Xylene (m+p)-Xylenes	Documented In-House Method No DETSC 3321 by GC-FID	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS SEDIMENTS (cont'd)	<u>Chemical Analysis</u> (cont'd)		
	Extractable Petroleum Hydrocarbons (EPH) (C_{10}-C_{40}) Diesel Range (C_{10}-C_{24}) Lube Oil range / Mineral Oil Range (C_{24}-C_{40})	Documented In-House Method No DETSC 3311 by GC-FID	A
	Polycyclic Aromatic Hydrocarbons (PAH's) specifically: Naphthalene Acenaphthylene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benz[a]anthracene Chrysene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo[a]pyrene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Dibenz[a,h]anthracene Total PAH (sum of EPA 16)	Documented In-House Method No DETSC 3301 by GC based on EPA 8100 and BG Soil Analysis 1999	A
	Polychlorinated Biphenyls (total)	Documented In-House Method No DETSC 3401 by GC-MS	A
SOILS	<u>Analysis</u>		
	Sulphate (acid soluble)	Documented In-House Method No DETSC 2321 by ICP-OES	A
	Sulphate (water soluble)	Documented In-House Method No DETSC 2076 (ICP-OES)	A
	Ammonia	Documented In-House Method No DETSC 2119 by spectrophotometry	A
	Thiocyanate	Documented In-House Method No DETSC 2130 by Skalar	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)		
	Cyanide (total) Cyanide (free) Phenol (monohydric)	Documented In-House Method No DETSC 2130 by Skalar	A
	Total Organic Carbon (TOC)	Documented In-House Method No DETSC 2084 by combustion and infra-red detection	A
	Loss on Drying at <30°C Moisture Content at 105°C	Documented In-House Method No DETSC 1004 by Gravimetry	A
	Fraction Organic Carbon by Calculation (Expressed as fraction of TOC)	Documented In-House Method No DETSC 2084	A
	Extractable Petroleum Hydrocarbons (EPH), C_{10}-C_{35}, specifically: Total EPH (C_{10}-C_{35}) Total Extractable Aliphatic Hydrocarbons (C_{10}-C_{35}) C_{10}-C_{12} (aliphatic) C_{12}-C_{16} (aliphatic) C_{16}-C_{21} (aliphatic) C_{21}-C_{35} (aliphatic) Total Extractable Aromatic Hydrocarbons (C_{10}-C_{35}) C_{10}-C_{12} (aromatic) C_{12}-C_{16} (aromatic) C_{16}-C_{21} (aromatic) C_{21}-C_{35} (aromatic)	Documented In-House Method DETSC 3072 by GC-FID	A
	Polychlorinated Biphenyls (total), comprising: PCB 28 / 31 PCB 52 PCB 101 PCB 118 PCB 138 PCB 153 PCB 180	Documented In-House Method No DETSC 3401 by GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)		
	Polyaromatic Hydrocarbons, comprising: Naphthalene Acenaphthylene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Dibenzo(a.h)anthracene Indeno(1,2,3-cd)pyrene Benzo(ghi)perylene Total PAH's (Sum of EPA 16)	Documented in house method No DETSC 3303 by GC-MS	A
	Gross Calorific value	Documented In-House Method No DETSC 5008 using Bomb calorimetry	A
	Net Calorific value	Documented in house calculation	A
Soils	Carbonate as Equivalent Carbon Dioxide	Documented in house method DETSC 2005 using titrimetry	A
Soils	Semi Volatile Organic Compounds: Phenol 2-Chlorophenol 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene Bis(2-chloroisopropyl)ether Benzyl alcohol 2-Methyl phenol N-Nitrosodi-n-propylamine Hexachloroethane 4-Methyl phenol & 3-Methylphenol Nitrobenzene Isophorone	Documented in house method DETSC 3433 using GCMS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd) Semi Volatile Organic Compounds: (cont'd) 2-Nitrophenol 2,4-Dimethyl phenol Bis (2-chloroethoxy) methane 2,4-Dichlorophenol 1,2,4-Trichlorobenzene Naphthalene Hexachlorobutadiene 4-Chloro-3-methyl phenol 2-Methylnaphthalene 1-Methylnaphthalene 2,4,6-Trichlorophenol 2-Chloronaphthalene Dimethylphthalate Acenaphthylene 2,6-Dinitrotoluene Acenaphthene Dibenzofuran Diethylphthalate Fluorene Diphenylamine Azobenzene 4-Bromophenyl-1-phenylether Hexachlorobenzene Phenanthrene Anthracene Di-n-butylphthalate Fluoranthene Pyrene Benzo(a)anthracene Chrysene Bis(2-ethylhexyl)phthalate Di-n-octylphthalate Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	Documented in house method DETSC 3433 using GCMS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd) Volatile Organic Compounds: Vinyl Chloride 1,1 Dichloroethylene Trans-1,2-dichloroethylene 1,1-dichloroethane Cis-1,2-dichloroethylene 2,2-dichloropropane Bromochloromethane Chloroform 1,1,1-trichloroethane 1,1-dichloropropene Carbon tetrachloride Benzene 1,2-dichloroethane Trichloroethylene 1,2-dichloropropane Dibromomethane Bromodichloromethane cis-1,3-dichloropropene Toluene trans-1,3-dichloropropene 1,1,2-trichloroethane Tetrachloroethylene 1,3-dichloropropane Dibromochloromethane 1,2-dibromoethane Chlorobenzene 1,1,1,2-tetrachloroethane Ethylbenzene m+p-Xylene o-Xylene Bromoform Isopropylbenzene Bromobenzene 1,2,3-trichloropropane n-propylbenzene 2-chlorotoluene 1,3,5-trimethylbenzene 4-chlorotoluene Tert-butylbenzene 1,2,4-trimethylbenzene sec-butylbenzene p-isopropyltoluene 1,3-dichlorobenzene 1,4-dichlorobenzene n-butylbenzene	Documented in house method DETSC 3431 using Headspace GCMS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)		
	Volatile Organic Compounds: (Cont'd) 1,2-dichlorobenzene 1,2-dibromo-3-chloropropane 1,2,4-trichlorobenzene Hexachlorobutadiene Naphthalene 1,2,3-trichlorobenzene	Documented in house method DETSC 3431 using Headspace GCMS	A
	Acid Herbicides, specifically: 2,4,5-TP (Fenoprop) Clopyralid Picloram 2,3,6-TBA Dicamba Benazolin Fluroxypyr Bentazone 2,4-D Bromoxynil MCPA Triclopyr Dichloprop Ioxynil Mecoprop 2,4,5-T 2,4-DB	Documented in house method DETSC 3447 ising LC-MS-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
BIOMASS and SOLID RECOVERED FUELS	Total Moisture	Documented In-House Method No DETSC 5004 using gravimetric techniques	A
	Analysis Moisture	Documented In-House Method No DETSC 5005 using gravimetric techniques	A
	Volatile matter	Documented In-House Method No DETSC 5003 using gravimetric techniques	A
	Gross Calorific value	Documented In-House Method No DETSC 5007 using Bomb calorimetry	A
	Net Calorific value	Documented in house calculation	A
	Ash Content	Documented In-House Method No DETSC 5002 using gravimetric techniques	A
	Mercury	Documented In-House Method No DETSC 5015 using hot block digestion and Cold Vapour Atomic Fluorescence	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
BIOMASS and SOLID RECOVERED FUELS (cont'd)	Metals Aluminium Arsenic Antimony Barium Beryllium Cadmium Calcium Cobalt Chromium Copper Iron Lead Magnesium Manganese Molybdenum Nickel Phosphorous Potassium Selenium Sodium Thallium Tin Titanium Vanadium Zinc	Documented In-House Method No DETSC 5014 using hot block digestion and ICP-OES	A
	Sulphur	Documented In-House Method No DETSC 5016 using hot block digestion and ICP-OES	A
	Chlorine Fluorine	Documented In-House Method No DETSC 5017 using Ion Chromatography	A
	Biomass Content	Documented In-House Method No DETSC 5012 based on BS EN ISO 21644:2021 using Gravimetry	A
	Carbon, Hydrogen, Nitrogen	Documented In-House Method No DETSC 5013 using CHN analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Analysis (cont'd)		
BIOMASS and SOLID RECOVERED FUELS (cont'd)	Oxygen (by calculation)	Documented In-House Method No DETSC 5013 by calculation	A
RECYCLED WASTE Trommel Fines	Loss on Ignition at 440°C	Documented in house method ref DETSC 5022 – using Gravimetric Analysis in accordance with HMRC Excise Notice LFT1 27 March 2015	A
	Health and Hygiene	Health and Safety Executive - Asbestos: The Analysts' Guide (HSG 248) – 2021	
ASBESTOS IN BULK MATERIALS including materials and products suspected of containing asbestos	Identification of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	Documented In-House Method DETSC 1101 using stereo-microscopy, polarised light optical microscopy and dispersion staining based on HSG 248.	A
ASBESTOS IN SOILS – The Identification of Asbestos fibres in bulk samples of Soil, *specifically*: *Soil* Aggregate Ballast	Identification of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	Documented In-House Method DETSC 1102 for identification using stereo-microscopy, polarised light optical microscopy and dispersion staining based on HSG 248.	A
ASBESTOS IN SOILS – The Identification and Quantification of Asbestos fibres in bulk samples of Soil, *specifically:* *Soil* *Ballast* *Aggregate*,	Identification and Quantification of Asbestos content of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	Documented In-House Method DETSC 1102 for identification using stereo-microscopy, polarised light optical microscopy and dispersion staining based on HSG 248 Documented In-House Method DETSC 1102 for quantification of asbestos using gravimetry and phase contrast microscopy	A
ASBESTOS CONTAINING MATERIALS	Water Absorption	Documented In-House Method DETSC 1103	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS	Analysis	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - Chemical Testing of Soil	
	pH value	Documented In-House Method No DETSC 2008 by **v**oltammetry	A
	Loss on Ignition	Documented In-House Method No DETSC 2003 based on BS 1377:Part 3:1990	A
	Organic Matter Content	Documented In-House Method No DETSC 2002 based on BS 1377:Part 3:1990	A
	Total Organic Carbon (TOC)	Documented In-House Method No DETSC 2084 by combustion and infra-red detection	A
	Fraction Organic Carbon by Calculation (Expressed as fraction of TOC)	Documented In-House Method No DETSC 2084	A
	Sulphate (acid soluble)	Documented In-House Method No DETSC 2321 by ICP-OES	A
	Sulphate (water soluble)	Documented In-House Method No DETSC 2076 (ICP-OES)	A
	Sulphate (acid soluble)	Documented In-House Method No DETSC 2004	A
	Ammonia	Documented In-House Method No DETSC 2119	A
	Thiocyanate	Documented In-House Method No DETSC 2130	A
	Cyanide (total)	Documented In-House Method No DETSC 2130 by Skalar	A
	Cyanide (free)	Documented In-House Method No DETSC 2130 by Skalar	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - Chemical Testing of Soil (cont'd)	
	Boron (water soluble)	Documented In-House Method No DETSC 2311 by ICP-OES	A
	Mercury	Documented In-House Method No DETSC 2325 by hotblock digestion and atomic fluorescence	A
	Sulphur (elemental)	Documented In-House Method No DETSC 3049 by HPLC based on Standing Committee of Analysts Method (HMSO) ISBN 011 751 726 7	A
	Metals: Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lead Manganese Molybdenum Nickel Selenium Vanadium Zinc	Documented In-House Method No DETSC 2301 by hotblock digestion and ICP-OES based on Standing Committee of Analysts Method (HMSO) ISBN 011 753 2444	A
	Phenol (monohydric)	Documented In-House Method No DETSC 2130	A
	Volatile Organic Compounds (VOCs), specifically: Benzene Ethylbenzene Toluene o-Xylene (m+p)-Xylenes	Documented In-House Method No DETSC 3321	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - Chemical Testing of Soil (cont'd)	
	Extractable Petroleum Hydrocarbons (EPH) (C_{10}-C_{40}) Diesel Range (C_{10}-C_{24}) Lube Oil Range / Mineral Oil Range (C_{24}-C_{40})	Documented In-House Method No DETSC 3311 by GC-FID	A
	Extractable Petroleum Hydrocarbons (EPH), C_{10}-C_{35}, specifically: Total EPH (C_{10}-C_{35}) Total Extractable Aliphatic Hydrocarbons (C_{10}-C_{35}) C_{10}-C_{12} (aliphatic) C_{12}-C_{16} (aliphatic) C_{16}-C_{21} (aliphatic) C_{21}-C_{35} (aliphatic)	Documented In-House Method DETSC 3072 by GC-FID	A
	Extractable Petroleum Hydrocarbons (EPH), C_{10}-C_{35}, specifically: Total Extractable Aromatic Hydrocarbons (C_{10}-C_{35}) C_{10}-C_{12} (aromatic) C_{12}-C_{16} (aromatic) C_{16}-C_{21} (aromatic) C_{21}-C_{35} (aromatic)	Documented In-House Method DETSC 3072 by GC-FID	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - Chemical Testing of Soil (cont'd)	
	Extractable Petroleum Hydrocarbons (EPH) specifically: >EC10-EC12 >EC12-EC16 >EC16-EC21 >EC21-EC35 >EC35-EC40 >EC10-C35 >EC10-C40 >EC10-C24 >EC24-C40 Total Extractable Aliphatic Hydrocarbons specifically: >EC10-EC12 >EC12-EC16 >EC16-EC21 >EC21-EC35 >EC35-EC40 >EC10-C35 >EC10-C40 Total Extractable Aromatic Hydrocarbons specifically: >EC10-EC12 >EC12-EC16 >EC16-EC21 >EC21-EC35 >EC10-C35	Documented In-House Method DETSC 3521 by GC/GC-FID	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	Analysis (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - Chemical Testing of Soil (cont'd)	
	Polychlorinated Biphenyls (total), comprising: PCB 28 / 31 PCB 52 PCB 101 PCB 118 PCB 138 PCB 153 PCB 180	Documented In-House Method No DETSC 3401 by GC-MS	A
	Polyaromatic Hydrocarbons, comprising: Naphthalene Fluoranthene Acenaphthylene Acenaphthene Phenanthrene Pyrene Benzo(a)anthracene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Dibenzo(a.h)anthracene Indeno(1,2,3-cd)pyrene Benzo(ghi)perylene	Documented in house method No DETSC 3303 by GC-MS	A
WASTEWATERS	Analysis	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
	Chemical Oxygen Demand	Method DETSC 2032 by Colorimetry	A
END			

Appendix E

Positioning and Water Depth Data

E.1 Positioning and Water Depth Data

Fugro report PE1129-GEOT-01 issue 2 summarises the borehole location coordinates and water depth measurements.

Target coordinates for all borehole locations were specified by Direction Générale de l'Energie et du Climat - DGEC /Client Consultant and the actual coordinates were approved before borehole and cone penetration test operations. The coordinates presented in this positioning and data report are the calculated location coordinates. Coordinates for all boreholes are expressed using the Universal Transverse Mercator (UTM) projection 30 N, World Geodetic System 1984, International Spheroid, with a central meridian of 3° east

Measured water depths were reduced to the Lowest Astronomical Tide (LAT) based on chart datum CD FR Bathyelli. It should be noted that all water depth measurements made during this investigation are considered sufficiently accurate for geotechnical use but should not be used in isolation for design purposes.

Positioning Data for Fugro Zephyr

Final Report | Bretagne Nord Ouest - Geotechnical Site Investigation

PE1129-GEOT-01 Issue 2 | 27 August 2025

Issue for Approval

DGEC

MINISTÈRE
DE LA TRANSITION
ÉNERGÉTIQUE

Liberté
Égalité
Fraternité

Document Control

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Report Amendment

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2	Entire				Office QC

Location Map

Location of Bretagne Nord Ouest - Geotechnical Site Investigation.

Executive Summary

Fugro was contracted by DGEC to supply navigation and positioning services for the geotechnical drilling vessel Fugro Zephyr at 15 sampling and/or in situ testing locations at Bretagne Nord Ouest - Geotechnical Site Investigation.

The sampling and/or in situ testing was carried out between 14 and 25 August 2025.

Fugro navigated and positioned the geotechnical drill ship Fugro Zephyr to the intended positions given by the Client.

Two StarPack GNSS receivers for the surface positioning were used during the project. Underwater positioning was via the vessel's Kongsberg HiPAP 501 USBL system. All depths measurements were reduced to LAT. The real-time GNSS tides were used throughout the project.

Depths at each sample location were measured using the following techniques: USBL depth, pressure sensor and drill string.

During the operations speed of sound measurements were taken and the results were entered into the HiPAP 501 USBL system.

All positions and peripheral (gyrocompass, USBL, etc.) data were sent to the navigation computer which calculated offsets positions in the local geodesy and projection, WGS84/UTM Zone 30N.

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Glossary

Accuracy	The accuracy of a measurement is its degree of closeness to its actual (true) value. Accuracy is the combination of the precision and reliability of an observation.
Augmentation Data	Additional information e.g. from a reference or tracking station, applied at a user receiver to improve the positioning solution. See also differential GNSS.
Azimuth	A horizontal angle measured from the spheroidal meridian clockwise from north through 360°. See also bearing and heading.
Bearing	Refers to a direction from one point to another on a chart right rotated from grid north (bearing = azimuth + convergence + arc to chord correction). See also azimuth and heading.
C-O Correction	Calculated minus observed correction. The difference found in a calibration procedure between a fixed value and an observation. The C O correction must always be added to the observation.
Chart Datum	Vertical Datum used in charting. Chart data e.g. Mean Sea Level (MSL), Lowest Astronomical Tide (LAT), Lowest Low Water Springs (LLWS), Normaal Amsterdams Peil (Amsterdam Ordnance Datum) (NAP), Normal Null (NN). See also Vertical Datum.
CM	Central meridian, the meridian that defines the central line of longitude of the chart projection. It is a zone constant used in chart projections.
Convergence	Clockwise angle in a point between true north and grid north.
CRP	Common Reference Point is the origin of all vessel coordinates. It is also referred to as the vessel datum. It often corresponds to the drill string on drilling vessels.
Datum (Geodetic)	A mathematical model designed to best-fit part or all of the geoid. It is defined by an ellipsoid and the relationship between the ellipsoid and a point on the topographic surface established as the origin of datum. This relationship can be defined by six quantities, generally (but not necessarily) the geodetic latitude, longitude and the height of the origin, the two components of the deflection of the vertical at the origin, and the geodetic azimuth of a line, from the origin to some other point.
Datum Rotation (Geodetic)	Defined as the anticlockwise rotation around the X-axis, Y-axis and Z-axis (Rx, Ry, and Rz) in the origin of two spheroids in terms of the Cartesian or geocentric coordinates. See also datum shift and scale.
Datum Shift (Geodetic)	Defined as the difference (ΔX, ΔY, ΔZ) in the origin of two spheroids in terms of the Cartesian or geocentric coordinates. See also datum rotation and scale.
Datum (Vessel)	The vessel datum is the origin of all vessel coordinates. It is referred to as the common reference point or CRP.
DGNSS	Augmentation technique requiring a GNSS receiver(s) to be placed at one or multiple known points from which GNSS observable (pseudo-range) corrections can be deduced. These corrections can then be applied to the offshore mobile receiver.
Differential Positioning	Determination of relative coordinates between two or more satellite receivers that are simultaneously tracking the same satellite signal.
DP	Dynamic positioning, mainly referring to a system keeping the vessel in one position compensating for current, wind and other natural influences, using a variety of positioning systems as reference.
Dynamic Calibration	A technique of calibration on the heading and motion sensors that can be undertaken whilst in port, in transit or during production. GNSS data from three GNSS antennas, placed in large separation along or athwart the vessel, are acquired while the sensor data are also logged. As a result, C-Os for heading, pitch and roll can be determined.

Ellipsoid/Spheroid	In geodesy, unless otherwise specified, a mathematical figure formed by revolving an ellipse about its minor axis. It is often used interchangeably with spheroid. Two quantities define an ellipsoid: these are usually given as the length of the semi-major axis, a, and the inverse flattening, 1/f = a / (a-b), where b is the length of the semi-minor axis. Prolate and triaxial ellipsoids are invariably described as such.
False Easting/False Northing	Defined projection coordinate offsets to the origin point of the projection.
Geoid	The particular equipotential surface with coincides with mean sea level, and which may be imagined to extend through the continents. This surface is perpendicular to the force of gravity everywhere.
GLONASS	Russian global navigation satellite system.
GPS	Global positioning system.
GNSS	Global navigation satellite system. A combination solution of GPS and GLONASS with provision for the future European Galileo space system.
HDOP	Horizontal dilution of precision. A measure of the magnitude of DOP errors in latitude and longitude.
Heading	Course of a vessel measured with a heading system, i.e. a gyrocompass, or a GPS vector heading system. If the heading is magnetic this will be stated. See also azimuth and bearing.
HiPAP	High precision acoustic positioning. A USBL system developed by Simrad - Kongsberg. See USBL definition.
HPR	Hydro acoustic positioning reference. See USBL definition.
Line Scale Factor	The ratio of a distance from point A to point B on the grid to the corresponding distance on the spheroid. K = plane distance/spheroidal distance 1/k=1/6(1/kA + 4/kM +1/kB). (kA, kB, kM being point scale factors at A, B, M. See also point scale factor)
Multifix	Multi reference differential global positioning system based on simultaneous calculated single DGPS positions for each reference station which solutions are then applied to a least squares calculation by which a new solution is created by weighting the single solutions on distance of the used reference station used in the single computations.
NTRIP	Networked Transport of RTCM via Internet Protocol. NTRIP is a protocol of streaming DGPS corrections over the internet.
Offset	A station offset from the main survey station. Must be defined by an azimuth and distance or ΔX, ΔY, ΔZ, or starboard/port, forward/aft, above/below.
OWF	Offshore Wind Farm.
PDOP	Position dilution of precision. A unit-less figure of merit expressing the relationship between the error in user position and the error in satellite position.
PPP	Precise Point Positioning. A global GNSS augmentation technique that corrects for GNSS satellite clock and orbit errors and employs additional modelling techniques to further correct and improve the point positioning accuracy.
Precision	A measure of the random errors in observations and estimated parameters.
Reference Station	A GNSS receiver located at a precisely known location and used to determine the differential corrections employed for DGNSS augmentation techniques.
Satellite Configuration	State of the satellite configuration at a specific time, relative to a specific user or set of users.
Satellite Constellation	The arrangement in space of the complete set of satellites of a system such as GPS.

Scale	Reduction/expansion used in datum-datum transformations. Unit: ppm (parts per million). See also datum shift and datum rotation.
Scale Factor (Point)	Ratio of an infinitesimal distance at a point on the grid to the corresponding distance on the spheroid. K = Δ (plane distance) / Δ (spheroidal distance).
S/CTD (probe)	Salinity or conductivity, temperature and depth probe. Used to determine speed of sound through the water column. Pressure to depth conversions may be applied to provide true depth values.
SD	Standard deviation. Measure of the dispersion of random errors about the mean value. If a large number of measurements or observations of the same quantity are made, the standard deviation is the square root of the sum of the squares of deviations from the mean value divided by the number of observations less one.
Starfix.G2	A decimetre accuracy integrated GNSS service which utilises Fugro's own global network of reference stations to measure carrier phase observations. This data is then processed, producing a corrections solution for each navigation satellite. These corrections are applied to the satellite time reference clock and ephemeris ("orbit") information, hence "clock and orbit corrections". This service utilises both GPS and GLONASS L1 and L2 frequencies, thereby providing an accurate measurement of variations in Ionospheric thickness. This enables signal delay to be calculated more precisely, resulting in a more accurate satellite to antenna range, and hence a more accurate position solution. Starfix.G2 provides a high availability, high integrity, global solution to an accuracy of 10 cm (95 % confidence level) both horizontally and vertically.
Starfix.G2+/G4+	Ultra-precise (3 cm) GPS and GLONASS Global Positioning Service, using Clock and Orbit Corrections enhanced with carrier-phase corrections from the Fugro G4 Network. Starfix.G2+/G4+ is an enhancement of Starfix.G2 service (based on GPS and GLONASS) and utilises advanced GNSS augmentation algorithms developed in-house by Fugro. The code and carrier-phase signals transmitted by GPS and GLONASS satellites are monitored globally by Fugro's worldwide network of reference stations. These observations are processed centrally in real-time using the company's proprietary algorithms to generate precise corrections which are used to augment the standard signals broadcast by GPS and GLONASS satellites. Corrections are received via communications satellites, providing at least two independent G2+/G4+ data sources.
Starfix.G4	A GPS, GLONASS, Galileo and BeiDou positioning system that is based on orbit and clock corrections generated from Fugro's own expanded network of multiple system reference stations. Starfix.G4 utilises Precise Point Positioning (PPP) technology, which distinguishes itself from the traditional differential approach as satellite errors are not lumped together but estimated at source on a per satellite basis. The GPS, GLONASS, Galileo and BeiDou orbit and clock corrections are computed separately, free of ionospheric and tropospheric effects.
Starfix.HP	This service utilises the Fugro international network of approximately 100 land-based reference stations. Unlike standard L1, which uses code based measurements, Starfix.HP is based upon carrier phase measurements which provide a much higher resolution. This service utilises the GPS L1 and L2 frequencies, thereby providing an accurate measurement of Ionospheric thickness. This results in a more accurate satellite to antenna range, and hence a more accurate position solution. At a distance of 1000 km from the nearest reference station Starfix.HP accuracies are typically 10 cm and 15 cm (95 % confidence level) in the horizontal and vertical planes respectively.

Starfix.XP2	This service utilises a third party global network of reference stations to measure carrier phase observations. This data is then processed, producing a corrections solution for each navigation satellite. These corrections are applied to the satellite time reference clock and ephemeris ("orbit") information, hence "clock and orbit corrections". This service utilises the GPS L1 and L2 frequencies, thereby providing an accurate measurement of variations in Ionospheric thickness. This enables signal delay to be calculated more precisely, resulting in a more accurate satellite to antenna range, and hence a more accurate position solution. Starfix.XP2 provides a high performance global solution to an accuracy of 10 cm and 20 cm (95 % confidence level) in the horizontal and vertical planes respectively.
Starfix.L1	This service is a GPS positioning correction system using single frequency code correction data from the Fugro network of reference stations, delivered via both Inmarsat and SpotBeam satellites. These corrections, combined with a single frequency GPS receiver, can provide a positional accuracy of better than 1.5 m (95 %) horizontally at a distance of 500 km from the closest reference station.
Starfix.NG	Fugro's in-house advanced vessel and ROV positioning software system.
StarPack	A StarPack unit consists of a survey grade GNSS receiver and powerful processor, running Linux multi-tasking operating system. The receiver is capable of tracking all current (GPS, GLONASS) and future (Galileo) systems. A StarPack can be extended with a second receiver (in the same unit), to provide accurate, GNSS derived heading.
Transceiver	A device that can transmit and receive signals.
Transducer	A device that converts electrical energy to acoustic energy and vice-versa.
Transponder	A device that can detect a signal on a particular frequency and in response transmits signal on another frequency.
UTM	Universal Transverse Mercator. A special case of the transverse Mercator projection whereby the projection parameters are specified by worldwide agreement, abbreviated as the UTM grid. It consists of 60 north south zones, each 6 degrees of longitude wide with a unique central meridian.
USBL	Ultra-Short BaseLine acoustic positioning method involving the measurement of range and bearing from a vessel-based transceiver to subsea transponders. It generally operates through phase discrimination of an acoustic signal as it passes over three transducers placed at right angles to each other within the Transducer head. Using this method, a three dimensional position of the beacon(s) can be determined.
Vertical Datum	An arbitrarily assumed value for a particular benchmark or a measured value at sea level at a tide station, or a fixed adjustment of many such measurements in a common adjustment. See also chart datum.
WGS 84	World Geodetic System 1984. A rotational ellipsoid having the following dimensions: semi-major axis 6378137.000 m, semi-minor axis (derived) 6356752.314 m, flattening (derived) 1/298.257224. This ellipsoid reference model / datum is the surface from which GPS coordinates are computed.

1. Introduction

Fugro was contracted by DGEC to supply navigation and positioning services for the geotechnical drilling vessel Fugro Zephyr at 15 sampling and/or in situ testing locations at Bretagne Nord Ouest - Geotechnical Site Investigation.

The positions and depths reported here were checked and quality controlled by the Fugro office staff onshore and supersedes the values in the preliminary report.

The sampling and/or in situ testing was carried out between 14 and 25 August 2025. The positioning results are given in Table 2.1 and Table 2.2.

System positioning performance parameters are outlined in Section 4.3.

2. Results

2.1 Field Locations

Table 2.1: Actual coordinates and water depths in local datum

Datum: WGS84/UTM Zone 30N, EPSG code: 32630					Depth* (LAT FR (BATHYELLI))† corrected		
Location	Easting [m]	Northing [m]	Latitude [North]	Longitude [West]	Pressure Sensor [m]	USBL [m]	Drill String [m]
BNO-OWF-BH01	427 075.84	5 428 214.35	49° 00′ 09.0564″	003° 59′ 49.4581″	85.4	85.5	85.6
BNO-OWF-BH02	437 799.03	5 426 682.55	48° 59′ 23.6811″	003° 51′ 00.8653″	80.2	80.4	80.2
BNO-OWF-BH03	431 213.65	5 432 684.60	49° 02′ 35.5117″	003° 56′ 28.5460″	84.5	84.6	84.7
BNO-OWF-BH03-a	431 214.23	5 432 689.90	49° 02′ 35.6835″	003° 56′ 28.5211″	84.4	84.6	84.7
BNO-OWF-BH04	426 592.66	5 418 623.59	48° 54′ 58.3062″	004° 00′ 07.0111″	82.6	82.7	82.9
BNO-OWF-BH07	434 030.60	5 417 960.73	48° 54′ 39.8562″	003° 54′ 01.1978″	80.0	79.9	80.1
BNO-OWF-BH08	414 111.11	5 413 632.68	48° 52′ 10.9299″	004° 10′ 16.4147″	85.8	85.8	85.9
BNO-OWF-BH10	411 963.32	5 415 669.80	48° 53′ 15.8032″	004° 12′ 03.4083″	87.7	87.8	88.0
BNO-OWF-BH11	416 829.81	5 421 236.85	48° 56′ 18.4747″	004° 08′ 08.5537″	86.8	86.8	86.8
BNO-OWF-BH12	421 008.86	5 423 621.95	48° 57′ 37.6731″	004° 04′ 44.8204″	85.6	85.6	85.7
BNO-OWF-BH12-a	421 009.42	5 423 626.76	48° 57′ 37.8293″	004° 04′ 44.7961″	85.5	85.5	85.7
BNO-OWF-BH13	426 180.89	5 425 025.86	48° 58′ 25.4323″	004° 00′ 31.4173″	83.3	83.4	83.5
BNO-OWF-BH15	432 314.68	5 429 579.00	49° 00′ 55.3917″	003° 55′ 32.4486″	81.0	81.2	81.1
BNO-OWF-BH17	437 034.11	5 421 322.73	48° 56′ 29.8468″	003° 51′ 35.5164″	80.2	80.2	80.5
BNO-OWF-BH19	409 659.79	5 417 657.13	48° 54′ 18.9541″	004° 13′ 58.0875″	90.5	90.5	90.8

Notes:
*: Refer to Section 5 (Methodology) for details on the different water depth measurement
†: A vertical offset of -0.11 m was applied to the transformation model Atlantic v2.1, as agreed with the client, to better accommodate their requested VCRS.

Table 2.2: Actual location details

Datum: WGS84/UTM Zone 30N, EPSG code: 32630				Standard Deviation		Proposed to Actual	
Location	Easting [m]	Northing [m]	No. of Fixes	Easting [m]	Northing [m]	Distance [m]	Bearing [°G]
BNO-OWF-BH01	427 075.84	5 428 214.35	120	0.07	0.03	0.52	124.32
BNO-OWF-BH02	437 799.03	5 426 682.55	120	0.07	0.04	5.34	061.13
BNO-OWF-BH03	431 213.65	5 432 684.60	119	0.06	0.04	0.69	227.38
BNO-OWF-BH03-a	431 214.23	5 432 689.90	120	0.16	0.16	4.83	000.74
BNO-OWF-BH04	426 592.66	5 418 623.59	118	0.03	0.03	0.46	253.66
BNO-OWF-BH07	434 030.60	5 417 960.73	114	0.11	0.12	0.32	073.90
BNO-OWF-BH08	414 111.11	5 413 632.68	120	0.04	0.04	0.69	211.32
BNO-OWF-BH10	411 963.32	5 415 669.80	120	0.12	0.14	0.62	254.23
BNO-OWF-BH11	416 829.81	5 421 236.85	120	0.08	0.04	1.74	198.08
BNO-OWF-BH12	421 008.86	5 423 621.95	120	0.05	0.04	0.83	268.54
BNO-OWF-BH12-a	421 009.42	5 423 626.76	120	0.09	0.05	4.80	356.78
BNO-OWF-BH13	426 180.89	5 425 025.86	120	0.04	0.03	0.89	202.32
BNO-OWF-BH15	432 314.68	5 429 579.00	120	0.05	0.03	0.44	233.37
BNO-OWF-BH17	437 034.11	5 421 322.73	116	0.05	0.05	0.33	226.82
BNO-OWF-BH19	409 659.79	5 417 657.13	120	0.05	0.03	0.64	044.15

3. Operations

3.1 Scope of Work

Fugro was contracted to provide positioning support for navigation between the sampling and/or in situ testing locations and determination of the drill string position at each location. Sampling and/or in situ testing was planned to be carried out at 13 locations.

Table 3.1: Proposed coordinates in local datum

Datum: WGS84/UTM Zone 30N, EPSG code: 32630				
Location	Easting [m]	Nothing [m]	Latitude [North]	Longitude [West]
BNO-OWF-BH01	427 075.41	5 428 214.65	49° 00′ 09.06567″	003° 59′ 49.47936″
BNO-OWF-BH02	437 794.35	5 426 679.97	48° 59′ 23.59586″	003° 51′ 01.09407″
BNO-OWF-BH03	431 214.16	5 432 685.07	49° 02′ 35.52706″	003° 56′ 28.52121″
BNO-OWF-BH04	426 593.10	5 418 623.72	48° 54′ 58.31054″	004° 00′ 06.98971″
BNO-OWF-BH07	434 030.29	5 417 960.64	48° 54′ 39.85321″	003° 54′ 01.21312″
BNO-OWF-BH08	414 111.47	5 413 633.27	48° 52′ 10.94926″	004° 10′ 16.39752″
BNO-OWF-BH10	411 963.91	5 415 669.97	48° 53′ 15.80891″	004° 12′ 03.37932″
BNO-OWF-BH11	416 830.35	5 421 238.50	48° 56′ 18.52854″	004° 08′ 08.52831″
BNO-OWF-BH12	421 009.69	5 423 621.97	48° 57′ 37.67418″	004° 04′ 44.77952″
BNO-OWF-BH13	426 181.23	5 425 026.68	48° 58′ 25.45915″	004° 00′ 31.40113″
BNO-OWF-BH15	432 315.04	5 429 579.27	49° 00′ 55.40040″	003° 55′ 32.43122″
BNO-OWF-BH17	437 034.35	5 421 322.95	48° 56′ 29.85426″	003° 51′ 35.50463″
BNO-OWF-BH19	409 659.35	5 417 656.67	48° 54′ 18.93897″	004° 13′ 58.10910″

3.2 Resources

Personnel	Name	From	To
Surveyor	ROC	14 August 2025	25 August 2025

Only equipment used is listed below; refer to Section 5 (Methodology) for procedural explanations.

Positioning Equipment	
Navigation software	Starfix.NG 2024.1 R12 online navigation suite
Primary positioning	Centre GNSS with Starfix.G4+ solution, corrections delivered via ERSAT
Secondary positioning	Port GNSS with Starfix.G4+ solution, corrections delivered via EASAT
Tertiary positioning	Centre GNSS with Starfix.XP2 solution, corrections delivered via ERSAT
Quaternary positioning	Port GNSS with Starfix.XP2 solution, corrections delivered via EASAT
Acoustic positioning	Sonardyne Ranger 2 USBL system (vessel)
Primary heading system	iXBlue Octans heading system (Vessel Gyro 2)
Secondary heading system	StarPack SP1 ProTrack vector heading system
Tertiary heading system	Vessel Gyro heading system
Reference stations	Leidschendam, Rogaland, Aberdeen, Shannon, Jacou, Vienna, Tórshavn, Brønnøysund, Faro
Spare correction source	NTRIP

Bathymetry Equipment	
Primary System	Valeport Midas SVX2 Pressure Sensor
Secondary System	Sonardyne Ranger 2 USBL system
Tertiary System	Drill string
Echo Sounder	Echotrac E20 Single-Beam Echo Sounder
Vertical Motion Compensator	iXBlue Octans
Atmospheric Pressure	Vaisala PTB210 Barometer
CTD sensor	Valeport Midas SVX2 (2x)
Sector Scan Sonar	Sonavision SV4040
Data Recording	Starfix.2024 online navigation suite

3.3 Offsets

3.3.1 Fugro Zephyr Vessel Offsets

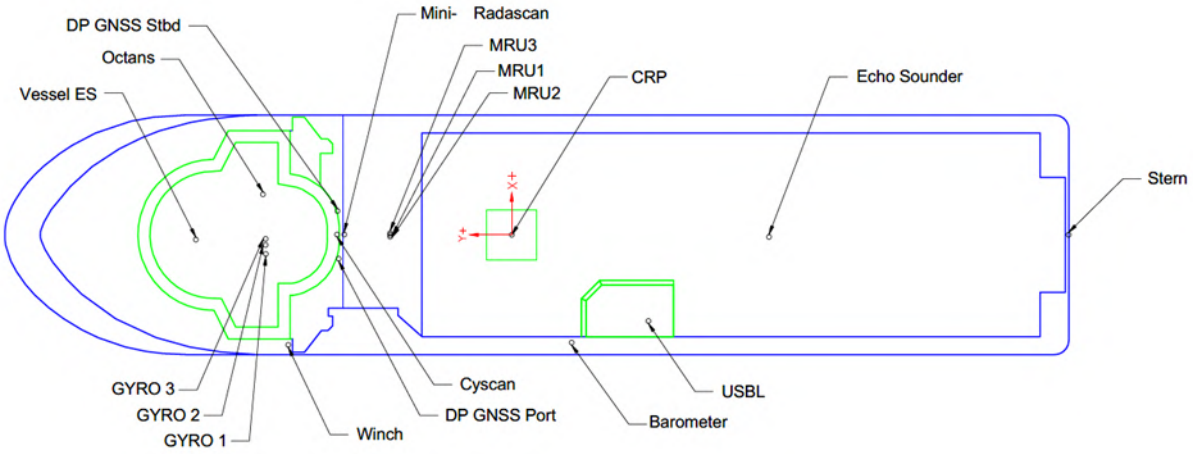

Figure 3.1: Fugro Zephyr offset diagram

Table 3.2: Fugro Zephyr offsets

Offsets	Athwart (X) [m]	Along (Y) [m]	Height (Z) [m]
Common Reference Point	0.00	0.00	0.00
Barometer (PTB210)	-9.00	-5.00	2.50
Cyscan	0.02	14.58	19.34
DP GNSS Port	-2.00	14.45	28.34
DP GNSS Stbd	1.99	14.55	28.35
Echo Sounder (ES)	-0.40	26.37	-8.42
Vessel ES	-0.18	-21.47	-8.43
GYRO 2	-1.60	20.53	12.38
GYRO 3	-0.85	20.55	12.38
GYRO 2	-0.34	20.54	12.38
Mini-Radarscan	0.02	13.99	18.39
MRU 1	-0.01	10.15	-0.70
MRU 2	-0.16	10.15	-0.70
MRU 3	0.13	10.15	-0.70
Octans	3.38	20.77	18.10
USBL (Hull)	-7.17	-11.36	-8.41
Winch	-9.19	18.66	5.98

3.3.2 Seabed Frame Offsets

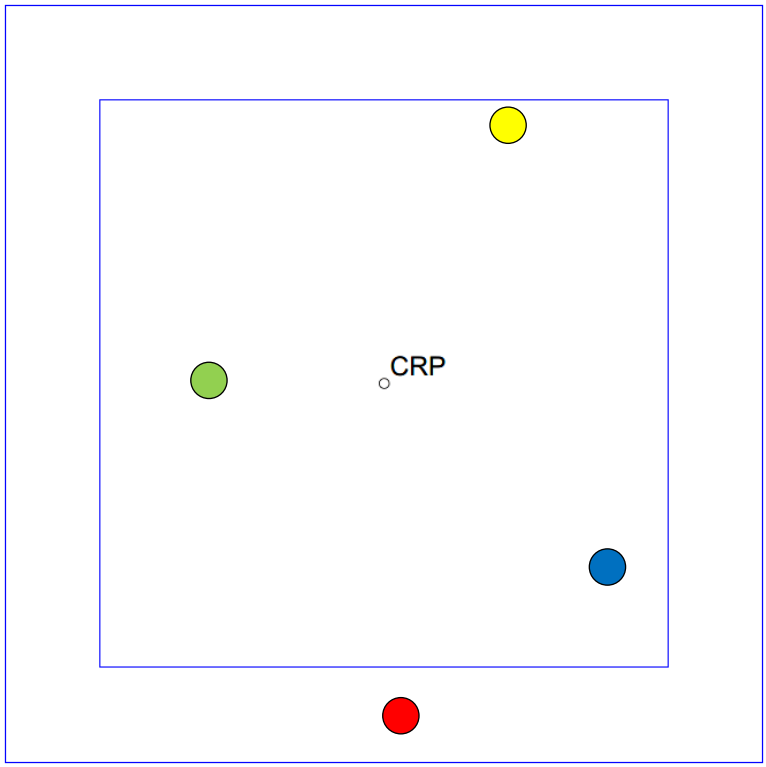

Figure 3.2: Seabed frame offset diagram

Table 3.3: SBF offsets

Offsets			Athwart (X) [m]	Along (Y) [m]	Height (Z) [m]
CRP (Drill string centre)			0.00	0.00	0.00
Mini Beacon (main beacon)			-0.86	0.04	4.26
Compatt Beacon (spare beacon)			0.93	-0.46	4.34
Midas SVX2			0.75	0.96	3.44
Sector Scan Sonar			0.00	-1.33	1.22

3.4 Calibration Results

This section details the results of the system calibrations that were carried out prior to positioning operations. Refer to Section 5 (Methodology), for a detailed description of the calibration procedures. Detailed results of the calibrations are available on request.

3.4.1 Positioning Systems

A positioning system verification was carried out on 28 May 2025, whilst the vessel was alongside Den Helder, The Netherlands, by means of Kinematic GNSS processing.

The results of the verification are presented in Table 3.4.

Table 3.4: Positioning system verification

Date	Location	Positioning System	ΔE [m]	S.D. [m]	ΔN [m]	S.D. [m]
28 May 2025	Den Helder	Port SPK - G4+	0.04	0.03	0.03	0.02
28 May 2025	Den Helder	Port SPK - XP2	0.01	0.04	0.04	0.03
28 May 2025	Den Helder	Centre SPK - G4+	0.05	0.04	0.02	0.03
28 May 2025	Den Helder	Centre SPK - XP2	0.04	0.06	0.04	0.02

To check the integrity of the positioning systems, a positioning system comparison was performed between 15:13 and 17:13 on 12 August 2025 whilst the vessel was alongside Brest, France. The positioning system comparison was performed between the primary positioning system (SP Port antenna, Starfix.G4+ solution) and the other positioning system solutions (Starfix.G4+ and Starfix.XP2) of the two StarPacks (SP Port and SP Starboard). From the antenna locations, with respect to the vessel primary heading source, positions of the vessel's datum point (CRP) were calculated and compared. The differences between the positioning systems were within the expected system accuracy. The results of the comparisons are presented in Table 3.5.

Table 3.5: Positioning system comparison

Date	Location	Positioning system	ΔE [m]	S.D. [m]	ΔN [m]	S.D. [m]
12 August 2025	Brest	Centre SPK G4+ vs Port SPK G4+	0.00	0.01	-0.01	0.01
12 August 2025	Brest	Centre SPK G4+ vs Centre SPK XP2	0.05	0.02	0.03	0.05
12 August 2025	Brest	Centre SPK G4+ vs Port SPK XP2	0.03	0.02	0.01	0.06

3.4.2 Heading Systems Alignment Check

The vessel heading and motion systems were checked by dynamic calibration whilst the vessel was alongside Den Helder, The Netherlands, between 12:59 and 20:59 on 28 May 2025. After completion of the checks, the corrections were entered into the online navigation software. The results of the heading alignment checks are presented in Table 3.6.

Table 3.6: Heading systems alignment check

Date	Location	Heading system	Method	C-O [°]	S.D. [°]
28 May 2025	Den Helder	Octans	Dynamic Calibration	0.95	0.01
28 May 2025	Den Helder	GNSS Heading	Dynamic Calibration	-89.77	0.02
28 May 2025	Den Helder	Gyro 1	Dynamic Calibration	-0.05	0.08
28 May 2025	Den Helder	Gyro 2	Dynamic Calibration	-0.58	0.04
28 May 2025	Den Helder	Gyro 3	Dynamic Calibration	-0.40	0.16

3.4.3 Speed of Sound and Water Density Measurements

Before the start of project data acquisition and at regular intervals during the project, conductivity, temperature and pressure measurements were taken to establish the local speed of sound profile and average water density. The speed of sound profile was entered into the Kongsberg HiPAP Ultra Short Baseline (USBL) system. The average water density was used for depth determination in conjunction with the pressure sensor. The results of these measurements are presented in Table 3.7.

Table 3.7: Speed of sound and water density measurements

Date	Location	Mean [m/s]	Surface [m/s]	Seabed [m/s]	Density [kg/m^3]
13 August 2025	BNO-OWF-BH19	1508.70	1508.22	1509.38	1026.47
14 August 2025	BNO-OWF-BH10	1509.25	1508.54	1509.67	1026.42
17 August 2025	BNO-OWF-BH12	1510.08	1510.69	1509.88	1026.33
19 August 2025	BNO-OWF-BH03	1510.16	1511.73	1508.88	1026.28
22 August 2025	BNO-OWF-BH17	1511.63	1514.21	1511.43	1026.07
24 August 2025	BNO-OWF-BH04	1509.57	1508.92	1510.23	1026.41

3.4.4 Kongsberg HiPAP USBL System

The Sonardyne Ranger 2 USBL system, installed onboard the Fugro Zephyr, was interfaced to the Starfix.NG as the subsea positioning system. A USBL calibration was performed on 12 and 13 May 2025. The calibration was undertaken offshore Kristiansand, Norway (Skagerrak Strait) in a water depth of 496 m. The results of the calibration are presented in Table 3.8.

Table 3.8: Port USBL calibration results in Starfix.NG

System	Date	X Offset [m]	Y Offset [m]	Z Offset [m]	Orientation [°]	Scale	Pitch [°]	Roll [°]
Ranger 2	11 May 2025	-7.20	-9.10	-8.61	0.35	N/A	-0.96	-0.96
Starfix.NG	13 May 2025	-7.20	11.40	-11.01	0.00	1.00	-0.03	-0.03

4. Datum and Tolerances

4.1 Geodetic and Projection Parameters

Table 4.1: Project geodetic parameters

WGS84/UTM zone 30N, LAT FR(BATHYELLI) [Atl v2.1 + -0.11 m]		
EPSG Code:	32630	
Global Navigation Satellite System (GNSS) Geodetic Parameters*		
Datum:	World Geodetic System 1984	EPSG Code: 6326
Ellipsoid:	WGS84	
Semi major axis:	a = 6 378 137.00 m	
Inverse Flattening:	1/f = 298.257 223 563	
Local Datum Geodetic Parameters†		
Datum:	World Geodetic System 1984	EPSG Code: 6326
Ellipsoid:	WGS84	
Semi major axis:	a = 6 378 137.00 m	
Inverse Flattening:	1/f = 298.257 223 563	
Project Projection Parameters		
Map Projection:	Universal Transverse Mercator	
Grid system:	UTM zone 30 North (UTM 30N)	EPSG Code: 16030
Latitude of Origin:	00° 00′ 00″ North	
Central Meridian:	003° 00′ 00″ West	
False Easting:	500 000 m	
False Northing:	0 m	
Scale factor on Central Meridian:	0.9996	
Project Vertical Parameters		
Vertical coordinate reference system:	LAT FR (BATHYELLI)	Fugro Code: 41069
Datum:	LAT FR (BATHYELLI)	Fugro Code: 40936
Transformation‡:	RGF93 v2 to LAT FR(BATHYELLI) to Vertical Offset	

Notes:
* = The geodetic datum of Fugro's global GNSS correction data is WGS84.
† = Source: Client.
‡ = A vertical offset of -0.11 m was applied, as agreed with the client, to better accommodate their requested VCRS.

4.2 Vertical Control

Chart Datum	LAT
Tidal Data	Real time GNSS tides reduced to LAT FR (BATHYELLI) using the transformation model Atlantic v2.1 and then a vertical offset was applied
Barometric pressure variation	Factored in pressure to depth calculation
Effect of wind	Factored in GNSS elevation measurements

4.3 System Performance Parameters

Surface positioning	± 0.1 m
USBL positioning	1 % slant range
Bathymetry (absolute)	± 0.5 m absolute using predicted tides
Bathymetry (relative)	Pressure sensor ± 0.01 % of range
	Drill string - variable
GNSS 3D mode	5 satellites minimum, PDOP < 6, Elevation > 10°
GNSS 2D mode	4 satellites minimum, HDOP < 4, Elevation > 10°
Heading system	1°

5. Methodology

5.1 Introduction

Sections 5.2 to 5.4 inclusive describe the procedures for determining the coordinates and water depths of geotechnical sample and/or in situ testing locations. Section 5.5 describes the calibration procedures carried out for the heading system, surface and subsurface positioning systems, and the echo sounder. The use of subsurface positioning systems, primarily USBL, depends on the type of geotechnical sampling and/or in situ testing methods used, hence some descriptions in the sections below may not be applicable to this report.

5.2 Position Determination

The actual location may be determined by surface positioning alone or with additional use of USBL. The USBL determines the position of the centre of the seabed frame on the seafloor. Particularly in deeper water, use of USBL provides a more accurate position of the sample and/or in situ testing location since the seabed frame may be offset from the surface position of the drill string due to currents.

The position is determined as soon as the seabed frame makes contact with the seafloor. A minimum of 100 position fixes are logged at two-second intervals. Data outliers are then discarded in accordance with standard statistical procedures. To determine the final seabed position of a sample and/or in situ testing location the following general sequence applies:

- From the global navigation satellite system (GNSS) receiver, the antenna's latitude and longitude in WGS 84 are transmitted to the navigation computer and converted to Easting and Northing on the local projection by the navigation software;
- The grid heading and X and Y offsets from the antenna to the common reference point (CRP) are applied to the antenna Easting and Northing in order to compute the position of the CRP on the local projection. If the USBL system is not used then this corresponds to the sample and/or in situ testing location since the CRP has been defined as the centre of the drill string;
- The grid heading and X and Y offsets from the CRP to the USBL transducer, mounted on the vessel's hull, are applied to the CRP Easting and Northing to determine the transducer position on the local projection;
- The USBL system measures the slant range and relative bearing (measured clockwise from the vessel centreline) from the USBL transducer to the beacon, mounted on the seabed frame, and also the depth of the beacon relative to the transducer. These values are converted to ΔX, ΔY in the horizontal plane and ΔZ in the vertical plane by the USBL processor;
- The ΔX, ΔY and ΔZ values are transmitted to the navigation computer where the Z offset of the USBL transducer is applied;

- The position of the beacon is computed in the local projection Easting and Northing and the beacon depth is computed relative to the water surface. The centre of the seabed frame, which corresponds to the seabed sample and/or in situ testing position, is derived from the USBL beacon position by applying the USBL beacons horizontal offsets. The heading of the frame is assumed to be the same as the vessel heading. When heading changes are implemented to the vessel after the location of the frame on the seafloor, the frame will be locked in its original heading by the use of a manual heading, derived from the position fix, in which heading information was logged.

5.3 System Configuration

5.3.1 Survey Position and Navigation Systems

The survey team used two StarPack GNSS Precise Point Positioning (PPP) receivers for the surface positioning during the project. The two single modus calculation position solutions (Starfix.G4+ and Starfix.XP2) from the two StarPack receivers were interfaced to the survey computer by means of a galvanic isolated network connection and were made available for comparison and QC. Differential correction signal redundancy was achieved by cross-linking the two StarPack receivers to provide corrections from different satellite transmissions, if required. Both Starfix.G4+ solutions were fed into Starfix.NG by means of a UDP Broadcast (serial backup). All six position solutions, three per receiver, were fed into StarPack QC suite for QC purposes.

All positions and peripheral (heading system, USBL, etc.) data were sent to the navigation computer where all data transformations, offset and survey calculations, and data integration and logging were performed. All data can be graphically and numerically presented on the navigation computer or any other computer connected to the survey network. An off-line computer is available for the survey crew to post-process and report survey data.

The geodetic and the datum transformation parameters used are presented in Section 4.1.

5.3.1.1 Primary Positioning System

The primary survey positioning service used by the survey team was Starfix.G4+ solution generated from Centre StarPack GNSS receiver. Positions were calculated by using clock and orbit corrections enhanced with carrier-phase corrections from the Fugro Starfix.G4 Network. These corrections were received by the StarPack via ERSAT transmissions and positions were output to the Starfix.NG software package.

5.3.1.2 Secondary Positioning System

The secondary survey positioning service used by the survey team was Starfix.G4+ solution generated from Port StarPack GNSS receiver. Positions were calculated by using clock and orbit corrections enhanced with carrier-phase corrections from the Fugro Starfix.G4 Network. These corrections were received by the StarPack via EASAT transmissions and positions were output to the Starfix.NG software package.

5.3.1.3 Tertiary Positioning System

The tertiary positioning service used by the survey team was Starfix.XP2 solution generated from Centre StarPack GNSS receiver. Positions were calculated using carrier phase corrections from the Fugro Starfix network. The corrections are received by the StarPack via ERSAT satellite transmissions and positions are output to the Starfix.NG software package.

5.3.1.4 Quaternary Positioning System

The quaternary positioning service used by the survey team was Starfix.XP2 solution generated from Port StarPack GNSS receiver. Positions were calculated by using carrier phase corrections from the Fugro Starfix network. The corrections were received by the StarPack via EASAT satellite transmissions and positions were output to the Starfix.NG software package.

5.3.2 Quality Control

The DGNSS and GNSS PPP data were quality controlled using StarPackQC quality control monitoring application. Real-time QC information was displayed as Time Series graphs, tabulated data and graphical displays such as Sky Plots, Error Ellipses and Lock Time graphs depicting satellite lock status. The quality of DGNSS and GNSS PPP derived position fixing data was monitored whilst logging position data for individual locations and also throughout the entire project period.

An assessment of quality was made based on Position Time Series View with the following time series graphs available to display:

- Standard Deviations (Latitude, Longitude and Height);
- HDOP and VDOP;
- Number of SVs;
- Number of Stations;
- Deltas (Easting, Northing and Height);
- Correction Age;
- F-Test.

An assessment of quality was also made by:

- Data Table Views;
- Satellite Lock Time View;
- Error Ellipses View;
- Satellite Constellation Views.

Within the area of operations the accuracy and repeatability of the Starfix.G2+/G4+ system was designed to be 0.03 m in the horizontal plane and 0.06 m in the vertical plane with 95 % confidence level.

5.4 Depth Determination

The depth at each location was measured using a combination of the following techniques:

- Pressure sensor;
- Drill string reading;
- USBL depth reading.

5.4.1 Pressure Sensor

A CTD probe or pressure sensor is secured to the seabed frame to measure water pressure using a Digiquartz sensor. The output from this unit is absolute pressure, i.e. atmospheric pressure plus water pressure. The atmospheric pressure is recorded on deployment and not updated until the probe returns to the surface. Adjustments are therefore necessary to take into account the actual atmospheric pressure changes that occur during the measurement cycle. Barometric pressure is recorded manually at four hourly intervals using the vessel's barometer. An UNESCO-recognised formula is then used to convert the raw pressure values to depth values. The CTD was mounted on the seabed frame.

5.4.2 Drill String Reading

This is a physical measurement made by the drilling personnel and is the total length of drill pipe used to reach the seabed. The measurement is corrected for the distance between the drill floor and the water surface (air gap) and corrected for local tidal variations. When operating in deep water, errors due to the effects of current may be induced in the drill string depth measurement.

5.4.3 USBL Reading

This is a measurement made by taking the Kongsberg HiPAP system USBL beacon Z-values (depth) and applying the vertical offset of the frame-mounted beacon above the seabed frame base.

5.5 System Calibration Procedures

Calibrations of all position and depth measuring equipment are carried out prior to sampling and/or in situ testing. This checks that all equipment is operating within acceptable limits and that the accuracy of the logged data is not compromised. Most equipment is permanently installed on the geotechnical drilling vessel and therefore not all calibrations are performed before the start of every sampling and/or in situ testing programme. The most recent calibrations of the equipment are assessed and new calibrations are carried out if deemed necessary.

5.5.1 Offset Measurements

At the start of the mobilisation, offsets from the vessel's datum (normally the centre of the drill string) to the various DGNSS antennas and other relevant offset points are measured. These measurements are compared with measurements taken from a scaled vessel plan or a previous vessel offset diagram. Seabed frame offsets from the frame's CRP to its transponder and the Z offset for the CTD probe are also measured. Offsets are entered into the navigation

software. The USBL transducer offset is already corrected to the vessel's CRP by the vessel's APOS programme.

5.5.2 Heading System Alignment Check

Four methods are possible when performing a heading system alignment check alongside. The resulting differences between computed and observed headings are entered into the navigation software as the heading system's computed minus observed C-O correction.

5.5.2.1 Total Station

These methods of performing a heading system alignment check uses land survey techniques. Reflectors are placed at or near the bow and stern of the vessel on the centreline and their positions fixed at regular intervals. Simultaneous heading system readings and heading observations are taken. The true bearing between the reflectors is calculated and compared to the observed heading system reading.

5.5.2.2 Sun Azimuth

Sun azimuth observations are performed with a total station and a sun filter when the sun is at a maximum elevation of approximately 30°. The vessel's heading is determined by measuring the angle between the vessel's centreline and the sun azimuth and applying this angle to the computed sun azimuth. The logged heading subtracted from the heading derived from the azimuth of the sun will give the heading system's C-O correction.

5.5.2.3 Taped Offsets

This method requires the known heading of the quay and two measurements are taken simultaneously from the quay to the vessel's centreline. The distance between the two measurements provides a baseline for calculating the angle of the vessel's centreline relative to the quay, which is then applied to the quay heading to derive the computed grid vessel heading. The convergence is applied to the computed grid heading to obtain the true heading which is compared with the observed heading system's reading in order to obtain the C-O correction.

5.5.2.4 Dynamic Calibration

For this method three GNSS antennas are installed on the vessel, one at the bow, one at starboard and one at vessel port side. The antennas are installed preferably at the same height and with minimum baselines of 15 m. GNSS antenna data are logged for a minimum of six hours, while simultaneously raw heading systems data are logged. All data are logged at a rate of 1 Hz.

The logged GNSS data are converted to RINEX format and processed using the Natural Resources Canada website, applying the CSRS (Canadian Spatial Reference System) PPP (Precise Point Positioning) method. Novatel GrafNav software is used for quality control of the resulting PPP data and calculates accurate 3D antenna positions. Finally the GrafNav

results are combined with the logged raw vessel heading systems data in Fugro software to calculate the C-O values for the heading systems.

5.5.3 Positioning System

In order to determine the integrity and reliability of the surface positioning systems, two main procedures are followed:

5.5.3.1 Positioning Verification

The position of the primary DGNSS antenna, in local projection coordinates, is verified using two independent methods.

The first method involves comparing the DGNSS antenna position to that derived through land survey techniques. A total station measures directly to the DGNSS antenna from a known point on the quay. The DGNSS antenna position and the position derived from the total station are logged simultaneously and should agree to better than 0.25 m. This method also validates the geodetic parameters entered into the online survey software.

The second method verifies the DGNSS antenna position by comparing logged SPK positions to results derived from kinematic GNSS processing. Raw GNSS data logged during operations is processed using the Natural Resources Canada website, applying the CSRS (Canadian Spatial Reference System) PPP (Precise Point Positioning) kinematic mode. The processed results are then compared to the SPK positions logged by Starfix.NG, ensuring agreement within 0.25 m and confirming the accuracy of the DGNSS antenna positioning.

Both methods provide independent verification to ensure precise and reliable positioning for geotechnical operations.

5.5.3.2 System Comparison

Once the position verification results are acceptable, a position comparison against all position computations is conducted. The antenna positions for all systems are logged and using the heading system and the measured antenna offsets are reduced to the vessel's CRP. The difference in the positions should agree to within 1 m and they are represented as Delta Easting (ΔE) and Delta Northing (ΔN).

5.5.4 Ultra-Short Baseline System

A USBL allows the measurement of range and bearing from a vessel-based transceiver to one or more subsea transponders. It generally operates through the phase discrimination of an acoustic signal recorded by three orthogonal transducers combined in one head. A USBL calibration is executed whenever work is carried out on the transducer and at least once a year. Calibrations are carried out in water depths slightly deeper than those in which the operations will occur.

5.5.4.1 Preparation

During the USBL calibration sequence, the vessel must be free to manoeuvre around a stationary transponder. Before starting the actual USBL calibration, it is assumed that:

- The vessel's positioning system has been verified;
- The vessel's heading system alignment has been checked;
- All relevant offsets, including the height of the transponder's transducer above the seabed, have been measured.

The actual water depth, measured by the echo sounder, and not corrected for tide, should also be known at the calibration site.

A speed of sound profile, determined at the calibration site, is entered into the USBL system before calibration data are collected.

For the USBL calibration a transponder, equipped with a remote controlled release mechanism or a surface buoy, is deployed, clear of all structures and pipelines, in an area with an approximate water depth slightly deeper than the proposed survey area. The surface positioning system is used to navigate the vessel during the calibration.

5.5.4.2 Range Scale, Orientation, Pitch and Roll

This phase of the calibration is carried out with the vessel positioned on the circumference of a circle of radius 1.5 to 2 times the water depth, centred on the beacon. The following describes a calibration with the vessel lying to the north, east, south, and west of the beacon with the vessel maintaining the same north heading. In the case of bad weather, this pattern may be rotated so that the vessel is heading into the current. The surface position of the vessel and the USBL position of the beacon are logged at each cardinal point. Generally a minimum of 100 fixes, at 5 second intervals, are logged at each cardinal point.

When the vessel is due north or south of the beacon and heading due north, roll errors are minimised and pitch errors are observed. Transducer alignment errors will plot the beacon offset to the east or west of its actual position. Range scaling errors will plot the beacon to the north or south of the actual position.

When the vessel moves to a position due east or west of the beacon, while still maintaining a heading of due north, roll errors are observed and pitch errors are minimised. Transducer alignment error will plot the beacon offset from its actual position. Range scaling errors will plot the beacon to the east or west of the actual position.

Any resultant errors will show the beacon plotted in four quadrants. If there are no errors, the beacon position will be shown as a circular scatter plot around the actual position.

The range error consists of a fixed error and the scalar multiplier. Overall it accounts for errors in ray path and speed of sound. The USBL module in Starfix.NG derives a range error value that contains and accounts for the range fixed error.

Starfix.NG computes the errors and displays the results as four parameters:

- Pitch error;
- Roll error;
- Transceiver misalignment;
- Range error.

5.5.4.3 Offset (Spin) Test

The first part of the calibration is carried out to verify the offsets between the USBL system and the navigation system. This is normally done by manoeuvring the vessel directly over a beacon deployed on the seabed and then rotating the vessel through 360° while logging the surface and USBL position. Any offset errors are displayed as a 'snail trail' showing the beacon position describing a circle around the intended beacon position. Alternatively, the vessel is positioned directly over the beacon, and an equal number of fixes are logged while the vessel is heading in each of the four cardinal directions.

The Z-offset is checked by comparing the Z component of the USBL observation and the value from the echo sounder, allowing for beacon height above the seafloor. As the vessel is directly over the seafloor beacon, this minimises any errors due to Range Scale and USBL transducer misalignment.

5.5.4.4 Verification of Results

The calibration results are checked using one of two methods:

1. Two lines are run at right angles and in opposite directions over the top of the beacon;
2. A static spin test at a location in a distance of 10 % of water depth from the calibrated beacon position.

In both cases the beacon's position is continuously logged and should not deviate, within operational parameters, from its calibrated position. A reasonably tight, circular scatter plot a few metres across, depending on the navigation system performance, the USBL system performance, and the depth of water, is an indication of a good calibration result.

Appendix F

Digital Data

F.1 Digital Data

This section details the digital data deliverables associated with the investigated locations.

Description	Document/File Name
AGS4 Field data	F255276_BNO_AGS4 Field Data_i03.ags
AGS4 Onshore Soil Laboratory data	F255276_BNO_AGS4 Soil Lab Data_i03.ags
AGS4 Onshore Rock Laboratory data	F255276_BNO_AGS4 Rock Lab Data_i03.ags
AGS4 CPT data	F255276_BNO_AGS4 CPT Data_i03.ags
ASCII Processed CPT data	F255276_BNO_ASCII CPT Data_i03.zip
Excel Laboratory Test Results	F255276_BNO_Lab Test Results_i03.zip
GIS data	F255276_BNO_GIS_i01