Appendix F

Geotechnical Investigations Report



Waitakere Coastal Communities Landslide Risk Assessment

Appendix F – Geotechnical Investigations Report - Muriwai

Auckland Council
15 May 2024

→ The Power of Commitment



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F1. Introduction

F1.1 Purpose of this report

GHD has been engaged by Auckland Council (AC)¹ to carry out landslide risk assessments and to provide associated landslide risk management advice and geotechnical investigations in the Waitakere area, specifically for the residential areas of Muriwai, Piha and Karekare.

One of the project work items is to conduct a geotechnical borehole investigation to understand the subsurface conditions in the vicinity of the 80 m-high escarpment to the east of Muriwai township that experienced damaging landslides in February 2023. This report is a factual account of the work undertaken, the materials that were encountered and their geotechnical characterisation from laboratory testing. These results are used to inform the engineering geological characterisation in Overall Report Appendix B.

Groundwater monitoring was installed in some boreholes for future groundwater monitoring by AC and some of this data is presented.

This report is an appendix to the overall GHD landslide risk report and should be read in conjunction with it, as well as associated appendices. The overall report contains additional information and synthesises the results of other appended assessments carried out by GHD.

F1.2 Background

Two significant rainfall events affected the Waitakere area in late January and early February 2023, resulting from the impacts of ex-tropical cyclones Hale and Gabrielle, respectively.

The Cyclone Gabrielle weather event of 14 February 2023 resulted in widespread catastrophic flooding and slope instability in the settlement of Muriwai where several debris avalanches (which included rocks and trees) occurred, some of which developed into saturated debris flows that resulted in damage to buildings and infrastructure. Two fatalities occurred due to impact of landslides on private dwellings. This tragic event was similar to a 1965 storm event that also claimed two lives.

Following the event, rapid building assessment of residential properties was undertaken in Muriwai, with some houses having access by owners restricted (a yellow placard – e.g. access in daylight hours only) and some for which no access was permitted (a red placard). Dwellings that retained unrestricted access were white placarded.

F1.3 Scope

The intention of the geotechnical investigation and groundwater monitoring installation was to:

- Support the development of the ground model of the site
- Provide an of understanding of geotechnical properties of previously failed landslide material
- Understand the presence of significant geological boundaries that may be influencing slope failure
- Identify groundwater profiles within the slope and their response to rain events, and to provide ongoing, telemetered data for use by AC.

¹ As part of contract CW198379, Master Services Agreement CCCS: CW74240 dated 7/09/2019, subsequent work item 'Waitakere Coastal Communities Landslide Risk Assessment', dated 26/04/2023

The scope for this investigation is as follows:

Boreholes

- Drill nine boreholes advanced to a depth of between 11 m and 80 m below ground level (bgl) at Muriwai in locations at the top and below the escarpment where landslides occurred in February 2023, with the following distribution:
 - Three approximately 80 m deep boreholes at Oaia Road, east of (above) the Muriwai escarpment
 - Three boreholes below the Muriwai escarpment on Domain Crescent (two to approximately 11 m bgl and one to approximately 41 m bgl)
 - Three boreholes below the Muriwai escarpment on Motutara Road (two to approximately 11 m bgl and one to approximately 41 m bgl)
- Log the recovered material using NZGS (2005) guidelines
- Conduct Standard Penetration Tests (SPTs) at 1.5 m intervals
- Record data in AGS4 format and upload borehole logs to the New Zealand Geotechnical Database

Groundwater monitoring

- Install standpipe piezometer screens in some of the boreholes
- Measure initial water levels during drilling and following screen installation
- Supervise installation of water level data recorders and AC monitoring-compatible telemetry hardware to allow ongoing data collection (by AC)

Laboratory testing

- Testing of recovered soils and rocks including:
 - Atterberg Limit testing
 - Particle size distribution (wet sieve) tests
 - Unconfined Compressive Strength tests
 - Pinhole and Crumb dispersibility

This report may be updated in the future to include ongoing data.

F1.4 Report structure

This report is a factual account of the Muriwai geotechnical investigation and is one of six appendices that are part of assessing the risk-to-life from landslides at Muriwai. A list of report appendices is presented in Table F1.

Table F1 Summary of accompanying Muriwai landslide risk assessment reports

Report Section	Description
Overall Report	Waitakere Coastal Communities Landslide Risk Assessment (Muriwai) Overall Report
Appendix A	Figures
Appendix B	Engineering Geological Report
Appendix C	Slope Stability Assessment
Appendix D	RAMMS debris flow analysis
Appendix E	Landslide Risk Assessment
Appendix F	Geotechnical Investigations Report (this report)

F2. Site investigation overview

F2.1 General

Intrusive site investigations commenced on the 29th of June 2023 and were completed on the 18th of August 2023. The location of Muriwai is shown in Figure F1 below and a plan showing the borehole locations is presented in Figure F1-1 in Appendix F1.

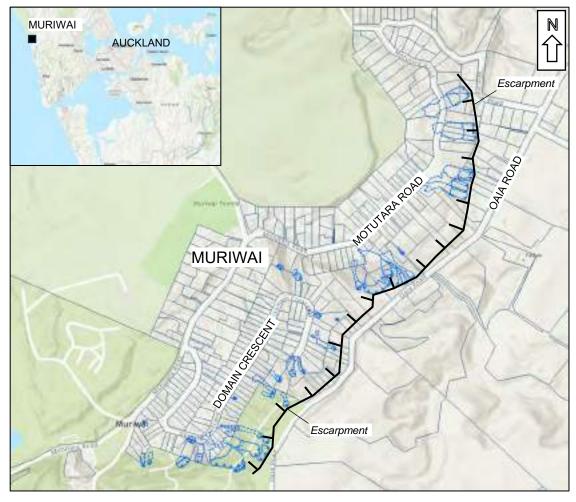


Figure F1 Muriwai location showing the February 2023 landslides mapped by GHD (blued lines)

All nine boreholes were drilled within the road reserve, with three holes along each of Oaia Road, Domain Crescent and Motutara Road. Six groundwater dataloggers with telemetry hardware were installed in the boreholes with piezometer screens. The location, depth and installation summary of these holes are presented in Table F2 below.

F2.2 Subcontractor management

GHD engaged DCN Drilling Limited (DCN) to undertake the site investigation physical works. DCN directly engaged and managed additional subcontractors required to complete the physical works on site, including traffic management and buried services clearance.

Babbage Geotechnical Laboratory (BGL) and Geotechnics Ltd were engaged to carry out geotechnical laboratory testing. ConnectM2M Limited installed piezometer dataloggers and telemetry.

Table F2 Borehole investigations summary (all holes to target depth)

Location ID	Street location	Easting	Northing	Reduced level (m)	Termination depth (m bgl)	Screen interval (m bgl)
BH-M01		1728691	5923873	138.0	79.60	73 – 79
BH-M02	Oaia Road	1728387	5923493	144.5	79.57	60 – 66
BH-M03		1728010	5923112	150.0	79.64	73 – 79
BH-M04		1727699	5923031	53.0	10.95	No installation
BH-M05	Domain Crescent	1727856	5923234	63.5	10.95	No installation
BH-M06		1728033	5923293	90.0	40.95	21 – 27
BH-M07		1728235	5923652	52.0	40.64	33 – 39
BH-M08	Motutara Road	1728392	5923798	63.0	10.95	No installation
BH-M09		1728448	5923911	72.5	10.95	7.2 – 10.2

F3. Site investigation methodology

F3.1 Boreholes

Boreholes were completed as follows:

- Hand auger or hydro-excavation to 1.5 m bgl to avoid striking buried services.
- Conventional ('Open Barrel') coring to recover nominal 83 mm diameter core in low strength near surface material.
- Wireline triple tube (HQTT) coring to recover nominal 61mm diameter core at greater depths.

Boreholes without piezometers installed were backfilled with bentonite and the surface reinstated. All well covers were capped with plastic lockable lids and rubber gaskets ('toby box'), flush to ground level. All receiver/transmitter units that house the telemetry equipment were installed in an adjacent service box, which itself is covered with a lockable plastic lid flush to ground level.

For BH-M06 & 07 wells are within the road, with the service boxes being offset less than 1 m away (outside of carriageway).

A short length of connecting wire is buried at shallow depth (less than 1 m bgl) between the well head and the service box. For BH-M06 and BH-M07, this is encased in a PVC plastic sleeve. Wire connections are not marked at ground level.

Borehole logs, core photographs and piezometer installation details are presented in Appendix F2.

F3.2 In-situ strength testing

The following in-situ strength testing was performed during the drilling of boreholes.

F3.2.1 Standard penetration testing (SPT)

Standard Penetration Testing (SPTs) were performed at 1.5 m intervals in accordance with NZS 4402: 1988 Test 6.5.1 "Determination of the penetration resistance of a soil". SPT results are recorded on the borehole logs in Appendix F2 with the associated hammer calibration sheets. SPT results plotted against reduced level are presented in Figure F2.

Values given on the attached borehole logs are uncorrected N values. Table F3 gives the hammer efficiency value for each SPT hammer used during the site investigations. The associated drilling rig is reported on the corresponding borehole log. SPT calibration documentation is presented in Appendix F4.

Table F3 Overview of the SPT hammer efficiency of the drilling rig

Drilling Rig	SPT Trip Hammer Reference	SPT Hammer Efficiency	Boreholes Drilled
TR 200	3	68.5 %	All boreholes except BH-M04
MOR 700	1	68.1 %	BH-M04

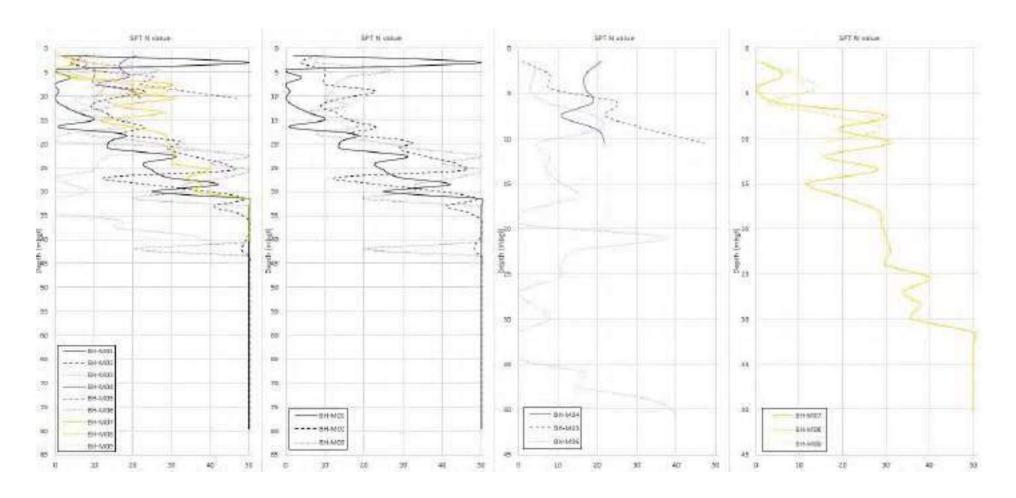


Figure F2 Uncorrected SPT 'N' value graphs against depth (m bgl) for all boreholes (left graph), with the same information separated into borehole groupings for clarity

F3.2.2 Handheld shear vane

Shear vane testing was performed during drilling of machine boreholes where cohesive soils were encountered. Measurements were typically taken every 1.5 m depth from core prior to extrusion from the core barrel.

All shear strengths shown on the appended logs are corrected vane shear strengths derived in accordance with the NZGS "Guideline for Hand Held Shear Vanes Test" (2001). The peak and remoulded vane readings represent hand-held dial readings from a 19 mm vane, adjusted using the calibration sheets attached in Appendix F4. These are reported on the logs as undrained shear strength and are summarised in Table F4.

Table F4 Shear vane testing summary

Borehole	Test Depth (m bgl)	Vane Serial Number	Corrected Peak Undrained Shear Strength (kPa)	Corrected Residual Undrained Shear Strength (kPa)	Note
BH-M01	3.0	GEO902	>211	n/a	Vane unable to penetrate
BH-M02	0.5	GEO1060	155	87	
BH-M02	1.0	GEO1060	142	74	
BH-M02	1.5	GEO1060	111	59	
BH-M02	3.0	GEO1060	>211	n/a	Vane unable to penetrate
BH-M06	3.0	GEO902	>211	n/a	Vane unable to penetrate
BH-M06	4.5	GEO902	>211	n/a	Vane unable to penetrate
BH-M08	3.0	GEO902	>211	n/a	Vane unable to penetrate

F3.3 Groundwater level monitoring

F3.3.1 Piezometer construction and static readings

Groundwater readings were periodically taken during the drilling programme (see Table F5). Groundwater levels measured in piezometers following bore development are summarised in Table F5.

F3.3.2 Variable head permeability (slug) testing

Slug testing was carried out between the 28th and 30th of August 2023 to estimate the permeability of the materials in the screened range of the piezometers. Rising and falling head tests were carried out in all six piezometers installed.

The data obtained from the rising and falling head tests were analysed using Aqtesolv Software (v 4.51), and the hydraulic conductivity values were obtained using the Bower and Rice (1976) and Hvorslev (1951) solutions. The results are provided in Table F6.

Table F5 Groundwater levels following piezometer installation and bore development.

Bore ID	Ground	Screen Interval	Groundwater level											
	Elevation		28 Au	g 2023	29 Au	ıg 2023	30 Au	g 2023	9 th Ap	or 2024	17 th A	pr 2024	19 th Ap	or 2024
	(m RL)	(m bgl)	(m bgl)	(m RL)	(m bgl)	(m RL)	(m bgl)	(m RL)	(m bgl)	(m RL)	(m bgl)	(m RL)	(m bgl)	(m RL)
BH-M01	138.0	73 – 79	59.38	78.62		Not	read		51.51	86.49	Not	read	Not	read
BH-M02	144.5	60 – 66	84.79	59.73	84.76	59.74	Not	read	Not	read	59.75	84.75	59.74	84.76
BH-M03	150.0	73 – 79	Dry	-	Dry	-	Dry	-	Not	read	Dry	-	Dry	-
BH-M06	90.0	21 – 27	19.97	70.02	19.82	70.17	19.86	70.14	Not	read	19.65	70.35	18.51	71.49
BH-M07	52.0	33 – 39	Not read	-	7.32	44.68	Not	read	Not	read	7.36	44.64	7.52	44.48
BH-M09	72.5	7.2 – 10.2	6.83	65.67	6.83	65.67	Not	read	Not	read	7.22	65.28	7.23	65.27

Tah	

Bore ID	Hydraulic conductivity (m/s)					
Dole 1D	Bouwer-Rice	Hvorslev	Mean			
BH-M01	8.8E-08	1.0E-07	9.5E-08			
BH-M02	5.5E-09	6.5E-09	5.9E-09			
BH-M06	1.7E-08	2.3E-08	2.0E-08			
DI I MOZ	3.4E-08	4.1E-08	7.45.00			
BH-M07	1.4E-07	1.3E-07	7.1E-08			

F3.3.3 Telemetry

To allow long-term remote monitoring of water levels in piezometers by AC each piezometer was fitted with a pressure transducer data logger and cellular telemetry unit. Data loggers and telemetry are self-contained, vented and battery powered.

The telemetered groundwater monitoring equipment includes:

- Hydrostatic Level Sensor (PTX-002) and associated cable,
- Site Sentinel (X1-001 4G),
- Road Marker Antenna (XANT-007),
- Analogue Junction Box 1 input with vent (XIO-004)
- Marley 250 mm x 250 mm sealed cable management pit.

Each hydrostatic level sensor records and reports the level of water above the sensor. Each telemetered unit is configured to record this water level at 15-minute intervals. The data is transmitted daily at 2 pm. Once transmitted, the data is pushed directly to Auckland Councils Hydrotel system. A summary of the installation depths of the hydrostatic level sensors in meters below ground level (m bgl), and an approximated² value in m RL, is provided in Table F7.

Groundwater plots from the telemetered data, between the period of 19th October 2023 and 22nd March 2024 are presented in Appendix F5. Rainfall data taken from the Muriwai Golf Course (available on Auckland Council's Environmental Data Portal) for the same date range has been plotted on the graphs also. The groundwater data trace presented in Appendix F5 for BH-M01 represents a signal that is unverifiable and as such has been assumed to be erroneous.

Table F7 Hydrostatic Level Sensor install depth summary.

Bore ID	Hydrostatic Level Sensor Installation Depth					
	Measured value in m bgl	Approximate value in m RL ²				
BH-M01	66.2	71.8				
BH-M02	65.85	78.7				
BH-M03	79.0	71.0				
BH-M06	27.0	63.0				
BH-M07	39.0	13.0				
BH-M09	10.3	62.2				

² Hydrostatic Level Sensor installation depth presented in m RL is calculated using the estimated collar height of the bore. This collar height has been estimated from a local GIS viewer and has not been measured using GNSS techniques.

F3.4 Investigation locations

The location of each borehole was recorded using handheld GPS, which has a metre-scale accuracy. This was compared with Auckland Council's online GIS viewer using measurements of investigation locations relative to known features.

Latitude and longitude are presented in terms of the New Zealand Transverse Mercator (NZTM 2000), the internationally recognised type of projection formally defined as the LINZS25002 standard (standard for New Zealand Geodetic Datum 2000 Projections), with elevation shown in the Auckland 1946 local mean sea level (MSL), one of thirteen local MSL circuits used in New Zealand.

F4. Geotechnical laboratory testing

F4.1 General

The following tests were scheduled for selected samples by BGL:

- Atterberg Limit, (NZS 4402:1986, Test 2.2, 2.3 & 2.4)
- Particle Size Distribution (Wet Sieve), (NZS 4402:1986, Test 2.8.1)
- Particle Size Distribution (Hydrometer), (NZS 4402:1986, Test 2.8.4)
- Detection of Presence of Allophane in Soils: (NZS4402:1986, Test 3.4)
- Unconfined Compressive Strength (UCS). (NZS4402:1986,Test 6.3.1)

The following tests were scheduled for selected samples by Geotechnics Ltd:

- Pinhole, (ASTM D4647-13 2020)
- Dispersibility by the Crumb Method (BS 1377: Part 5: 1990 Clause 6.3, not IANZ accredited)
- Water Content, (NZS 4402: 1986, Test 2.1)

The number and type of tests are presented in Table F8. Testing results are presented in Appendix F3.

Table F8 General summary of geotechnical laboratory testing scheduled.

Investig ation ID	Water content	Atterberg limits (PL, LL, PI)	Particle size distribution (wet sieve)	Particle size distribution (hydrometer)	Crumb test	Uniaxial compressive strength (UCS)	Pinhole	Allophane Presence
BH-M01	1	1	2	1	1		1	
BH-M02	1		1			13	1	
BH-M03			1			9		
BH-M05			1					
Bh-M06			1					
BH-M07			3					
BH-M08			2					1
BH-M09			2					

F4.2 Atterberg Limit

One sample was tested for Atterberg Limits, (NZS 4402:1986, Test 2.2, 2.3 & 2.4); the result is plotted on the plasticity index chart in Figure F3.

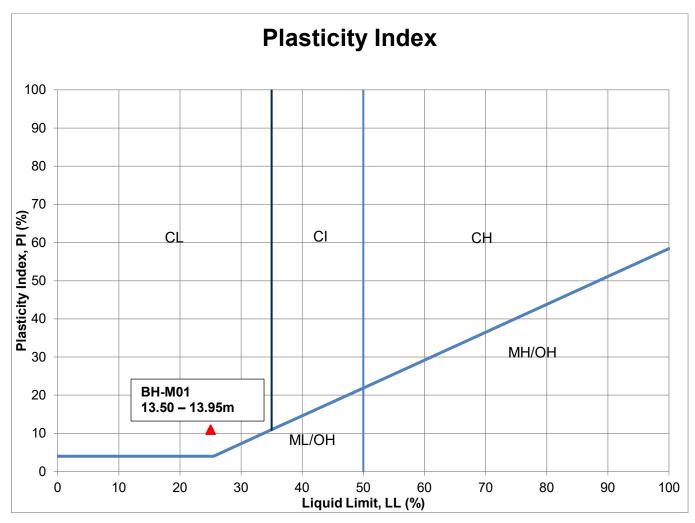


Figure F3 Plasticity Index chart

F4.3 Particle Size Distribution

Thirteen samples were taken from BH-M01 to BH-M09 and tested for Particle Size Distribution (PSD - wet sieve). One PSD sample from BH-M01 was tested for PSD - hydrometer (NZS 4402:1986 Test 2.8.4). The results are presented in Figure F4.

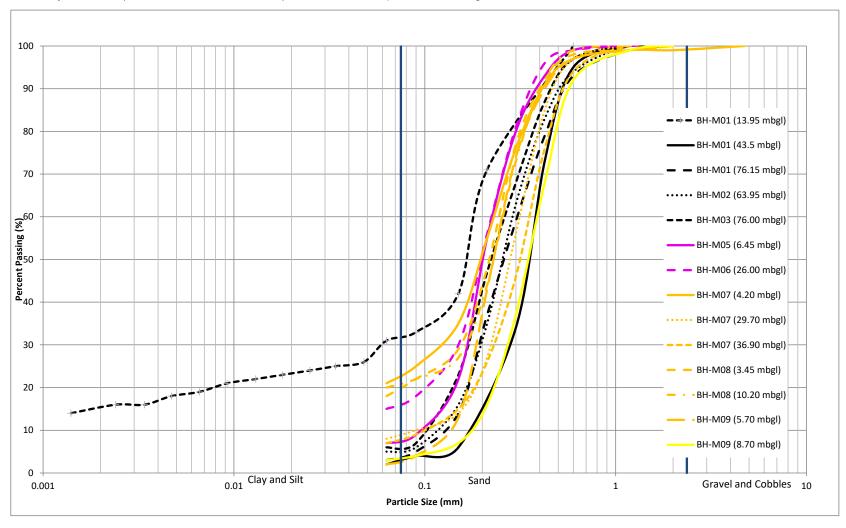


Figure F4 Particle Size Distribution chart

F4.4 Detection of Presence of Allophane in Soils:

One sample (BH-M08, 10.00-10.10m) was tested for presence of allophane (NZS4402:1986, Test 3.4). The result indicates an allophane content of less than 5%.

F4.5 Pinhole and Crumb Testing

Two samples were tested for dispersibility using Pinhole (ASTM D4647-13) and Crumb (BS 1377: Part 5: 1990 Clause 6.3) methods. The results are outlined in Table F9.

Table F9 Summary of Pinhole and Crumb Testing

Sample (BH & Depth)	Lab Description	Pinhole Method Classification	Crumb Method Classification
BH-M01 - 2.02 -2.06 m	Clayey SILT, dark brown; very soft, wet, high plasticity.	D1 (dispersive)	Grade 4 - Strong reaction (dispersive)
BH-M02 – 1.96 – 2.00 m	Silty CLAY, orange brown; very soft, wet, high plasticity	ND1 (non-dispersive)	Grade 4 - Strong reaction (dispersive)

F4.6 Uniaxial Compressive Strength (UCS)

UCS testing was undertaken by BGL on Awhiti Group core samples from BH-M02 and BH-M03 (NZS4402:1986, Test 6.3.1). The results are presented against depth in Figure F5.

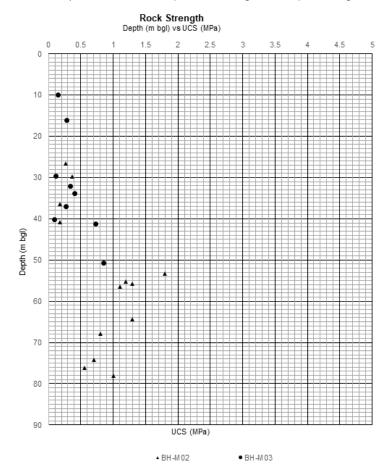


Figure F5 Uniaxial Compressive Strength (UCS) versus depth

F5. References

Auckland Council GIS Viewer, Retrieved March 2020, https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

Auckland Council (2019), "Professional Services Term Contract – Geotechnical Works Professional Services Scope"

Bouwer & Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

Hvorslev, 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bul. no. 26, Waterways Experiment Station, Corps of Engineers, U.S. Army, Vicksburg, Mississippi

New Zealand Geotechnical Society (2005) "Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes"

New Zealand Geotechnical Society (2001) "Guideline for Hand Held Shear Vane Test"

New Zealand Standard 4402 (1986) "Methods of testing soils for civil engineering purposes"

F6. Limitations

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This report presents information obtained from, and testing undertaken at or in connection with, specific sample points, investigation locations and test points. Conditions at other parts of the site may be different from conditions found at the specific sample points. The actual characteristics of materials may vary significantly.

Sampling, investigations and testing were undertaken at a specific point in time. Ground conditions, including groundwater levels and contaminant concentrations can change over time. Therefore, the information from the sampling, investigations and testing may not represent the conditions that may be encountered across the site at any future point in time.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as physical access and the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

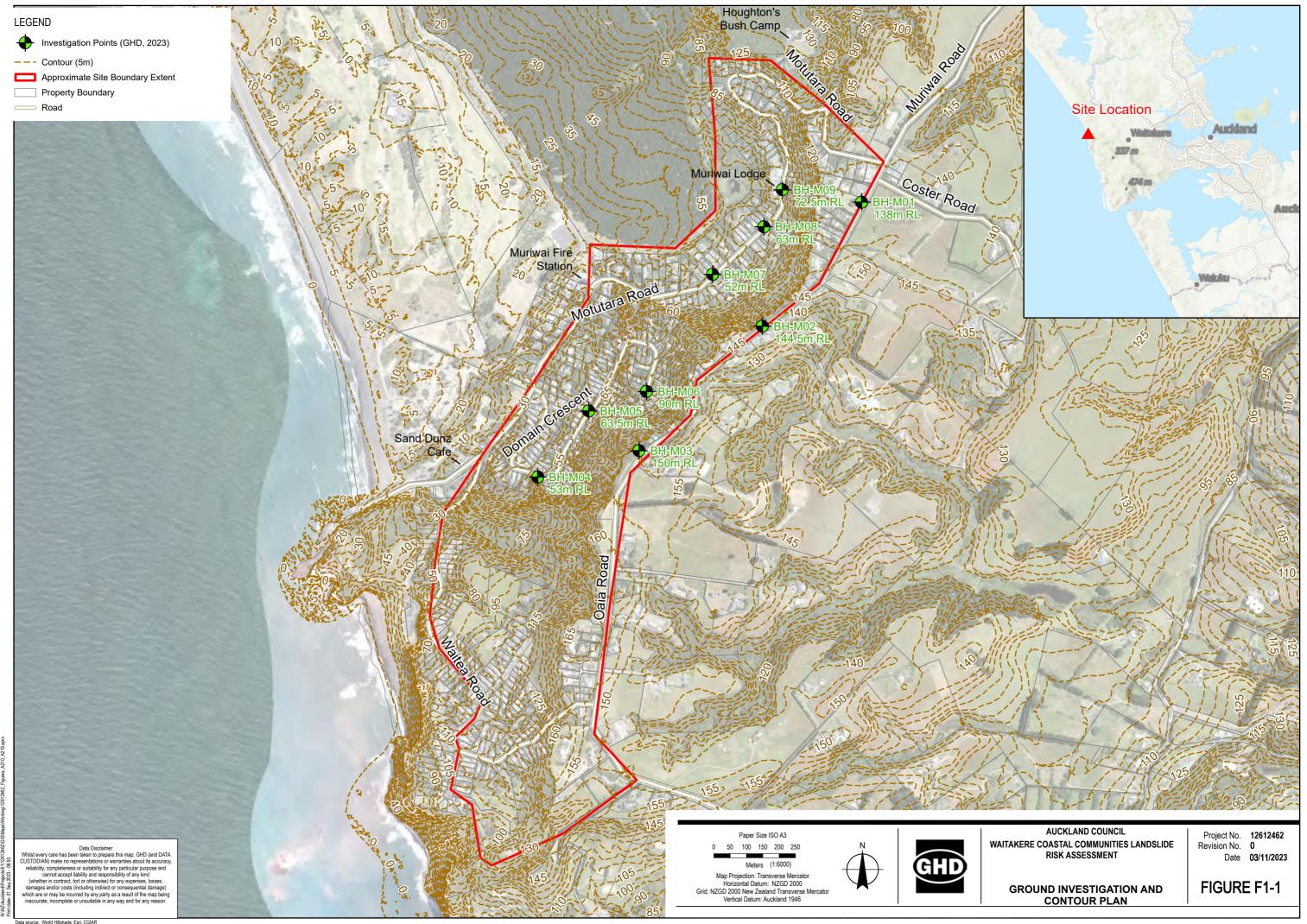
An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this report should not be altered, amended, abbreviated, or issued in part in any way without prior written approval by GHD. GHD does not accept liability in connection with the issuing of an unapproved or modified version of this report.

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. If the revealed ground or groundwater conditions vary from those assumed or described in this report the matter should be referred back to GHD.

Appendices

Appendix F1

Site Plan



Appendix F2

Borehole Logs and Photographs

- Glossary of symbols
- Borehole logs and photoboards

GLOSSARY OF SYMBOLS



This standard sheet should be read in conjunction with all test hole log sheets and any idealised geological sections prepared for the investigation report.

GENERAL ABBREVIATIONS

Activity type / drilling method

DT Dual tube OP Observation pit/trench
CA Casing advancement PM Pressuremeter test hole
EXP Logged exposure PQTT PQ triple tube coring
GCOP GCO probe RC Rotary cored

HA Hand Auger RCG Rotary drilling in common ground

HV Hydro Vacuum excavation RO Rotary open hole
HQTT HQ triple tube coring SCP Static cone penetrometer

ICBR In situ CBR test SH Shaft

IDENIn situ density testSNCSonic core drillingINSTInstrumentSPTStandard penetration test

IVAN In situ vane test TP Trial pit/trench MHA Machine Hollow auger Triple tube coring TT MSA Machine Solid auger VC Vibrocore NQ triple tube coring W Wash boring **NQTT**

OB Open barrel

Sampling type

AMAL Amalgamated sample LB Large bulk disturbed sample (for earthworks testing)
B Bulk disturbed sample LDS Large Disturbed Sample

B Bulk disturbed sample LDS Large Disturbed Sample BLK Block sample M Mazier type sample C Core sample P Piston sample

CBR CBR mould sample TW Thin walled push in sample D Small disturbed sample U Undisturbed sample - open drive ES Soil sample for environmental testing U100 U110 Undisturbed Sample EW Water sample for environmental testing U76 U76 Undisturbed Sample

G Gas sample UT Thin wall open drive tube sampler

J Jar W Water sample

Other testing

F Falling Head Permeability Test
N Total blows - SPT Value

PK Packer Test

PP Pocket Penetrometer (suffixed by value in kPa)

PT Pressuremeter Test

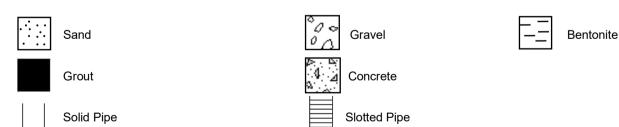
R Rising Head Permeability Test

SV Shear Vane Test (suffixed by value in kPa, peak/residual values)

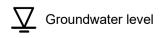
UTP Unable to penetrate (shear vane testing)

TD Target depth
HCL Hydrochloric acid

WELL SYMBOLS

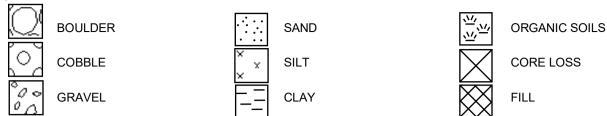


GROUNDWATER SYMBOLS



SOIL SYMBOLS

Main Components



Note: Composite soil types will be signified by combined symbols, e.g.

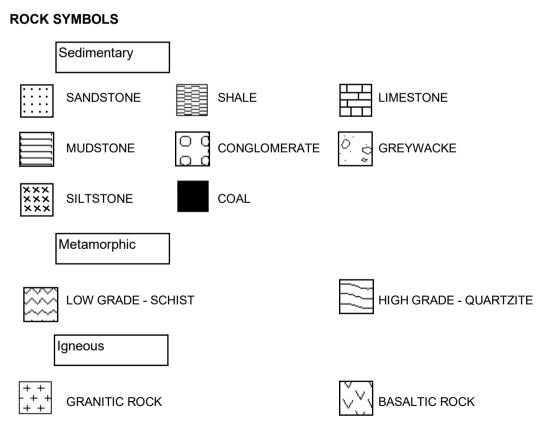


SOIL DESCRIPTION ABBREVIATIONS

Consiste	ency	S-F	Soft to firm
D	Dense	St	Stiff
D-VD	Dense to very dense	St-VSt	Stiff to very stiff
F	Firm	VD	Very dense
F-St	Firm to stiff	VL	Very loose
Н	Hard	VL-L	Very loose to loose
L	Loose	VS	Very soft
L-MD	Loose to medium dense	VS-S	Very soft to soft
MD	Medium dense	VSt	Very stiff
MD-D	Medium dense to dense	VSt-H	Very Stiff to hard
S	Soft		•

Moisture Condition

ט	Dry
D-M	Dry to moist
M	Moist
M-W	Moist to wet
S	Saturated
W	Wet



Note: Additional rock symbols may be allocated for a particular project. Interbedded rock will be represented using alternatively the above symbols

ROCK DESCRIPTION ABBREVIATIONS

Rock Strength

Extremely weak EW EW - VW Extremely to very weak

VW Very weak VW - W Very weak to weak

W Weak

W-MS Weak to moderately strong

MS Moderately strong

MS - S Moderately strong to strong

S Strona

S - VSStrong to very strong

Very strong VS

VS - ES Very strong to extremely strong

ES Extremely strong

Weathering

RS Residual soil

CW-RS Completely weathered to residual soil

CW Completely weathered

Highly weathered to completely weathered HW-CW

HW Highly weathered

Moderately weathered to highly weathered MW-HW

Moderated weathering MW

SW-MW Slightly weathered to moderately weathered

Slightly Weathered SW

UW-SW Unweathered to slightly weathered

UW Unweathered (fresh)

DEFECT DESCRIPTION ABBREVIATIONS

Fracture Type

Bedding Plane JΤ Joint CB

SF **Sheared Surface** Cross Bed CI Cleavage SM Seam

Crushed Seam CS SS

Sheared Seam

CZ Crush zone SZ Sheared Zone (>250 mm) FΙ

Foliation VN Vein Fractured Zone (>250 mm)

JS Joint set

Inclination

FΖ

Sub-horizontal SB G Gently inclined Μ Moderately inclined S Steeply inclined VS Very steeply inclined

SV Sub-vertical

Roughness

Slickensided sl Rough Smooth sm

Texture

Ы Planar St Stepped U Undulating

Joint Set Counts

X 2 2 joints

X 3 3 joints

X 4 4 joints X 5 5 joints

X 6 6 joints

X 7 7 joints

8 joints 8 X

9 joints X 9

> 10 joints

Core Recovery Parameters

100

TCR - Total Core Recovery % SCR - Solid Core Recovery %

RQD - Rock Quality Designation %

Aperture

Т Tight

VN Very Narrow Narrow Ν

Moderately Narrow MN MW Moderately Wide

Wide W VW Very Wide

Infilling or Coating

CN Clean

Carbonaceous Χ

CLAY Clay Chlorite KT Calcite CA Iron Oxide Fe MΙ Micaceous Quartz Ω7 VΕ Veneer

Spacing

EC Extremely closely spaced VC Very closely spaced С Closely spaced

MWModerately widely spaced

W Widely spaced VW Very widely spaced

Visual Defects



Visual representation of defect angle from horizontal (example shown is 45°)



Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

Hole No. : BH-M01

Sheet : 1 of 10 Hole Length : 79.60m Scale @ A4 : 1:40

Fas	tina	17286	Commenced: 29/06/2023 691.45 Northing: 5923873.69	Com Syst							ogged roces			: JM : JM				
RL:	_		Datum: AUCKHT1946	Jysi	он. I	4∠ I Í\	1200	J			heck			: JH				
IXE.	100		Material Description		Geological Unit	condition	cy / ensity		mple				6			mm)	tation n	Ι.
RL (m)	Depth (m)	Graphic			Geolog	Moisture condition		Number / Type	Result	Casing	Method	क्ष हाush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	on Defect	Instrumentation Installation	Motor Lava
-	5	70:7 7:77 7:77	Clayey SILT with some organics; brown, mottled orang grey. 'Soft to firm', moist, low plasticity. Organics, rootle roots. [TOPSOIL].	ge and ets and	TOPSOIL	М	'S-F'											
137 -	1 - 2		Clayey SILT with minor organics; brown, mottled orang grey. 'Soft to firm', moist, low plasticity. Organics, rootle [FILL].	ets.	FILL						HA				100			
- -	-	×	Clayey SILT with some roots; brown, speckled grey. 'S moist, low plasticity. Roots, 3 to 25 mm in diameter. [A SAND FORMATION]. 1.35 - 1.50 Wet.	oft', WHITU		W	'S'		SPT 1/0 0/1 0/1 N = 2		SPT				100			
- 138	2 - 1	* ; * ; * ; * ;	Silty CLAY; brown, speckled grey. 'Soft', moist, high pla	asticity.	-						В				400			
135 -	2.7	× × × ×	Silty fine SAND; dark brown, speckled black-grey. Very moist.	y dense,			VD		SV@3m		OB				100			
- -	3.3	×	CORE LOSS			-	-		SV@3m UTP SPT 15/17 21/29 for 70mm N > 50		SPT				100			, , ,
- - - - -	1 - 1 - 1 - 1 - 3.65	×	Silty fine SAND; dark brown, speckled black and grey. dense, moist.	Very	FORMATION	M	VD		SPT 17/33		нотт нотт				71			, , , , , ,
- - -	184		CORE LOSS		AWHITU SAND	-	-		for 65mm N > 50		HQTT				0			
- 132	6.45	× . × . × .	Silty fine SAND; grey, speckled black. Loose, moist. CORE LOSS		<u> </u>	М	L		SPT 1/1 1/1 1/1 1/1 N = 4		SPT				38			
- - - - - -	7-1	×	Silty fine SAND; grey, speckled black. Loose, moist.			M	VL				НОП				82			
130 -	7.95	× . × . × .							SPT 0/0 0/0 0/0 0/0 N = 0		SPT				0			-
			ments:	Inclinat	ion: \	ertica	al		Or	ientati	on:			Gro	ound Wa	T		
Coor subje	rdinate ect to	es and F future s	.60m, Target Depth. RLs are approximated from the local GIS viewer. Locations are urvey.	Contract Equipm Shear \	ent:	ΓR 20		2						Dat	e Time	Reading (mbgl)	Hole de (mbgl)	∍pth



Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 29/06/2023

Completed: 5/07/2023

Hole No. : BH-M01

Sheet : 2 of 10 Hole Length : 79.60m : 1:40

Scale @ A4 : JM Logged

			Datum: AUCKHT1946		Unit	tion	-		mple	ļ'	heck			: Jŀ			_
RL (m)	Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density	Number / Type	Result	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	Defect Defect Spacing (mm)	Instrumentation Installation
129	9-	x—. x x x x x	Clayey silty fine SAND; grey, speckled black. Very loose moist. (continued from layer starting at 8.0m)	e,					SPT		НОТТ	25 50 75		332	78	0 0 0	
-	1.6	× ·- × ·: × ·: × ·:	Sandy SILT with some clay; grey with minor brown stre 'Very soft', saturated, non-plastic. Sand, fine.	aks.		S	'VS'	_	0/0 0/0 0/0 0/1 N = 1		SPT				100	_	- -
- 87 - 1	0 1 2	× · · · · · · · · · · · · · · · · · · ·	Silty fine SAND; grey with minor light brown streaks. W	et.		W	-				НОТТ				100	-	
1127 ' '	95 1 1 1 1 1 9	×× × × × -x	Clayey silty fine SAND; grey with some light brown stre Very loose, moist.			М	VL		SPT 0/0 0/0 0/0 0/0 N = 0		SPT				0		
≒ 1 - -	1 - 00	× · · · · · · · · · · · · · · · · · · ·	Sandy SILT with minor clay; grey, streaked light brown. soft', wet, non-plastic. Sand, fine to medium.	'Very	NOIL	W	'VS'				натт				100	-	
- 92 - 1	2-	× × × × × × × × × × × × × × × × × × ×	Silty fine SAND; light grey, streaked brown, speckled bl Very loose, wet.	ack.	AWHITU SAND FORMATION		VL	•	SPT 0/0 0/0 1/1 N = 2		SPT				0	1111111	
- 1756 - 1	3-	× · · · · · · · · · · · · · · · · · · ·	12.45 - 18.00 Very loose to loose.		AWHI		VL-L				НОТТ				100	-	
- - - 1	4-	× × × × × × × × × × × × × × × × × × ×						P3.95 13.95 DS 13.50	SPT 0/0 0/0 1/5 N = 6		SPT				100	- - - -	
- - -		×						14.30 B			натт				100	,	
- 1 	5 -	× × × × × × × × × × × × × × × × × × ×							SPT 1/1 1/2 2/5 N = 10		SPT				0		
122	-	×		T							HQTT				100		
End	of Ho	le @ 79	nments: .60m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Inclinat			dI		Or	ientat	ion:			Da	ound W	- In ::	Hole dep
sub	ject to	es and i future s	nce and approximated from the local Gro viewer. Locations are urvey.	Equipn				2									



Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 29/06/2023 Completed: 5/07/2023

: BH-M01 Hole No.

Sheet : 3 of 10 : 79.60m Hole Length : 1:40 Scale @ A4

Logged : JM

ΚL	: 138		Datum: AUCKHT1946		=			Saı	nple		heck			: J I	15			Γ
RL (m)	Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density	Number / Type	Result	Casing	Method	Flush Return (%)	Weathering	Estimated Strength (MPa)	TCR SCR RQD (%)	Defect Spacing (mm)	Instrumentation Installation	Motor Inch
	-	× ·: × ·: × .:	Silty fine SAND; light grey, streaked brown, speckled bl Very loose, wet. <i>(continued from layer starting at 11.7r)</i>	ack. n)							НДТТ	25 50 75	5 -	w > 5 2 >	100	20 000) \ (C	
1 121 .		× × × •	16.40 - 16.50 Brown streaks.						SPT 0/0 0/1 0/0 N = 1		SPT				0			, ,
= 1 - -	17 - - - -	×									натт				100			-
1120 -	18-	× · · · · · · · · · · · · · · · · · · ·							ерт		он				100			-
-	3.5	× · · · · · · · · · · · · · · · · · · ·	18.00 - 18.50 Medium dense.		_		MD		SPT 2/2 3/3 4/8 N = 18		SPT				100			
- 1119	19-		Fine SAND, trace silt; grey. Medium dense, moist.			M					нотт				100			
-					NO				SPT 1/1							-		-
- 118	20 -				AWHITU SAND FORMATION				2/3 4/5 N = 14		SPT				0	<u>.</u>		
-	20.4	××	Silty fine to medium SAND with trace clay; light brown, streaked light orange. Medium dense, moist.		AWHITU SA						натт				100			- - -
- 1117	21 -	× . · . · .× × · . · .×							SPT 2/2 2/3 4/5		т				0			-
-	21.45	× · · ·	Fine to medium SAND, trace silt; grey, mottled orange; indistinctly, very thinly bedded at 5-10°. Medium dense	to	-		MD-D		N = 14		SPT					-		- - -
- 116	22 -		dense, moist.								НОТТ				100			Ţ
-									SPT 3/5 8/8 7/8 N = 31		SPT				0	-	0,000 10,000	
- 115	23 -																	
- 4											НОТТ				100			
	es an	d Com	ments:	Inclination	on: \	ertica	al		lOri	ientat	ion:	ШШ 		Gr	ound W	ater Le	اکا لک vel	<u>.</u>
End	d of Ho	le @ 79	60m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Contrac										Da	te Time	Reading (mbgl)	g Hole de (mbgl)	pth
SUD	դ ե նւ 10	future s	ui vey.	Equipme Shear V				2										
Ref	er to e	xplanati	on sheets for abbreviation and symbols	1		0	502	•										

RL: 138 Depth (26

Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

Hole No. : BH-M01 Sheet : 4 of 10 : 79.60m Hole Length

Scale @ A4 : 1:40 Logged : JM

Commenced: 29/06/2023 Completed: 5/07/2023 Processed : JM Easting: 1728691.45 Northing: 5923873.69 System: NZTM2000 Checked : JHS Datum: AUCKHT1946 Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Defect Spacing (mm) Flush Return **Material Description** Water level Estimated Number / Method Casing Result SCR RQD Fine to medium SAND, trace silt; grey, mottled orange; indistinctly, very thinly bedded at 5-10°. Medium dense to SPT 100 dense, moist. (continued from layer starting at 21.5m) HØH 100 Highly weathered, dark grey-green, speckled light grey and black, fine to medium grained SANDSTONE; extremely weak SPT 100 HÖH 100 SPT 4/4 4/6 8/11 N = 29 SPT 100 AWHITU SAND FORMATION 27.65 Grey-green. Highly weathered, orange brown, speckled grey and dark brown, fine to medium grained SANDSTONE; extremely weak. HØH 100 SPT 0 HQT 100 SPT 0 Highly weathered, orange brown, streaked black, dark grey and dark red, distinctly bedded, fine to medium grained SANDSTONE; extremely weak; very thinly bedded at 10-20°. 보 100 Moderately weathered, dark grey, fine to medium grained SANDSTONE; extremely weak. SPT 8/13 15/17 18 for 65mm N > 50 SPT 82 100 **Ground Water Level** Inclination: Vertical Orientation: Notes and Comments: End of Hole @ 79.60m, Target Depth.

25 August 2023

GHD - NZGD.GLB || Date:

REV3.GPJ || Library:

GENERAL LOG | Project: BH-M01

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Report I

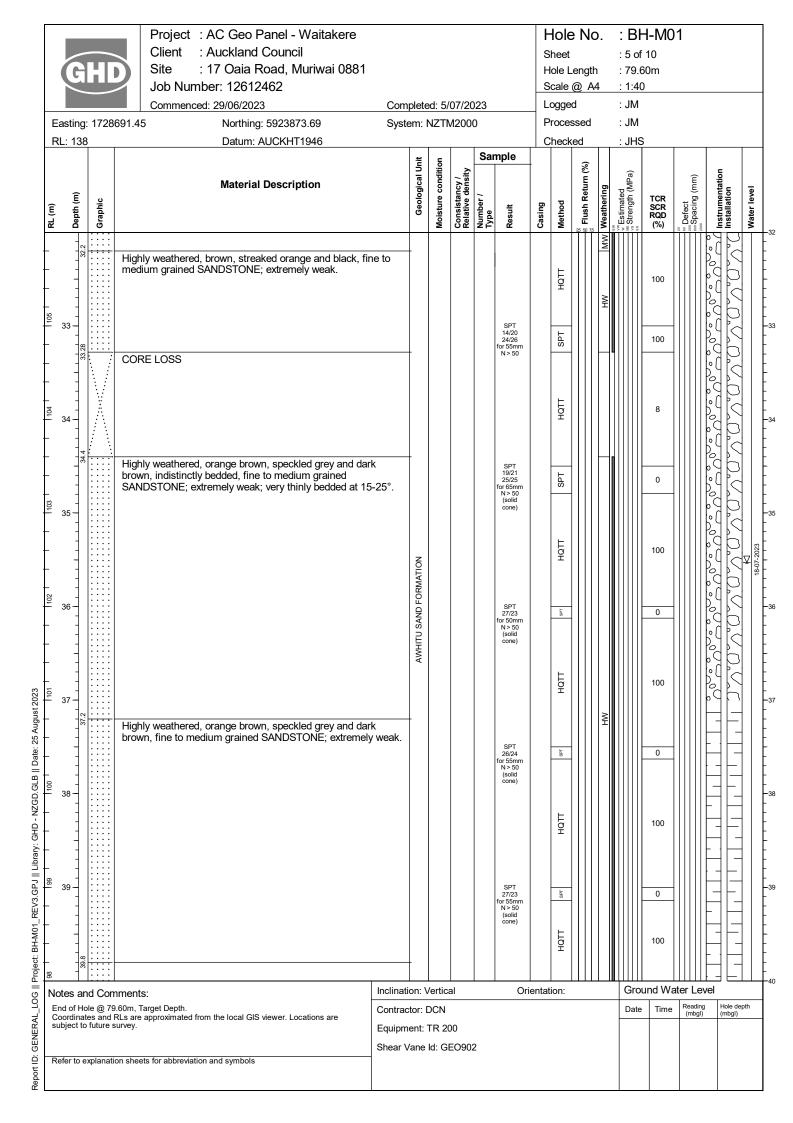
Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

Refer to explanation sheets for abbreviation and symbols

Contractor: DCN

Equipment: TR 200 Shear Vane Id: GEO902

Reading (mbgl) Date Time





Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

 Hole No. : BH-M01

Sheet : 6 of 10 Hole Length : 79.60m Scale @ A4 : 1:40

Logged : JM

RL: 138		Datum: AUCKHT1946					Sai	nple	C	heck	ed	1 1	: JHS	S 		
RL (m) Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density			Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	Defect Spacing (mm)	Instrumentation Installation
		Highly weathered, brown, speckled grey and dark brown distinctly bedded, fine to medium grained SANDSTONE extremely weak; very thinly bedded at 0-20°. (continued layer starting at 39.8m)	Ξ;					SPT 28/22 for 50mm N > 50 (solid cone)		SPT	25 50 75		7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7	100	00	
		Highly weathered, brown, speckled dark orange brown, medium grained SANDSTONE; extremely weak.	fine to					SPT 25/25 for 60mm N > 50 (solid cone)		SPT HQTT				0		
56 43				AWHITU SAND FORMATION			43.80 B 43.50	SPT 29/21 for 45mm N > 50 (solid cone)		. HQTT		HW		0		
		45.00 - 45.03 Extremely weak, dark brown LIGNITE.		AWHITUS				SPT 28/22 for 50mm N > 50 (solid cone)		TT SPT HQTT				0		
78 46		Highly weathered, brown, speckled grey and dark orang brown, distinctly bedded, fine to medium grained SANDSTONE; extremely weak; very thinly bedded at 10						SPT 35/15 for 20mm N > 50 (solid cone)		T HQTT				0		
Notes an	le @ 79	.60m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Inclinat Contrac Equipm	ctor: I	DCN			Ori	entat	ion:			Gro	ound Wa	- In II	



Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

: BH-M01 Hole No.

Sheet : 7 of 10 Hole Length : 79.60m Scale @ A4 : 1:40

	_: 1:	-		691.45 Northing: 5923873.69 Datum: AUCKHT1946	Syst	em.	INZ I I	И200	U			roces			: JM : JH				
IXI		30		Datum. ACCN 11 1940		=	_		Saı	mple		, I ICCK			. 31 10				
RL (m)	Denth (m)	Ceptin (iii)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density	Number / Type	Result	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	Defect	Instrumentation Installation	Water level
	-	99		Highly weathered, brown, speckled grey and dark orang brown, distinctly bedded, fine to medium grained SANDSTONE; extremely weak; very thinly bedded at 10 (continued from layer starting at 46.8m) 48.00 - 48.65 Trace organic fragments to 5 mm.						SPI 32/18 for 25mm N > 50 (solid cone)						0	-		-
80	- - 49 - - -	48.6		Highly weathered, orange brown, distinctly bedded, fine medium grained SANDSTONE; trace organics to 5 mm extremely weak; very thinly bedded at 10-30°.	to ;							НОТТ		^		100			- - - -
	-	49.5		Highly weathered, orange brown, fine to medium graine SANDSTONE; extremely weak.	d					SPT 20/30 for 45mm N > 50 (solid cone)		- 8s		AH		0	-		-
	50 - - - - -											НОТТ				100			- - -
. /01	- - 51 -	1 "	× × × × × ×	Completely weathered, brown, mottled light yellowish br SILTSTONE; extremely weak. Moderately weathered, grey, speckled light brown, fine medium grained SANDSTONE; extremely weak.		†				SPT 39/11 for 15mm		1-8		CW		0	- -		-
	- - - - - 52 – -			medium grained SANDSTONE; extremely weak. 51.20 - 51.35 20-40 mm shell fragments.		AWHITU SAND FORMATION				N > 50 (solid cone)		НОТТ				100			
3	53 - - - - - - -	52.5		Moderately weathered, dark grey-green, distinctly bedde to medium grained SANDSTONE; extremely weak; very bedded at 10-30° with very closely spaced irregular laminations of silty sandstone.	ed, fine thinly	AWHI				SPT 42/18 for 5mm N > 50 (solid cone)		нотт		M		100		0,000000000000000000000000000000000000	
	- - - 54 -	2								SPT 38/12 for 35mm		\$PT		M		0	-	0,0,0	
	-	54.8 54		Moderately weathered, brown, mixed grey and light yello distinctly bedded, fine to medium grained SANDSTONE extremely weak; very thinly laminated at 15-25°.	<u>;</u>					N > 50 (solid cone)		НОТТ				100			
	- 55 - - - -	-		Moderately weathered, dark grey-brown, distinctly bedde to medium grained SANDSTONE; extremely weak; very bedded at 15-35°.	ed, fine thinly					SPT									
70	-	-			T					33/17 for 35mm N > 50 (solid cone)		HQTT				100		\0,V	
				nments:	Inclinat			al		Ori	entat	ion:					ater Le		enth.
Su	ordii	nate t to	es and I future s	.60m, Target Depth. RLs are approximated from the local GIS viewer. Locations are univey. on sheets for abbreviation and symbols	Equipm Shear	nent:	TR 20		2						04/07		(mbgl)	(mbgl)	5.63

: BH-M01 Project : AC Geo Panel - Waitakere Hole No. Client : Auckland Council : 8 of 10 Sheet Site : 17 Oaia Road, Muriwai 0881 : 79.60m Hole Length Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 29/06/2023 Completed: 5/07/2023 Logged : JM Processed : JM Easting: 1728691.45 Northing: 5923873.69 System: NZTM2000 RL: 138 Checked Datum: AUCKHT1946 : JHS Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Defect Spacing (mm) Flush Return **Material Description** Estimated Number / Method Casing Depth (SCR RQD Moderately weathered, dark grey-brown, distinctly bedded, fine to medium grained SANDSTONE; extremely weak; very thinly bedded at 15-35°. (continued from layer starting at 54.8m) HOT 100 SPT 24/26 for 55mn N > 50 (solid cone) SPT 0 ĦÖĦ 100 58 0 SPT HQT 88 Moderately weathered, dark grey, mixed brown and orange, fine to medium grained SANDSTONE; extremely weak. AWHITU SAND FORMATION SPT n CORE LOSS Highly to moderately weathered, dark grey, mottled brown-orange, fine to medium grained SANDSTONE; extremely weak. HÖT 81 25 August 2023 SPT 25/25 for 55mm N > 50 (solid cone) GHD - NZGD.GLB || Date: SPT 0 **CORE LOSS** Moderately weathered, grey, mottled orange, fine to medium grained SANDSTONE; extremely weak. HØH 84 Moderately weathered, dark grey, fine to medium grained REV3.GPJ || Library: SANDSTONE; extremely weak. SPT 31/19 for 55mr N > 50 (solid cone) SPT 0 CORE LOSS HØH 22 **Ground Water Level** Inclination: Vertical Orientation: Notes and Comments:

|| Project: BH-M01 GENERAL LOG ≘

Report I

End of Hole @ 79.60m, Target Depth. Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

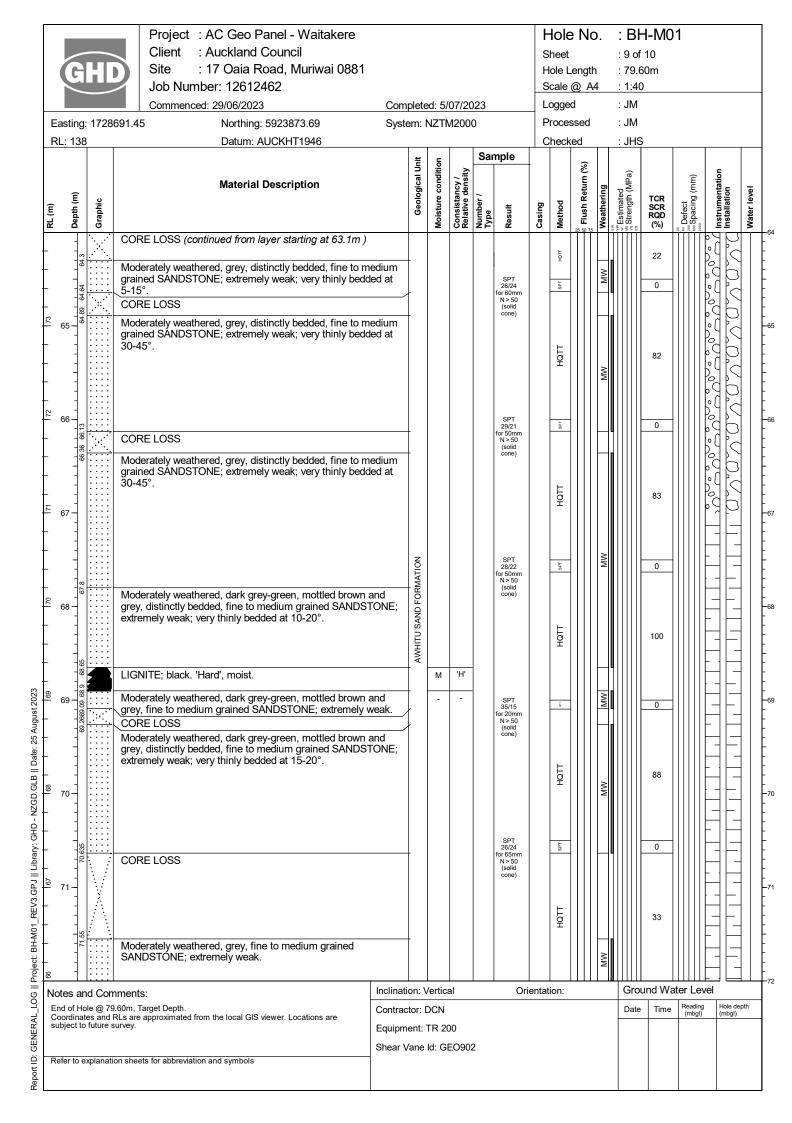
Refer to explanation sheets for abbreviation and symbols

Contractor: DCN Equipment: TR 200

Reading (mbgl) Date Time

Water level

Shear Vane Id: GEO902



Easting: 1728691.45

Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 17 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 29/06/2023 Completed: 5/07/2023 Northing: 5923873.69 System: NZTM2000

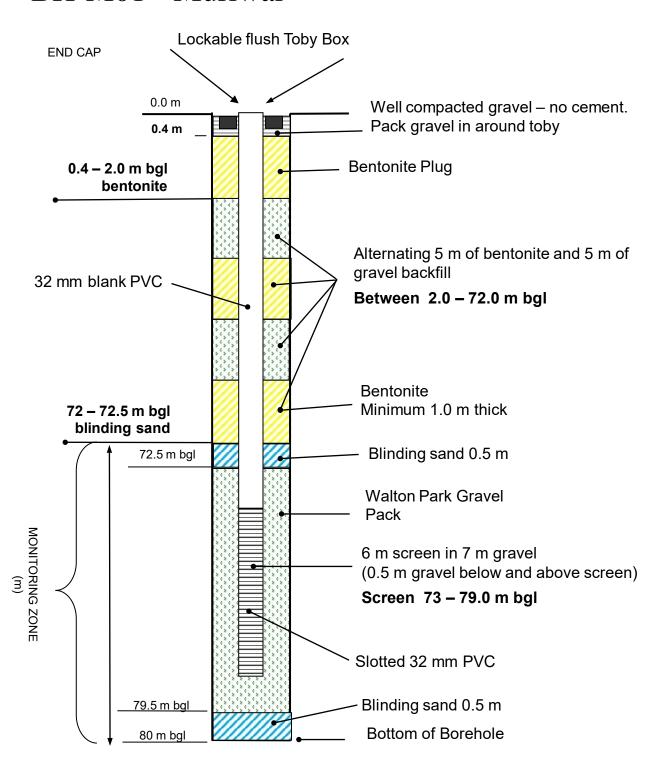
Hole No. : BH-M01

Sheet : 10 of 10 Hole Length : 79.60m Scale @ A4 : 1:40

Logged : JM Processed : JM

. \	L: 138		Datum: AUCKHT1946		= ,			Sai	mple		heck				JHS				
RL (m)	Depth (m)	Graphic	Material Description		Geological Unit	Consistancy /	Relative density	Number / Type	Result	Casing	Method	Flush Return (%)	Weathering	Ew Estimated	Strength (MPa)	TCR SCR RQD (%)	© Defect Spacing (mm)	Instrumentation Installation	Water level
	-		Moderately weathered, grey, fine to medium grained SANDSTONE; extremely weak. (continued from layer stat at 71.6m)	rting					SPI 34/16 for 20mm N > 50 (solid cone)		à	25 50 3	75		- W	0	5 6 5 6 5		
	-								,		НОТТ					100) \ \ (
3	73 – 8		Moderately weathered, dark grey, distinctly bedded, fine to medium grained SANDSTONE; extremely weak; thinly bed at 25-35°.	o dded															
	-								SPT 40/10 for 10mm N > 50 (solid cone)		5					0			
	74 -								33.137		нотт					100			
	- - - - -										_ <u>_</u>								
3	75 -				2				SPT 33/17 for 30mm N > 50 (solid		T/dS					0			
	-				AWHIIU SAND FORMAIION				cone)		НОТТ		WM			100			
70	76 -			ļ	WHITO SAN						Ĭ								
	-				∢				SPT 26/24 for 55mm N > 50 (solid		FR					0			
	77 -								cone)		E					100			
	-										НОТ					100			
3	78 -								SPT 29/21 for 50mm N > 50 (solid		F dS				-	0			
	-								cone)		НОТТ					100			
5	79 -										H H					100			
	1	::::							SPT 35/15		5					0			
3	1		End of Hole @ 79.60m, Target Depth.						for 20mm N > 50 (solid cone)										
	tes ar	nd Cor	nments:	Inclination	n: Ver	tical			Ori	entat	ion:	l	I		Grou	nd Wa	iter Le	vel	
Cc	ordina	tes and	RLs are approximated from the local GIS viewer. Locations are	Contracto											Date 5/07/23	Time 3 08:05	Readin (mbgl)	(mbgl)	epth 2.095
ъú	uj e ul ((future :		Equipmer Shear Var										18	3/07/23	3 16:15	35	5 79	9.59
Re	fer to e	explanat	ion sheets for abbreviation and symbols	onoai val	io iu.	JLC	,002	-											

BH-M01 - Muriwai



NOT TO SCALE





Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
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Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	





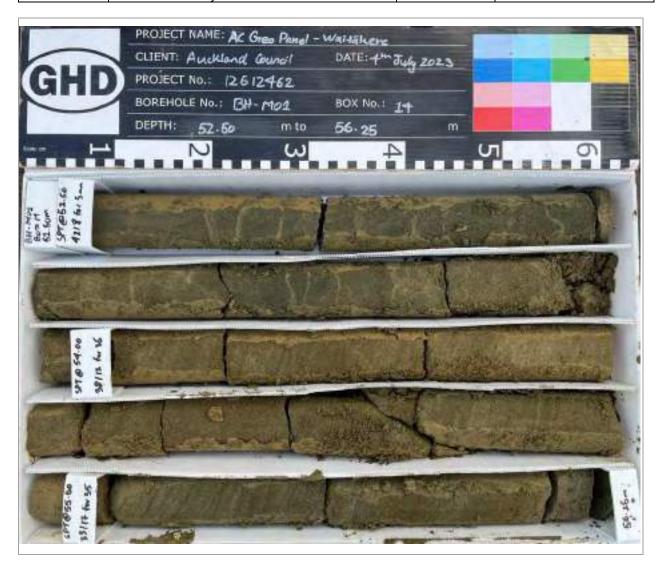
Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
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Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
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Date	29 June to 5 July 2023	Location	





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Job Number	12612462	(NZTM 2000)	5923873.69 N
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Date	29 June to 5 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	





Photograph @ 6.0 m not recovered.





Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	



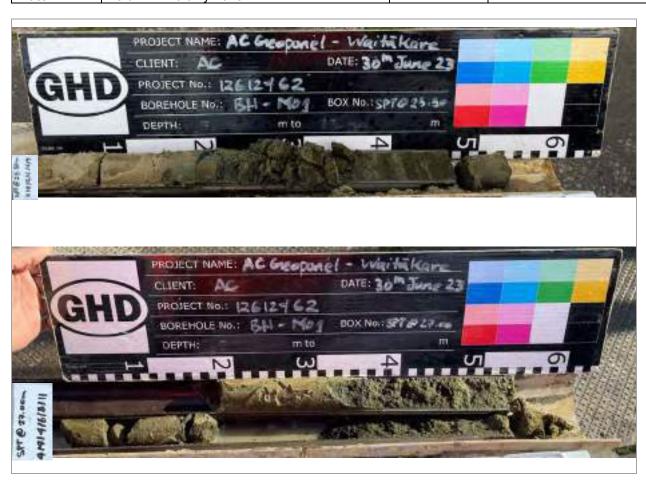


Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
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Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
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Date	29 June to 5 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728691.45 E
Job Number	12612462	(NZTM 2000)	5923873.69 N
Client	Auckland Council	Location	17 Oaia Rd, Muriwai
Date	29 June to 5 July 2023	Location	





Client : Auckland Council

Site : 150 Oaia Rd, Muriwai 0881

Job Number: 12612462

Scale @ A4 : 1:40

Hole No.

Hole Length

Sheet

: BH-M02

: 1 of 10

: 79.57m

	: 144		387.63 Northing: 5923493.52 Datum: AUCKHT1946	Syste	art. f	· <u>-</u> 11	00	•			heck	ssed ed		: JN : JH	IS 23/08	/2023	
			Datam. Ale Stati Te Te		Unit	tion	_		mple								_
RL (m)	Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density	Number / Type	Result	Casing	Method	ଞ୍ଚ ଞ୍ଚ Flush Return (%)	Weathering	*** Estimated	TCR SCR RQD (%)	be Defect Spacing (mm)	Instrumentation Installation
-	-	\(\bar{\chi}\cdot\) \(\bar{\gamma}\cdot\) \(Clayey SILT; dark brown, mottled orange-brown. 'Very moist, low plasticity. [TOPSOIL].	stiff',	OPSOIL	М	'VSt'										
- 144 4	10.4		Clayey SILT; brown, speckled orange-dark brown. Very moist, low plasticity. [FILL].	y stiff,	FILL		VSt		SV@0.5m 155/87 kPa		HA						
-	1-	× × · · · · · · · · · · · · · · · · · ·	Clayey SILT with trace sand; brown, mottled and streat orange. Very stiff, moist, low plasticity. Sand, fine. [AW SAND FORMATION].	ked /HITU					SV@1m 142/74 kPa								
1143	1.7	×	Clayey SILT; brown, mottled and streaked orange. 'Ver	av otiff'	-		'VSt'		SV@1.5m 111/59 kPa SPT 1/1		SPT				100	-	
-	2-	× × ; × × ;	moist, low plasticity.	y suii,			VSt		1/1 2/2 2/2 N = 8		0)					- -	
. 741		* -* ; × -* ; × -× ;									0B				100		
	3-	× × ; × × ; × × ;	3.00 - 3.20 Hard.				Н		SV@3m UTP SPT		F				400	<u>.</u>	
1 141		× - : × - : × - :	Clayey SILT with minor sand; brown streaked yellow-o 'Stiff', moist, low plasticity. Sand, fine. [AWHITU SAND FORMATION]	range.)			'St'		1/0 1/1 1/1 1/1 N = 4		SPT				100	<u>.</u>	
	4 - 36.8	×	3.80 - 3.95 Speckled black. Clayey fine SAND; grey speckled black. Moist.		ATION		-				0B				100		
- 140	4.3	× . × . · . · .×	Silty fine SAND; light grey speckled black, streaked or Loose, moist.	ange.	SAND FORMATION		L		SPT 1/1							<u>.</u>	
-	5	× × ×			AWHITU 8				1/2 3/4 N = 10		SPT				100	<u>.</u>	
- 		× · · · × · · · × · · · · · · · · · · ·									0B				100		
- -	6-	×							SPT 1/1							-	
- 138	-	×							1/3 3/3 N = 10		SPT				0	- -	
	7-	× · . · · · × · · · · · · · · · · · · ·	6.80 With trace clay.								0B				100		
		×							SPT							-	
-	7.95 7.8	× .	Amorphous PEAT; brown-black, streaked red-orange.	'Very	-		'VSt'		1/0 1/3 3/3 N = 10		SPT				100	<u> </u>	- <u> </u>
			iments:	Inclination			al		Ori	ientat	ion:			-	ound Wa	Reading	Hole depth
Coc	rdina	es and I future s	.57m, Target Depth. RLs are approximated from the local GIS viewer. Locations are urvey.	Contrac			00							Da	te Time	(mbgl)	(mbgl)
				Shear V				60									

Client : Auckland Council

Site : 150 Oaia Rd, Muriwai 0881

Job Number: 12612462

Commenced: 4/08/2023

Completed: 17/08/2023

Scale @ A4 : 1:40 Logged : JM

Sheet

Hole Length

Hole No. : BH-M02

: 2 of 10

: 79.57m

RL (m)					=					1								1
	Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		Result	Casing	Method	Flush Return (%)	Weathering	*** ***Estimated *** Strength (MPa)	TCR SCR RQD (%)	" Defect Spacing (mm)	Instrumentation Installation	10/040.1
	-12	::::	stiff', moist.			-	-	<u> </u>		+	-	25 50 7	5	33388	81	200 800 800 800 800 800 800 800 800 800		f
- 136	18	<u> </u>	CORE LOSS (continued from layer starting at 8.0m) Amorphous PEAT; brown-black, streaked red-orange. " stiff', moist.	Very		М	'VSt'				OB				81			-
-	9 - 2/8	× . 	Silty fine to medium SAND; grey-brown, streaked orange-yellow. Medium dense, moist.				MD	-	SPT 1/2			-						_
135	9.45	×	CORE LOSS				-	-	4/6 6/7 N = 23		SPT	-			100			
- - 1	0-9										НФТТ				52			
. 134	, T.	× × ×	Silty fine to medium SAND; light grey, streaked dark gr Medium dense, moist; indistinctly, closely bedded at 0-	ey. 5°.		М	MD				Ĭ 							
-		× · × · × ·							SPT 1/1 2/3 4/5 N = 14		SPT				0			
។ - - ន	1-	× × ×																
-	11.74	× · . · . ×	CORE LOSS		RMATION		-	-			HØT				75		0,00	
- 1: -	2-2	× . × . × .	Silty fine to medium SAND; light grey, streaked dark grunder Loose, moist.	ey.	AWHITU SAND FORMATION	M	L	_	SPT 3/0 1/1 3/4 N = 9		SPT	-			0			
1132	121826	× · · · · · · · · · · · · · · · · · · ·	Clayey SILT; grey. 'Stiff', moist.		AWHIT		'St' /	7				-						
- 1: -	3-	× · · × × · · ×	Silty fine to medium SAND; light grey, speckled black; indistinctly very thinly bedded at 0-5°. Medium dense, n	noist.			MID				НОТ				100			
- 131		× · . × · .							SPT 2/2 2/2 4/5 N = 13		SPT	-			0			\\\\\\\\\\\
- 1. -	4 - 4	×	CORE LOSS			-	-	-	14-10									
1130	14.7	× . × . × .	Silty fine to medium SAND; grey-orange, speckled light grey-black. Medium dense, moist.			М	MD	-			НОТТ				67			
- 1: -	5 -	×							SPT 2/1 2/3 5/6 N = 16		SPT				0			-
1129	15.45	Î×	CORE LOSS		1	-	-	-			НФТТ				0			
Note	es ar		nments:	Inclinat	ion: \	ertic	al		Oı	riental				Gr	ound W			L
Coo	rdinat	ole @ 79 tes and ofuture s	9.57m, Target Depth. RLs are approximated from the local GIS viewer. Locations are survey.	Contrac			20							Da	te Time	Readin (mbgl)	g Hole de (mbgl)	pth
~)			•	Equipm Shear \				60										



Client : Auckland Council

: 150 Oaia Rd, Muriwai 0881 Site

Job Number: 12612462

: BH-M02 Hole No.

Sheet : 3 of 10 : 79.57m Hole Length Scale @ A4 : 1:40

RI	_: 144		387.63 Northing: 5923493.52 Datum: AUCKHT1946	System							heck	ed		: JH	S 23/08	/2023		
- 1 11			Batani. AGGRITI 1040	3	¥ T	5			nple					. 011	20,00	2020		Τ
RL (m)	Depth (m)	Graphic	Material Description	1	Geological Unit	Moisture condition	Consistancy / Relative density	Number / Type	Result	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	Defect Spacing (mm)	Instrumentation Installation	
-	<u>-</u>		CORE LOSS (continued from layer starting at 15.5m)		_					натт	25 50 75			0	20 80 200 200 200 200 200 200 200 200 20		ľ
- 1128	16.5	× . × . × .	Silty fine to medium SAND; light brownish grey. Mediudense, moist.	um		М	MD		SPT 2/1 2/4 7/10 N = 23		SPT				100			-
-	17 - 9	×	CORE LOSS			-	-											
	17.6	× .	Silty fine to medium SAND; light brownish grey. Mediudense, moist.	um		М	MD				НОТТ				38			
-	18 - 18	× · · · × · · · · · · · · · · · · · · ·	Clayey SILT with minor sand; grey, speckled black. 'Fi stiff, moist, low plasticity. Sand, fine to coarse.	irm to			'F-St'		SPT 4/4 4/4 4/5 N = 17		SPT				100			Ī Ā
1126	18.7	×	18.20 - 18.35 Grey, speckled black. Silty fine to medium SAND; light grey-light brown, streand mottled orange; indistinctly bedded very thinly bed	eaked dded at			MD				ш				100			-
. 671	19 -	× · . · . × · . · × · . · × · . · × · . · ×	40°. Medium dense, moist.					\			НОТТ				100			
-	1 1 1 93.6	× · · · × · · · · · · · · · · · · · · ·		CI	PORMAIION		>		SPT 5/5 6/8 8/10 N = 32		SPT				0			,
	20		CORE LOSS	THE PART OF THE PA	AWHILD SAND	-	•				натт				38			,
	21 -	× . × . × . × .	Silty fine to medium SAND; light grey-light brown, stre light orange, mottled orange. Medium dense, moist.		₹ _	М	MD		SPT 4/6								0,000	
- 571	21.45	×	Silty fine to medium SAND; orange brown, speckled b	olack,					6/7 8/8 N = 29		SPT				0			}
-	22 -	× · . × × × × × · . ×	streaked yellow-orange. Medium dense, moist. 21.85 - 21.90 Dark orange-red.	, l							НДТТ				100			
- 22		× × ×	22.50 - 23.60 Dense.				D		SPT 4/6									
	23 -	· · · · · · · · · · · · · · · · · · ·	22.60 - 23.60 Orange-brown, streaked orange.						7/8 9/11 N = 35		SPT				100		00000 0000	
- 121	9.	× · . · . · . · . · . · . · . · . · . ·									НДТТ				100			
	32		Fine to medium SAND; orange brown, speckled black distinctly very thinly bedded at 5-15°. Dense, moist. 23.60 Carbonaceous fragments up to 10mm.			urti -				iont-					ound Wa	ater I c		
			nments: .57m, Target Depth.	Inclination			11		Or	ientat	ion:			Date		Reading	Hole de	
Co	ordinat	es and f future s	RLs are approximated from the local GIS viewer. Locations are	Equipmen Shear Var	ıt: T	R 20		60						08/08		(mbgi)		9.9



Client : Auckland Council

Site : 150 Oaia Rd, Muriwai 0881

Job Number: 12612462

Commenced: 4/08/2023

: BH-M02 Hole No.

: 1:40

Sheet : 4 of 10 Hole Length : 79.57m

Scale @ A4 Logged : JM

_	j: 1728:		Syste	m: N	IZTN	/1200	0			roces			: JM		12022		
RL (m) Depth (m)	Graphic Graphic	Datum: AUCKHT1946 Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		Result	Casing	Method	E Flush Return (%)	Weathering	Strength (MPa)	TCR SCR RQD (%)	Defect on Spacing (mm)	Instrumentation Installation	Water level
120 -		Fine to medium SAND; orange brown, speckled black; distinctly very thinly bedded at 5-15°. Dense, moist. (confrom layer starting at 23.6m)	ntinued					SPI 3/3 7/11 12/13 N = 43		SPT	2 3 7			44			
25 —										НОТТ				100			-
26 —								SPT 4/8 10/12 12/12 N = 46		SPT				44			-
							26.75 C 26.50			натт				100			-
27 -		27.00 - 29.40 Medium dense.		NOIL		MD		SPT 2/2 2/3 3/5 N = 13		SPT				0			-
28 -		28.00 - 28.25 With patches of carbonaceous material.	S	AWHITU SAND FORMATION						НОТТ				100			
29				AW				SPT 3/2 4/5 6/9 N = 24		SPT				100			
30						D	29.92 C 29.69	SPT		НОТТ				100			
							29	SPT 6/7 8/9 10/13 N = 40		SPT				100			
31 -								QDT.		НОТТ				100			
- - - -								SPT 9/10 12/14 14/9 N = 49 (solid cone)		SPT				0			
Notes ar End of Ho Coordina subject to	ole @ 79 tes and F	57m, Target Depth. kLs are approximated from the local GIS viewer. Locations are	Contract Equipme	tor: D	CN R 20	00	60	Ori	ientat	ion:			Date		Reading (mbgl)	Hole de (mbgl)	epth

Completed: 17/08/2023

Client : Auckland Council

Site : 150 Oaia Rd, Muriwai 0881

Job Number: 12612462

Commenced: 4/08/2023

Completed: 17/08/2023

: BH-M02 Hole No. Sheet : 5 of 10 Hole Length : 79.57m Scale @ A4 : 1:40

Logged : JM

Easting: RL: 144		887.63 Northing: 5923493.52 Datum: AUCKHT1946	Syste							roces heck			: JM : JH	\$ 23/08	/2023	_
RL (m) Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		Result	Casing	Method	Flush Return (%)	Weathering	***Estimated	TCR SCR RQD (%)	" Defect " Defect (mm) " Spacing (mm) " Instrumentation Installation	Water level
		Fine to medium SAND; orange brown, speckled black; distinctly very thinly bedded at 5-15°. Dense, moist. (confrom layer starting at 23.6m)	ontinued							HQTT	25 50 75		5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	100		
33 -								SPT 12/12 8/9 12/12 N = 41 (solid cone)		SPT				0		
34-										HQTT				100		
35 —						<		SPT 9/11 10/12 12/13 N = 47 (solid cone)		SPT				0		
36 —				AWHITU SAND FORMATION				SPT		HQTT				100		
		36.00 - 40.50 Very dense.		AWHITU SAN		VD	36.65 C 36.35	SPT 14/16 18/18 14 for 55mm N > 50 (solid cone)		T SPT				0		Ӯ
37 -			*					SPT 15/16 19		SPT HQTT				0		
38 -		37.90 - 38.00 Very thinly bedded at 20-30°.						for 75mm N > 50 (solid cone)		нотт				100		
39 —								SPT 11/11 12/16 for 75mm		Has I				0		
								N > 50 (solid cone)		HQTT				100	\0,\0,\0,\0,\0,\0,\0,\0,\0,\0,\0,\0,\0,\	
Notes an End of Ho Coordinate subject to	le @ 79 es and F	57m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Contrac Equipme	tor: [DCN FR 20	00	60	Ori	ientati	ion:			Gro		Reading (mbgl) Hole dep (mbgl)	oth



Client : Auckland Council

Site : 150 Oaia Rd, Muriwai 0881

Job Number: 12612462

Commenced: 4/08/2023

Completed: 17/08/2023

: BH-M02 Hole No. Sheet : 6 of 10 Hole Length : 79.57m

Scale @ A4 : 1:40

: JM Logged

	.: 144		Datum: AUCKHT1946					Sar	nnla	Γ' -	heck	Cu		. 011	S 23/08.		
RL (m)	Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		Result eldu	Casing	Method	Flush Return (%)	Weathering	EW WEstimated Strength (MPa)	TCR SCR RQD (%)	Defect Defect Spacing (mm)	Instrumentation Installation
-			Fine to medium SAND; orange brown, speckled black; distinctly very thinly bedded at 5-15°. Dense, moist. (cc from layer starting at 23.6m)	ontinued							НОТТ	25 50 7	5	3 8 8 3 11	100		
1103	41 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Highly weathered, orange brown, streaked orange, spe black, fine to medium grained, indistinctly bedded SANDSTONE; extremely weak; very thinly bedded at 20	ockled 0-30°.	-	-	-	41.00 C 40.80			НОТТ		MW		100		
102	42 1 41.8		Highly weathered, greenish grey, streaked brown-orang speckled black, fine to medium grained SANDSTONE; extremely weak.		_				SPT 9/10 12/12 12/12 N = 48 (solid cone)		SPT				0	0	1,V,O,V,(
- - -	43 42.8 42.642	× × × × × × × × × × × × × × × × × × ×	Silty CLAY; ligh grey, streaked dark grey-orange. 'Stiff', low plasticity. Highly weathered, light grey, speckled dark grey-black, SILTSTONE; extremely weak. Highly weathered, brown, streaked and speckled orang fine to medium grained SANDSTONE; extremely weak. Highly weathered, light orange brown, streaked orange	ge-black,	, , ,	- M	'St'		,		НОТТ				100	0 2/12 0 2/12	
1101	44 —		speckled black, indistinctly bedded, fine to medium grain SANDSTONE; extremely weak; very thinly bedded at 1:	ined	AWHITU SAND FORMATION		>		SPT 8/11 14/15 15/6 for 25mm N > 50 (solid cone)		SPT				0		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
- 100	45 —				AWHITUS				SPT		НОТТ				100	-	
- - 66									11/14 26/24 for 55mm N > 50 (solid cone)		Т SPT		HW		0	- - - - - - - -	
- 86	46 -								SPT 12/15		т натт				100	- - - -	
- - -	- - - 47 — - -								25/25 for 65mm N > 50 (solid cone)		тт				100		
26				Inclinati	or: '	/o=+: -				entat	НОП			Cri	100	ater Leve	
			iments: .57m, Target Depth.	Contrac			a1		OII	onial				Dat		Reading	Hole dept
Co	ordinate	es and f future s	RLs are approximated from the local GIS viewer. Locations are	Equipme			00							09/08		(mbgl)	(mbgl) 40.9
				Shear V				30									
_	fer to e			Jingui V	_,,,	OI	, , ,							1	- 1	1	1



Client : Auckland Council

: 150 Oaia Rd, Muriwai 0881 Site

Job Number: 12612462

Hole No. : BH-M02 Sheet : 7 of 10 : 79.57m Hole Length Scale @ A4 : 1:40

Easing: 1728/387.03 Northing: 5923493.52 Spalem: NZTM2000 Processed: J.M. Material Description Material D					Commenced: 4/08/2023	Com	nolete	ed: 17	7/08/2	2023			ogge.			: JN	l			
Material Description	Eastii	ng:	: 172	8387.	'							\neg								
Material Description Section Part Par	RL: 1	44	.5		Datum: AUCKHT1946							_ c	heck	ed		: JH	S 23/08	/2023		
Second Sample Second Sampl							曹	ē			mple	1		(%						
speckled black, indistinctly bedded, fine to medium grained SANDSTONE: extremely weak: we trivily bedded at 15-25'. Continued from layer starting at 43.0m	Don'th (m)	Deptin (m)	Graphic				Geological L	Moisture conditi	Consistancy / Relative density	Number / Type		Casing	Method	ع Flush Return (۹	Weathering	***Estimated ***Strength (MPa)	SCR	Defect Spacing (mm)	Instrumentation Installation	Water level
50 - 52 - 52 - 63 Light orange brown, streaked orange. 52 - 52 - 52 - 63 Light orange brown, streaked orange. 53 - 54 - 50 - 54 - 60 100% flush loss. 54 - 5 - 5 - 54 - 60 100% flush loss. 55 - 5 - 54 - 60 100% flush loss. 56 - 5 - 64 - 60 100% flush loss. 57 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -		- - - -	:::	spe SA	eckled black, indistinctly bedded, fine to medium gra NDSTONE; extremely weak; very thinly bedded at 1	ined					18/18 14 for 50mm N > 50		SPT				0	-		
51	49 -	-	:::		munaca nonnayer starting at 45.6m y						(solid cone)		НОП				100		PAICI	
52 — 52.00 - 52.63 Light orange brown, streaked orange. 52 — 52.00 - 52.63 Light orange brown, streaked orange. 53 — 54 — 53.50 - 54.00 100% flush loss. 54 — 53.50 - 54.00 100% flush loss. 55 — 65 — 65 — 65 — 65 — 65 — 65 — 65	- - -										13/16 22/28 for 75mm N > 50		SPT				0			
52 — 52.00 - 52.63 Light orange brown, streaked orange. 52 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 53 — Flighty weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. 54 — Sand Comments: 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 65 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 66 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 67 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 68 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 68 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 69 — Flighty weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak.	50 -										(solid									
52.00 - 52.63 Light orange brown, streaked orange. 52.00 - 52.63 Light orange brown, streaked orange. 53.50 - 54.00 100% flush loss. 53.90 - 54.13 Dark greyish brown. CORE LOSS Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 53.90 - 54.13 Dark greyish brown. CORE LOSS Highly weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. Inclination: Vertical Orientation: Ground Water Level control or control	-												HQT				100		700	
52— 52— 52.00 - 52.63 Light orange brown, streaked orange. 53— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 53— Highly weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. 54— 55— Highly weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 55— Corrections and Comments: 16— 18— 18— 19— 100 100 100 100 100 100 100	51 -										16/18 24/26 for 50mm		SPT		HW		0	-		
Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 53 -	-					•	MATION	2			(solid									
Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. 53 -	52 -	- - - - -		52.	00 - 52.63 Light orange brown, streaked orange.	7	SAND FORM						HQTT				100			
53.50 - 54.00 100% flush loss. 54. Solution of Hole @ 79.57m, Target Depth. oortdnates and RLs are approximated from the local GIS viewer. Locations are	-	52.635		Hic	ahly weathered, brown, speckled black, fine to media	um	AWHITU				21/29 for 60mm		SPT				0	-		
53.50 - 54.00 100% flush loss. 53.90 - 54.13 Dark greyish brown. CORE LOSS Highly weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. The property of the following pr	53 -	-		gra	ined SANDSTONE; extremely weak.						(solid		НОТТ				100			
53.90 - 54.13 Dark greyish brown. 54.00 - 54.13 Dark greyish brown. 55.00 - 54.13 Da				53.	50 - 54.00 100% flush loss.					ပ 										
Highly weathered, dark brown-grey, speckled black, fine to medium grained SANDSTONE; extremely weak. Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. Dies and Comments: Inclination: Vertical Orientation: Ground Water Level contributes and RLs are approximated from the local GIS viewer. Locations are	54 -	3154.13	:::	:							23/27 for 60mm N > 50		SPT				0	- - - - - - - - - - - - - - - - - - -	64 N	
Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. Highly weathered, brown, speckled black, fine to medium grained SANDSTONE; extremely weak. Inclination: Vertical Orientation: Ground Water Level Ontractor: DCN Date Time Reading Hole de Contractor: DCN Date	-	13.		me		ne to							+QTT				73			
totes and Comments: Inclination: Vertical Inclination: Vertical Orientation: Ground Water Level Contractor: DCN Date Time Reading (midst) Hole de (midst)	55 -		:::							<u> [</u>					MH					
otes and Comments: Inclination: Vertical Orientation: Ground Water Level Contractor: DCN Date Time Reading (midgl) Hole de (midgl) (-	55.625	:::	Hig gra	ghly weathered, brown, speckled black, fine to mediu nined SANDSTONE; extremely weak.	um				55.86	25/25 for 50mm N > 50 (solid							-		
contractor: DCN Date Time Reading (mbgl) Time Contractor: DCN	ntec	an	nd Cc	mmor	nte·	Inclinat	ion: \	l /ertic	l al		l Or	ientat		Ш	Ш	Gro	ound W	IIIIII ater Le	⊥⊟ L⊒ vel	
coordinates and RLs are approximated from the local GIS viewer. Locations are	nd of	Но	ole @	79.57m	, Target Depth.													Reading	Hole dep	oth
	Coordi	inat	es an	d RLs a	re approximated from the local GIS viewer. Locations are				00									(ITIDGI)		
Shear Vane Id: GEO1060										60										



Client : Auckland Council

Site : 150 Oaia Rd, Muriwai 0881

Job Number: 12612462

Commenced: 4/08/2023

Completed: 17/08/2023

Hole No. : BH-M02 Sheet : 8 of 10

: 79.57m Hole Length Scale @ A4 : 1:40

Logged : JM · IM

RL: 144		387.63 Northing: 5923493.52 Datum: AUCKHT1946	Syste	111. I	NZ 11	/IZUU				ocess necke		, ,	: JM : JHS	23/08	/2023	1	
RL (m) Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		Result	Casing	Method	Flush Return (%)	Weathering	*** Estimated *** Strength (MPa)	TCR SCR RQD (%)	© Defect Spacing (mm)	Instrumentation Installation	Water level
57 —		Highly weathered, brown, speckled black, fine to mediur grained SANDSTONE; extremely weak. (continued from starting at 55.6m)	n n layer				56.90 C 56.50 56.11 C	SPT 24/26		нотт нот	5 50 75		2 8 8 2 9	100	22 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
58								for 55mm N > 50 (solid cone)		НОТТ		HW		100			
59-						(SPT 23/27 for 65mm N > 50 (solid cone)		Tras				0	-		
60 - 60				AWHITU SAND FORMATION				SPT 24/26 for 55mm		вет НОТТ				0			
61 —		CORE LOSS		AWHITU S.				N > 50 (solid cone)		НОТТ				4			
8 61.45		Highly weathered, brown, speckled black, fine to mediur grained SANDSTONE; extremely weak.	n					SPT 21/29 for 70mm N > 50 (solid	_	SPT				0			
62 -		Highly weathered, dark brown, speckled black, medium coarse grained SANDSTONE; weak.	to					cone)		НФТТ		MH		100			
63		Moderately weathered, greyish green, speckled black-gr fine to medium grained SANDSTONE; extremely weak.	rey,					SPT 21/29 for 65mm N > 50 (solid cone)	_	SPT		MW		0			
63.5		Highly weathered, orange brown, speckled black-grey, fi medium grained SANDSTONE; extremely weak.	ine to							НОТТ		MH		100			
	ole @ 79 tes and	.57m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Inclination Contract Equipment Shear Va	or: [DCN TR 20	00	60	Ori	entatio	on:			Gro		Reading (mbgl)		pth

Project : AC Geo Panel - Waitakere Client : Auckland Council

: 150 Oaia Rd, Muriwai 0881 Site

Job Number: 12612462

Commenced: 4/08/2023

Completed: 17/08/2023

Scale @ A4 Logged

: JM

Hole No.

Hole Length

Sheet

: BH-M02

: 9 of 10

: 79.57m

: 1:40

RL: 144.	5	Datum: AUCKHT1946					0-		<u> </u>	heck	ed	П	: JHS	3 23/08 I	/2023		Т
RL (m) Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		Result ald m	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	© Defect Spacing (mm)	Instrumentation Installation	Motor lovel
8 -		Highly weathered, orange brown, speckled black-grey, medium grained SANDSTONE; extremely weak. (conti from layer starting at 63.5m)	fine to nued				64.72 C 64.44	SPT 26/24 for 55mm N > 50 (solid cone)		SPT HQTT	2 2 7	HW		0	N 0 N 0 N		
99 79 79		Moderately weathered, greyish green, speckled black-g fine to medium grained SANDSTONE; extremely weak	irey,					SPT 25/25 for 65mm N > 50		вы				0			
67 —						<		(solid cone)		нотт		MW		100			
68 -	×	Silty fine to medium SAND; greyish green, speckled	2	AWHITU SAND FORMATION		>	68.33 C 67.93	SPT 50 for 65mm bouncing @ 65 mm		HQTT				100			
69 75 69	× .× × .×	black-grey. Very dense, moist. CORE LOSS Moderately weathered, greenish grey, speckled black-c	rey,					SPT 50 for 70mm bouncing @ 70 mm		2				0			-
70 -		fine to medium grained SANDSTONE; extremely weak						SPT		НОТТ		MW		69			-
71 - 71 - 71 - 71 - 71 - 71 - 71 - 71 -		CORE LOSS Moderately weathered, grey, speckled black-dark grey, distinctly bedded, fine to medium grained SANDSTONE extremely weak; very thinly bedded at 0-15°.	Ξ;	_				23/27 for 65mm N > 50 (solid cone)		натт		MW		86			-
Notes and End of Hol Coordinate subject to	e @ 79 s and f	.57m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Inclinati Contrac Equipm	tor: [DCN			Ori	entat	ion:			Gro Date 16/08/		Reading (mbgl)	g Hole der (mbgl)	epth



Project : AC Geo Panel - Waitakere

Client : Auckland Council

: 150 Oaia Rd, Muriwai 0881 Site

Job Number: 12612462

Commenced: 4/08/2023

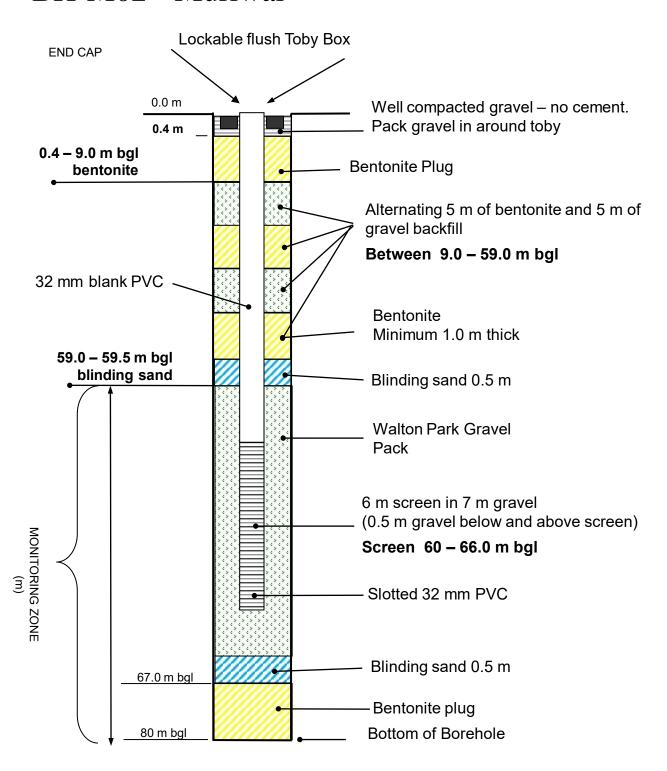
Completed: 17/08/2023

: BH-M02 Hole No. Sheet : 10 of 10 : 79.57m Hole Length Scale @ A4 : 1:40

Logged : JM

	-				_		Sar	nple		heck	eu	\Box	. JII	3 23/08	72025		Г
RL (m) Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density			Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	Defect Spacing (mm)	Instrumentation Installation	
		Moderately weathered, grey, speckled black-dark grey, distinctly bedded, fine to medium grained SANDSTON extremely weak; very thinly bedded at 0-15°. (continue layer starting at 70.8m)	IE;			<u> </u>	2.5	SPI 35/15 for 15mm N > 50 (solid cone)		HQTT	25 50 7	MW N	S S S S S S S S S S S S S S S S S S S	100	200		
		CORE LOSS		-				SPT 31/19 for 20mm N > 50 (solid cone)		1.69				0			
. 0/1		Moderately weathered, grey, speckled black-dark grey, distinctly bedded, fine to medium grained SANDSTON extremely weak; very thinly bedded at 0-15°. 74.50 - 75.12 Distinctly bedded, very closely spaced, withinly bedded, dark grey, sandstone beds at sub-horizon angles.	IE; /ery				74.50 C 74.20			НОТТ		MW		59			
		CORE LOSS Moderately weathered, grey, distinctly bedded, fine to a grained SANDSTONE; extremely weak; very closely be 0-10°.	medium edded at	FORMATION				SPT 30/20 for 45mm N > 50 (solid cone)		SPT				0			
				AWHITU SAND FORMATION			76.40 C 76.13	SPT 31/19 for 25mm N > 50 (solid cone)		натт натт		MW		0 /	*		
38.6				-			78.47 C 78.14	SPT 50 for 75mm bouncing @ 75 mm		š				0			
79-		Highly weathered, dark grey, fine to medium grained SANDSTONE, trace carbonaceous material; extremely	y weak.					SPT 50 (HQTT		HW		100			
		End of Hole @ 79.57m,Target Depth.						for 70mm bouncing @ 70 mm									
	le @ 79. es and F	57m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Contraction Equipment Shear V	tor: [ent: ⁻	DCN FR 20	00	60	Ori	ientat	ion:			Date	und Wa	T	Hole de	pth

BH-M02 - Muriwai



NOT TO SCALE



Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
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Job Number	12612462	(NZTM 2000)	5923493.52 N
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Job Number	12612462	(NZTM 2000)	5923493.52 N
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Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
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Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





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Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
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Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
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Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E				
Job Number	12612462	(NZTM 2000)	5923493.52 N				
Client	Auckland Council	Location	150 Oaia Rd, Muriwai				
Date	7 August to 17 July 2023	Location					





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E				
Job Number	12612462	(NZTM 2000)	5923493.52 N				
Client	Auckland Council	Location	150 Oaia Rd, Muriwai				
Date	7 August to 17 July 2023	Location					





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E	
Job Number	12612462	(NZTM 2000) 5923493.5. 150 Qaja Rd. Muriwa		
Client	Auckland Council	Location	150 Oaia Rd, Muriwai	
Date	7 August to 17 July 2023	Location		





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E				
Job Number	12612462	(NZTM 2000)	5923493.52 N				
Client	Auckland Council	Location	150 Oaia Rd, Muriwai				
Date	7 August to 17 July 2023	Location					





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E				
Job Number	12612462	(NZTM 2000)	5923493.52 N				
Client	Auckland Council	Location	150 Oaia Rd, Muriwai				
Date	7 August to 17 July 2023	Location					





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E			
Job Number	12612462	(NZTM 2000)	5923493.52 N			
Client	Auckland Council	Location	150 Oaia Rd, Muriwai			
Date	7 August to 17 July 2023	Location				





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E
Job Number	12612462	(NZTM 2000)	5923493.52 N
Client	Auckland Council	Location	150 Oaia Rd, Muriwai
Date	7 August to 17 July 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728387.63 E				
Job Number	12612462	(NZTM 2000)	5923493.52 N				
Client	Auckland Council	Location	150 Oaia Rd, Muriwai				
Date	7 August to 17 July 2023	Location					





Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 250 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 25/07/2023 Completed: 3/08/2023

Hole No. : BH-M03 Sheet : 1 of 10

Hole Length : 79.64m Scale @ A4 : 1:40

Logged : JM, MK

RI	_: 150)		Datum: AUCKHT1946		≥ c Sample										: JHS 23/08/2023				
RL (m)	Depth (m)	Graphic		Material Description		Geological Unit	Moisture condition	Consistancy / Relative density	umber /	Result	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD	Defect Spacing (mm)	Instrumentation Installation		
<u> </u>) :	HAND AUGERE	D. NOT LOGGED			-	-	ZF	<u>~</u>	0	2	25 50 75	>	3 3 5 5	(%)	200			
- 149 -	1-											HA				0				
- 148	2-	× .	Silty fine to med Loose, moist. [A	um SAND; orange-brown, speckled bl WHITU SAND FORMATION]	ack.		М	L	-	SPT 2/2 2/2 2/3 N = 9		SPT				100				
- 147	3	×	2.55 - 2.73 Light 2.73 - 4.30 Orar							SPT		OB				100				
-	3 -	×······································	< < < <		•					SPT 1/1 1/2 2/3 N = 8		SPT				100				
1146	4	× .	Silty fine to med	um SAND; light grey streaked orange. noist.		MATION		MD		SPT 5/5		OB				100				
1145	5-	×	4.65 - 4.70 Orar	ge brown.		AWHITU SAND FORMATION				5/5 5/6 7/9 N = 27		SPT				100				
. 44	9	× · · · · · · · · · · · · · · · · · · ·	< ∖Sand: fine, oran	um SAND; light grey. Medium dense,	/	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		'H' MD		SPT 3/3		НОТТ				100				
	6.45	× .	CORE LOSS			_	-	-	-	3/3 4/4 4/4 N = 16		SPT				100		0,000		
1143	7-	× .	Silty fine to med Medium dense,	um SAND; light grey mottled orange b noist.	prown.		М	MD				НОТТ				67				
	1 - 2	×	<		T	<u> </u>				SPT 1/2 2/3 3/5 N = 13		SPT				100				
			mments: '9.64m, Target Depth.		Inclinat			al		Or	rientat	ion:			Gro	ound Wa	Reading	Hole de		
Co	ordina	tes and		rom the local GIS viewer. Locations are	Equipm			00							Dat	.5 Time	(mbgl)	(mbgl)		
Г	fort		fian about for 11	an and a mahala	Shear \	/ane	ld:													
ĸe	ier to e	xpiana	tion sheets for abbreviat	on and symbols																

Hole No. : BH-M03 Project : AC Geo Panel - Waitakere Client : Auckland Council Sheet : 2 of 10 Site : 250 Oaia Road, Muriwai 0881 Hole Length : 79.64m Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 25/07/2023 Completed: 3/08/2023 Logged : JM, MK Processed : MK Easting: 1728010.05 Northing: 5923112.26 System: NZTM2000 RL: 150 Checked : JHS 23/08/2023 Datum: AUCKHT1946 Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return Spacing (mm) **Material Description** Neathering Water level Estimated TCR SCR RQD Depth (m) Number / Graphic Method Casing Defect CORE LOSS (continued from layer starting at 8.0m) 보 n SPT 2/2 2/3 3/4 N = 12 9 Silty fine to medium SAND; light grey. Medium dense, moist. MD SPT 9.00 - 9.05 Orange. 100 9.70 - 10.50 Grey locally mottle orange brown. HOT O 100 10 9.95 Gently inclined, orange brown, 15 mm bed. Silty fine to medium SAND, some carbonaceous inclusions; grey. Medium dense, moist. SPT 0 Completely to highly weathered, grey, fine to medium grained SANDSTONE; extremely weak. 보 100 AWHITU SAND FORMATION SPT 1/1 2/3 4/7 N = 16 SPT 0 12.50 - 12.52 Sub-horizontal carbonaceous bed. Highly weathered, grey, fine to medium grained SANDSTONE; very weak with carbonaceous fragments to 5mm. REV4.GPJ | Library: GHD - NZGD.GLB | Date: 25 August 2023 보연 ⋛ 100 13.20 - 13.33 Orange-grey. 'VSt' Silty CLAY, minor sand; grey. 'Very stiff', moist, high plasticity. SPT 0/1 0/1 1/3 N = 5 Sand: fine. SPT 0 14.03 - 14.13 Mottled orange. MD Silty fine to medium SAND; light grey, mottled orange. Medium dense, moist, Ę 100 135 SPT 3/3 4/4 4/6 N = 18 SPT 0 ₹ GENERAL LOG | Project: BH-M03 Highly weathered, light grey, fine to medium grained SANDSTONE; extremely weak. HØH 100 00.9 Ground Water Level Inclination: Vertical Orientation: Notes and Comments: Reading (mbgl) End of Hole @ 79.64m, Target Depth. Contractor: DCN Date Time Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey. Equipment: TR 200 Shear Vane Id: ≘ Refer to explanation sheets for abbreviation and symbols Report I



Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 250 Oaia Road, Muriwai 0881

Job Number: 12612462

Hole Length : 79.64m Scale @ A4 : 1:40

: BH-M03

: 3 of 10

Hole No.

Sheet

	150		010.05 Northing: 5923112.26 Datum: AUCKHT1946	Syster		1 2 1	VIZOU	O			roces			: Mł	s 23/08	3/2023		
TKE.			Material Description		Geological Unit	condition	ncy / density		nple		TICON.	Flush Return (%)	ng				ntation on	le le
RL (m)	Depth (m)	Graphic			Geolo	Moisture	Consistancy / Relative density	Number / Type	Result	Casing	Method	E Flush R	ਲ Weathering	Estimated Strength (MPa)	TCR SCR RQD (%)	Defect Spacing (mm)	Instrumentation Installation	Water level
	16.27 16	× .,	Highly weathered, light grey, fine to medium grained SANDSTONE; very weak. 16.21 - 16.27 Stained orange.			M	MD	16.27 C			HQTT		H		100			<u></u>
2		^ 	Silty fine to medium SAND; light grey, mottled orange. dense, moist.	Medium				_	SPT 2/3 4/4 4/6 N = 18		SPT				100	-		
- 17	17.15 17	×	Silty fine to medium SAND; light grey, mottled orange. dense, moist.	Medium		_	-									†		
2 15	-		Highly weathered, orange, fine to medium grained SANDSTONE; extremely weak.								НОТТ		MH		100			
- 18	55 1 1 1 8	× . × . × .	Silty fine to medium SAND; orange brown. Loose to medium, moist.	edium		М	L-MD		SPT 1/1 1/2 2/3 N = 8		SPT				100	-		
<u>-</u> 19	15 1 1 1 18		Highly weathered, brown, fine to medium grained SANDSTONE; extremely weak. 19.00 - 19.15 Orange.			-					натт		MH		100			
	19.35 19	× .	Completely weathered, orange, fine to medium grained SANDSTONE; extremely weak			M	MD						S					
2		× · . × . × . × . × . × . × . × . × . ×	Silty fine to medium SAND; orange. Medium dense, me	oist.	FORMATION	M	MID		SPT 2/3 4/6 6/7 N = 23		SPT				0	1		
- 20	- 1 - 1 - 2 - 2 - 2 - 2 - 3 - 4		CORE LOSS	N	AWHITU SAND F	-	-	-								†		
	1 -	× . × . × . × .	Silty fine to medium SAND; orange. Dense, moist.		AWHI	М	D		SPT		НОТТ				57			
_	45	×							3/5 7/8 9/9 N = 33		SPT				100			
2	12		CORE LOSS			-	-				F							
22	22.3	× × × × ×	Sandy SILT; brownish grey. 'Stiff', moist, low plasticity. fine. Silty fine to medium SAND; orange. Moist.	Sand:		M	'St'				HQTT				48			
. 23	22.45		Highly weathered, orange, fine to medium grained SANDSTONE; extremely weak.			-			SPT 6/10 15/15 15/5 for 25mm N > 50		SPT		^		100	-		
	1 1 1 1 1										НДТТ		MH		100		70,00	
	33.	× .	Silty fine to medium SAND; orange. Dense, moist.			М	D											
End	of Ho	le @ 79	ments: 64m, Target Depth.	Inclinatio			al		Ori	entat	ion:			Gre		Reading (mbgl)		pth
Cooi	rdinat ect to	es and F future s	tLs are approximated from the local GIS viewer. Locations are urvey.	Equipme Shear Va			00									(bgi)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 250 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 25/07/2023 Completed: 3/08/2023

Scale @ A4 : 1:40

Hole Length

Hole No.

Sheet

Logged : JM, MK

: BH-M03

: 4 of 10

: 79.64m

	_: 150		010.05 Northing: 5923112.26 Datum: AUCKHT1946	Syste	em: l	NZTN	/1200	0			roces heck			: МК	: S 23/08	/2023		
1 11	100				I Unit	dition	ity		nple		, ICON				20/00		uo	
RL (m)	Depth (m)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy /	Number / Type	Result	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	²⁰ ⁸⁰ Defect ⁸⁰⁰ Spacing (mm)	Instrumentation Installation	
		× . : :	Silty fine to medium SAND; orange. Dense, moist. (co from layer starting at 23.7m)	ntinued			011	2 -	SPI 6/8 8/9 11/12 N = 40		SPT	25 50 75		5 3 5 9 6	0	20 60 200 800 800 200		<u> </u>
	24.4		CORE LOSS		-	-	-	-										
C71 -	25 - 25	× . · . · .× · . · .	Silty fine to medium SAND; orange. Moist.			М					HQTT				57			
	1 1 1 25		Highly weathered, orange, fine to medium grained SANDSTONE; extremely weak.			-			SPT 7/11 16/18 16		SPT		HW		100			
. 47	26 – 95	:::: :::::	CORE LOSS		-				for 35mm N > 50									
			Highly weathered, light brown, fine to medium grained SANDSTONE; extremely weak. 26.35 - 26.92 Grades to dark orange.								НОТТ		,		82			
. 5711	27 -								SPT 6/7 10/11 11/12 N = 44		SPT		HW		0		00°	
-	27.45		Completely weathered, orange, fine to medium grained SANDSTONE; extremely weak.	d	RMATION													
- 1122	28 -			1	AWHITU SAND FORMATION						HQTT		CW		100			-
	28.4		Highly weathered, orange brown, fine to medium grain SANDSTONE; extremely weak.	ned	AWH				SPT 6/7 8/8 8/9 N = 33		SPT				0			
	29 -							29.55			нотт				100			
1120	30 -							29.75 C	SPT				HW					-
									4/4 6/8 9/10 N = 33		SPT				100			
	31 -										НОТТ				100			
	31.55	×—: ×—: ×—:	31.45 - 31.55 Completely weathered. Clayey SILT, some sand; grey. 'Hard', moist, low plast Sand: fine.	-		М	'H'	31.95	SPT 3/4 5/5 5/5 N = 20		SPT		¢w		100			
[≈] No	tes ar	× —∃ nd Com	31.55 - 32.50 Grades to underlying geology with depth ments:	n. Inclinati	on: \	ertica	al	E	Or	ientat	ion:			Gro	ound Wa	ater Lev	∟ ∟ vel	_
En	d of Ho	ole @ 79 es and I	.64m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Contrac										Date	e Time	Reading (mbgl)	Hole de (mbgl)	pth
		future s	on sheets for abbreviation and symbols	Equipm Shear V			00											

Hole No. : BH-M03 Project : AC Geo Panel - Waitakere Client : Auckland Council Sheet : 5 of 10 Site : 250 Oaia Road, Muriwai 0881 Hole Length : 79.64m Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 25/07/2023 Completed: 3/08/2023 Logged : JM, MK Processed : MK Easting: 1728010.05 Northing: 5923112.26 System: NZTM2000 RL: 150 Checked : JHS 23/08/2023 Datum: AUCKHT1946 Sample **Geological Unit** Moisture condition 8 ***Estimated ***Strength (MPa) Consistancy / Relative density Defect Spacing (mm) Flush Return **Material Description** Weathering TCR SCR RQD Number Method Casing Depth (Clayey SILT, some sand; grey. 'Hard', moist, low plasticity. Sand: fine. (continued from layer starting at 31.6m) × 32.23 × 보 100 Silty fine to medium SAND with some clay; grey. Very dense, VD SPT 100 Highly weathered, orange-brown, fine to medium grained SANDSTONE; extremely weak. HQTT 100 34 100 SPT HÖH 100 AWHITU SAND FORMATION 36 SPT 100 REV4.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 HØH 100 SPT 19/31 SPT 100 or 65mm N > 50 CORE LOSS 보 15 Highly weathered, orange brown, fine to medium grained SANDSTONE; extremely weak. SPT 100 Highly weathered, dark brown-orange, fine to medium grained SANDSTONE; very weak. HØT 100 **Ground Water Level** Inclination: Vertical Orientation: Notes and Comments: Reading (mbgl) Date

₹ GENERAL LOG | Project: BH-M03 ≘ Report I

End of Hole @ 79.64m, Target Depth. Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

Refer to explanation sheets for abbreviation and symbols

Contractor: DCN

Time

Water level

Equipment: TR 200 Shear Vane Id:

Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 250 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 25/07/2023 Completed: 3/08/2023

: BH-M03 Hole No. Sheet : 6 of 10

Hole Length : 79.64m Scale @ A4 : 1:40

Logged : JM. MK

Easting: 1728	040 0F N						7	oggeo				MK			
	_	System	n: NZT	M200	0			roces			: MK				
RL: 150	Datum: AUCKHT1946				Sor	mnla	C	hecke	ed	П	: JHS	3 23/08 	/2023		
RL (m) Depth (m) Graphic	Material Description	1	Geological Unit	Consistancy / Relative density		Result aldu	Casing	Method	ಜ್ಞ Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	20 90 Defect 90 Spacing (mm)	Instrumentation Installation	Water level
	Highly weathered, dark brown-orange, fine to medium gr SANDSTONE; very weak. (continued from layer starting 39.5m)	rained g at			41.15 40.43 C 40.14	SPT 8/10 12/12 13/13 N > 50		SPT HQTT		HW		0			
	Highly weathered, grey SILTSTONE; very weak. Highly weathered, grey-brown, indistinctly bedded SILTSTONE; very weak; very thinly bedded at 0-5°. Completely weathered, greyish brown MUDSTONE; extr weak.	remely			41.43 C	SPT 3/3 5/5 5/5 5/5 for 75mm N > 50 (solid		SPT HQTT		CW		100			
43 - 701 43 - 77	Highly weathered, grey-orange, indistinctly bedded, fine medium grained SANDSTONE; very weak. Highly weathered, orange, fine to medium grained SANDSTONE; extremely weak. 43.00 - 43.03 Dark brown layer. 43.02 - 43.03 Moderately strongly cemented layer.		OKWALION			SPT 12/16 18/20 12 for 35mm N > 50		SPT HQTT				0			
44	Highly weathered, red streaked brown, distinctly bedded		AWHILD SAND FORMALION			(solid cone) SPT 23/27 for 65mm N > 50 (solid cone)		HQTT		HW		0			
46 -	to medium grained SANDSTONE; extremely weak; very closely spaced, thin iron oxide laminations, inclined 10-3	0°.				SPT 21/29 for 70mm N > 50 (solid cone)		ТДН				0			
Notes and Cor	9.64m, Target Depth. RLs are approximated from the local GIS viewer. Locations are	Inclination Contractor Equipmen	r: DCN			Ori	entati	ion:			Gro Date		Reading (mbgl)	Hole de (mbgl)	epth

Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 250 Oaia Road, Muriwai 0881

Job Number: 12612462

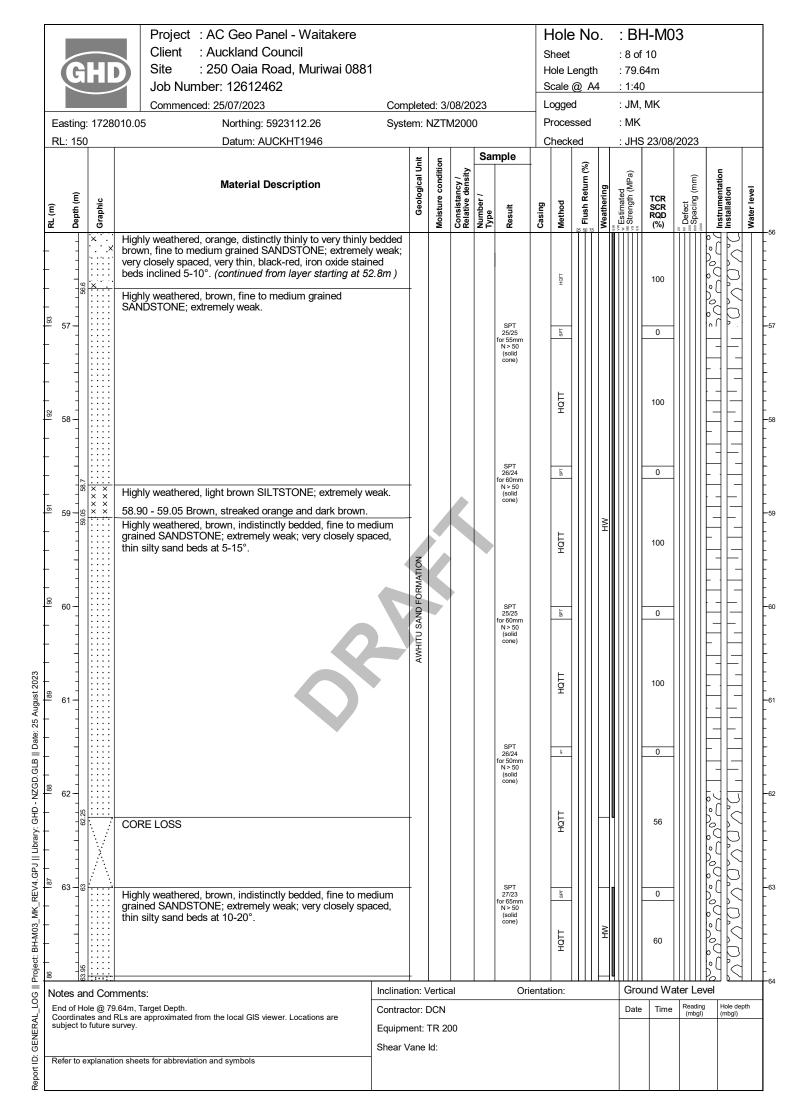
Commenced: 25/07/2023 Completed: 3/08/2023

: BH-M03 Hole No.

Sheet : 7 of 10 Hole Length : 79.64m Scale @ A4 : 1:40

Logged : JM, MK

															Sa	mple										i T
												I Unit	dition	ry ,			1		(%) ر		a)		-	,	5	
RL (m)	Depth (m)	Graphic				N	Material	Descr	ription			Geological Unit	Moisture condition	Consistancy / Relative dens.	Number / Type	Result	Casing	Method	Flush Return	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	© Defect	000	Instrumentation Installation	Water level
- 4	19		: t	o mediu :losely s	m grain paced,	ed SAI thin iro	NDSTON	NE; ext laminat	remely w ions, inc	tly bedded veak; very slined 10-3						SPI 21/29 for 60mm N > 50 (solid cone)		НОТТ	\$ 917	5		100	0 2 0 2	-		
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		: ç	rained S	SANDS	TONE;	extreme	ely wea	edded, fi k; very c clined 5-	ne to med closely spa 10°.	lium aced,					SPT 20/30 for 65mm N > 50		SPT				0				
- 5	50 -		: 5	19.74 Re 50.00 - 5 50.00 - 5	60.03 B	ack, m		ly stron	gly ceme	ented.					73	(solid cone)		НОТТ		MH		92		- - -		
<u> </u>	51 —			50.73 - 5 51.12 Da											51.00 C 50.73	SPT 28/22 for 45mm N > 50 (solid cone)		SPT				0		-		
<u> </u>	52 —		5	51.42 Br	own.						7	AWHITU SAND FORMATION		·				HQTT				100				
	52 7652 58		<u>.</u> (52.50 - 5 CORE L	OSS eathere	d, oran	ige, disti	nctly th	ninly to ve	ery thinly be	pedded	AWHITU 8				SPT 26/24 for 50mm N > 50 (solid cone)		ž				0		000000	10,V0,	
	,~	×	\	ery clos peds incl	elv spa	ced. ve	gramed ry thin, b	black-re	ed, iron o	oxide stain	ed .							НОТТ				89		00000		
96 (54 -	× .	×													SPT 21/29 for 55mm N > 50 (solid cone)		₽.		HW		0		0000000	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
	55 —	×	× : : :															HQTT				100				
\$	-	× .			66.60 D	ark bro	wn, spe	ckled b	lack.							SPT 22/28 for 55mm N > 50 (solid cone)		HQTT				100		00000), V, O, V	
End	d of Ho	ole @ tes and future	79.64 d RL:	m, Target s are appre	Depth. oximated	from the	local GIS	viewer. I	Locations a	are	Contract Equipm Shear V	tor: [DCN TR 20			Ori	entat	ion:			Date 31/07		Read (mbo	ina	Hole del (mbgl)	pth 1.13



Hole No. : BH-M03 Project : AC Geo Panel - Waitakere Client : Auckland Council Sheet : 9 of 10 Site : 250 Oaia Road, Muriwai 0881 Hole Length : 79.64m Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 25/07/2023 Completed: 3/08/2023 Logged : JM, MK Easting: 1728010.05 Processed : MK Northing: 5923112.26 System: NZTM2000 RL: 150 Checked : JHS 23/08/2023 Datum: AUCKHT1946 Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Weathering Estimated TCR SCR RQD Depth (m) Number / Graphic Method Casing CORE LOSS (continued from layer starting at 64.0m) HOT 60 0 SPT VD Silty fine to medium SAND; brown, streaked and speckled М HØH 62 orange; indistinctly very thinly bedded at 10-25°. Very dense, 66 SPT 0 CORE LOSS HQT 33 AWHITU SAND FORMATION Silty fine to medium SAND; brown, streaked orange, speckled SPT 0 black. Very dense, moist. 68 HØH 100 REV4.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 SPT 11/12 14/17 19 for 75mm N > 50 (solid cone) SPT 0 HØH 100 8/11 13/16 18/3 for 10mr N > 50 (solid cone) SPT 0 ₹ HØH || Project: BH-M03 100 **Ground Water Level** Orientation: GENERAL_LOG

Notes and Comments:

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Report I

End of Hole @ 79.64m, Target Depth. Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

Refer to explanation sheets for abbreviation and symbols

Inclination: Vertical

Contractor: DCN Equipment: TR 200 Shear Vane Id:

Reading (mbgl) Date Time

Defect Spacing (mm)

Water level



Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 250 Oaia Road, Muriwai 0881

Job Number: 12612462

Commenced: 25/07/2023 Completed: 3/08/2023

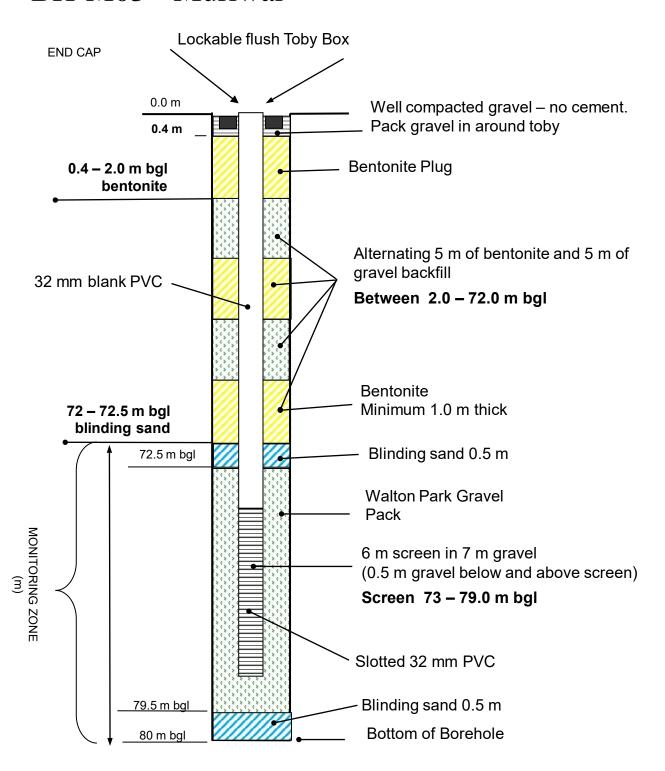
: BH-M03 Hole No.

Sheet : 10 of 10 : 79.64m Hole Length Scale @ A4 : 1:40

Logged : JM, MK

nt (m) Deoth (m)								C ~-	mnla		'							1
ھ ر	(III)	Graphic	Material Description		Geological Unit	Moisture condition	Consistancy / Relative density	Number / Pg	Result	Casing	Method	Flush Return (%)	Weathering	***Estimated ***Strength (MPa)	TCR SCR RQD (%)	Defect Spacing (mm)	Instrumentation Installation	
-	62	× .	Silty fine to medium SAND; brown, streaked orange, spellack. Very dense, moist. (continued from layer starting	eckled at			OE	2 F	SPI 14/17 22/28	0	SPT	25 50 7	5	3 3 2 3 u	0	20 200 200 200 200 200 200 200 200 200		_
- - -	72.:		CORE LOSS		,	-	1		for 65mm N > 50 (solid cone)									
73 -	72.97	× .	Silty fine to medium SAND; brown, streaked orange, spoblack. Very dense, moist.	eckled		М	VD	-			НОТТ				43			
- - -		×							SPT 12/14 16/16		_					-		
- - - 74 -	90'1	× . × .							18 for 65mm N > 50 (solid cone)		SPT				0	-		
- - - -	72		CORE LOSS			-	-				НОТТ				18			
75 - - - -	35				7				SPT 10/12 15/16 7 for 65mm		SPT				0	-		
- - - -	75.36	× . · × · ×	Silty fine to medium SAND; greyish brown, streaked red brown. Very dense, moist.	ldish	AWHITU SAND FORMATION	M	VD		N > 50 (solid cone)							-		
76 - - -		× ×	75.90 - 76.00 Very weakly cemented iron oxide bed.		WHITU SAN						HQTT				100			
- - -	3.78	× . × .	76.30 - 76.40 Very weakly cemented iron oxide bed.						SPT 14/23 26/24 for 55mm N > 50		SPT				0	-		
77 - - - - -	7 86.98 7		CORE LOSS Highly weathered, greyish brown, distinctly bedded, fine medium grained SANDSTONE; extremely weak; very cle spaced, very thinly bedded, brown sandstone beds at 5-	osely 15°.		-	1		(solid cone)		НОТТ		нм см		81			
- - - -	11		76.98 - 77.08 Completely weathered, recovered as sand 77.50 - 77.60 Completely weathered, recovered as sand								H		¢w		01			
78 - - - -									SPT 27/23 for 50mm N > 50 (solid cone)		SPT		HW		0	-		
- - - - - 79	2		CORE LOSS								НОТТ				21			
- - - -									SPT 25/25									
- - -		: :	End of Hole @ 79.64m,Target Depth.						25/25 for 60mm N > 50 (solid cone)		T dS			111111	0			
Votes	and	d Com	ments:	Inclination	on: V	ertica	al		Ori	ientat	ion:			Gro	ound W	ater Le	vel	
	nate	es and F	64m, Target Depth. ILs are approximated from the local GIS viewer. Locations are urvey.	Contract Equipme	ent: ¯	ΓR 20	00							Dat 02/08		(mbgi)	(mbgl)	epth 2.29

BH-M03 - Muriwai



NOT TO SCALE





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
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Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinate	s 1728010.05 E
Job Number	12612462	(NZTM 200	0) 5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinate	s 1728010.05 E
Job Number	12612462	(NZTM 200	0) 5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







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Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinate	s 1728010.05 E
Job Number	12612462	(NZTM 200	0) 5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	







Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





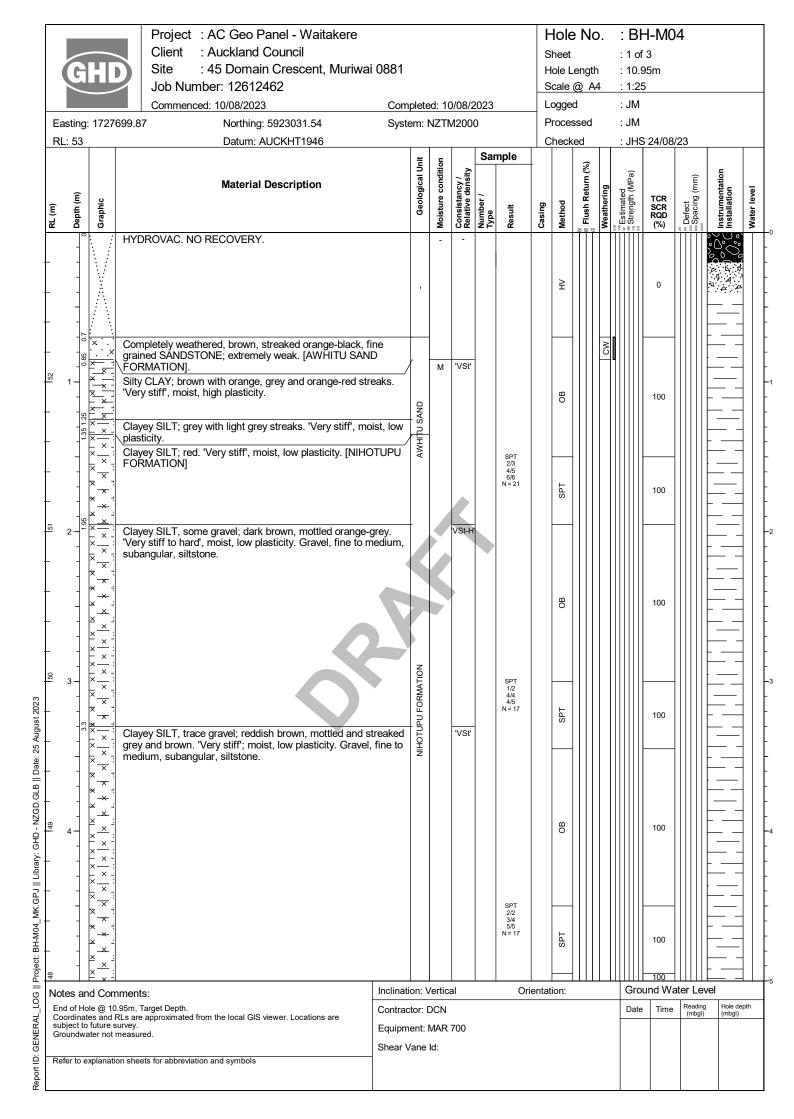
Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project	AC Geo Panel – Waitākere	Coordinates	1728010.05 E
Job Number	12612462	(NZTM 2000)	5923112.26 N
Client	Auckland Council	Location	250 Oaia Rd, Muriwai
Date	25 July to 3 August 2023	Location	





Project : AC Geo Panel - Waitakere Hole No. : BH-M04 Client : Auckland Council Sheet : 2 of 3 Site : 45 Domain Crescent, Muriwai 0881 : 10.95m Hole Length Job Number: 12612462 Scale @ A4 : 1:25 Commenced: 10/08/2023 Completed: 10/08/2023 Logged : JM Processed : JM Easting: 1727699.87 Northing: 5923031.54 System: NZTM2000 RL: 53 Datum: AUCKHT1946 Checked : JHS 24/08/23 Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Estimated Depth (m) Number / Method Casing RL (m) SCR RQD Clayey SILT, trace gravel; reddish brown, mottled and streaked grey and brown. 'Very stiff'; moist, low plasticity. Gravel, fine to medium, subangular, siltstone. (continued from layer starting at 3.3m) OB 100 SPT 100 × 6.65 - 7.20 Contains minor subangular siltstone gravel. × 6.80 - 8.95 Trace fine sand. × OB 100 × 'VSt NIHOTUPU FORMATION SPT 2/2 2/3 3/3 N = 11 × × SPT 51 × × 25 August 2023 8.10 30mm interbed of very stiff red clay. OB 62 × GHD - NZGD.GLB || Date: CORE LOSS Clayey SILT with trace gravel; reddish brown, mottled and 'VSt' streaked orange-brown-black. 'Very stiff', moist, low plasticity. MK.GPJ || Library: Sand, fine. Gravel, fine, subangular, siltstone. SPT 100 GENERAL_LOG || Project: BH-M04_ OB 100 Inclination: Vertical **Ground Water Level**

Notes and Comments:

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Report I

End of Hole @ 10.95m, Target Depth. Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

Groundwater not measured.

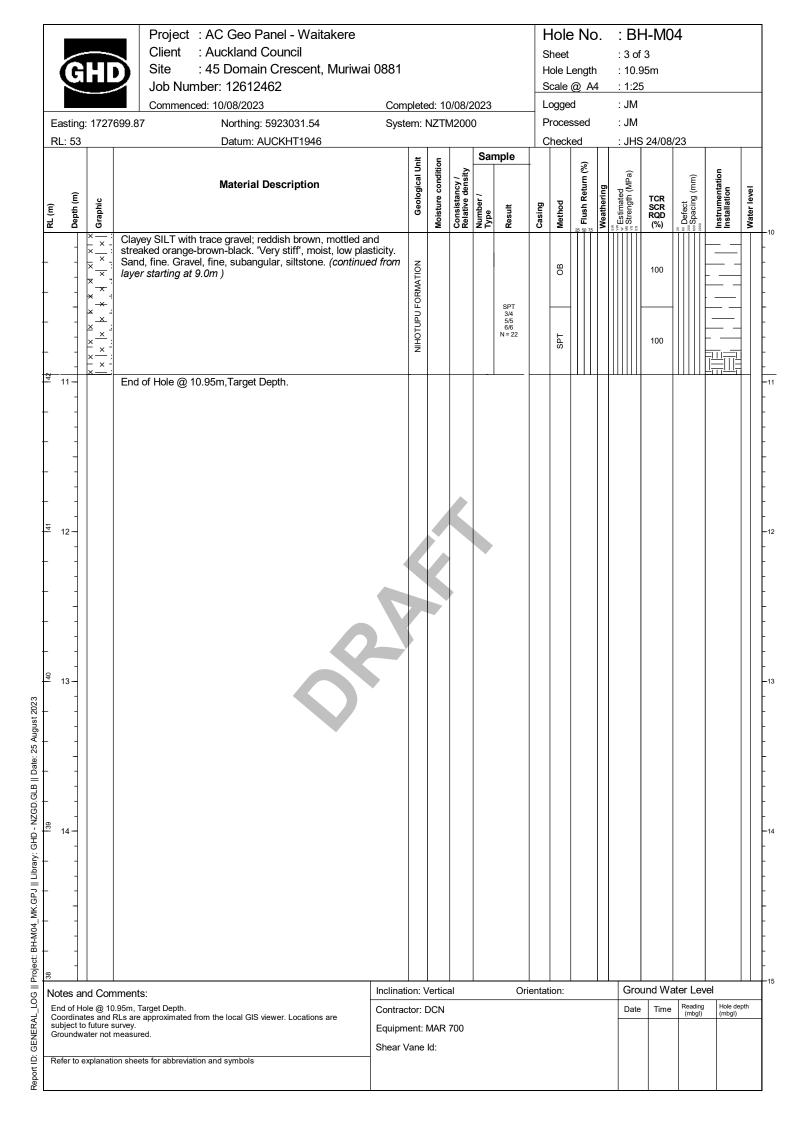
Refer to explanation sheets for abbreviation and symbols

Contractor: DCN Equipment: MAR 700 Shear Vane Id:

Orientation:

Reading (mbgl) Date Time

Water level





Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai





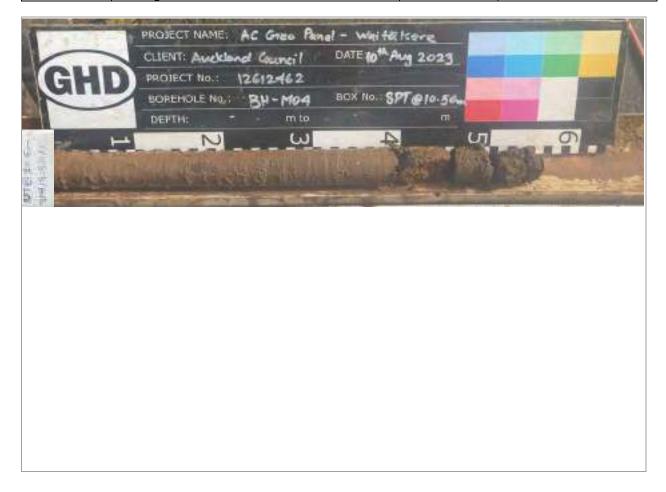
Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1727699.87 E
Job Number	12612462	(NZTM 2000)	5923031.54 N
Client	Auckland Council	Location	45 Domain Crescent,
Date	10 August 2023	Location	Muriwai



: BH-M05 Project : AC Geo Panel - Waitakere Hole No. Client : Auckland Council Sheet : 1 of 2 Site : 58 Domain Crescent, Muriwai 0881 : 10.95m Hole Length Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 18/07/2023 Completed: 18/07/2023 Logged : MK Processed : MK Easting: 1727856.03 Northing: 5923234.43 System: NZTM2000 RL: 63.5 Checked : JHS 22/08/2023 Datum: AUCKHT1946 Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Neathering Estimated Number / Method Casing Depth (SCR RQD $^{\circ}$ ASPHALT Sandy SILT with some clay; dark grey-black. 'Firm', moist, low М plasticity. Sand, fine. [FILL] Silty fine to coarse GRAVEL; dark grey. Moist. Gravel, 'St' ·× sub-rounded to sub-angular, greywacke. Sandy SILT with some clay; brown-grey-orange. 'Stiff', moist, low plasticity. Sand: fine to medium. [PALAEO-COLLUVIUM] ₹ .× 1.10 Wood fragments up to 50 mm. × SPT 100 Sandy organic SILT; black. 'Stiff', moist, low plasticity. Sand, 2 fine to medium. PALAEO-COLLUVIUM **CORE LOSS** В Sandy organic SILT; black. 'Stiff', moist, low plasticity. Sand, М 'St' 57 fine to medium. 7/4/ Silty fine to medium SAND; grey. Loose, moist. L SPT 0/0 2/2 2/2 N = 8 SPT 100 Sandy organic SILT; grey-brown. 'Stiff', moist, low plasticity. Sand, fine to medium. 'St' ٠x 74/ Sandy SILT, some clay, minor organics; dark greyish brown. 'VSt' ·× OB 100 'Very stiff', moist, low plasticity. Sand, fine to medium. .× Organics, fibrous. .× Fine to medium SAND with some silt; grey. Loose, moist. L 0/1 2/2 2/2 N = 8 [AWHITU SAND FORMATION] SPT 100 4.50 - 4.65 Light brown. CORE LOSS ОВ 25 August 2023 n 보 44 MK.GPJ | Library: GHD - NZGD.GLB | Date: Fine to medium SAND with some silt; grey. Medium dense, М MD AWHITU SAND FORMATION SPT 3/4 5/6 7/7 N = 25 SPT 100 보 100 || Project: BH-M05 SPT 3/4 4/5 6/7 N = 22 SPT

Notes and Comments:

GENERAL LOG

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Report I

End of Hole @ 10.95m, Target Depth. Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

Groundwater not measured.

Refer to explanation sheets for abbreviation and symbols

Inclination: Vertical

Orientation:

Ground Water Level

Date

Contractor: DCN Equipment: TR 200 Shear Vane Id:

Reading (mbgl) Time

Defect Spacing (mm)

Water level

Easting: 1727856.03

Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 58 Domain Crescent, Muriwai 0881

Job Number: 12612462

Commenced: 18/07/2023 Completed: 18/07/2023

: BH-M05 Hole No.

Sheet : 2 of 2 : 10.95m Hole Length

Scale @ A4 : 1:40 Logged : MK

	.: 63.: Depth (m)	Graphic	Datum: AUCKHT1946 Material Description		Geological Unit	Moisture condition	Consistancy / Relative density		mple	_	hecke	Flush Return (%)	Weathering	Estimated		TCR SCR RQD (%)	E Defect Spacing (mm)	Instrumentation Installation	
R (E)	Dept	Grag	Fine to medium SAND with some silt; grey. Medium de	ense		Mois	Con	M A	Result	Casing	Method	25 50 7 	Wea	Est		RQD (%) 100	Spa Spa	Instr	- 3
	-		moist. (continued from layer starting at 5.6m)	,															
3	-		8.40 - 9.25 Greenish grey.								HØTT					100			
	-																		
	9-				VIOIT				SPT 3/4 6/7										
	5 9.25	×	Silty fine SAND; grey. Medium dense, moist.		AWHITU SAND FORMATION				6/7 9/11 N = 33		SPT					100			
5	9.6 9.4	.::: <u>^</u>	CORE LOSS		AND F	- M	-												
	9.6	. · . · .	Fine to medium SAND with some silt; grey. Moist. Moderately weathered, grey SILTSTONE; very weak.		SOLI	- M													
	10 –	× × × × × × × × × ×			A						HQTT					86			
2	10.3	××	Moderately weathered, greenish grey, fine to medium of	grained									WW	ď					
3	+	::::	SANDSTÓNE; extremely weak.						SPT 6/8 9/11		-								
									12/15 N = 47		SPT					100			
•	11 -		End of Hole @ 10.95m,Target Depth.																
.,	}																		
2	1																		
	1																		
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			nments:	Inclination			al		Or	ientat	ion:			-		und Wa	1		den#
Co	d of Ho ordinat	le @ 10 es and l future s	.95m, Target Depth. RLs are approximated from the local GIS viewer. Locations are uurvev.	Contract			20							_	Date	Time	Readin (mbgl) Hole (mbgl	depth I)
Sur	oundwa	ater not	measured.	Equipme	51 IL.	ır. Zl	<i>,</i>												
Gro				Shear Va	ane	ld:													





Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai







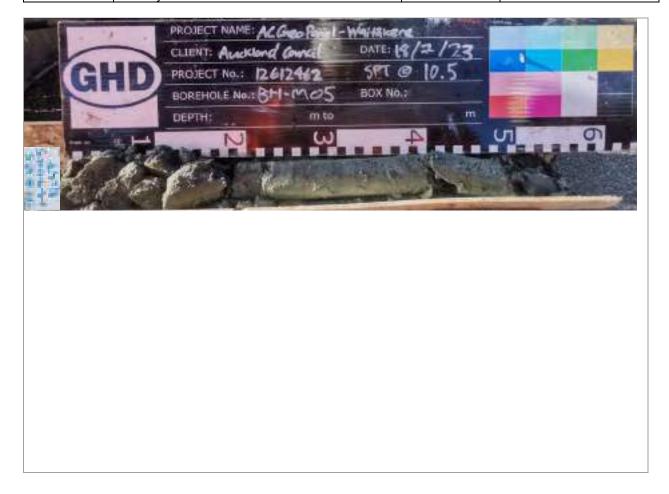
Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai

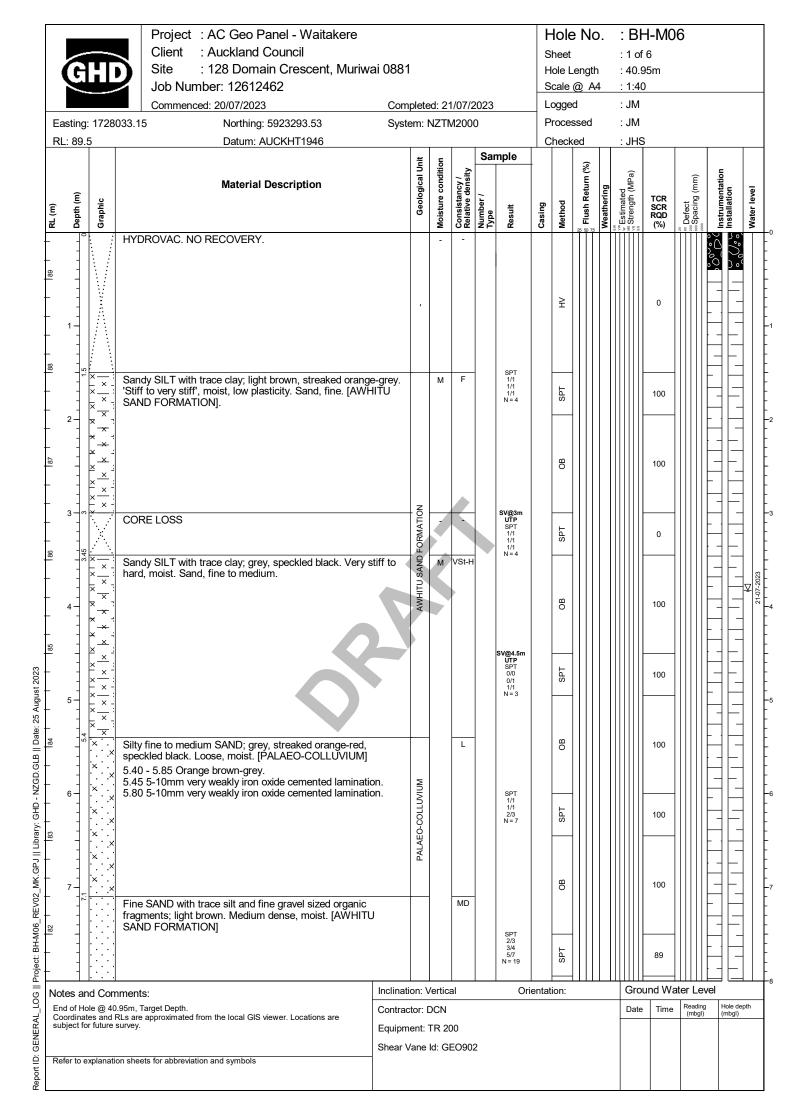


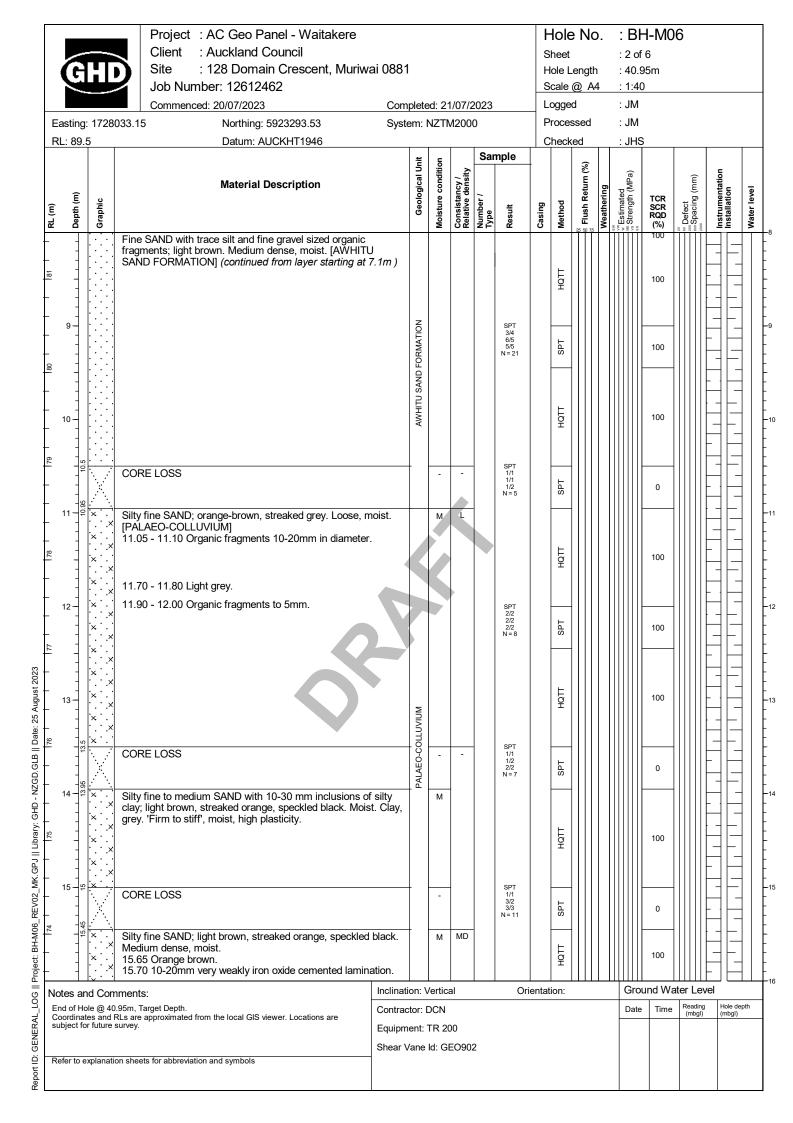




Project	AC Geo Panel – Waitākere	Coordinates	1727856.03 E
Job Number	12612462	(NZTM 2000)	5923234.43 N
Client	Auckland Council	Location	58 Domain Crescent,
Date	18 July 2023	Location	Muriwai







: BH-M06 Project : AC Geo Panel - Waitakere Hole No. Client : Auckland Council Sheet : 3 of 6 Site : 128 Domain Crescent, Muriwai 0881 : 40.95m Hole Length Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 20/07/2023 Completed: 21/07/2023 Logged : JM Processed : JM Easting: 1728033.15 Northing: 5923293.53 System: NZTM2000 RL: 89.5 Checked Datum: AUCKHT1946 : JHS Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Estimated Number / Method Casing Depth (SCR RQD Silty fine SAND; light brown, streaked orange, speckled black. Medium dense, moist. (continued from layer starting at 15.5m 얼 100 Silty CLAY; grey, speckled and streaked orange-red speckles. 'F' SPT 'Firm', moist, high plasticity. MD Silty fine SAND with closely spaced thin interbeds of silty clay; light grey mottled orange. Medium dense, moist. Clay, firm, moist, high plasticity. PALAEO-COLLUVIUM HØH 100 SPT 1/1 0/0 1/1 N = 2 **CORE LOSS** SPT Clayey SILT with minor sand with very closely spaced very thin interbeds of sandy silt and trace fine gravel sized organic fragments; light grey, mottled orange. Firm, moist, low plasticity. Sand, fine. [AWHITU SAND FORMATION] × × HØT 100 CORE LOSS SPT 20 HQTT Silty CLAY; grey-brown. 'Firm', moist, high plasticity. М 'F' 25 August 2023 AWHITU SAND FORMATION Silty fine SAND; light grey, streaked orange. Dense, moist. SPT 100 GHD - NZGD.GLB || Date: **CORE LOSS** HØH Silty fine SAND; light grey. Medium dense, moist. М MD .GPJ || Library: CORE LOSS SPT ₹ Silty fine SAND; light grey. Loose to medium dense, wet. W L-MD REV02 보연 || Project: BH-M06 100

Notes and Comments: End of Hole @ 40.95m, Target Depth.

GENERAL_LOG

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Report I

Coordinates and RLs are approximated from the local GIS viewer. Locations are subject for future survey.

Refer to explanation sheets for abbreviation and symbols

Orientation:

Contractor: DCN Date

Equipment: TR 200 Shear Vane Id: GEO902

Inclination: Vertical

20/07/23 21/07/23 15:45 08:30

Ground Water Level

Defect Spacing (mm)

93

0

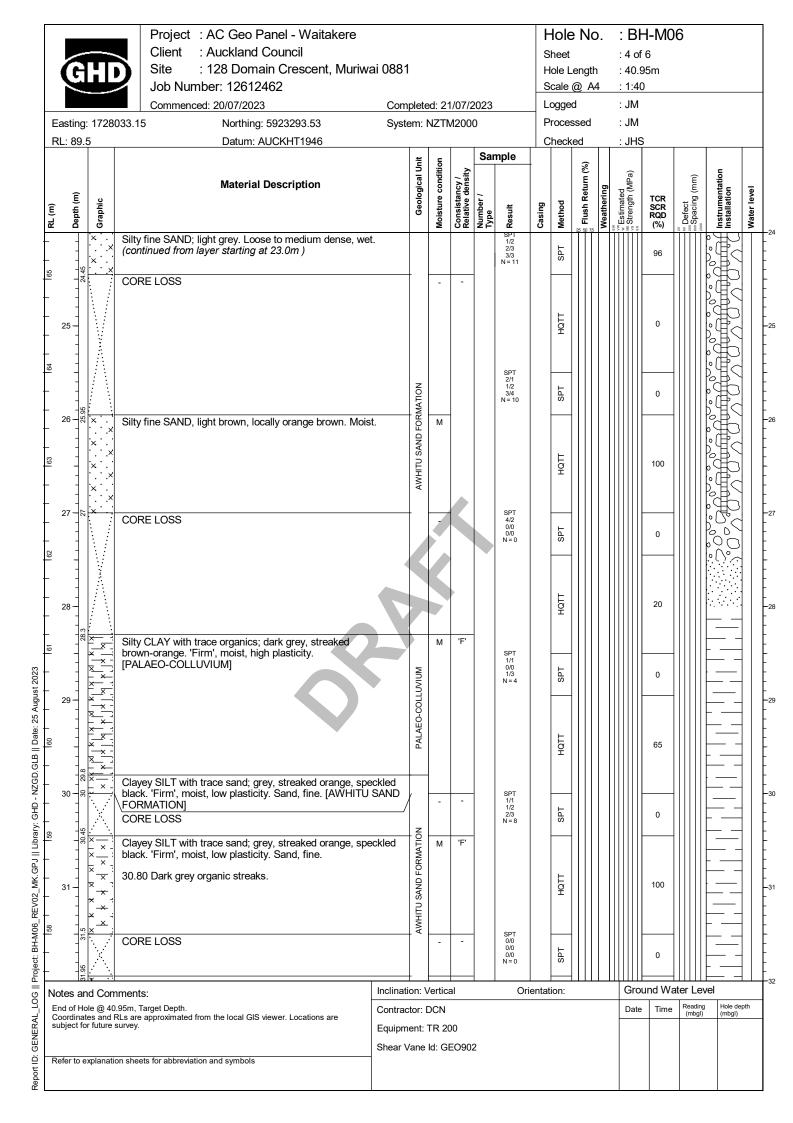
0

29

48

0

Water level





Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 128 Domain Crescent, Muriwai 0881

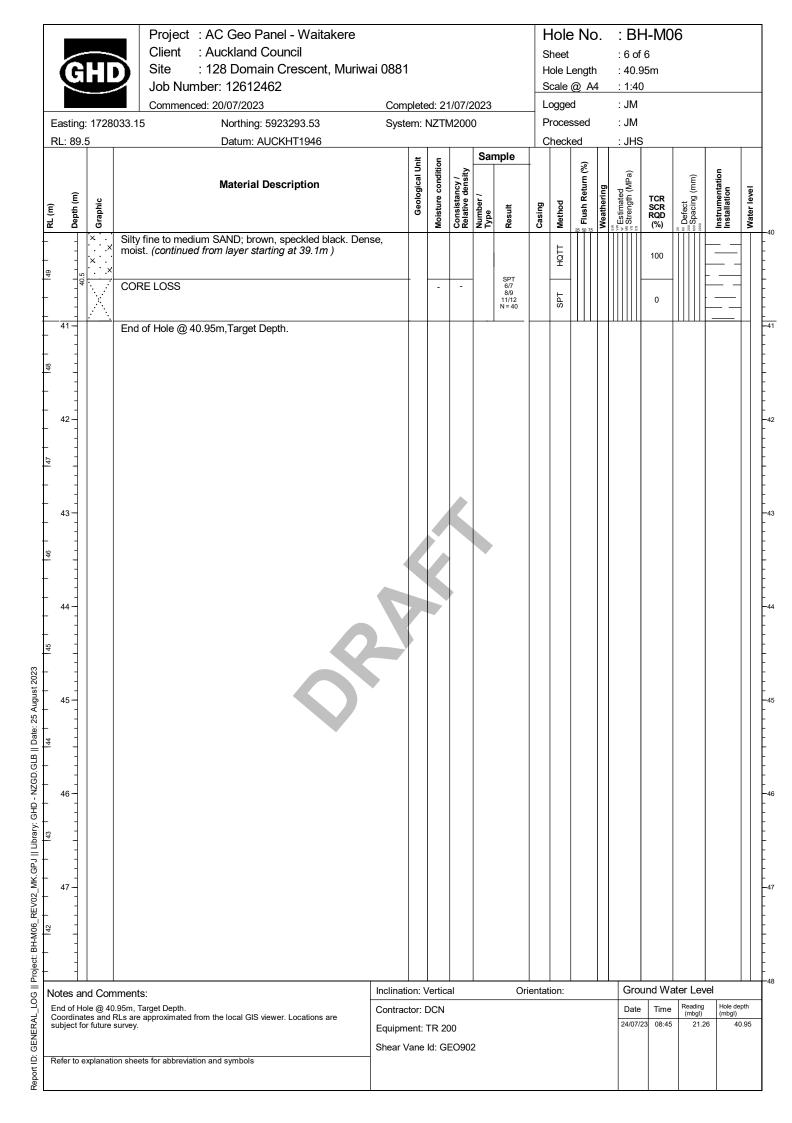
Job Number: 12612462

Commenced: 20/07/2023 Completed: 21/07/2023 Hole No. : BH-M06

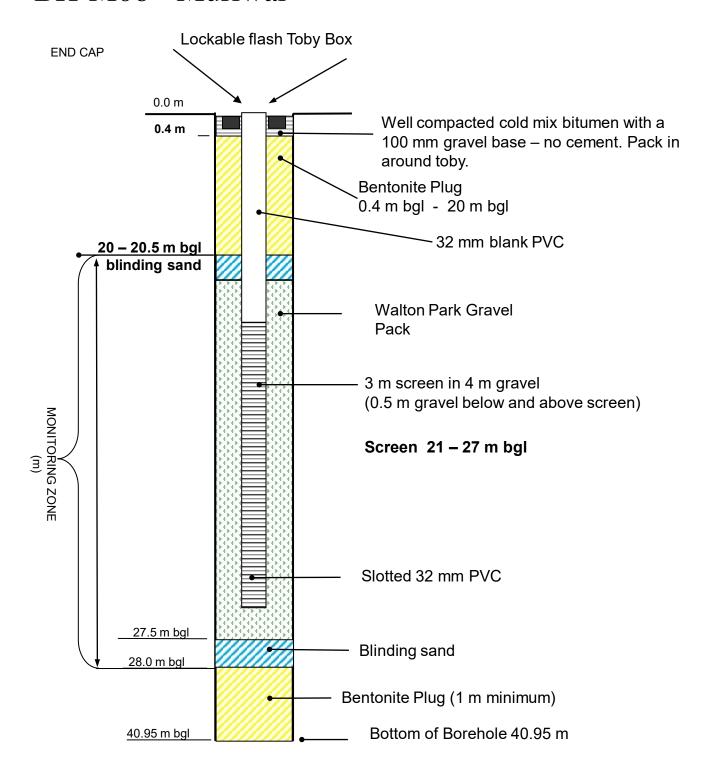
Sheet : 5 of 6 Hole Length : 40.95m

Scale @ A4 : 1:40 Logged : JM

33 - X · · · · · · · · · · · · · · · · · ·	Sandy SILT; light grey, streaked light grey-brown. 'Firm', low plasticity. Sand, fine. (continued from layer starting 32.0m) x x x x x x x	at NOLLEWING GIVES LITHWA	Moi Mi	بَ Consistancy / Relative density		SPT 0/0 0/0 0/0	Casing	HQTT Method	rn (%)		.: "Estimated .: Strength (MPa)	TCR SCR RQD (%)	Defect	instrumentation installation
33 - × × × × × × × × × × × × × × × × × ×	Sandy SILT; light grey, streaked light grey-brown. 'Firm', low plasticity. Sand, fine. (continued from layer starting 32.0m) Silty CLAY with trace organics; dark grey-brown. 'Firm to be seen as a series of the same and the same as a series of th	moist, at	Moi Mi		Number / Type	SPT 0/0 0/0 0/0		2	% Flush Return (%)	Weathering	** Strength (MPa)	100		instrumentation
33 - × × × × × × × × × × × × × × × × × ×	Sandy SILT; light grey, streaked light grey-brown. 'Firm', low plasticity. Sand, fine. (continued from layer starting 32.0m) Silty CLAY with trace organics; dark grey-brown. 'Firm to be seen as a second series of the second series of the second series or the second series of the second second series of the second series of the second second series of the second s	at NOLLEWING GIVES LITHWA	M			SPT 0/0 0/0 0/0			5 50 75		- W - W - W - W - W - W - W - W - W - W	100	20 60 70 70 80 80 80	
34	× : × : × Silty CLAY with trace organics; dark grey-brown. 'Firm to					N = 0		SPT				0		
	 Clayey SILT with minor organics; grey, mottled brown. 'S wet, low plasticity. 	Soft',	W	'F-St'		SPT 0/0 0/0 0/0 0/0 N = 0	_	SPT HQTT				100		
	Silty CLAY; dark grey-brown. 'Firm', moist, high plasticity [AWHITU SAND FORMATION] Clayey SILT with trace sand; light grey, streaked dark grey-brown. 'Firm', moist, low plasticity. Sand, fine. CORE LOSS	y.	M	'F'		SPT 2/3 3/4 4/6 N=17		SPT HQTT				0		
37 - ×	Silty fine SAND; light grey, streaked orange brown. Med dense, moist. 36.80 - 38.20 Orange streaks inclined 50-60°.	ium	M	MD		SPT 1/1 3/4 4/4 N = 15	_	SPT HQTT				0		
39 - 58 ×	38.80 Orange brown and grey. Silty fine to medium SAND; brown, speckled black. Dense moist.			D		SPT 2/3 5/7 11/11 N = 34	_	HQTT SPT HQTT				96		
	ற 40.95m, Target Depth. and RLs are approximated from the local GIS viewer. Locations are	Inclination Contractor Equipment	: DCN t: TR 2	00	2	Ori	ientatio				Gro	ound Wa	Readi (mbg	ng Hole dept



BH-M06 - Muriwai



NOT TO SCALE



Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





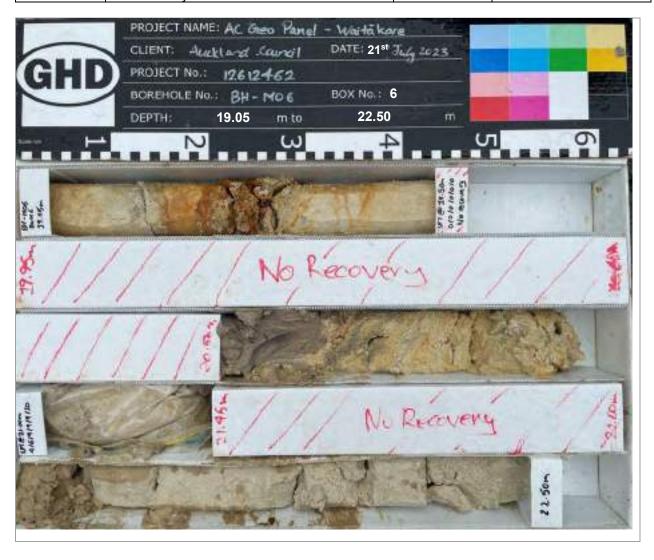


Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





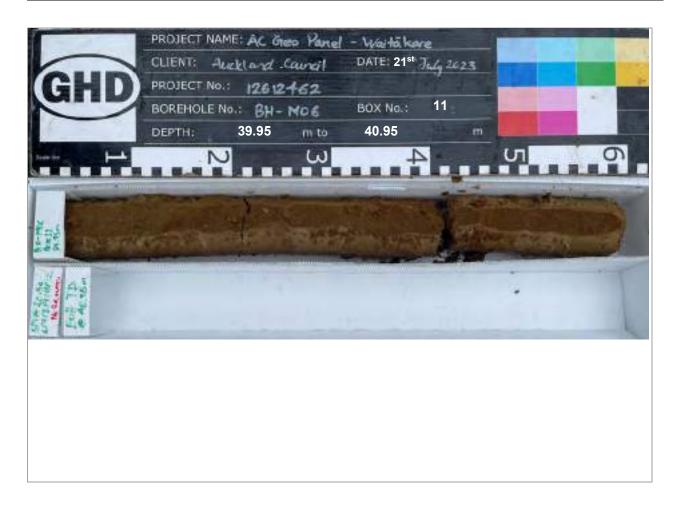
Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai

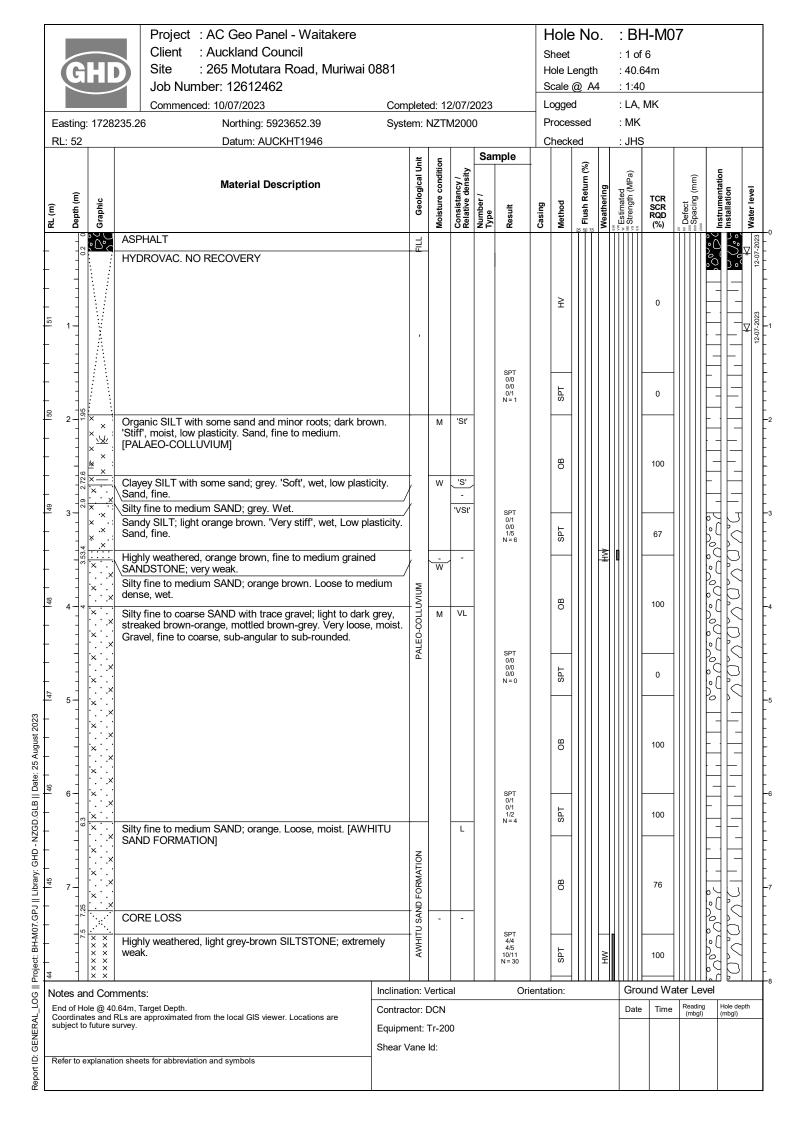






Project	AC Geo Panel – Waitākere	Coordinates	1728033.15 E
Job Number	12612462	(NZTM 2000)	5923293.53 N
Client	Auckland Council	Location	128 Domain Crescent,
Date	20 to 21 July 2023	Location	Muriwai





Hole No. : BH-M07 Project : AC Geo Panel - Waitakere Client : Auckland Council Sheet : 2 of 6 Site : 265 Motutara Road, Muriwai 0881 Hole Length : 40.64m Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 10/07/2023 Completed: 12/07/2023 Logged : LA, MK Processed : MK Easting: 1728235.26 Northing: 5923652.39 System: NZTM2000 Checked RL: 52 Datum: AUCKHT1946 : JHS Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Defect Spacing (mm) Flush Return **Material Description** Water level Neathering Estimated TCR SCR RQD Depth (m) Number / Graphic Method Casing Highly weathered, orange brown, fine to medium grained SANDSTONE; extremely weak. 보 100 SPT 2/2 3/4 5/7 N = 19 9 SPT 100 CORE LOSS HQT 0 10 Silty fine SAND; dark greenish grey. Medium dense to dense, moist. MD-D М SPT 100 Silty fine to medium SAND; dark orange brown. Moist. 보 **CORE LOSS** 33 AWHITU SAND FORMATION 120mm SPT 2/2 3/3 5/5 N = 16 Silty fine to medium SAND; dark orange brown. Medium М MD dense, moist. SPT 67 보연 100 || Project: BH-M07.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 SPT 5/5 6/6 7/9 N = 28 SPT 100 CORE LOSS Highly weathered, dark orange brown, fine to medium grained SANDSTONE; extremely weak. HQTT ≩ 62 М Fine to medium SAND with some silt; orange brown. Moist. **CORE LOSS** SPT 0 Silty fine to medium SAND; light grey. Medium dense, moist. MD М HØH 100 **Ground Water Level** Inclination: Vertical Orientation: Notes and Comments: GENERAL LOG End of Hole @ 40.64m, Target Depth. Reading (mbgl) Contractor: DCN Date Time Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey. Equipment: Tr-200 Shear Vane Id:

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Report I

Refer to explanation sheets for abbreviation and symbols

Project : AC Geo Panel - Waitakere Hole No. Client : Auckland Council Sheet Site : 265 Motutara Road, Muriwai 0881 Hole Length Job Number: 12612462 Scale @ A4 Commenced: 10/07/2023 Completed: 12/07/2023 Logged Processed Easting: 1728235.26 Northing: 5923652.39 System: NZTM2000 RL: 52 Checked Datum: AUCKHT1946 Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Flush Return **Material Description** Number / Graphic Method Casing Depth (Silty fine to medium SAND; orange brown. Medium dense, moist. (continued from layer starting at 15.9m) 덛 SPT 1/2 3/4 6/7 N = 20 SPT CORE LOSS ĦÖĦ Silty fine to medium SAND; orange brown. Medium dense, М MD SPT 3/3 5/6 8/9 N = 28 SPT CORE LOSS Silty fine to medium SAND; orange brown. Medium dense, М MD HÖT 18.90 - 19.40 Brownish grey. AWHITU SAND FORMATION 4/4 6/6 7/10 N = 29 SPT HQTT CORE LOSS Silty fine to medium SAND; orange brown. Medium dense, MD М SPT 4/4 6/7 8/9 N = 30 moist. || Project: BH-M07.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 SPT **CORE LOSS** Silty fine to medium SAND; orange brown. Medium dense to MD-D dense, moist. HØT SPT 23.20 - 24.50 Dark reddish brown.

Notes and Comments:

End of Hole @ 40.64m, Target Depth.

Refer to explanation sheets for abbreviation and symbols

Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

GENERAL LOG

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Report I

38 0 76 100 48 100 76 100 보연 100 Ground Water Level Inclination: Vertical Orientation: Reading (mbgl) Date Contractor: DCN Time Equipment: Tr-200 Shear Vane Id:

: BH-M07

: 3 of 6

: 40.64m

: LA, MK

: 1:40

: MK

: JHS

Strength (MPa)

SCR RQD

100

100

Estimated

Defect Spacing (mm)

Water level

: BH-M07 Project : AC Geo Panel - Waitakere Hole No. Client : Auckland Council Sheet : 4 of 6 Site : 265 Motutara Road, Muriwai 0881 : 40.64m Hole Length Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 10/07/2023 Completed: 12/07/2023 Logged : LA, MK Processed : MK Easting: 1728235.26 Northing: 5923652.39 System: NZTM2000 RL: 52 Checked Datum: AUCKHT1946 : JHS Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Estimated Number / Graphic Method Casing Depth (Result SCR RQD SP1 6/7 6/7 8/9 N = 30 Silty fine to medium SAND; orange brown. Medium dense to dense, moist. (continued from layer starting at 21.6m) SPT 100 24.50 - 24.70 Fine sand. CORE LOSS HØH 57 Silty fine to medium SAND; orange brown. Moist. М 25.20 - 25.30 Carbonaceous inclusions SPT 6/7 9/10 10/11 N = 40 Silty fine to medium SAND; reddish orange brown. Dense, D SPT 100 25.50 - 25.67 Carbonaceous fragments to 10 mm. 26 26.33 - 26.47 Very closely spaced iron oxide stained HÖH 100 laminations at 20-30°. SPT 100 AWHITU SAND FORMATION HOT 100 SPT 100 33 29.00 - 30.00 Very closely spaced, orange brown laminations || Project: BH-M07.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 at 15-30°. HÖT 100 SPT 100 보 100 Highly weathered, orange brown, fine to medium grained SANDSTONE; extremely weak. Recovered as:

Notes and Comments: End of Hole @ 40.64m, Target Depth.

GENERAL LOG

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Report I

Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey.

Silty SAND. Very dense, moist.

Refer to explanation sheets for abbreviation and symbols

Orientation:

SPT

Ground Water Level

100

Contractor: DCN Equipment: Tr-200 Shear Vane Id:

Inclination: Vertical

Reading (mbgl) Date Time

Instrumentation Installation

Water level

Defect Spacing (mm)

: BH-M07 Project : AC Geo Panel - Waitakere Hole No. Client : Auckland Council Sheet : 5 of 6 Site : 265 Motutara Road, Muriwai 0881 : 40.64m Hole Length Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 10/07/2023 Completed: 12/07/2023 Logged : LA, MK Processed : MK Easting: 1728235.26 Northing: 5923652.39 System: NZTM2000 RL: 52 Checked Datum: AUCKHT1946 : JHS Sample **Geological Unit** Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Estimated Number / Method Casing Depth (SCR RQD Silty fine to medium SAND; dark reddish orange brown. Very VD М 보 dense, moist. 100 32.69 - 32.82 Carbonaceous fragments to 10 mm. SPT 10/12 13/14 12/12 N > 50 (solid cone) Completely weathered, dark orange brown, distinctly bedded, fine to coarse SANDSTONE; extremely weak; very thinly SPT 0 bedded at 40-45°. 33.35 - 33.40 Iron staining. CORE LOSS HQT 52 Completely weathered, brown, streaked red-orange, fine to medium grained SANDSTONE; extremely weak. SPT 0 (solid cone) HQT 100 AWHITU SAND FORMATION SPT 14/19 24/26 or 65mn N > 50 (solid cone) SPT 0 VD Fine to medium SAND with some silt; dark orange brown. Very М dense, moist. HØH 100 37 || Project: BH-M07.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 SPT 23/27 for 70mm N > 50 (solid cone) 37.50 ~20 mm layer of fine to medium, sub-angular, dark red SPT 0 iron stained, sandstone gravel. Highly weathered, dark reddish brown, mottled dark grey-orange brown, fine to medium grained SANDSTONE; HQT extremely weak. 100 SPT 9/14 24/26 for 65mm N > 50 (solid cone) SPT 0 HØH 100

Spacing (mm)

Defect

Water level

0

33.45

Time

08:30

0.2

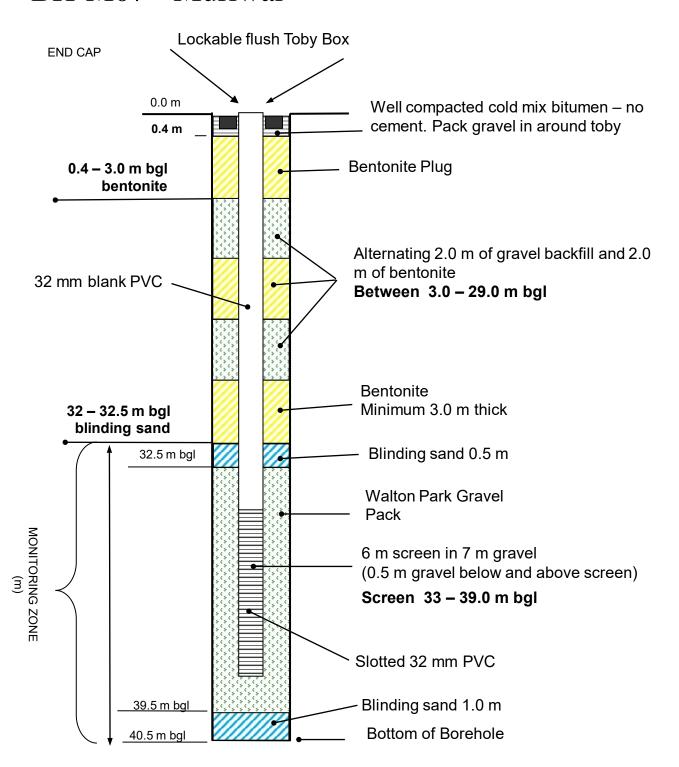
GENERAL LOG ≘ Report I

Ground Water Level Inclination: Vertical Orientation: Notes and Comments: End of Hole @ 40.64m, Target Depth. Contractor: DCN Date Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey. 12/07/23 Equipment: Tr-200 Shear Vane Id: Refer to explanation sheets for abbreviation and symbols

Project : AC Geo Panel - Waitakere : BH-M07 Hole No. Client : Auckland Council Sheet : 6 of 6 Site : 265 Motutara Road, Muriwai 0881 Hole Length : 40.64m Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 10/07/2023 Completed: 12/07/2023 Logged : LA, MK Processed : MK Easting: 1728235.26 Northing: 5923652.39 System: NZTM2000 RL: 52 Datum: AUCKHT1946 Checked : JHS Sample Geological Unit Moisture condition 8 Consistancy / Relative density Strength (MPa) Flush Return **Material Description** Water level TCR SCR RQD Depth (m) Number / Method Casing Highly weathered, dark grey, fine to medium grained SANDSTONE; extremely weak. (continued from layer starting 100 at 39.8m) End of Hole @ 40.64m, Target Depth. GENERAL_LOG || Project: BH-M07.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 Ground Water Level Inclination: Vertical Orientation: Notes and Comments: End of Hole @ 40.64m, Target Depth.

Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey. Date Contractor: DCN Time 12/07/23 14:00 1.02 40.635 Equipment: Tr-200 Shear Vane Id: Report ID: Refer to explanation sheets for abbreviation and symbols

BH-M07 - Muriwai



NOT TO SCALE



Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai





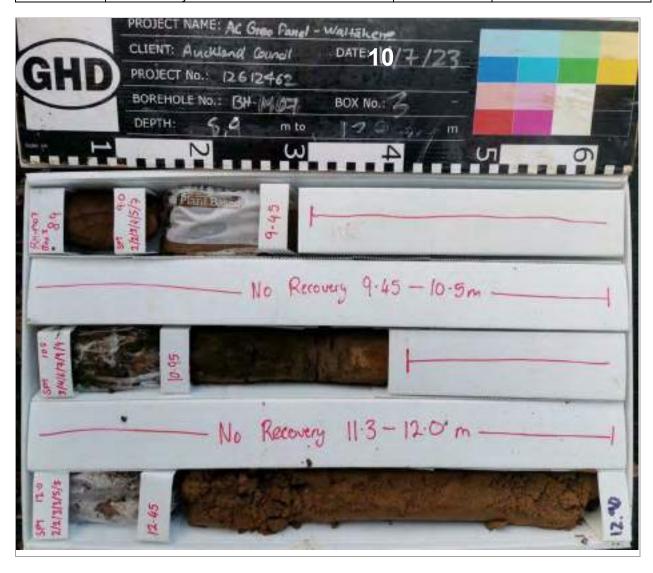
Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023		Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023		Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023		Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Location	265 Motutara Road,
Date	10 to 12 July 2023		Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E
Job Number	12612462	(NZTM 2000)	5923652.39 N
Client	Auckland Council	Lagation	265 Motutara Road,
Date	10 to 12 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E		
Job Number	12612462	(NZTM 2000)	5923652.39 N		
Client	Auckland Council	Location	265 Motutara Road,		
Date	10 to 12 July 2023	Location	Muriwai		





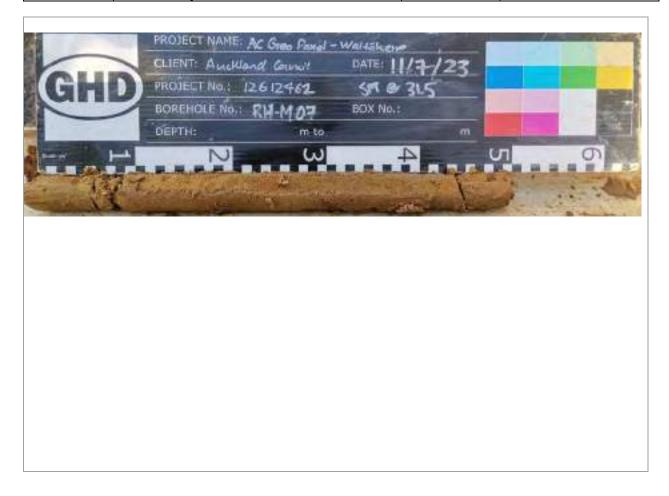
Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E		
Job Number	12612462	(NZTM 2000)	5923652.39 N		
Client	Auckland Council	Location	265 Motutara Road,		
Date	10 to 12 July 2023	Location	Muriwai		







Project	AC Geo Panel – Waitākere	Coordinates	1728235.26 E		
Job Number	12612462	(NZTM 2000)	5923652.39 N		
Client	Auckland Council	Location	265 Motutara Road,		
Date	10 to 12 July 2023	Location	Muriwai		





Project : AC Geo Panel - Waitakere

Client : Auckland Council

Site : 217 Motutara Rd, Muriwai 0881

Job Number: 12612462

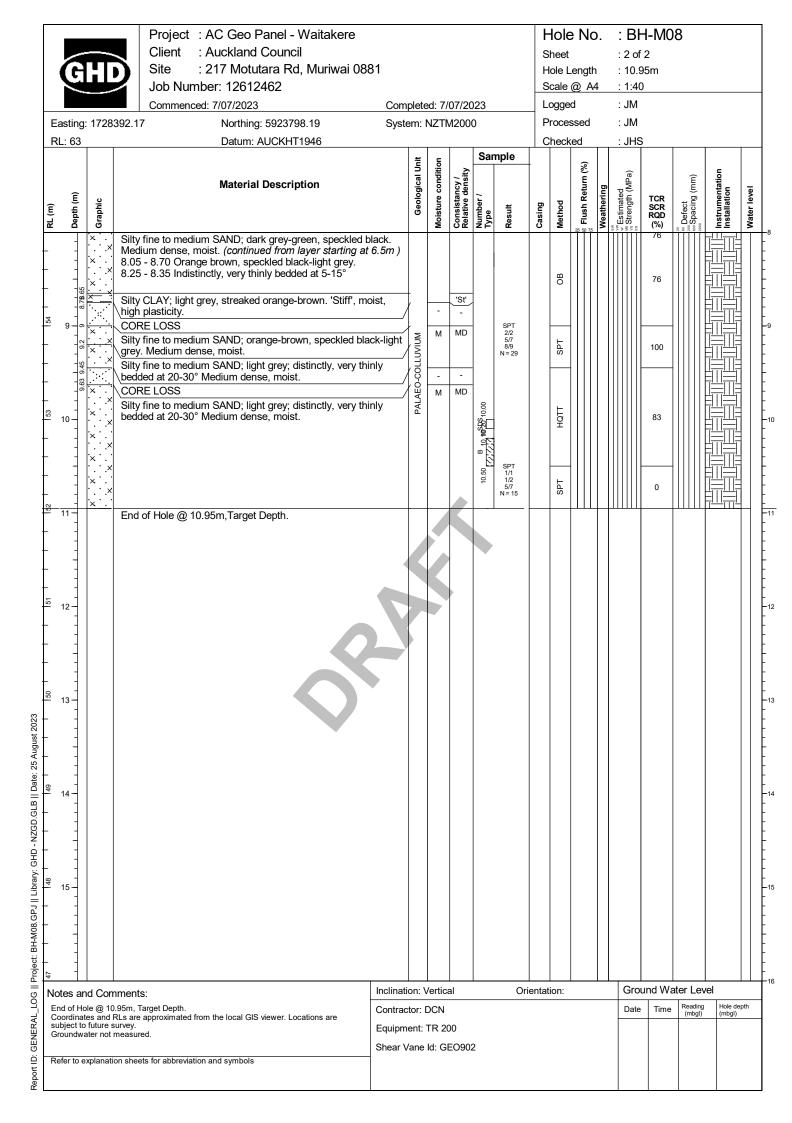
Commenced: 7/07/2023 Completed: 7/07/2023

: BH-M08 Hole No.

Sheet : 1 of 2 : 10.95m Hole Length

Scale @ A4 : 1:40 Logged : JM

Ea	asting	g: 172	283	92.17 Northing: 5923798.19	Syste				0		\neg	roce	ssed		: JN	l			
RL	_: 63			Datum: AUCKHT1946							c	heck	ed		: JH	s			
	(E)	J		Material Description		Geological Unit	Moisture condition	tancy / e density	Number / Type	nple	_	-	Flush Return (%)	əring	westimated Strength (MPa)	TCR	Defect Spacing (mm)	Instrumentation Installation	lovol
R E	Depth (m)	Graphic				Š	Moistu	Consis	Numbe	Result	Casing	Method	Flush	Weathering	Estim	TCR SCR RQD (%)	Defec Spaci	Instrur	Water level
	-	1	:	HYDROVAC - NO RECOVERY			-	-					25 50 75		1		3 6 5 6 5	000	1
	-																		
	1																	60°C	<u>'</u>
]					'						₹				0		000	}
_	1-																	500	
	-																		\
		- ×	- ;	Silty fine to medium SAND with pockets of organics to grey, mottled light grey. Very loose, moist.	25 mm;		М	VS		SPT 0/0 0/0		F							
	-	× ×	-	[PALAEO-COLLUVIUM]						0/0 N = 0		SPT				0		600	
_	2-	× ×	7															600	}
		×_×	4									m							,
	1	×××										OB				100		600	,
3	-	××	- 1	2.85 - 3.15 Grey-green.														000	}
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	-	^`. _× :		Silty fine to medium SAND; light grey, mottled orange. moist.	Loose,				3.45	1/1 3/4		SF				100		000	}
		 	×		4	K			3.70 B										
n n	-		.×						3.70			OB				100		6000	,
_	4-		.×									0				100		000	}
			·×			Σ				0.0.7								000	
]	×	·×	4.55 - 4.65 Medium dense.		OLLUV		MD		SPT 1/1 2/3 4/5 N = 14		SPT				100			\
8	5	×	·×			AEO-COLLUVIUM				N = 14		S							,
	Ĭ -	×	·^			PALA												500	
]	× .	×	_								OB				100			}
		×	×																
	6	×	×							SPT									,
		×	. ×	6.10 - 7.20 Dark brown, speckled black.						1/0 1/0 1/1		SPT				0			
	6.45		:	Silty fine to medium SAND; dark grey-green, speckled	hlack	+		MD		N = 3									
	+	×.	.×	Medium dense, moist.	JIGON.			""											=
8	7-	×		6.85 - 7.05 Brown, speckled black-light grey, streaked green-orange.								0B				100			=
	1	×	Ĵ	7.20 - 7.30 Light grey, speckled black.															
	‡	×	$\hat{\cdot}$	7.30 - 8.05 Brown, speckled black-light grey, streaked green-orange.						SPT 1/1									1
		×	`^	7.55 - 7.65 Reddish orange, speckled black.															
8	Notes and Comments: Inclination: Vertical Orientation: Ground Water Level																		
En	d of H	ole @	10.9	95m, Target Depth.	Contrac			aı		Or	ıcıııdl	ion.			Dat		T	g Hole de	epth
Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey. Equipment: TR 200																			
Refer to explanation sheets for abbreviation and symbols Shear Vane Id: GEO902																			
	10 6	onpiail	auUl	sssa for approvation and symbols															





Project	AC Geo Panel – Waitākere	Coordinates	1728367.96 E
Job Number	12612462	(NZTM 2000)	5923777.42 N
Client	Auckland Council	Lacation	217 Motutara Road,
Date	7 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728367.96 E
Job Number	12612462	(NZTM 2000)	5923777.42 N
Client	Auckland Council	Location	217 Motutara Road,
Date	7 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728367.96 E
Job Number	12612462	(NZTM 2000)	5923777.42 N
Client	Auckland Council	Location	217 Motutara Road,
Date	7 July 2023	Location	Muriwai





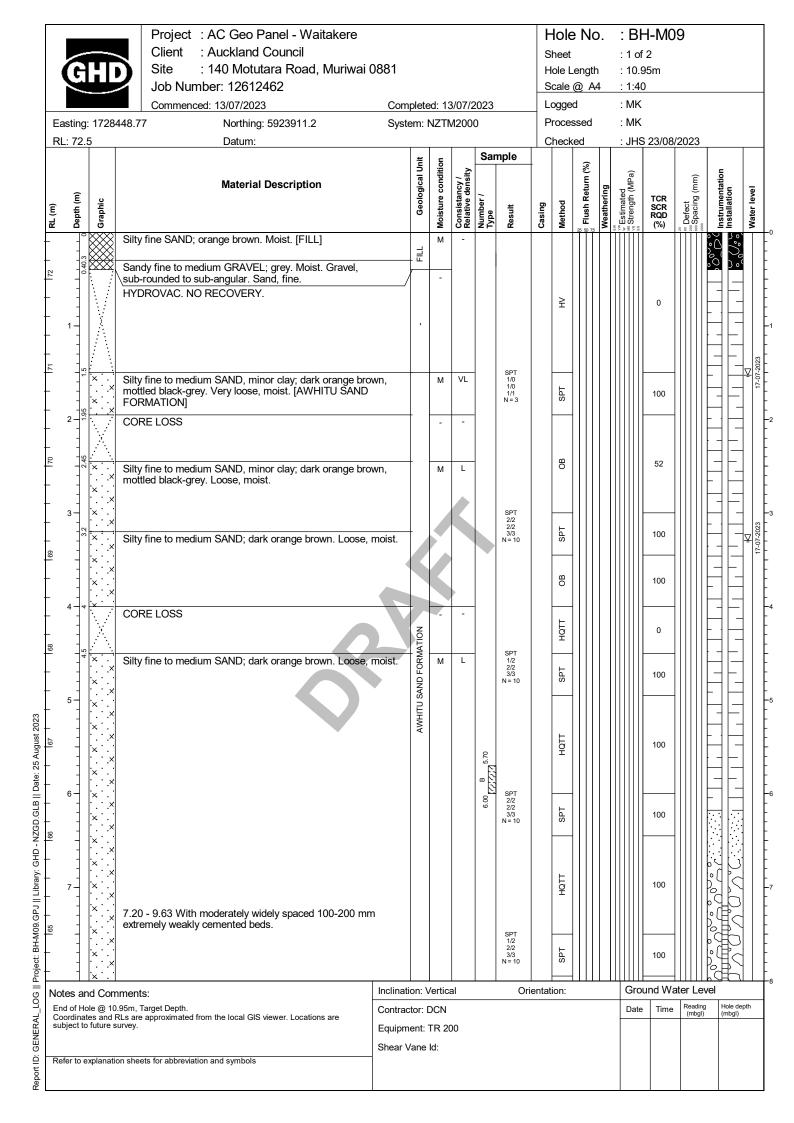
Project	AC Geo Panel – Waitākere	Coordinates	1728367.96 E
Job Number	12612462	(NZTM 2000)	5923777.42 N
Client	Auckland Council	Location	217 Motutara Road,
Date	7 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728367.96 E
Job Number	12612462	(NZTM 2000)	5923777.42 N
Client	Auckland Council	Location	217 Motutara Road,
Date	7 July 2023	Location	Muriwai





Project : AC Geo Panel - Waitakere Hole No. : BH-M09 Client : Auckland Council Sheet : 2 of 2 Site : 140 Motutara Road, Muriwai 0881 Hole Length : 10.95m Job Number: 12612462 Scale @ A4 : 1:40 Commenced: 13/07/2023 Completed: 13/07/2023 Logged : MK Processed : MK Easting: 1728448.77 Northing: 5923911.2 System: NZTM2000 RL: 72.5 Checked : JHS 23/08/2023 Datum: Sample **Geological Unit** Moisture condition 8 [™]Estimated
[™]Strength (MPa) Consistancy / Relative density Flush Return **Material Description** TCR SCR RQD Depth (m) Number / Graphic Method Casing Silty fine to medium SAND; dark orange brown. Loose, moist. (continued from layer starting at 4.5m) 보 100 SPT 1/2 2/2 3/3 N = 10 AWHITU SAND FORMATION SPT 78 Highly weathered, dark orange brown, fine to medium grained SANDSTONE; extremely weak. HQTT 100 10 Silty fine to coarse SAND; dark orange brown. Medium dense, MD moist. SPT 100 End of Hole @ 10.95m, Target Depth. 12 || Project: BH-M09.GPJ || Library: GHD - NZGD.GLB || Date: 25 August 2023 Inclination: Vertical **Ground Water Level** Orientation: Notes and Comments: GENERAL_LOG End of Hole @ 10.95m, Target Depth.

Coordinates and RLs are approximated from the local GIS viewer. Locations are subject to future survey. Date Time Contractor: DCN 17/07/23 17/07/23 12:15 14:15 1.5 3.27 Equipment: TR 200

Shear Vane Id:

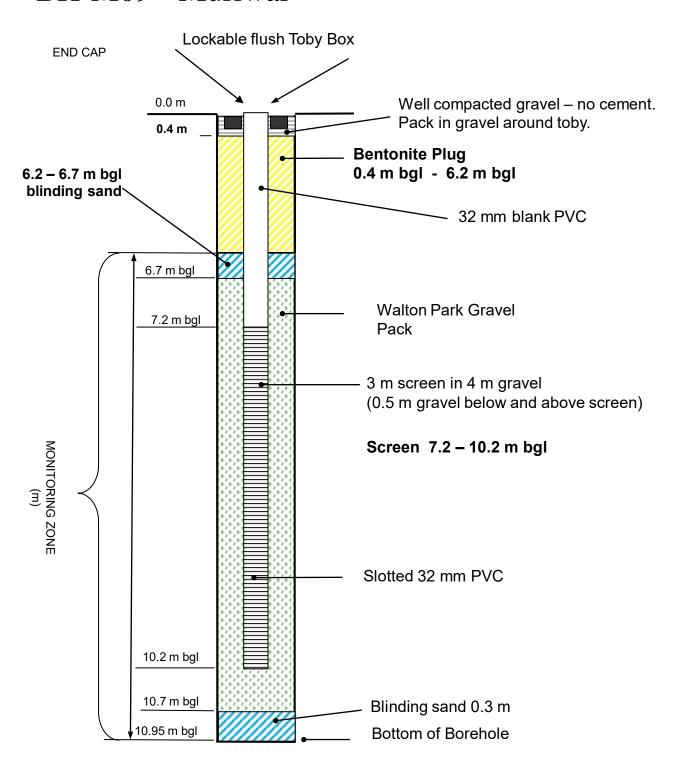
≘

Report I

Refer to explanation sheets for abbreviation and symbols

Water level

BH-M09 - Muriwai

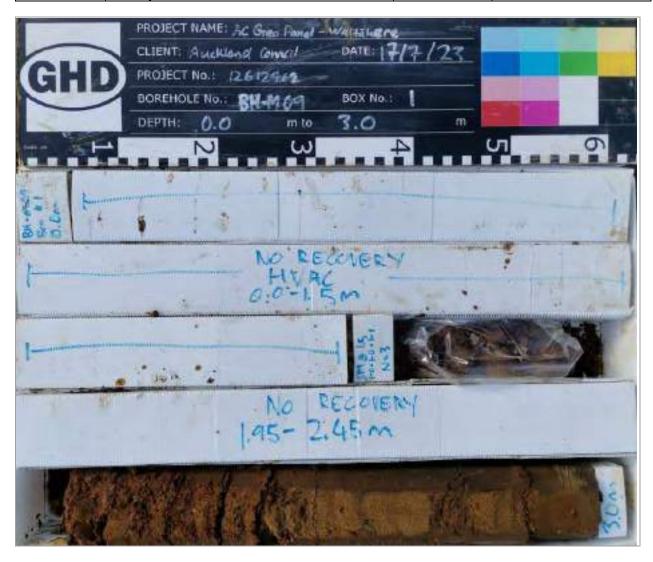


NOT TO SCALE





Project	AC Geo Panel – Waitākere	Coordinates	1728448.77 E
Job Number	12612462	(NZTM 2000)	5923911.20 N
Client	Auckland Council	Location	140 Motutara Road,
Date	17 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728448.77 E
Job Number	12612462	(NZTM 2000)	5923911.20 N
Client	Auckland Council	Location	140 Motutara Road,
Date	17 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728448.77 E
Job Number	12612462	(NZTM 2000)	5923911.20 N
Client	Auckland Council	Location	140 Motutara Road,
Date	17 July 2023	Location	Muriwai







Project	AC Geo Panel – Waitākere	Coordinates	1728448.77 E
Job Number	12612462	(NZTM 2000)	5923911.20 N
Client	Auckland Council	Location	140 Motutara Road,
Date	17 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728448.77 E
Job Number	12612462	(NZTM 2000)	5923911.20 N
Client	Auckland Council	Location	140 Motutara Road,
Date	17 July 2023	Location	Muriwai





Project	AC Geo Panel – Waitākere	Coordinates	1728448.77 E
Job Number	12612462	(NZTM 2000)	5923911.20 N
Client	Auckland Council	Location	140 Motutara Road,
Date	17 July 2023	Location	Muriwai



Appendix F3

Laboratory Test Results



Babbage Geotechnical Laboratory

Level 4

68 Beach Road P O Box 2027
Auckland 1010 New Zealand
Telephone 64-9-367 4954
E-mail wec@babbage.co.nz

Please reply to: W.E. Campton Page 1 of 3

GHD Limited PO Box 6543 Wellesley Street Auckland 1141 Job Number: 63532#L BGL Registration Number: 2806

Checked by: WEC

22nd September 2023

Attention: METTE van LITH

ATTERBERG LIMITS TESTING

Dear Mette,

Re: WAITAKERE LHRA – MURIWAI GROUND INVESTIGATION

Your Reference:

Report Number: 63532#L/AL Waitakere LHRA

The following report presents the results of Atterberg Limits testing at BGL of a soil sample delivered to this laboratory during August 2023. Test results are summarised below, with page 3 showing where the sample plots on the Unified Soil Classification System (Casagrande) Chart. Test standards used were:

 Water Content:
 NZS4402:1986:Test 2.1

 Liquid Limit:
 NZS4402:1986:Test 2.2

 Plastic Limit:
 NZS4402:1986:Test 2.3

 Plasticity Index:
 NZS4402:1986:Test 2.4

Borehole	Sample	Depth (m)	Water	Liquid	Plastic	Plasticity
Number	Number		Content (%)	Limit	Limit	Index
BH-M01	S 1	13.50 – 13.95	29.0	25 ♦	14 ♦	11 ♦

= The soil fraction passing a 425μm sieve was used for the liquid limit and plastic limit tests.

The whole soil was used for the water content test (the soil was in a natural state), and the soil fraction passing a 0.425mm sieve was used for the liquid limit and plastic limit tests. The soil was wet up and dried where required for the liquid limit and plastic limit tests.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.2: liquid limit and test 2.3: plastic limit are reported to the nearest whole number.



Please note that the test results relate only to the sample as-received, and relate only to the sample under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.



Job Number:	63532#L	Sheet 1 of 1	Page 3 of 3
Reg. Number:	2806	Version No:	7
Report No:	63532#L/AL Waitakere LHRA	Version Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

DETERMINATION OF THE LIQUID LIMIT, PLASTIC LIMIT & THE PLASTICITY INDEX

Test Methods: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4

Tested By:	JL	August 2023
Compiled By:	JF	10/08/2023
Checked By:	JF	10/08/2023

	SUMMARY OF TESTING					
Borehole Number	Sample Number	Depth (m)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification Based on USCS Chart Below
BH-M01	S1	13.50 - 13.95	25	14	11	CL
						_

The chart below & soil classification terminology is taken from ASTM D2487-17^{e1} "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)", April 2020, & is based on the classification scheme developed by A. Casagrande in the 1940's (Casagrande, A., 1948: Classification and identification of soil. Transactions of the American Society of Civil Engineers, v. 113, p. 901-930). The chart below & the soil classification given in the table above are included for your information only, and are not included in the IANZ endorsement for this report.

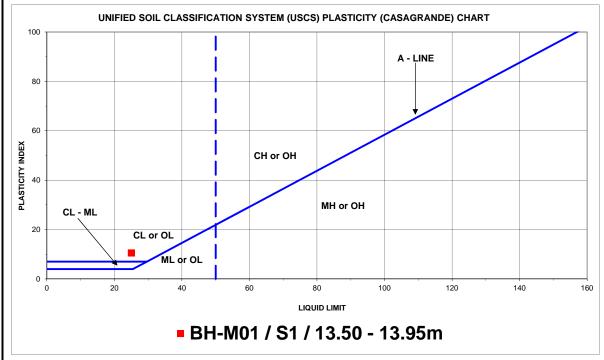


CHART LEGEND

CL = CLAY, low plasticity ('lean' clay)

CH = CLAY, high plasticity ('fat' clay)

OL = ORGANIC CLAY or ORGANIC SILT, low liquid limit

OH = ORGANIC CLAY or ORGANIC SILT, high liquid limit

ML = SILT, low liquid limit CL - ML = SILTY CLAY MH = SILT, high liquid limit ('elastic silt')



Babbage Geotechnical Laboratory

Level 4

68 Beach Road P O Box 2027
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Please reply to: W.E. Campton

Page 1 of 16

BGL Registration Number: 2806

Checked by: WEC

25th September 2023

Job Number: 63532#L

GHD Limited PO Box 6543 Wellesley Street Auckland 1141

Attention: METTE van LITH

WET SIEVE PARTICLE-SIZE DISTRIBUTION TESTING

Dear Mette.

Re: WAITAKERE LHRA – MURIWAI GROUND INVESTIGATION

Your Reference:

Report Number: 63532#L/AL Waitakere LHRA

The following report presents the results of wet sieve particle-size distribution testing at BGL of soil samples delivered to this laboratory during August & September 2023. Test results are summarised below, with the following pages showing graphs and detailed results.

Test standards used were:

 Water Content:
 NZS4402:1986:Test 2.1

 Wet Sieve Test:
 NZS4402:1986:Test 2.8.1

			Fraction	of Sample (% of Dr	ry Mass)
Borehole Number	Sample Number	Depth (m)	GRAVEL (2 – 60mm)	SAND (0.06 – 2mm)	SILT & CLAY FRACTIONS (< 0.06mm)
BH-M01	S3	43.50 – 43.80	0	98	2
BH-M05	S1	6.45 - 6.65	0	93	7
BH-M07	S1	4.20 – 4.50	1	78	21
BH-M07	S2	29.70 – 30.00	0	92	8
BH-M08	S1	3.45 – 3.70	0	82	18
BH-M08	S3	10.20 – 10.50	0	80	20
ВН-М09	S 1	5.70 - 6.00	0	98	2

Please note that the results table immediately above with the various particle-size fractions is included for your information only, and is not included in the IANZ endorsement for this report.



			Fraction	of Sample (% of Di	y Mass)
Borehole Number	Sample Number	Depth (m)	GRAVEL (2 – 60mm)	SAND (0.06 – 2mm)	SILT & CLAY FRACTIONS (< 0.06mm)
BH-M01	D4	76.15 – 76.50	0	97	3
BH-M02	D14	63.95 – 64.25	0	95	5
BH-M03	D10	76.00 – 76.30	0	94	6
ВН-М06	D1	26.00 – 26.30	0	85	15
BH-M07	D3	36.90 – 37.20	0	93	7
ВН-М09	D2	8.70 – 9.00	0	97	3

Please note that the results table immediately above with the various particle-size fractions is included for your information only, and is not included in the IANZ endorsement for this report.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.8.1: wet sieve, the percentages passing the sieves are reported to nearest 1%.

The wet sieve method used by BGL is a slight variation of the 2.8.1 test standard. It is, in our opinion, a more accurate method as it does not rely on an assumed total dry mass determined from water content testing of sub-samples, but actually determines & uses the exact total dry mass (*opinion not IANZ endorsed*).

The following departures from the test standard occurred:

- The total dry mass of the entire sieved sample was determined, and was not calculated by using two
 water content sub-samples as in the standard.
- A detergent was used to deflocculate the sample rather than a sodium hexametaphosphate/sodium carbonate dispersing agent solution.
- The recovery of the wet fines (i.e. the silt & clay passing the 63μm wash sieve) for determining the percentage of silt & clay was omitted (as per 2.8.1 Note 7), therefore the percentage passing the 63μm was obtained by difference. A 10% hydrochloric acid flocculating agent was therefore not used.



Job Number: 63532#L 25th September 2023 Page 3 of 16

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.



Job Number:	63532#L	Sheet 1 of 1	Page 4 of 16
Reg. Number:	2806	Version No:	5
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC/JL	11-Aug-23
Compiled By:	JL	11-Aug-23
Checked By:	JF	14-Aug-23

вн: **ВН-М01**

Sample No:

Depth: 43.50 - 43.80m

Water Content: 22.1 % (material < 37.5mm)

S3

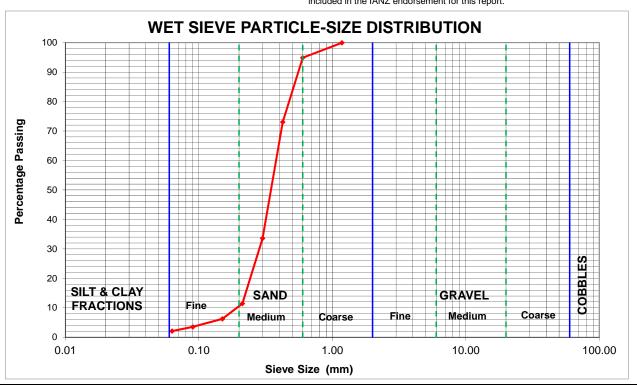
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
1.18	100
0.600	95
0.425	73
0.300	34
0.212	11
0.150	6
0.090	4
0.063	2

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	5		
SAND:	(Medium)	0.6 - 0.2mm	84	98	%
	(Fine)	0.2 - 0.06mm	9		
SILT & CLAY	FRACTIONS:	< 0.06mm		2	%
				100%	





Report No.	03332#L/F3D Wallakele LITIKA	issue Date.	July 2022
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022
Reg. Number:	2806	Version No:	5
Job Number:	63532#L	Sheet 1 of 1	Page 5 of 16

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC / JL	11-Aug-23
Compiled By:	JL	11-Aug-23
Checked By:	JF	14-Aug-23

BH: BH-M05

Sample No:

S1

Depth: 6.45 - 6.65m

Water Content:

27.7 % (material < 37.5mm)

100%

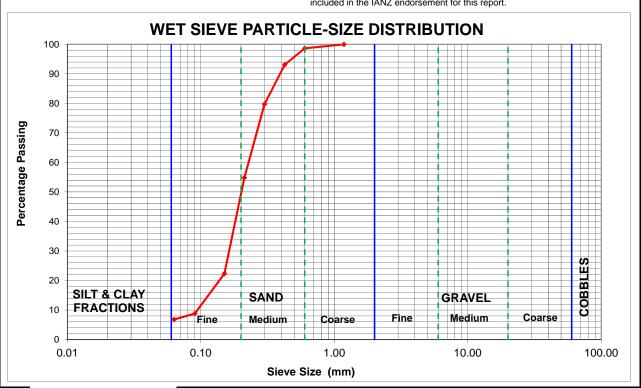
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
1.18	100
0.600	99
0.425	93
0.300	80
0.212	55
0.150	22
0.090	9
0.063	7

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	1		
SAND:	(Medium)	0.6 - 0.2mm	50	93	%
	(Fine)	0.2 - 0.06mm	42		
	•			_	
SILT & CLAY	FRACTIONS:	< 0.06mm		7	%





Job Number:	63532#L	Sheet 1 of 1	Page 6 of 16
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Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC/JL	14-Aug-23
Compiled By:	JL	14-Aug-23
Checked By:	JF	14-Aug-23

вн: **ВН-М07**

Sample No:

S1

Depth: 4.20 - 4.50m

Water Content:

31.0 % (material < 37.5mm)

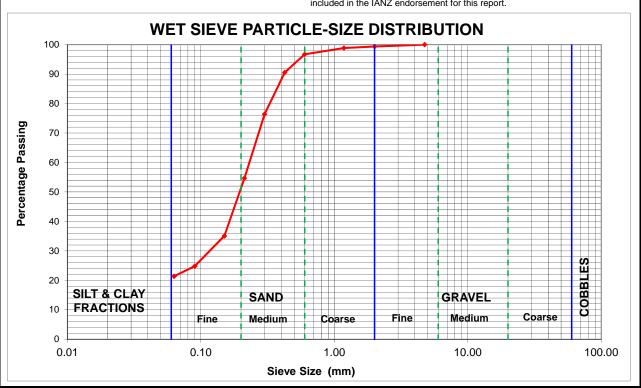
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
4.75	100
2.00	99
1.18	99
0.600	97
0.425	91
0.300	76
0.212	55
0.150	35
0.090	25
0.063	21

	OIL 1 L / (11/ (L)	010 (70 01 GI)	mace		
				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	1	%
	(Fine)	6 - 2mm	1		
	(Coarse)	2.0 - 0.6mm	2		
SAND:	(Medium)	0.6 - 0.2mm	46	78	%
	(Fine)	0.2 - 0.06mm	30		
		<u>.</u>			
SILT & CLAY	FRACTIONS:	< 0.06mm		21	%
				100%	





Job Number:	63532#L	Sheet 1 of 1	Page 7 of 16
Reg. Number:	2806	Version No:	5
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022
	14/4/5		

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC/JL	14-Aug-23
Compiled By:	JL	14-Aug-23
Checked By:	JF	14-Aug-23

вн: **ВН-М07**

Sample No:

S2

Depth: 29.70 - 30.00m

Water Content:

25.4 % (material < 37.5mm)

100%

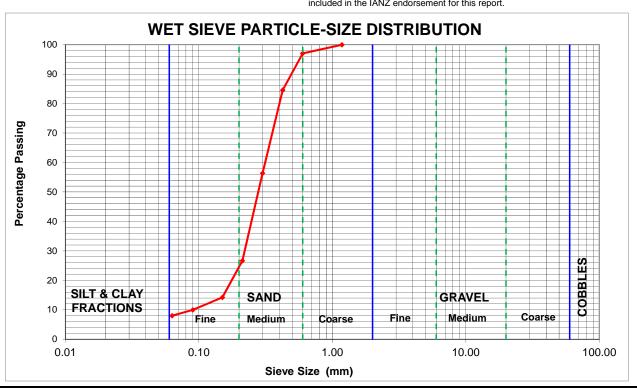
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
1.18	100
0.600	97
0.425	85
0.300	56
0.212	27
0.150	14
0.090	10
0.063	8

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	3		
SAND:	(Medium)	0.6 - 0.2mm	72	92	%
	(Fine)	0.2 - 0.06mm	17		
				_	
SILT & CLAY	FRACTIONS:	< 0.06mm		8	%





Job Number:	63532#L	Sheet 1 of 1	Page 8 of 16
Reg. Number:	2806	Version No:	5
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC/JL	11-Aug-23
Compiled By:	JL	11-Aug-23
Checked By:	JF	14-Aug-23

BH-M08

Sample No:

S1

Depth: 3.45 - 3.70m

Water Content:

42.5 % (material < 37.5mm)

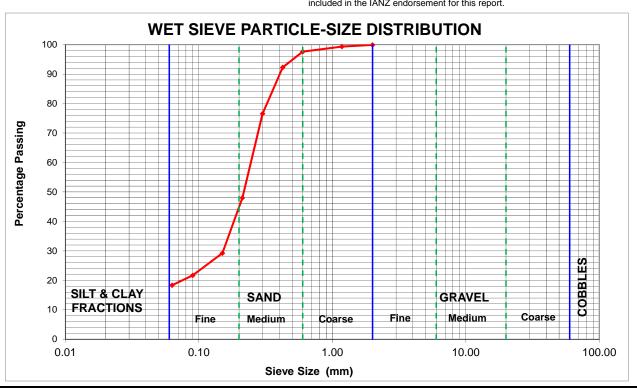
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	99
0.600	98
0.425	92
0.300	77
0.212	48
0.150	29
0.090	22
0.063	18

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	2		
SAND:	(Medium)	0.6 - 0.2mm	53	82	%
	(Fine)	0.2 - 0.06mm	27		
				_	
SILT & CLAY	FRACTIONS:	< 0.06mm		18	%
			<u> </u>	100%	





Job Number:	63532#L	Sheet 1 of 1	Page 9 of 16
Reg. Number:	2806	Version No:	5
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC/JL	14-Aug-23
Compiled By:	JL	14-Aug-23
Checked By:	JF	14-Aug-23

BH: BH-M08

Sample No:

S3

Depth: 10.20 - 10.50m

Water Content:

26.2 % (material < 37.5mm)

100%

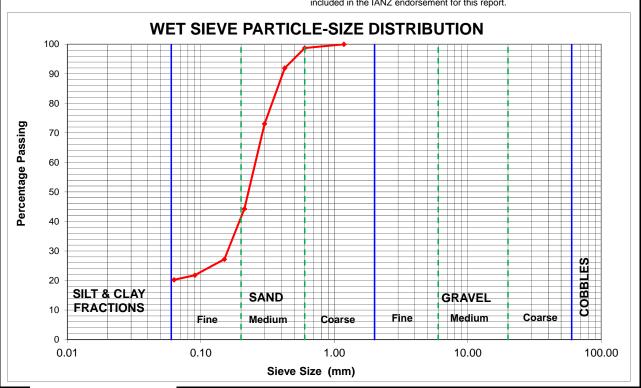
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage	
Size (mm)	Passing	
1.18	100	
0.600	99	
0.425	92	
0.300	73	
0.212	44	
0.150	27	
0.090	22	
0.063	20	

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
•					
	(Coarse)	2.0 - 0.6mm	1		
SAND:	(Medium)	0.6 - 0.2mm	58	80	%
	(Fine)	0.2 - 0.06mm	21		
				_	
SILT & CLAY	FRACTIONS:	< 0.06mm		20	%





report No.	00002#Lif OD Waltakere LiffkA	issue pate.	July 2022
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022
Reg. Number:	2806	Version No:	5
Job Number:	63532#L	Sheet 1 of 1	Page 10 of 16

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	WEC/JL	14-Aug-23
Compiled By:	JL	14-Aug-23
Checked By:	JF	14-Aug-23

вн: **ВН-М09**

Sample No:

S1

Depth: 5.70 - 6.00m

Water Content: 26.2 % (material < 37.5mm)

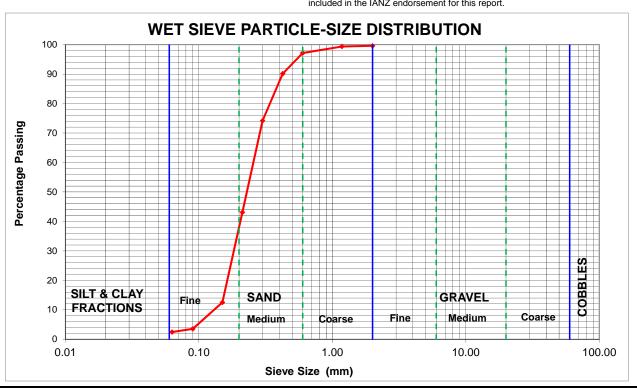
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	99
0.600	97
0.425	90
0.300	74
0.212	43
0.150	13
0.090	4
0.063	2

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	3		
SAND:	(Medium)	0.6 - 0.2mm	59	98	%
	(Fine)	0.2 - 0.06mm	36		
SILT & CLAY	FRACTIONS:	< 0.06mm		2	%
				100%	





Job Number:	63532#L	Sheet 1 of 1	Page 11 of 16
Reg. Number:	2806	Version No:	5
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	JW / JL	21 & 25/09/23
Compiled By:	JL	25-Sep-23
Checked Bv:	JF	25-Sep-23

вн: **ВН-М01**

Sample No:

D4

Depth: 76.15 - 76.50m

Water Content:

26.2 % (material < 37.5mm)

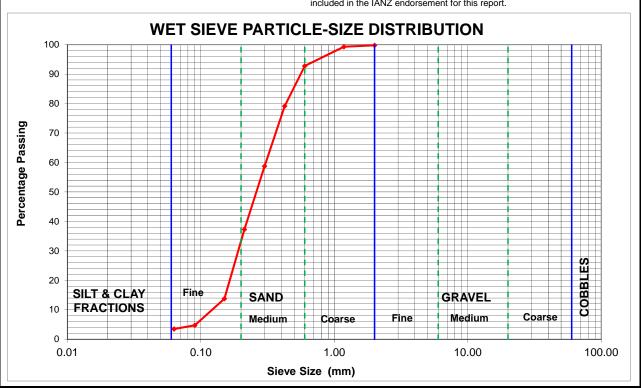
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	99
0.600	93
0.425	79
0.300	59
0.212	37
0.150	14
0.090	5
0.063	3

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	7		
SAND:	(Medium)	0.6 - 0.2mm	60	97	%
	(Fine)	0.2 - 0.06mm	30		
SILT & CLAY	FRACTIONS:	< 0.06mm		3	%
				100%	





Job Number:	63532#L	Sheet 1 of 1	Page 12 of 16
Reg. Number:	2806	Version No:	5
Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	JW	21-Sep-23
Compiled By:	JW	21-Sep-23
Checked By:	WEC	21-Sep-23

BH-M02

Sample No:

D14

Depth: 63.95 - 64.25m

Water Content:

24.2 % (material < 37.5mm)

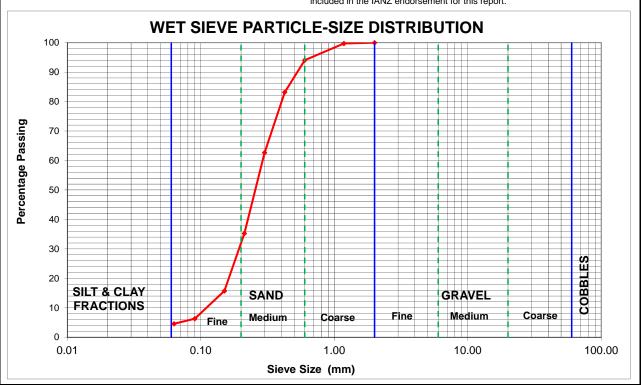
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	100
0.600	94
0.425	83
0.300	63
0.212	35
0.150	16
0.090	6
0.063	5

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	6		
SAND:	(Medium)	0.6 - 0.2mm	62	95	%
	(Fine)	0.2 - 0.06mm	27		
				_	
SILT & CLAY	FRACTIONS:	< 0.06mm		5	%
				100%	





Job Number:	63532#L	Sheet 1 of 1	Page 13 of 16
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	JW	21-Sep-23
Compiled By:	JW	21-Sep-23
Checked By:	WEC	21-Sep-23

BH-M03

Sample No:

D10

Depth: 76.00 - 76.30m

Water Content:

25.2 % (material < 37.5mm)

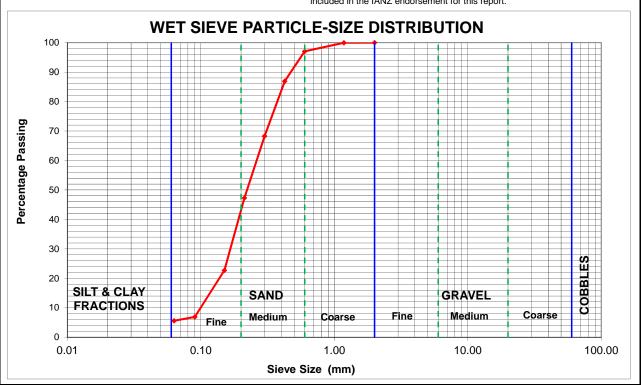
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	100
0.600	97
0.425	87
0.300	68
0.212	47
0.150	23
0.090	7
0.063	6

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	3		
SAND:	(Medium)	0.6 - 0.2mm	54	94	%
	(Fine)	0.2 - 0.06mm	37		
SILT & CLAY	FRACTIONS:	< 0.06mm		6	%
				100%	





Job Nu	ımber:	63532#L	Sheet 1 of 1	Page 14 of 16
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Report	:No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	JW	21-Sep-23
Compiled By:	JW	21-Sep-23
Checked By:	WEC	21-Sep-23

вн: **ВН-М06**

Sample No:

D1

Depth: 26.00 - 26.30m

Water Content:

19.9 % (material < 37.5mm)

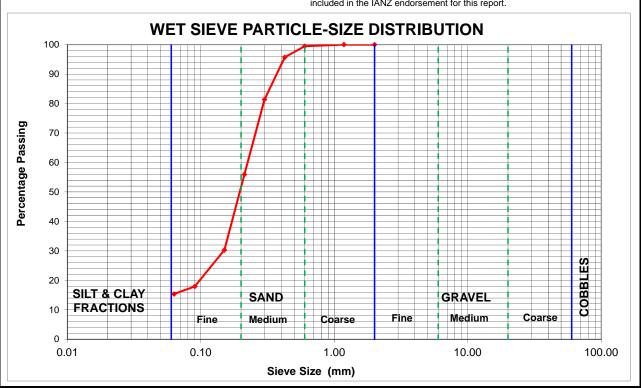
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	100
0.600	99
0.425	96
0.300	81
0.212	56
0.150	30
0.090	18
0.063	15

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	1		
SAND:	(Medium)	0.6 - 0.2mm	47	85	%
	(Fine)	0.2 - 0.06mm	37		
SILT & CLAY	FRACTIONS:	< 0.06mm		15	%
				100%	





Job Number:	63532#L	Sheet 1 of 1	Page 15 of 16
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	JW	21-Sep-23
Compiled By:	JW	21-Sep-23
Checked By:	WEC	21-Sep-23

вн: **ВН-М07**

Sample No:

D3

Depth: 36.9

36.90 - 37.20m

Water Content:

25.8 % (material < 37.5mm)

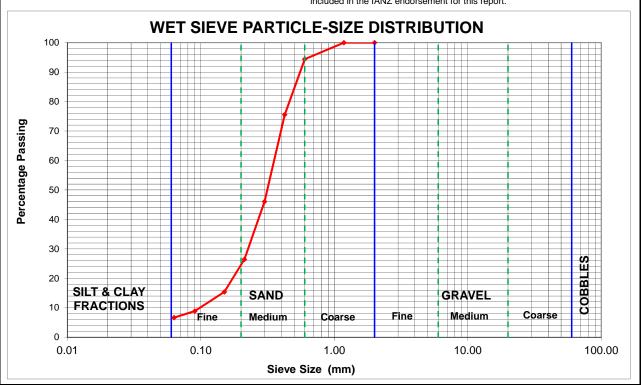
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	100
0.600	94
0.425	76
0.300	46
0.212	26
0.150	15
0.090	9
0.063	7

(Medium) (Fine) (Coarse) (Medium) (Fine)	20 - 6mm 6 - 2mm 2.0 - 0.6mm 0.6 - 0.2mm 0.2 - 0.06mm	0 0 6 70 17	93	% %
(Fine)	6 - 2mm 2.0 - 0.6mm	6	93	
(Fine)	6 - 2mm	Ū	0	%
` ,		0	0	%
` ,		0	0	%
(Medium)	20 - 6mm	0	0	%
` '				
(Coarse)	60 - 20mm	0		
			·	,,
	200 - 60mm		0	%
			TOTAL	
		200 - 60mm	200 - 60mm	200 - 60mm





Job Number:	63532#L	Sheet 1 of 1	Page 16 of 16
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Report No:	63532#L/PSD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY WET SIEVE

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1

Tested By:	JL	25-Sep-23
Compiled By:	JL	25-Sep-23
Checked By:	JF	25-Sep-23

вн: **ВН-М09**

Sample No:

D2

Depth: 8.70 - 9.00m

Water Content:

25.8 % (material < 37.5mm)

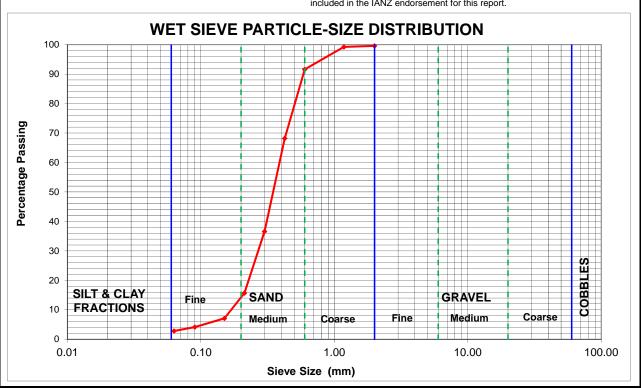
TEST METHOD:

Sample weighed wet, then oven-dried and re-weighed. Sample then washed over a $63\mu m$ sieve. Sample then oven dried, weighed & sieved over a stack of test sieves. The percentage passing the $63\mu m$ was obtained by difference.

SIEVE ANALYSIS (% of dry mass)

Sieve	Percentage
Size (mm)	Passing
2.00	100
1.18	99
0.600	92
0.425	68
0.300	37
0.212	16
0.150	7
0.090	4
0.063	3

				TOTAL	
COBBLES:		200 - 60mm		0	%
	(Coarse)	60 - 20mm	0		
GRAVEL:	(Medium)	20 - 6mm	0	0	%
	(Fine)	6 - 2mm	0		
	(Coarse)	2.0 - 0.6mm	8		
SAND:	(Medium)	0.6 - 0.2mm	78	97	%
	(Fine)	0.2 - 0.06mm	11		
SILT & CLAY	FRACTIONS:	< 0.06mm		3	%
				100%	





Babbage Geotechnical Laboratory

Level 4

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Telephone 64-9-367 4954
E-mail wec@babbage.co.nz

Please reply to: W.E. Campton Page 1 of 3

GHD Limited PO Box 6543 Wellesley Street Auckland 1141

BGL Registration Number: 2806

Checked by: WEC

22nd September 2023

Job Number: 63532#L

Attention: METTE van LITH

HYDROMETER PARTICLE-SIZE DISTRIBUTION TESTING

Dear Mette,

Re: WAITAKERE LHRA – MURIWAI GROUND INVESTIGATION

Your Reference:

Report Number: 63532#L/AL Waitakere LHRA

The following report presents the results of hydrometer particle-size distribution testing at BGL of a soil sample delivered to this laboratory during August 2023. Test results are summarised below, with page 3 showing a graph and detailed results.

Test standards used were:

 Water Content:
 NZS4402:1986:Test 2.1

 Wet Sieve Test:
 NZS4402:1986:Test 2.8.1

 Hydrometer Test:
 NZS4402:1986:Test 2.8.4

			Нус	drometer Gradi	ng (% of Dry M	ass)
Borehole Number	Sample Number	Depth (m)	GRAVEL (2 – <9.50mm)	SAND (0.06 – 2mm)	SILT FRACTION (0.002 – 0.06mm)	CLAY FRACTION (< 0.002mm)
BH-M01	S2	13.95 – 14.30	0	70	15	15

The whole soil was used for this hydrometer test. As the organic content of the soil tested was very low, peroxide pretreatment was not carried out. A solid density of 2.65t/m³ was assumed for this hydrometer test, and is not part of the IANZ endorsement for this report.





As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.8.1: wet sieve & Test 2.8.4: hydrometer, the 'percentages passing' and 'percentages finer than' are reported to nearest 1%.

Please note that the test results relate only to the sample as-received, and relate only to the sample under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin Key Technical Person Assistant Laboratory Manager Babbage Geotechnical Laboratory



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.



Job Number:	63532#L	Sheet 1 of 1	Page 3 of 3
Reg. Number:	2806	Version No:	7
Report No:	63532#L/HYD Waitakere LHRA	Issue Date:	July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

PARTICLE-SIZE DISTRIBUTION BY HYDROMETER

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1, Test 2.8.4

Tested By:	WEC	10-Aug-23
Compiled By:	WEC	11-Aug-23
Checked By:	JF	14-Aug-23

BH No: BH-M01 Sample No: S2 Depth: 13.95 - 14.30m

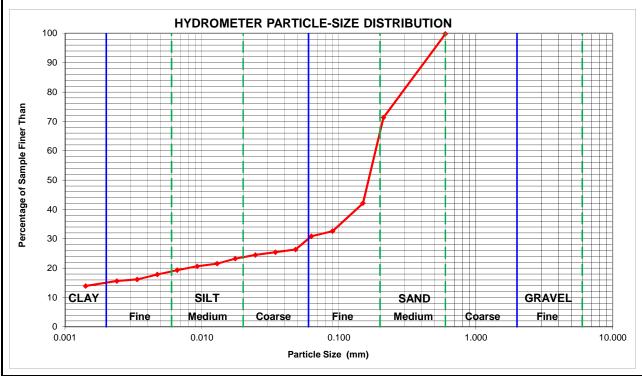
Water Content (%): 26.4

Sample History: Natural /-Air Dried / Oven Dried / Unknown pH of sedimentation suspension: 8.5

Particle Size (mm)	% Finer Than
0.600	100
0.212	71
0.150	42
0.090	33
0.063	31
0.048	26
0.034	25
0.025	24
0.018	23
0.013	22
0.0092	21
0.0066	19
0.0047	18
0.0034	16
0.0024	16
0.0014	14

<u>IYDROMETER</u>	TOTAL				
				1	
CDAVEL.	(Madium)	< 9.5 - 6mm	0	0	%
GRAVEL:	(Medium) (Fine)	< 9.5 - 6mm	0	U	70
	(i iiie)	0 2111111			
	(Coarse)	2.0 - 0.6mm	0		
SAND:	(Medium)	0.6 - 0.2mm	33	70	%
	(Fine)	0.2 - 0.06mm	37		
				•	
SILT	(Coarse)	0.06 - 0.02mm	6		
FRACTION:	(Medium)	0.02 - 0.006mm	5	15	%
TITAOTION:	(Fine)	0.006 - 0.002mm	4		
CLAY F	RACTION:	< 0.002mm		15	%
				100%	

HYDROMETER TEST WAS CARRIED OUT ON THE WHOLE SOIL /-SOIL FRACTION PASSING A 9.50mm SIEVE





Babbage Geotechnical Laboratory Level 4

68 Beach Road P O Box 2027 Auckland 1010 Telephone E-mail

New Zealand 64-9-367 4954

wec@babbage.co.nz

Page 1 of 1

Please reply to: W.E. Campton

GHD Limited PO Box 6543 Wellesley Street Auckland 1141

Attention: **METTE van LITH** Job Number: 63532#L

BGL Registration Number: 2806

Checked by: WEC

22nd September 2023

DETECTION OF THE PRESENCE OF ALLOPHANE

Dear Mette,

WAITAKERE LHRA – MURIWAI GROUND INVESTIGATION Re:

Your Reference:

Report Number: 63532#L/AL Waitakere LHRA

The following table presents the results of 'Detection of the Presence of Allophane in Soils' testing at BGL of a soil sample delivered to this laboratory during August 2023. This sample was tested in accordance with the following standard:

Detection of Presence of Allophane in Soils: NZS4402:1986:Test 3.4

Borehole Number	' I I I I I I I I I I I I I I I I I I I		Allophane Content
BH-M08	S2	10.00 – 10.10	< 5%

Please note that the test results relate only to the sample as-received, and relate only to the sample under test. Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin **Key Technical Person Assistant Laboratory Manager Babbage Geotechnical Laboratory**



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.



Babbage Geotechnical Laboratory

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Please reply to: W.E. Campton

Page 1 of 69

GHD Limited PO Box 6543 Wellesley Street Auckland 1141 Job Number: 63532#L

BGL Registration Number: 2806

Checked by: WEC

2nd October 2023

Attention: METTE van LITH

UNCONFINED COMPRESSIVE STRENGTH (UCS) TESTING

Dear Mette,

Re: WAITAKERE LHRA – MURIWAI GROUND INVESTIGATION

Your Reference:

Report Number: 63532#L/AL Waitakere LHRA

The following report presents the results of Uniaxial Unconfined Compressive Strength Testing at BGL of rock core samples delivered to this laboratory on the 18th of September 2023. These samples were tested in accordance with the following standards:

Water Content: NZS4402:1986:Test 2.1
Unconfined Compressive Strength Test: NZS4402:1986:Test 6.3.1

The table below summarises the test results, with the following pages presenting sample measurements and test data.

			F.	AILURE CO	ONDITION	s
Borehole Number	Sample Number	Depth (m)	Unconfined	Strain a	t Failure	Failure Mode
		,	Compressive Strength (kPa)	%	mm	Fallure Mode
BH-M02	S 1	26.50 – 26.75	270	0.74	0.89	planar
BH-M02	S 2	29.69 – 29.92	370	0.75	0.86	planar
BH-M02	S 3	36.35 – 36.65	180	0.50	0.61	planar
BH-M02	S 4	40.80 – 41.00	180	0.46	0.55	planar



			FAILURE CONDITIONS			s
Borehole Number	Sample Number	Depth (m)	Unconfined Compressive	Strain a	t Failure	Failure Mode
			Strength (kPa)	%	mm	i anure woue
BH-M02	S5	53.30 - 53.90	1,800	0.49	0.59	brittle
BH-M02	S6	55.20 - 55.50	1,200	0.52	0.63	planar
BH-M02	S 7	55.80 – 56.11	1,300	0.42	0.51	brittle
BH-M02	S8	56.50 - 56.90	1,100	0.50	0.60	brittle
BH-M02	S9	64.44 – 64.72	1,300	0.45	0.55	brittle
BH-M02	S10	67.93 – 68.33	800	0.48	0.58	brittle
BH-M02	S11	74.20 – 74.50	700	0.59	0.71	brittle
BH-M02	S12	76.13 – 76.40	560	0.43	0.51	brittle
BH-M02	S13	78.14 – 78.47	1,000	0.45	0.54	brittle
BH-M03*	UCS01	9.93 – 10.13	140	1.0	0.81	plastic / brittle
BH-M03	UCS02	16.00 – 16.27	280	1.0	1.2	brittle
BH-M03	UCS03	29.55 – 29.75	110	0.75	0.81	planar
BH-M03	UCS04	31.95 – 32.23	330	1.7	2.0	planar
BH-M03	UCS05	33.76 – 34.06	400	0.55	0.67	planar / brittle
BH-M03	UCS06	37.00 – 37.25	270	0.60	0.72	planar / brittle
BH-M03	UCS07	40.14 – 40.43	92	0.74	0.85	plastic
BH-M03	UCS08	41.15 – 41.43	720	0.81	0.94	planar
BH-M03	UCS09	50.73 – 51.00	850	0.62	0.74	brittle



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Please note that the sample indicated with an asterisk () was less than that required by the test standard i.e. "The test is limited to specimens in the form of right cylinders of height approximately equal to twice the diameter", therefore the results for this sample are not IANZ endorsed. In our experience the UCS value determined for this sample will be higher than if the sample had a length of twice the diameter (opinion not IANZ endorsed).

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. As per the reporting requirements of NZS4402: 1986: Test 6.3.1: UCS, dry density is reported to the nearest 0.05t/m³, the unconfined compressive strength is reported to two significant figures, and the strain & rate of axial compression at failure is reported to two significant figures.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory



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Job No:	Reg. No:	Report No:	Page 4 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022
PROJECT:		TAKERE LHRA ROUND INVEST	

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

100112 1111201101111011					
Tested By:	WEC	27-Sep-23			
Compiled By:	WEC	28-Sep-23			
Checked By:	JF	2-Oct-23			

Borehole: **BH-M02** Sample Number: **S1** Depth: 26.50 – 26.75m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	9.799	0.000	0.000	7.776	0.0	2878.6	0
0.38	9.902	0.102	0.001	7.783	32.7	2881.0	11
0.75	9.996	0.197	0.002	7.793	83.7	2883.3	29
1.12	10.084	0.285	0.002	7.807	155.2	2885.4	54
1.50	10.166	0.367	0.003	7.823	236.7	2887.4	82
1.87	10.250	0.450	0.004	7.841	327.2	2889.4	113
2.23	10.331	0.531	0.004	7.862	428.8	2891.4	148
2.62	10.370	0.571	0.005	7.871	475.2	2892.3	164
2.98	10.445	0.645	0.005	7.892	582.1	2894.1	201
3.35	10.524	0.724	0.006	7.912	681.2	2896.1	235
3.73	10.602	0.803	0.007	7.928	763.6	2898.0	264
4.10	10.686	0.886	0.007	7.934	794.7	2900.0	274
4.37	10.737	0.938	0.008	7.913	688.2	2901.3	237
4.50	10.768	0.968	0.008	7.904	639.7	2902.0	220
4.65	10.792	0.993	0.008	7.897	604.7	2902.6	208
4.78	10.821	1.022	0.009	7.889	564.1	2903.3	194
4.92	10.865	1.066	0.009	7.884	539.4	2904.4	186
5.07	10.917	1.117	0.009	7.880	523.4	2905.6	180
5.20	10.999	1.199	0.010	7.877	504.1	2907.6	173
5.33	11.098	1.299	0.011	7.866	452.2	2910.1	155

Unconfined Compressive Strength:

270

kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S1** Depth: 26,50 - 26,75m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 60.54 mm
Initial Length: 119.87 mm

Initial Mass: 663.65

Initial Bulk Density: 1.92 t/m³

Initial Dry Density: 1.50 t/m³

Water Content After Test: 29.0 %

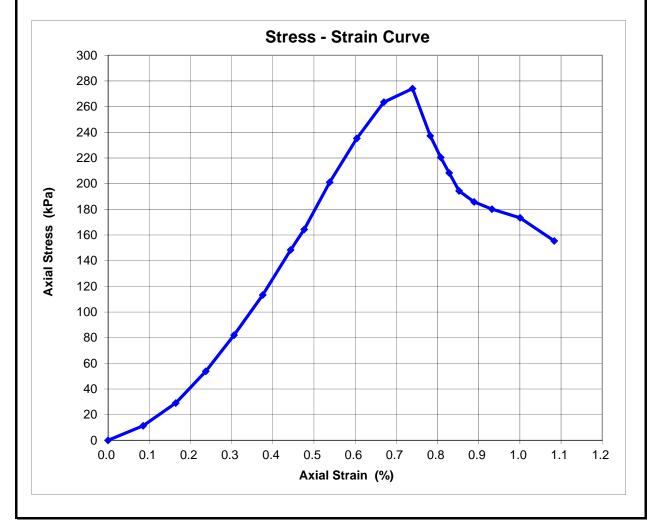
Failure Conditions:

Strain at failure: 0.74 %

Compression at failure: 0.89 mm

Rate of Compression: 0.22 mm / minute

Mode of Failure: planar





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength ofTested By:WEC27-Sep-23Cohesive SoilsCompiled By:WEC28-Sep-23Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1Checked By:JF2-Oct-23

Borehole: BH-M02 Sample Number: S1 Depth: 26.50 - 26.75m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, orange, weakly cemented.

SAMPLE BEFORE TEST







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	WA	TAKERE LHRA	- MURIWAI

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$2** Depth: **29.69 – 29.92m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	9.218	0.000	0.000	7.778	0.0	2908.8	0
0.38	9.314	0.096	0.001	7.793	74.5	2911.3	26
0.75	9.404	0.186	0.002	7.812	172.1	2913.5	59
1.12	9.489	0.270	0.002	7.835	285.5	2915.7	98
1.50	9.563	0.345	0.003	7.861	415.7	2917.6	142
1.87	9.606	0.388	0.003	7.873	477.3	2918.7	164
2.25	9.677	0.459	0.004	7.902	621.3	2920.5	213
2.62	9.760	0.542	0.005	7.926	744.9	2922.6	255
2.98	9.789	0.571	0.005	7.954	884.4	2923.3	303
3.37	9.862	0.644	0.006	7.973	979.3	2925.2	335
3.73	9.948	0.730	0.006	7.986	1045.2	2927.4	357
3.87	9.988	0.770	0.007	7.990	1065.9	2928.4	364
4.02	10.031	0.813	0.007	7.994	1083.5	2929.5	370
4.15	10.076	0.858	0.007	7.996	1094.3	2930.7	373
4.28	10.124	0.906	0.008	7.996	1093.6	2931.9	373
4.43	10.175	0.957	0.008	7.992	1076.2	2933.2	367
4.57	10.234	1.016	0.009	7.979	1010.3	2934.7	344
4.70	10.305	1.086	0.009	7.954	884.6	2936.5	301
4.85	10.370	1.152	0.010	7.937	800.0	2938.2	272
4.98	10.428	1.210	0.011	7.926	745.2	2939.7	254
5.12	10.485	1.267	0.011	7.917	698.7	2941.2	238
5.27	10.536	1.318	0.011	7.909	660.4	2942.5	224
5.40	10.586	1.368	0.012	7.902	625.5	2943.8	212
5.53	10.631	1.413	0.012	7.897	597.5	2945.0	203
5.68	10.684	1.466	0.013	7.891	569.7	2946.4	193
5.82	10.739	1.521	0.013	7.886	542.9	2947.8	184
5.97	10.787	1.569	0.014	7.868	454.1	2949.0	154

Unconfined Compressive Strength:

370 kPa



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WAITAKERE LHRA - MURIWAI GROUND **INVESTIGATION**

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Depth: 29.69 - 29.92m Borehole: BH-M02 Sample Number: **S2**

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

> **Initial Diameter:** 60.86 mm **Initial Length:** 115.09 Initial Mass: 641.83

Initial Bulk Density: 1.92

1.45 t/m³ Initial Dry Density:

Water Content After Test: 32.1

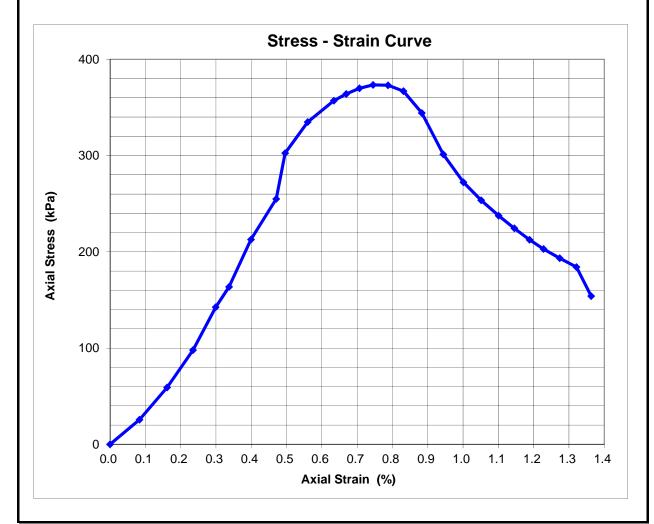
Failure Conditions:

0.75 Strain at failure:

Compression at failure: 0.86 mm

Rate of Compression: 0.21 mm / minute

Mode of Failure: planar





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M02 Sample Number: S2 Depth: 29.69 - 29.92m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, orange, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$3** Depth: **36.35 – 36.65m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	9.551	0.000	0.000	7.776	0.0	2738.6	0
0.38	9.641	0.090	0.001	7.784	41.7	2740.7	15
0.75	9.727	0.176	0.001	7.795	94.7	2742.6	35
1.13	9.811	0.260	0.002	7.808	160.2	2744.6	58
1.50	9.885	0.334	0.003	7.823	237.5	2746.2	86
1.87	9.964	0.413	0.003	7.841	327.3	2748.1	119
2.25	10.043	0.492	0.004	7.860	419.8	2749.9	153
2.62	10.105	0.554	0.005	7.870	472.9	2751.3	172
2.98	10.157	0.606	0.005	7.877	507.8	2752.5	185
3.37	10.268	0.717	0.006	7.875	497.8	2755.1	181
3.60	10.418	0.866	0.007	7.861	425.4	2758.5	154
3.83	10.491	0.939	0.008	7.853	384.4	2760.2	139
4.08	10.552	1.001	0.008	7.846	352.8	2761.6	128
4.32	10.614	1.063	0.009	7.839	317.4	2763.1	115
4.55	10.671	1.120	0.009	7.831	278.6	2764.4	101

Unconfined Compressive Strength: 180

kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S3** Depth: 36,35 - 36,65m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 59.05 mm

Initial Length: 120.04 mm

Initial Mass: 662.61 g

Initial Bulk Density: 2.02 t/m³

Initial Dry Density: 1.65 t/m³

Water Content After Test: 23.8 %

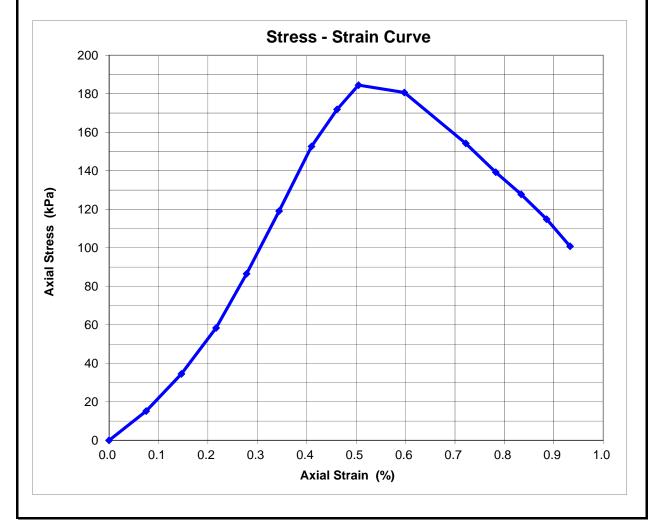
Failure Conditions:

Strain at failure: 0.50 %

Compression at failure: 0.61 mm

Rate of Compression: 0.20 mm / minute

Mode of Failure: planar





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M02 Sample Number: \$3 Depth: 36.35 - 36.65m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, orange, weakly cemented.

SAMPLE BEFORE TEST







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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$4** Depth: **40.80 – 41.00m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	4.440	0.000	0.000	7.773	0.0	2885.0	0
0.38	4.510	0.070	0.001	7.779	33.9	2886.7	12
0.75	4.581	0.141	0.001	7.788	74.8	2888.4	26
1.12	4.649	0.209	0.002	7.798	127.1	2890.0	44
1.50	4.711	0.271	0.002	7.811	194.2	2891.5	67
1.87	4.774	0.334	0.003	7.826	266.4	2893.0	92
2.23	4.838	0.398	0.003	7.842	347.4	2894.6	120
2.62	4.903	0.463	0.004	7.858	429.8	2896.2	148
2.98	4.940	0.500	0.004	7.865	463.9	2897.1	160
3.35	4.990	0.550	0.005	7.875	513.7	2898.3	177
3.73	5.157	0.716	0.006	7.825	263.1	2902.3	91
4.10	5.233	0.793	0.007	7.820	236.5	2904.2	81
4.48	5.325	0.884	0.007	7.810	185.6	2906.4	64
4.85	5.409	0.968	0.008	7.792	98.3	2908.5	34

Unconfined Compressive Strength:

180

kPa



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PROJECT: WA

#L | 2806 | 63532#L/UCS Waitakere LHRA | Version 3, July 2022 WAITAKERE LHRA - MURIWAI GROUND

INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$4** Depth: **40.80 - 41.00m**

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 60.61 mm

Initial Length: 119.91 mm

Initial Mass: 690.28

Initial Bulk Density: 2.00 t/m³

Initial Dry Density: 1.60 t/m³

Water Content After Test: 24.6 %

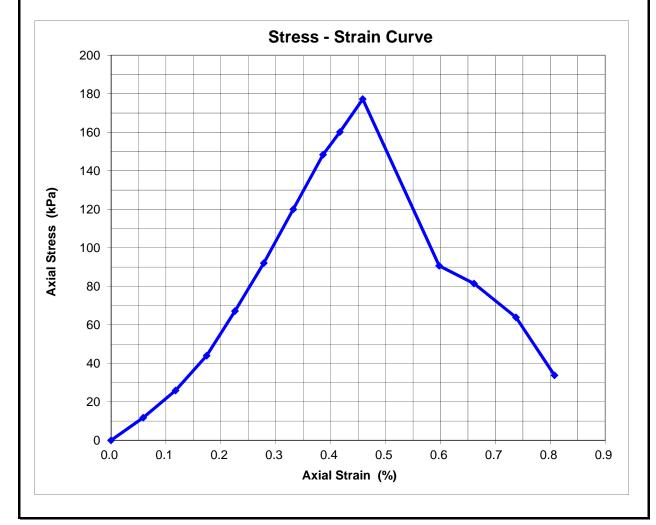
Failure Conditions:

Strain at failure: 0.46 %

Compression at failure: 0.55 mm

Rate of Compression: 0.16 mm / minute

Mode of Failure: planar





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength o	of Tested By:	WEC	27-Sep-23
Cohesive Soils	Compiled By:	WEC	28-Sep-23
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1	Checked By:	JF	2-Oct-23

Borehole: BH-M02 Sample Number: S4 Depth: 40.80 - 41.00m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, orange, weakly cemented.

SAMPLE BEFORE TEST







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	WA	TAKERE LHRA	- MURIWAI

VAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M02 Sample Number: \$5 Depth: 53.30 - 53.90m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	4.685	0.000	0.000	7.784	0.0	2864.5	0
0.28	4.729	0.043	0.000	7.810	128.6	2865.6	45
0.57	4.757	0.072	0.001	7.843	295.4	2866.2	103
0.87	4.778	0.092	0.001	7.870	428.5	2866.7	149
1.15	4.809	0.123	0.001	7.893	547.1	2867.5	191
1.43	4.838	0.153	0.001	7.933	747.5	2868.2	261
1.73	4.865	0.180	0.001	7.977	965.0	2868.8	336
2.02	4.888	0.203	0.002	8.024	1205.3	2869.4	420
2.30	4.911	0.225	0.002	8.074	1452.0	2869.9	506
2.60	4.930	0.245	0.002	8.124	1706.6	2870.4	595
2.88	4.949	0.263	0.002	8.175	1959.1	2870.8	682
3.17	4.964	0.278	0.002	8.226	2219.3	2871.2	773
3.47	4.978	0.292	0.002	8.278	2478.8	2871.5	863
3.75	4.993	0.307	0.003	8.329	2735.5	2871.9	953
4.03	5.009	0.323	0.003	8.379	2986.8	2872.3	1040
4.33	5.026	0.341	0.003	8.429	3234.2	2872.7	1126
4.62	5.043	0.358	0.003	8.478	3483.5	2873.1	1212
4.92	5.062	0.377	0.003	8.526	3725.5	2873.5	1296
5.20	5.085	0.400	0.003	8.575	3967.8	2874.1	1381
5.48	5.107	0.421	0.003	8.623	4208.7	2874.6	1464
5.78	5.128	0.443	0.004	8.670	4444.2	2875.1	1546
6.07	5.151	0.465	0.004	8.716	4675.3	2875.7	1626
6.35	5.174	0.489	0.004	8.762	4906.3	2876.2	1706
6.50	5.187	0.501	0.004	8.783	5012.7	2876.5	1743
6.63	5.200	0.514	0.004	8.803	5114.3	2876.8	1778
6.77	5.218	0.532	0.004	8.821	5205.8	2877.3	1809
6.92	5.240	0.555	0.005	8.836	5282.4	2877.8	1836
7.05	5.279	0.594	0.005	8.838	5291.7	2878.7	1838
7.18	6.520	1.834	0.015	7.864	401.3	2908.8	138
7.33	6.537	1.852	0.015	7.858	372.1	2909.3	128
7.47	6.540	1.854	0.015	7.857	362.7	2909.3	125

Unconfined Compressive Strength: 1,800

kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M02 Sample Number: \$5 Depth: 53.30 - 53.90m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 60.39 mm

Initial Length: 120.43 mm

Initial Mass: 662.48 g

Initial Bulk Density: 1.92 t/m³

Initial Dry Density: 1.55 t/m³

Water Content After Test: 24.7 %

Failure Conditions:

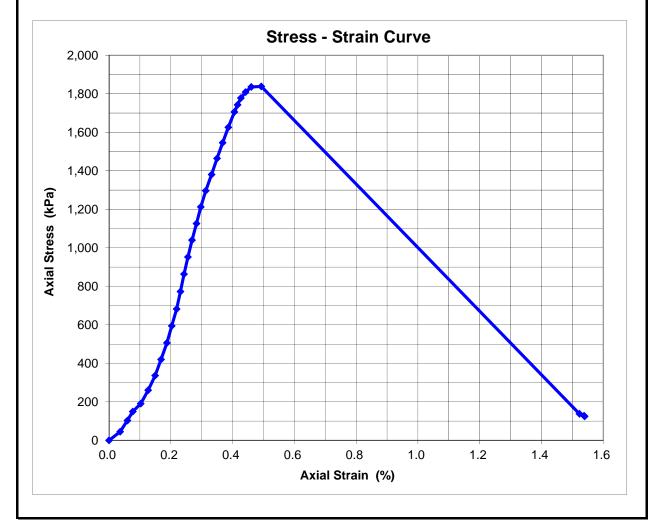
Strain at failure: 0.49 %

Compression at failure: 0.59 mm

0.084 mm / minute

Mode of Failure: brittle

Rate of Compression:





Job No:	Reg. No:	Report No:	Page 18 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M02 Sample Number: S5 Depth: 53.30 - 53.90m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, very weak, orange, weakly cemented.

SAMPLE BEFORE TEST







Job No:	Reg. No:	Report No:	Page 19 of 69
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	WA	TAKERE LHRA	- MURIWAI

VAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S6** Depth: **55.20 – 55.50m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	1.892	0.000	0.000	6.499	0.0	2863.8	0
0.38	1.957	0.065	0.001	6.513	69.8	2865.4	24
0.75	2.010	0.118	0.001	6.534	177.4	2866.7	62
1.12	2.050	0.159	0.001	6.559	302.4	2867.6	105
1.50	2.085	0.194	0.002	6.585	432.2	2868.5	151
1.87	2.104	0.213	0.002	6.599	504.0	2868.9	176
2.23	2.143	0.251	0.002	6.632	669.0	2869.8	233
2.62	2.178	0.286	0.002	6.669	851.6	2870.7	297
2.98	2.213	0.321	0.003	6.709	1052.0	2871.5	366
3.37	2.245	0.354	0.003	6.752	1267.5	2872.3	441
3.73	2.278	0.387	0.003	6.796	1491.1	2873.1	519
4.10	2.308	0.417	0.003	6.843	1724.9	2873.8	600
4.48	2.338	0.447	0.004	6.890	1964.6	2874.5	683
4.85	2.368	0.476	0.004	6.939	2209.6	2875.3	768
5.22	2.396	0.505	0.004	6.989	2458.9	2875.9	855
5.60	2.425	0.534	0.004	7.038	2705.9	2876.6	941
5.97	2.453	0.561	0.005	7.088	2956.9	2877.3	1028
6.33	2.481	0.589	0.005	7.136	3196.5	2878.0	1111
6.72	2.518	0.626	0.005	7.177	3403.6	2878.9	1182
7.08	3.420	1.528	0.013	6.558	298.3	2900.8	103
7.30	3.476	1.584	0.013	6.556	285.6	2902.2	98

Unconfined Compressive Strength: 1,200

kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By: WEC 27-Sep-23 Compiled By: WEC 28-Sep-23 Checked By: 2-Oct-23

Depth: 55.20 - 55.50m Borehole: BH-M02 Sample Number: \$6

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

> **Initial Diameter:** 60.39 mm **Initial Length:** 119.93 **Initial Mass:** 673.48

Initial Bulk Density: 1.96

Initial Dry Density: 1.65 t/m³

Water Content After Test: 19.5

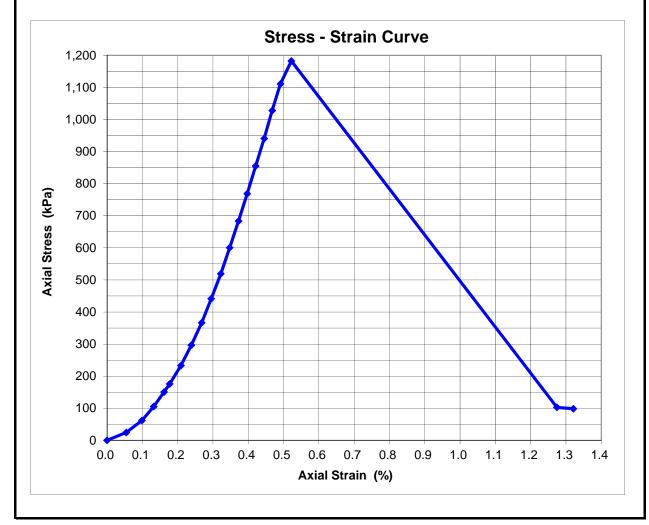
Failure Conditions:

Strain at failure: 0.52

Compression at failure: 0.63 mm

Rate of Compression: 0.093 mm / minute

Mode of Failure: planar





Job No:	Reg. No:	Report No:	Page 21 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M02 Sample Number: S6 Depth: 55.20 - 55.50m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to medium, very weak, dark orange, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

 Tested By:
 WEC
 27-Sep-23

 Compiled By:
 WEC
 28-Sep-23

 Checked By:
 JF
 2-Oct-23

Borehole: **BH-M02** Sample Number: **S7** Depth: **55.80** – **56.11m**

Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
1.386	0.000	0.000	6.505	0.0	2546.6	0
1.454	0.067	0.001	6.524	96.1	2548.0	38
1.513	0.127	0.001	6.549	220.5	2549.3	86
1.562	0.176	0.001	6.581	382.8	2550.3	150
1.575	0.189	0.002	6.601	483.1	2550.6	189
1.597	0.210	0.002	6.637	662.9	2551.1	260
1.622	0.235	0.002	6.678	870.6	2551.6	341
1.643	0.257	0.002	6.724	1099.3	2552.1	431
1.668	0.282	0.002	6.771	1338.4	2552.6	524
1.689	0.302	0.003	6.822	1590.9	2553.0	623
1.713	0.326	0.003	6.873	1846.5	2553.6	723
1.737	0.351	0.003	6.925	2109.3	2554.1	826
1.760	0.374	0.003	6.978	2373.9	2554.6	929
1.787	0.400	0.003	7.030	2635.4	2555.1	1031
1.813	0.426	0.004	7.080	2889.5	2555.7	1131
1.842	0.456	0.004	7.129	3134.5	2556.3	1226
1.893	0.507	0.004	7.164	3310.3	2557.4	1294
1.926	0.539	0.004	7.156	3266.8	2558.1	1277
2.475	1.088	0.009	6.759	1273.6	2569.9	496
			1			
	Gauge (mm) 1.386 1.454 1.513 1.562 1.575 1.597 1.622 1.643 1.668 1.689 1.713 1.737 1.760 1.787 1.813 1.842 1.893	Gauge (mm) Compression (mm) 1.386 0.000 1.454 0.067 1.513 0.127 1.562 0.176 1.575 0.189 1.597 0.210 1.622 0.235 1.643 0.257 1.668 0.282 1.689 0.302 1.713 0.326 1.737 0.351 1.760 0.374 1.787 0.400 1.813 0.426 1.842 0.456 1.893 0.507 1.926 0.539	Gauge (mm) Compression (mm) Strain 1.386 0.000 0.000 1.454 0.067 0.001 1.513 0.127 0.001 1.562 0.176 0.001 1.575 0.189 0.002 1.597 0.210 0.002 1.622 0.235 0.002 1.643 0.257 0.002 1.668 0.282 0.002 1.689 0.302 0.003 1.713 0.326 0.003 1.737 0.351 0.003 1.760 0.374 0.003 1.813 0.426 0.004 1.842 0.456 0.004 1.893 0.507 0.004 1.926 0.539 0.004	Gauge (mm) Compression (mm) Strain Load Gauge (mm) 1.386 0.000 0.000 6.505 1.454 0.067 0.001 6.524 1.513 0.127 0.001 6.549 1.562 0.176 0.001 6.581 1.575 0.189 0.002 6.601 1.597 0.210 0.002 6.637 1.622 0.235 0.002 6.678 1.643 0.257 0.002 6.724 1.688 0.282 0.002 6.771 1.689 0.302 0.003 6.822 1.713 0.326 0.003 6.873 1.737 0.351 0.003 6.925 1.760 0.374 0.003 7.030 1.813 0.426 0.004 7.080 1.842 0.456 0.004 7.164 1.926 0.539 0.004 7.156	Gauge (mm) Compression (mm) Strain (mm) Load Gauge (mm) Axial Force (N) 1.386 0.000 0.000 6.505 0.0 1.454 0.067 0.001 6.524 96.1 1.513 0.127 0.001 6.549 220.5 1.562 0.176 0.001 6.581 382.8 1.575 0.189 0.002 6.601 483.1 1.597 0.210 0.002 6.637 662.9 1.622 0.235 0.002 6.678 870.6 1.643 0.257 0.002 6.724 1099.3 1.668 0.282 0.002 6.771 1338.4 1.689 0.302 0.003 6.822 1590.9 1.713 0.326 0.003 6.873 1846.5 1.737 0.351 0.003 6.925 2109.3 1.760 0.374 0.003 7.030 2635.4 1.813 0.426 0.004 7.080 2889.5 <td>Gauge (mm) Compression (mm) Strain (mm) Load Gauge (mm) Axial Force (N) Area (mm²) 1.386 0.000 0.000 6.505 0.0 2546.6 1.454 0.067 0.001 6.524 96.1 2548.0 1.513 0.127 0.001 6.549 220.5 2549.3 1.562 0.176 0.001 6.581 382.8 2550.3 1.575 0.189 0.002 6.601 483.1 2550.6 1.597 0.210 0.002 6.637 662.9 2551.1 1.622 0.235 0.002 6.678 870.6 2551.6 1.643 0.257 0.002 6.724 1099.3 2552.1 1.668 0.282 0.002 6.771 1338.4 2552.6 1.689 0.302 0.003 6.822 1590.9 2553.0 1.713 0.326 0.003 6.873 1846.5 2553.6 1.737 0.351 0.003 6.925</td>	Gauge (mm) Compression (mm) Strain (mm) Load Gauge (mm) Axial Force (N) Area (mm²) 1.386 0.000 0.000 6.505 0.0 2546.6 1.454 0.067 0.001 6.524 96.1 2548.0 1.513 0.127 0.001 6.549 220.5 2549.3 1.562 0.176 0.001 6.581 382.8 2550.3 1.575 0.189 0.002 6.601 483.1 2550.6 1.597 0.210 0.002 6.637 662.9 2551.1 1.622 0.235 0.002 6.678 870.6 2551.6 1.643 0.257 0.002 6.724 1099.3 2552.1 1.668 0.282 0.002 6.771 1338.4 2552.6 1.689 0.302 0.003 6.822 1590.9 2553.0 1.713 0.326 0.003 6.873 1846.5 2553.6 1.737 0.351 0.003 6.925

Unconfined Compressive Strength: 1,300 kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$7** Depth: **55.80 – 56.11m**

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 56.94 mm

Initial Length: 120.02 mm

Initial Mass: 586.43

Initial Bulk Density: 1.92 t/m³

Initial Dry Density: 1.60 t/m³

Water Content After Test: 20.6 %

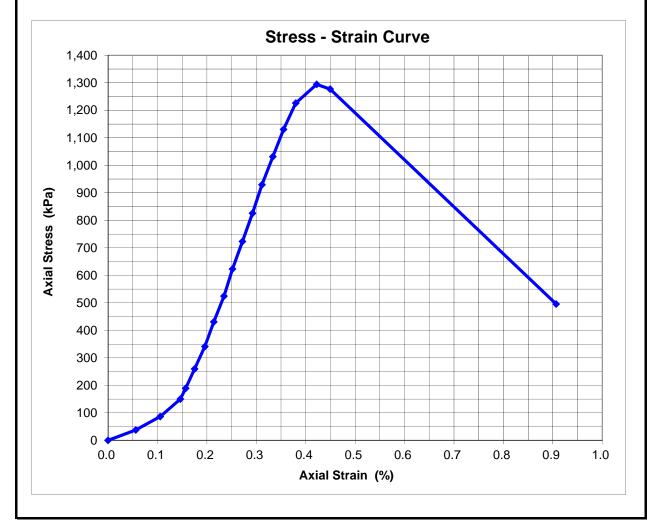
Failure Conditions:

Strain at failure: 0.42 %

Compression at failure: 0.51 mm

Rate of Compression: 0.085 mm / minute

Mode of Failure: brittle





Job No:	Reg. No:	Report No:	Page 24 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M02 Sample Number: S7 Depth: 55.80 - 56.11m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, very weak, dark orange, weakly to moderately cemented.

SAMPLE BEFORE TEST







Job No:	Reg. No:	Report No:	Page 25 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$8** Depth: **56.50 - 56.90m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	6.645	0.000	0.000	6.499	0.0	2738.4	0
0.13	6.672	0.027	0.000	6.505	28.1	2739.0	10
0.27	6.700	0.055	0.000	6.510	57.2	2739.6	21
0.42	6.727	0.082	0.001	6.516	85.9	2740.2	31
0.55	6.758	0.113	0.001	6.522	116.8	2741.0	43
0.70	6.786	0.141	0.001	6.530	154.3	2741.6	56
0.83	6.815	0.170	0.001	6.536	187.3	2742.2	68
0.97	6.839	0.193	0.002	6.545	230.4	2742.8	84
1.12	6.854	0.209	0.002	6.554	276.7	2743.2	101
1.48	6.885	0.240	0.002	6.584	425.3	2743.9	155
1.85	6.901	0.256	0.002	6.595	481.1	2744.2	175
2.23	6.928	0.282	0.002	6.631	662.7	2744.8	241
2.60	6.959	0.313	0.003	6.670	858.5	2745.5	313
2.97	6.988	0.343	0.003	6.712	1070.9	2746.2	390
3.35	7.012	0.367	0.003	6.758	1298.5	2746.8	473
3.72	7.039	0.394	0.003	6.805	1533.7	2747.4	558
4.08	7.069	0.424	0.004	6.853	1778.0	2748.1	647
4.47	7.092	0.447	0.004	6.904	2035.1	2748.6	740
4.83	7.115	0.470	0.004	6.956	2294.8	2749.1	835
5.22	7.135	0.490	0.004	7.009	2560.3	2749.6	931
5.58	7.159	0.514	0.004	7.060	2818.1	2750.1	1025
5.93	7.223	0.577	0.005	7.078	2908.5	2751.6	1057
6.17	7.248	0.602	0.005	7,107	3050.2	2752.2	1108
6.42	7.997	1.352	0.011	6.548	246.9	2769.5	89

Unconfined Compressive Strength: 1,100 kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Depth: 56.50 - 56.90m Borehole: BH-M02 Sample Number: \$8

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 59.05 mm **Initial Length:** 120.11 **Initial Mass:** 636.25 Initial Bulk Density: 1.93

Initial Dry Density: 1.60 t/m³

Water Content After Test: 20.8

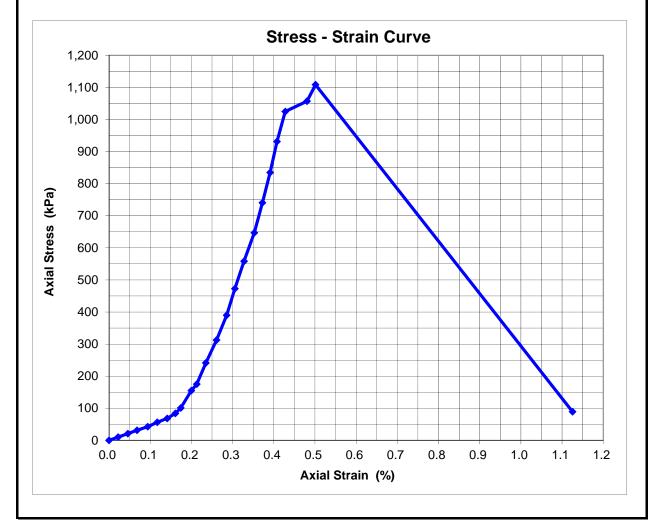
Failure Conditions:

0.50 Strain at failure:

0.60 Compression at failure: mm

Rate of Compression: 0.098 mm / minute

Mode of Failure: brittle





 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: **BH-M02** Sample Number: **S8** Depth: **56.50 – 56.90m**

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, very weak, dark orange, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S9** Depth: **64.44** – **64.72m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	2.253	0.000	0.000	5.246	0.0	2693.3	0
0.37	2.317	0.063	0.001	5.258	58.3	2694.8	22
0.73	2.372	0.119	0.001	5.274	138.6	2696.0	51
1.12	2.430	0.177	0.001	5.297	252.7	2697.3	94
1.48	2.484	0.230	0.002	5.327	404.7	2698.5	150
1.87	2.512	0.258	0.002	5.340	470.5	2699.1	174
2.23	2.525	0.272	0.002	5.380	670.0	2699.4	248
2.60	2.552	0.299	0.002	5.425	895.1	2700.0	332
2.98	2.576	0.323	0.003	5.472	1132.0	2700.5	419
3.35	2.599	0.346	0.003	5.521	1380.5	2701.0	511
3.72	2.622	0.369	0.003	5.574	1644.2	2701.6	609
4.10	2.645	0.391	0.003	5.627	1911.8	2702.1	708
4.47	2.666	0.413	0.003	5.682	2188.0	2702.6	810
4.83	2.688	0.435	0.004	5.737	2464.7	2703.1	912
5.22	2.712	0.458	0.004	5.790	2731.2	2703.6	1010
5.58	2.744	0.491	0.004	5.835	2956.3	2704.3	1093
5.83	2.765	0.512	0.004	5.865	3108.3	2704.8	1149
6.07	2.784	0.531	0.004	5.897	3265.6	2705.2	1207
6.30	2.804	0.551	0.005	5.922	3392.3	2705.7	1254
6.55	2.885	0.632	0.005	5.874	3150.0	2707.5	1163
6.78	3.639	1.385	0.011	5.351	524.6	2724.5	193
					1		

Unconfined Compressive Strength: 1,300 kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Depth: 64.44 - 64.72m Borehole: BH-M02 Sample Number: \$9

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

> **Initial Diameter:** 58.56 mm **Initial Length:** 121.19 **Initial Mass:** 667.98

Initial Bulk Density: 2.05 t/m³

Initial Dry Density: 1.65 t/m³

Water Content After Test: 22.9

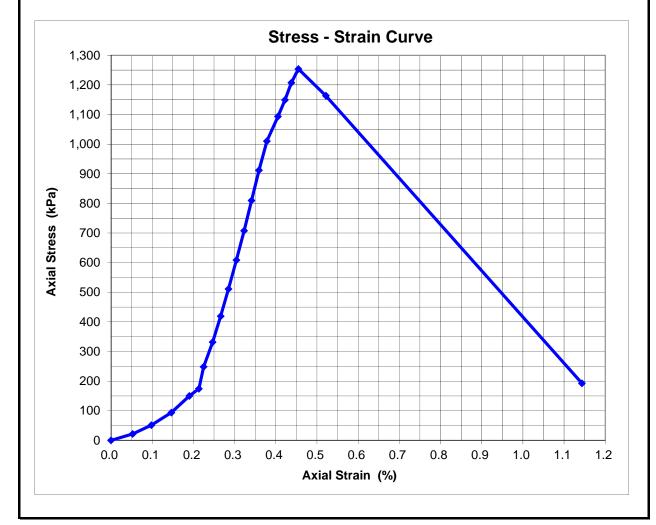
Failure Conditions:

0.45 Strain at failure:

Compression at failure: 0.55 mm

Rate of Compression: 0.088 mm / minute

Mode of Failure: brittle





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: **BH-M02** Sample Number: **S9** Depth: **64.44** – **64.72**m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, very weak, dark brownish orange, weakly to moderately cemented.

SAMPLE BEFORE TEST







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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23	
Compiled By:	WEC	28-Sep-23	•
Checked By:	JF	2-Oct-23	•

Borehole: **BH-M02** Sample Number: **S10** Depth: **67.93 – 68.33m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	8.820	0.000	0.000	5.246	0.0	2634.3	0
0.37	8.897	0.077	0.001	5.254	40.0	2636.0	15
0.73	8.972	0.152	0.001	5.267	104.8	2637.7	40
1.12	9.037	0.216	0.002	5.288	209.4	2639.1	79
1.48	9.085	0.265	0.002	5.316	348.3	2640.2	132
1.85	9.116	0.296	0.002	5.339	463.6	2640.8	176
2.23	9.129	0.309	0.003	5.365	595.9	2641.1	226
2.60	9.160	0.339	0.003	5.406	802.8	2641.8	304
2.97	9.192	0.371	0.003	5.448	1012.6	2642.5	383
3.35	9.226	0.406	0.003	5.491	1228.9	2643.3	465
3.72	9.273	0.453	0.004	5.526	1403.7	2644.3	531
4.00	9.299	0.479	0.004	5.557	1561.9	2644.9	591
4.13	9.312	0.492	0.004	5.573	1641.1	2645.2	620
4.27	9.325	0.505	0.004	5.589	1719.8	2645.5	650
4.42	9.339	0.519	0.004	5.606	1805.8	2645.8	683
4.55	9.352	0.532	0.004	5.623	1889.0	2646.0	714
4.70	9.366	0.546	0.005	5.638	1965.6	2646.4	743
4.83	9.380	0.560	0.005	5.653	2044.1	2646.7	772
4.97	9.397	0.577	0.005	5.666	2108.5	2647.0	797
5.12	9.804	0.984	0.008	5.347	505.4	2656.1	190

Unconfined Compressive Strength: 800



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S10** Depth: **67.93** – **68.33m**

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

643.51

Initial Diameter: 57.92 mm

Initial Length: 120.24 mm

Initial Bulk Density: 2.03 t/m³

Initial Dry Density: 1.65 t/m³

Water Content After Test: 24.2 %

Initial Mass:

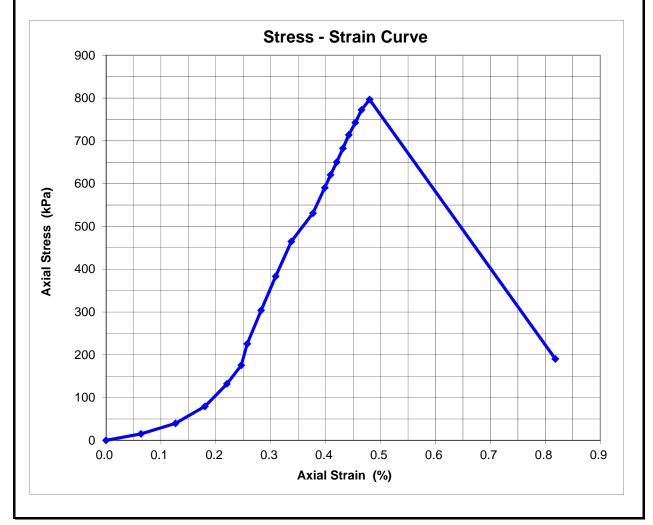
Failure Conditions:

Strain at failure: 0.48 %

Compression at failure: 0.58 mm

Rate of Compression: 0.12 mm / minute

Mode of Failure: brittle





Job No:	Reg. No:	Report No:	Page 33 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M02 Sample Number: S10 Depth: 67.93 - 68.33m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, dark orangish brown, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S11** Depth: **74.20 – 74.50m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	3.600	0.000	0.000	5.246	0.0	2899.0	0
0.37	3.673	0.073	0.001	5.263	83.8	2900.8	29
0.75	3.740	0.140	0.001	5.282	179.9	2902.4	62
1.12	3.798	0.197	0.002	5.304	290.9	2903.8	100
1.48	3.855	0.255	0.002	5.328	410.3	2905.2	141
1.87	3.874	0.274	0.002	5.338	461.0	2905.7	159
2.23	3.910	0.309	0.003	5.368	609.8	2906.5	210
2.60	3.953	0.352	0.003	5.401	775.8	2907.6	267
2.98	3.995	0.394	0.003	5.435	945.6	2908.6	325
3.35	4.038	0.437	0.004	5.471	1125.5	2909.6	387
3.72	4.078	0.477	0.004	5.508	1312.2	2910.6	451
4.10	4.127	0.527	0.004	5.543	1491.9	2911.8	512
4.27	4.145	0.545	0.005	5.562	1583.8	2912.3	544
4.42	4.159	0.558	0.005	5.576	1654.8	2912.6	568
4.55	4.182	0.582	0.005	5.588	1715.0	2913.2	589
4.68	4.189	0.589	0.005	5.604	1796.5	2913.3	617
4.83	4.214	0.614	0.005	5.614	1847.5	2913.9	634
4.97	4.229	0.629	0.005	5.627	1908.9	2914.3	655
5.12	4.253	0.653	0.005	5.635	1953.2	2914.9	670
5.25	4.269	0.669	0.006	5.645	2001.3	2915.3	686
5.38	4.288	0.687	0.006	5.652	2037.2	2915.7	699
5.53	4.312	0.712	0.006	5.653	2043.1	2916.3	701
5.67	4.342	0.742	0.006	5.649	2019.4	2917.1	692
5.80	4.398	0.798	0.007	5.612	1835.0	2918.4	629
5.95	4.553	0.953	0.008	5.482	1181.8	2922.2	404
6.08	4.737	1.137	0.009	5.381	676.1	2926.8	231
6.22	4.798	1.197	0.010	5.358	559.8	2928.3	191
6.37	4.845	1.245	0.010	5.343	484.3	2929.4	165
6.50	4.897	1.296	0.011	5.331	426.3	2930.7	145

Unconfined Compressive Strength:

700



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S11** Depth: **74.20 – 74.50m**

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

655.99

Initial Diameter: 60.76 mm

Initial Length: 120.00 mm

Initial Bulk Density: 1.89 t/m³

Initial Dry Density: 1.45 t/m³

Water Content After Test: 31.8 %

Initial Mass:

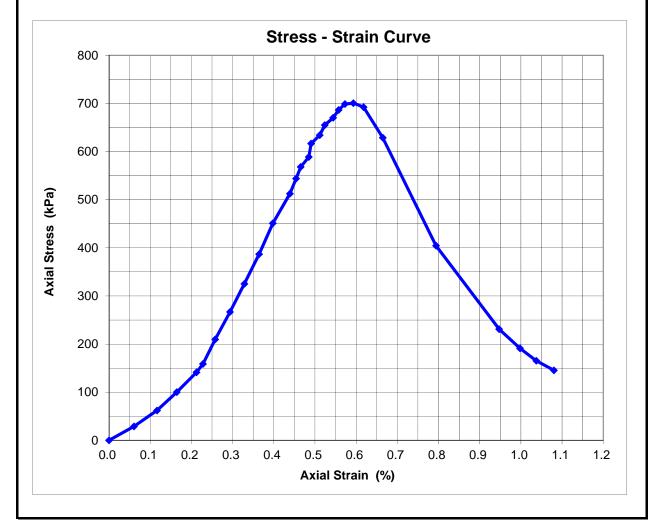
Failure Conditions:

Strain at failure: 0.59 %

Compression at failure: 0.71 mm

Rate of Compression: 0.13 mm / minute

Mode of Failure: brittle





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: **BH-M02** Sample Number: **S11** Depth: **74.20 – 74.50m**

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, brown, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S12** Depth: **76.13 – 76.40m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	8.870	0.000	0.000	5.244	0.0	2887.4	0
0.37	8.944	0.075	0.001	5.255	53.6	2889.2	19
0.73	8.980	0.110	0.001	5.271	133.4	2890.0	46
1.12	9.034	0.164	0.001	5.290	229.3	2891.3	79
1.48	9.081	0.211	0.002	5.316	361.0	2892.5	125
1.87	9.117	0.247	0.002	5.336	457.5	2893.3	158
2.23	9.140	0.270	0.002	5.356	558.2	2893.9	193
2.60	9.181	0.312	0.003	5.388	720.3	2894.9	249
2.98	9.221	0.351	0.003	5.423	894.9	2895.8	309
3.35	9.257	0.388	0.003	5.461	1086.2	2896.7	375
3.72	9.294	0.424	0.004	5.500	1284.2	2897.6	443
4.10	9.331	0.462	0.004	5.538	1474.9	2898.5	509
4.47	9.380	0.511	0.004	5.566	1613.1	2899.7	556
4.73	9.432	0.562	0.005	5.555	1556.9	2901.0	537
4.88	9.482	0.612	0.005	5.523	1399.1	2902.2	482
5.02	9.534	0.665	0.006	5.520	1383.4	2903.5	476
5.15	9.581	0.711	0.006	5.518	1374.5	2904.6	473
5.30	9.625	0.756	0.006	5.514	1350.9	2905.7	465
5.43	9.699	0.829	0.007	5.487	1219.8	2907.5	420
5.57	9.754	0.885	0.007	5.470	1132.0	2908.8	389
5.72	9.814	0.944	0.008	5.443	996.2	2910.3	342
5.85	9.882	1.012	0.008	5.410	831.5	2911.9	286

Unconfined Compressive Strength:



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **S12** Depth: **76.13 – 76.40m**

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 60.63 mm

Initial Length: 119.95 mm

Initial Mass: 647.59

Initial Bulk Density: 1.87 t/m³

Initial Dry Density: 1.40 t/m³

Water Content After Test: 31.8 %

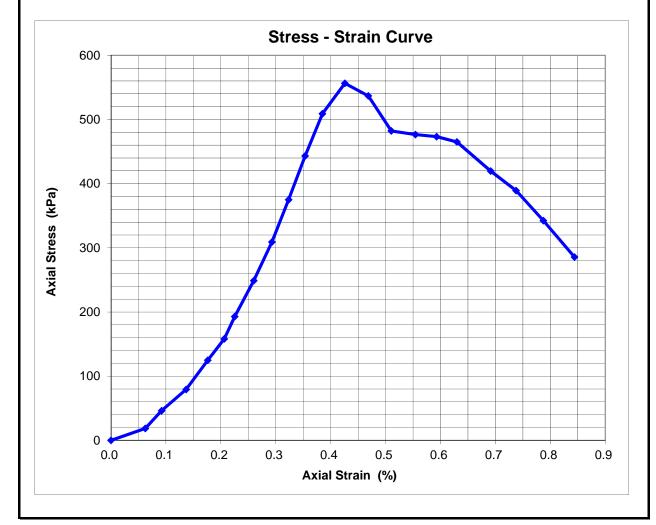
Failure Conditions:

Strain at failure: 0.43 %

Compression at failure: 0.51 mm

Rate of Compression: 0.11 mm / minute

Mode of Failure: brittle





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Report No:

Tested By:	WEC	27-Sep-23		
Compiled By:	WEC	28-Sep-23		
Checked By:	IF	2-Oct-23		

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Version 3, July 2022

Unconfined Compressive Strength of Cohesive Soils Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Sample Number: \$12 Depth: 76.13 - 76.40m Borehole: BH-M02

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak, grey with light brown oxidation around circumference, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: **BH-M02** Sample Number: **\$13** Depth: **78.14 – 78.47m**

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	8.668	0.000	0.000	5.243	0.0	2696.3	0
0.38	8.737	0.070	0.001	5.258	75.8	2697.9	28
0.75	8.800	0.132	0.001	5.279	181.6	2699.3	67
1.12	8.856	0.188	0.002	5.304	306.5	2700.6	113
1.50	8.895	0.228	0.002	5.332	449.3	2701.5	166
1.87	8.910	0.242	0.002	5.344	507.4	2701.8	188
2.23	8.948	0.281	0.002	5.377	674.4	2702.7	250
2.62	8.971	0.304	0.003	5.416	871.2	2703.2	322
2.98	9.006	0.338	0.003	5.454	1063.4	2704.0	393
3.23	9.025	0.357	0.003	5.482	1199.4	2704.4	443
3.47	9.046	0.379	0.003	5.509	1339.6	2704.9	495
3.72	9.067	0.399	0.003	5.537	1479.6	2705.3	547
3.95	9.086	0.418	0.003	5.567	1626.8	2705.8	601
4.18	9.102	0.434	0.004	5.596	1773.6	2706.1	655
4.43	9.119	0.451	0.004	5.625	1921.4	2706.5	710
4.67	9.131	0.463	0.004	5.657	2081.9	2706.8	769
4.90	9.145	0.477	0.004	5.688	2236.5	2707.1	826
5.15	9.162	0.494	0.004	5.718	2387.9	2707.5	882
5.38	9.176	0.508	0.004	5.749	2540.9	2707.8	938
5.62	9.191	0.524	0.004	5.779	2691.0	2708.1	994
5.87	9.209	0.541	0.005	5.805	2822.4	2708.5	1042
6.10	9.561	0.894	0.007	5.549	1536.5	2716.6	566
6.33	9.625	0.958	0.008	5.551	1549.6	2718.0	570
6.58	9.692	1.024	0.009	5.555	1569.4	2719.5	577
6.82	9.750	1.082	0.009	5.562	1605.5	2720.9	590
7.05	9.808	1.140	0.009	5.570	1641.4	2722.2	603

Unconfined Compressive Strength: 1,000 kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Depth: 78.14 - 78.47m Borehole: BH-M02 Sample Number: \$13

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

> **Initial Diameter:** 58.59 mm **Initial Length:** 120.07 Initial Mass: 633.33

Initial Bulk Density: 1.96

1.55 **Initial Dry Density:** t/m³

Water Content After Test: 25.4

Failure Conditions:

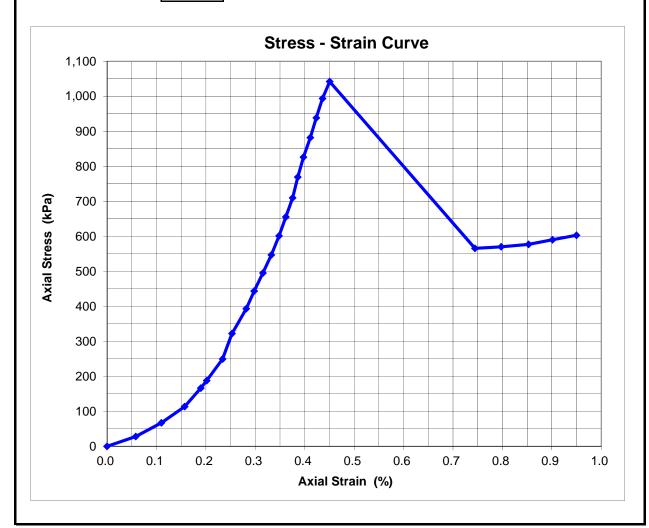
0.45 Strain at failure:

Compression at failure: 0.54 mm

Rate of Compression:

Mode of Failure: brittle

0.092 mm / minute





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: **BH-M02** Sample Number: **S13** Depth: **78.14 – 78.47m**

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to coarse, extremely weak to very weak, banded brown & dark brown, weakly cemented.

SAMPLE BEFORE TEST







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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23	
Compiled By:	WEC	28-Sep-23	
Checked Bv:	JF	2-Oct-23	

Borehole: BH-M03 Sample Number: UCS01 Depth: 9.93 - 10.13m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	3.399	0.000	0.000	5.243	0.0	2745.8	0
0.28	3.461	0.062	0.001	5.248	25.3	2747.9	9
0.58	3.521	0.122	0.002	5.253	53.3	2750.0	19
0.87	3.578	0.179	0.002	5.260	87.1	2752.0	32
1.15	3.630	0.232	0.003	5.268	126.3	2753.8	46
1.45	3.683	0.284	0.004	5.276	167.8	2755.6	61
1.73	3.738	0.340	0.004	5.284	206.2	2757.5	75
2.02	3.792	0.394	0.005	5.291	242.9	2759.4	88
2.32	3.847	0.449	0.006	5.298	278.5	2761.3	101
2.60	3.904	0.505	0.006	5.304	309.5	2763.3	112
2.88	3.962	0.563	0.007	5.309	335.4	2765.3	121
3.18	4.022	0.624	0.008	5.313	355.8	2767.4	129
3.47	4.083	0.684	0.009	5.317	373.0	2769.5	135
3.75	4.144	0.745	0.009	5.319	385.7	2771.6	139
4.05	4.207	0.808	0.010	5.320	390.7	2773.9	141
4.33	4.279	0.880	0.011	5.316	367.7	2776.4	132
4.62	4.344	0.946	0.012	5.315	363.3	2778.7	131
4.92	4.410	1.012	0.013	5.314	360.9	2781.0	130
5.20	4.478	1.079	0.014	5.314	360.2	2783.4	129
5.48	4.545	1.146	0.014	5.314	359.3	2785.7	129
5.78	4.609	1.210	0.015	5.314	359.6	2788.0	129
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Unconfined Compressive Strength: 140 kPa



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS01 Depth: 9.93 - 10.13m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 59.13 mm

Initial Length: 79.91 mm

Initial Mass: 432.98 g

Initial Bulk Density: 1.97 t/m³

Initial Dry Density: 1.60 t/m³

Water Content After Test: 24.5 %

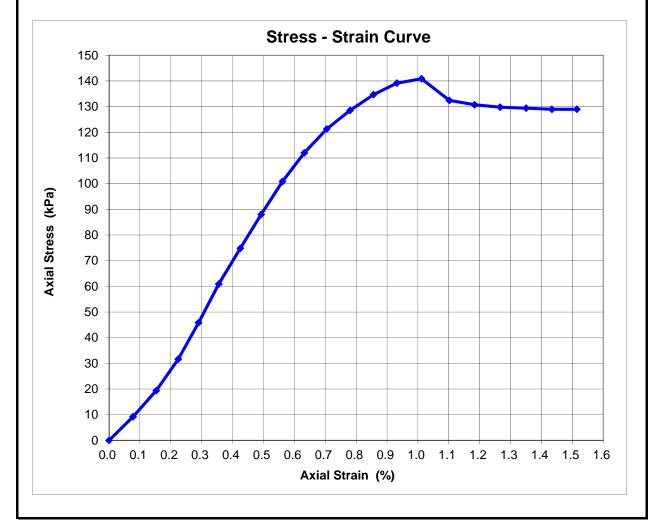
Failure Conditions:

Strain at failure: 1.0 %

Compression at failure: 0.81 mm

Rate of Compression: 0.20 mm / minute

Mode of Failure: plastic / brittle





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS01 Depth: 9.93 – 10.13m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine, extremely weak, banded orange, dark orange & yellow, very weakly cemented.

SAMPLE BEFORE TEST







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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS02 Depth: 16.00 - 16.27m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	3.064	0.000	0.000	5.256	0.0	2645.0	0
0.28	3.120	0.057	0.000	5.265	42.0	2646.3	16
0.58	3.183	0.120	0.001	5.270	70.8	2647.7	27
0.87	3.240	0.177	0.001	5.278	106.4	2648.9	40
1.15	3.297	0.234	0.002	5.286	149.7	2650.2	56
1.45	3.354	0.290	0.002	5.295	194.2	2651.5	73
1.73	3.406	0.343	0.003	5.305	245.3	2652.6	92
2.02	3.454	0.391	0.003	5.317	302.0	2653.7	114
2.32	3.507	0.443	0.004	5.327	353.9	2654.8	133
2.60	3.559	0.495	0.004	5.338	410.2	2656.0	154
2.88	3.612	0.548	0.005	5.349	464.8	2657.2	175
3.18	3.657	0.593	0.005	5.354	487.9	2658.2	184
3.47	3.697	0.633	0.005	5.358	508.1	2659.1	191
3.60	3.725	0.661	0.006	5.362	529.7	2659.7	199
3.75	3.754	0.690	0.006	5.366	550.0	2660.3	207
3.88	3.782	0.718	0.006	5.370	568.1	2661.0	213
4.02	3.811	0.747	0.006	5.373	584.8	2661.6	220
4.17	3.840	0.776	0.006	5.376	602.2	2662.3	226
4.30	3.867	0.804	0.007	5.380	619.5	2662.9	233
4.43	3.896	0.832	0.007	5.383	635.6	2663.5	239
4.58	3.923	0.860	0.007	5.386	651.6	2664.1	245
4.72	3.953	0.889	0.007	5.389	664.5	2664.8	249
4.85	3.982	0.918	0.008	5.392	678.4	2665.4	255
5.00	4.012	0.948	0.008	5.394	690.5	2666.1	259
5.13	4.042	0.978	0.008	5.396	701.4	2666.8	263
5.27	4.072	1.009	0.008	5.398	710.4	2667.5	266
5.42	4.103	1.040	0.009	5.400	720.3	2668.2	270
5.55	4.132	1.069	0.009	5.402	730.7	2668.8	274
5.68	4.162	1.098	0.009	5.404	740.2	2669.5	277
5.83	4.194	1.130	0.009	5.405	747.1	2670.2	280
5.97	4.226	1.162	0.010	5.406	751.9	2670.9	282
6.10	4.258	1.194	0.010	5.407	754.0	2671.6	282
6.25	4.291	1.227	0.010	5.407	754.5	2672.4	282
6.38	4.323	1.260	0.010	5.406	752.6	2673.1	282
6.52	4.359	1.295	0.011	5.405	747.2	2673.9	279
6.67	4.396	1.332	0.011	5.404	740.3	2674.7	277
6.80	4.431	1.367	0.011	5.402	729.7	2675.5	273
6.93	4.467	1.403	0.012	5.400	718.9	2676.3	269
7.08	4.502	1.439	0.012	5.397	707.6	2677.1	264
7.22	4.537	1.474	0.012	5.394	693.2	2677.9	259
7.35	4.573	1.509	0.013	5.391	674.0	2678.7	252

Unconfined Compressive Strength: 2

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Job No:	Reg. No:	Report No:	Page 47 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND **INVESTIGATION**

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Depth: 16.00 - 16.27m Borehole: BH-M03 Sample Number: UCS02

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 58.03 mm **Initial Length:** 119.99 Initial Mass: 612.76 Initial Bulk Density: 1.93

1.50 **Initial Dry Density:** t/m³

Water Content After Test: 30.8

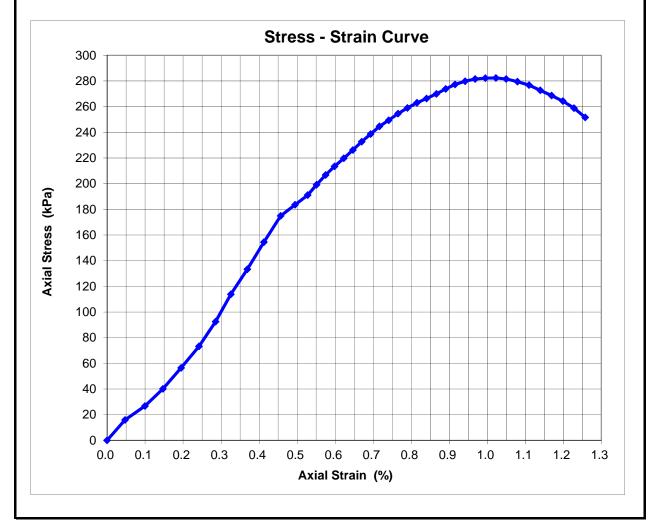
Failure Conditions:

1.0 Strain at failure:

Compression at failure: 1.2 mm

Rate of Compression: 0.20 mm / minute

Mode of Failure: brittle





Job No:	Reg. No:	Report No:	Page 48 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS02 Depth: 16.00 - 16.27m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine, extremely weak, light grey, weakly cemented.

SAMPLE BEFORE TEST







Job No:	Reg. No:	Report No:	Page 49 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022
PROJECT:	WAI	TAKERE LHRA	- MURIWAI

essive Strength of

Compiled By: WEC
Checked By: JF

GROUND INVESTIGATION

Tested By:

WEC

27-Sep-23

28-Sep-23

2-Oct-23

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Borehole: BH-M03 Sample Number: UCS03 Depth: 29.55 - 29.75m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	5.496	0.000	0.000	5.247	0.0	2820.6	0
0.30	5.564	0.068	0.001	5.250	16.3	2822.4	6
0.58	5.631	0.134	0.001	5.253	29.2	2824.1	10
0.87	5.695	0.199	0.002	5.256	46.7	2825.8	17
1.17	5.756	0.259	0.002	5.262	77.2	2827.3	27
1.45	5.817	0.321	0.003	5.267	100.9	2829.0	36
1.75	5.878	0.382	0.004	5.273	130.6	2830.5	46
2.03	5.936	0.440	0.004	5.280	166.8	2832.1	59
2.32	5.994	0.497	0.005	5.288	206.2	2833.6	73
2.62	6.053	0.557	0.005	5.295	242.8	2835.1	86
2.90	6.113	0.617	0.006	5.301	273.6	2836.7	96
3.18	6.173	0.676	0.006	5.306	294.6	2838.3	104
3.43	6.220	0.723	0.007	5.308	309.0	2839.5	109
3.63	6.264	0.768	0.007	5.309	313.3	2840.7	110
3.83	6.310	0.813	0.007	5.310	315.1	2841.9	111
4.05	6.360	0.863	0.008	5.309	311.4	2843.2	110
4.25	6.412	0.915	0.008	5.308	305.4	2844.5	107
4.45	6.468	0.971	0.009	5.304	287.5	2846.0	101
4.67	6.517	1.021	0.009	5.304	285.4	2847.3	100
4.87	6.569	1.072	0.010	5.302	275.7	2848.7	97
5.07	6.621	1.124	0.010	5.299	264.0	2850.1	93
5.28	6.675	1.179	0.011	5.297	254.3	2851.5	89
5.48	6.734	1.237	0.011	5.295	241.9	2853.1	85
5.68	6.797	1.300	0.012	5.291	219.8	2854.7	77

Unconfined Compressive Strength: 110



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WAITAKERE LHRA - MURIWAI GROUND
INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS03 Depth: 29.55 – 29.75m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

PROJECT:

Initial Diameter: 59.93 mm

Initial Length: 108.76 mm

Initial Mass: 614.84

Initial Bulk Density: 2.00 t/m³

Initial Dry Density: 1.60 t/m³

Water Content After Test: 23.4 %

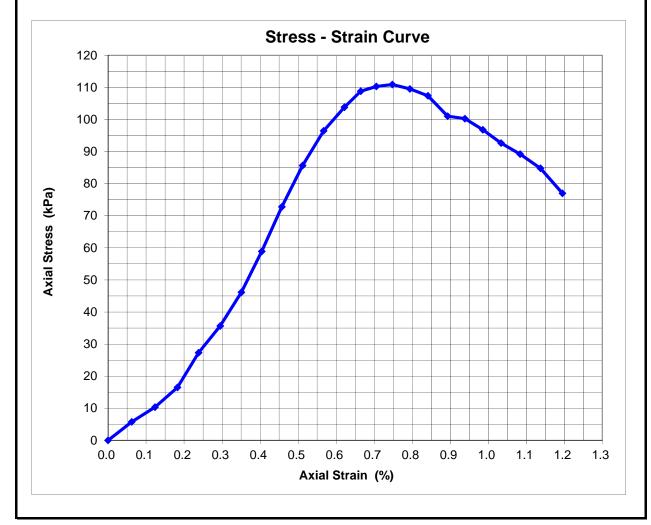
Failure Conditions:

Strain at failure: 0.75 %

Compression at failure: 0.81 mm

Rate of Compression: 0.21 mm / minute

Mode of Failure: planar





Cohesive Soils

WAITAKERE LHRA -	MURIWAI	GROUND
INVESTI	GATION	

Report No:

63532#L/UCS Waitakere LHRA

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	IE	2-Oct-23

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Version 3, July 2022

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1 Checked By:

Borehole: BH-M03 Sample Number: UCS03 Depth: 29.55 – 29.75m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to medium, extremely weak, orange, weakly cemented.

SAMPLE BEFORE TEST





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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

 Tested By:
 WEC
 27-Sep-23

 Compiled By:
 WEC
 28-Sep-23

 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS04 Depth: 31.95 - 32.23m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	2.463	0.000	0.000	5.251	0.0	2604.0	0
0.28	2.522	0.059	0.000	5.257	30.8	2605.2	12
0.58	2.580	0.117	0.001	5.262	54.0	2606.5	21
0.87	2.641	0.178	0.001	5.266	76.2	2607.8	29
1.15	2.702	0.239	0.002	5.271	99.0	2609.2	38
1.45	2.763	0.300	0.003	5.275	121.1	2610.5	46
1.73	2.825	0.362	0.003	5.280	144.3	2611.8	55
2.02	2.886	0.423	0.004	5.285	168.9	2613.2	65
2.32	2.947	0.484	0.004	5.290	193.3	2614.5	74
2.60	3.008	0.545	0.005	5.295	219.4	2615.9	84
2.88	3.069	0.606	0.005	5.300	244.7	2617.2	93
3.18	3.128	0.665	0.006	5.305	272.2	2618.5	104
3.47	3.188	0.725	0.006	5.311	300.2	2619.8	115
3.75	3.247	0.784	0.007	5.316	327.4	2621.1	125
3.97	3.289	0.826	0.007	5.321	349.2	2622.0	133
4.17	3.329	0.866	0.007	5.325	370.3	2622.9	141
4.37	3.370	0.907	0.008	5.329	391.0	2623.8	149
4.58	3.410	0.947	0.008	5.333	412.8	2624.7	157
4.78	3.451	0.988	0.008	5.338	436.1	2625.6	166
5.00	3.492	1.029	0.009	5.342	457.6	2626.5	174
5.40	3.550	1.087	0.009	5.347	480.5	2627.8	183
5.82	3.610	1.147	0.010	5.354	518.4	2629.1	197
6.23	3.692	1.229	0.010	5.364	565.2	2630.9	215
6.63	3.773	1.311	0.011	5.373	609.2	2632.7	231
7.05	3.857	1.394	0.012	5.381	653.1	2634.6	248
7.47	3.938	1.475	0.012	5.390	695.1	2636.4	264
7.87	4.020	1.557	0.013	5.398	735.0	2638.2	279
8.28	4.104	1.641	0.014	5.405	773.3	2640.1	293
8.48	4.146	1.683	0.014	5.409	790.8	2641.0	299
8.90	4.230	1.768	0.015	5.415	821.2	2642.9	311
9.12	4.273	1.810	0.015	5.417	834.9	2643.9	316
9.32	4.314	1.852	0.015	5.420	846.9	2644.8	320
9.52	4.358	1.895	0.016	5.422	856.1	2645.8	324
9.73	4.402	1.939	0.016	5.423	864.1	2646.8	326
9.93	4.447	1.984	0.017	5.424	866.5	2647.8	327
10.13	4.493	2.030	0.017	5.423	864.0	2648.8	326
10.35	4.541	2.078	0.017	5.420	849.7	2649.9	321
10.55	4.593	2.130	0.018	5.415	821.0	2651.1	310
10.75	4.649	2.186	0.018	5.407	782.4	2652.3	295
10.97	4.703	2.240	0.019	5.399	743.6	2653.5	280
11.17	4.761	2.298	0.019	5.388	685.5	2654.8	258

Unconfined Compressive Strength:

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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	27-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS04 Depth: 31.95 - 32.23m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 57.58 mm

Initial Length: 119.87 mm

Initial Mass: 590.37 g

ial Bulk Density: 1.89 t/m³

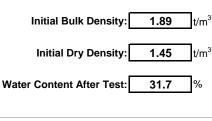
Failure Conditions:

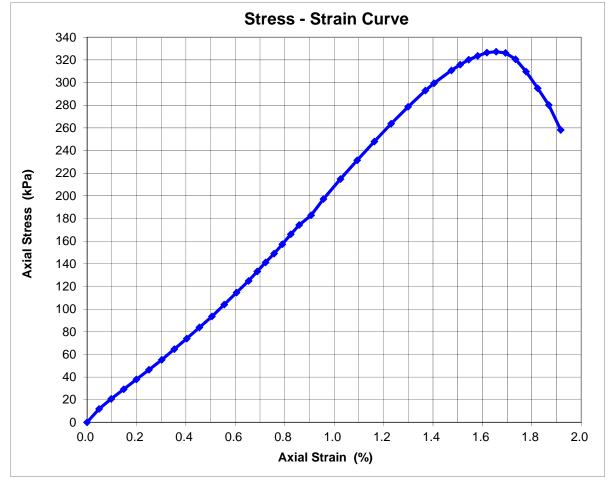
Strain at failure: 1.7 %

Compression at failure: 2.0 mm

Rate of Compression: 0.20 mm / minute

Mode of Failure: planar







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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 27-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS04 Depth: 31.95 - 32.23m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to medium, extremely weak, light grey, weakly cemented.

SAMPLE BEFORE TEST







Job No:	Reg. No:	Report No:	Page 55 of 69		
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022		
PROJECT:	WAITAKERE LHRA - MURIWAI				

Unconfined Compressive Strength of

Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

GROUND INVESTIGATION						
Tested By: WEC 28-Sep-23						
	Compiled By:	WEC	28-Sep-23			
	Checked By:	JF	2-Oct-23			

Borehole: BH-M03 Sample Number: UCS05 Depth: 33.76 - 34.06m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	2.069	0.000	0.000	5.248	0.0	2604.2	0
0.28	2.119	0.050	0.000	5.257	44.8	2605.3	17
0.58	2.169	0.100	0.001	5.268	97.1	2606.3	37
0.87	2.216	0.147	0.001	5.279	155.8	2607.4	60
1.15	2.258	0.189	0.002	5.293	225.9	2608.3	87
1.45	2.298	0.229	0.002	5.309	303.1	2609.2	116
1.73	2.336	0.267	0.002	5.325	383.4	2610.0	147
2.02	2.371	0.302	0.003	5.340	462.1	2610.7	177
2.32	2.388	0.319	0.003	5.344	479.2	2611.1	184
2.60	2.422	0.353	0.003	5.359	557.1	2611.9	213
2.88	2.457	0.388	0.003	5.376	643.8	2612.6	246
3.18	2.491	0.422	0.004	5.394	729.8	2613.4	279
3.47	2.530	0.462	0.004	5.409	806.0	2614.2	308
3.75	2.571	0.502	0.004	5.423	878.3	2615.1	336
4.05	2.610	0.541	0.005	5.438	953.2	2616.0	364
4.33	2.654	0.585	0.005	5.451	1017.4	2616.9	389
4.47	2.677	0.608	0.005	5.455	1040.6	2617.4	398
4.62	2.705	0.636	0.005	5.458	1055.4	2618.0	403
4.75	2.735	0.666	0.006	5.459	1059.4	2618.7	405
4.88	2.771	0.702	0.006	5.457	1047.5	2619.5	400
5.03	2.829	0.760	0.006	5.442	974.5	2620.8	372
5.17	2.877	0.808	0.007	5.434	931.8	2621.8	355
5.30	2.912	0.843	0.007	5.433	929.8	2622.6	355
5.45	2.942	0.873	0.007	5.434	932.4	2623.2	355
5.58	2.974	0.905	0.008	5.434	933.5	2623.9	356
5.72	3.005	0.936	0.008	5.433	930.4	2624.6	354
5.87	3.034	0.965	0.008	5.430	914.1	2625.3	348

Unconfined Compressive Strength: 400



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	28-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS05 Depth: 33.76 - 34.06m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 57.58 mm

Initial Length: 120.16 mm

Initial Mass: 611.10 g

Initial Bulk Density: 1.95 t/m³

Initial Dry Density: 1.55 t/m³

Water Content After Test: 24.6 %

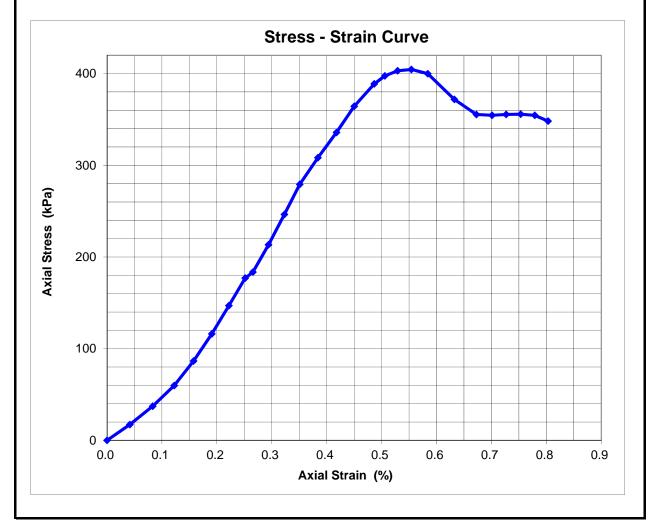
Failure Conditions:

Strain at failure: 0.55 %

Compression at failure: 0.67 mm

Rate of Compression: 0.14 mm / minute

Mode of Failure: planar / brittle





Job No:	Reg. No:	Report No:	Page 57 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 28-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS05 Depth: 33.76 - 34.06m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to medium, extremely weak, dark orange, weakly cemented.

SAMPLE BEFORE TEST







Job No:	Reg. No:	Report No:	Page 58 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

 Tested By:
 WEC
 28-Sep-23

 Compiled By:
 WEC
 28-Sep-23

 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS06 Depth: 37.00 - 37.25m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	7.535	0.000	0.000	5.252	0.0	2836.6	0
0.13	7.564	0.028	0.000	5.254	14.0	2837.3	5
0.28	7.591	0.056	0.000	5.256	22.9	2838.0	8
0.42	7.614	0.079	0.001	5.259	35.4	2838.5	12
0.55	7.640	0.105	0.001	5.261	47.9	2839.1	17
0.70	7.667	0.132	0.001	5.263	59.7	2839.7	21
0.83	7.692	0.157	0.001	5.267	75.3	2840.3	27
0.98	7.720	0.184	0.002	5.270	90.2	2841.0	32
1.12	7.746	0.211	0.002	5.273	107.8	2841.6	38
1.27	7.772	0.237	0.002	5.276	124.0	2842.2	44
1.40	7.797	0.261	0.002	5.281	147.1	2842.8	52
1.53	7.821	0.286	0.002	5.286	170.8	2843.4	60
1.68	7.844	0.309	0.003	5.291	198.7	2844.0	70
1.82	7.867	0.332	0.003	5.297	226.6	2844.5	80
1.95	7.888	0.353	0.003	5.303	259.0	2845.0	91
2.10	7.910	0.374	0.003	5.310	291.7	2845.5	103
2.23	7.930	0.394	0.003	5.317	326.3	2846.0	115
2.37	7.949	0.414	0.003	5.324	363.7	2846.4	128
2.52	7.968	0.432	0.004	5.331	401.3	2846.9	141
2.65	7.986	0.451	0.004	5.340	443.2	2847.3	156
2.78	8.002	0.467	0.004	5.342	452.6	2847.7	159
2.93	8.015	0.480	0.004	5.343	458.5	2848.0	161
3.07	8.022	0.487	0.004	5.345	470.7	2848.2	165
3.20	8.040	0.505	0.004	5.354	513.3	2848.6	180
3.35	8.061	0.525	0.004	5.362	552.3	2849.1	194
3.48	8.082	0.546	0.005	5.369	590.8	2849.6	207
3.62	8.104	0.568	0.005	5.377	627.8	2850.1	220
3.77	8.127	0.591	0.005	5.384	662.6	2850.7	232
3.90	8.150	0.614	0.005	5.390	696.1	2851.2	244
4.03	8.176	0.640	0.005	5.396	724.0	2851.9	254
4.18	8.201	0.666	0.006	5.401	750.0	2852.5	263
4.32	8.226	0.691	0.006	5.406	773.8	2853.1	271
4.45	8.253	0.718	0.006	5.406	774.8	2853.7	271
4.60	8.344	0.809	0.007	5.363	558.7	2855.9	196
4.73	8.375	0.840	0.007	5.361	547.3	2856.6	192
4.87	8.401	0.866	0.007	5.361	551.3	2857.3	193
5.02	8.428	0.893	0.007	5.362	552.5	2857.9	193
5.15	8.470	0.934	0.008	5.358	533.5	2858.9	187

Unconfined Compressive Strength: 270



Job No:	Reg. No:	Report No:	Page 59 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	28-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS06 Depth: 37,00 - 37,25m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

1.70

t/m³

Initial Diameter: 60.10 mm

Initial Length: 119.92 mm

Initial Mass: 686.61 g

Initial Bulk Density: 2.02 t/m³

initial Bulk Density: 2.02 | t/m²

Water Content After Test: 19.5 %

Initial Dry Density:

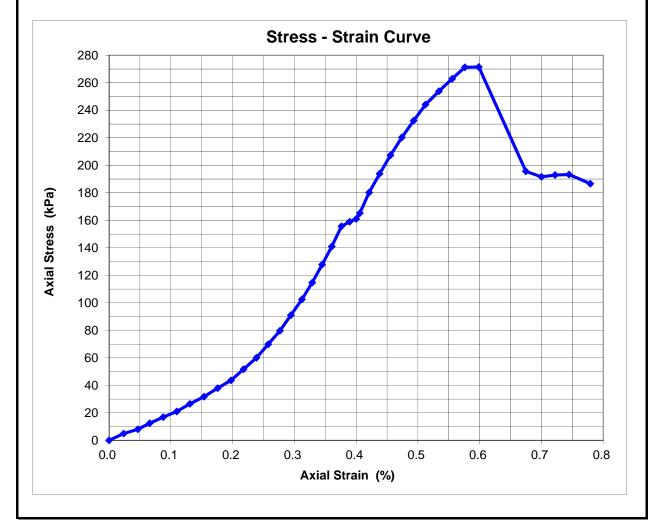
Failure Conditions:

Strain at failure: 0.60 %

Compression at failure: 0.72 mm

Rate of Compression: 0.16 mm / minute

Mode of Failure: planar / brittle





Job No:	Reg. No:	Report No:	Page 60 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 28-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS06 Depth: 37.00 - 37.25m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to medium, extremely weak, dark orange, uncemented.

SAMPLE BEFORE TEST







Job No:	Reg. No:	Report No:	Page 61 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022
	WΔ	TAKERE I HRA	- MURIWAI

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils
Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	28-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS07 Depth: 40.14 - 40.43m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	7.347	0.000	0.000	5.251	0.0	2830.7	0
0.15	7.381	0.035	0.000	5.252	5.1	2831.6	2
0.28	7.415	0.069	0.001	5.253	11.4	2832.4	4
0.42	7.450	0.103	0.001	5.255	18.4	2833.3	6
0.57	7.484	0.137	0.001	5.256	25.3	2834.1	9
0.70	7.518	0.171	0.001	5.257	32.3	2834.9	11
1.07	7.607	0.260	0.002	5.261	52.4	2837.2	18
1.45	7.695	0.348	0.003	5.267	78.9	2839.3	28
1.82	7.781	0.434	0.004	5.273	112.6	2841.5	40
2.18	7.863	0.516	0.004	5.281	151.3	2843.5	53
2.57	7.944	0.598	0.005	5.289	189.5	2845.5	67
2.93	8.024	0.677	0.006	5.296	224.6	2847.5	79
3.30	8.110	0.763	0.007	5.301	249.7	2849.7	88
3.68	8.200	0.853	0.007	5.303	262.0	2851.9	92
4.05	8.297	0.950	0.008	5.303	259.7	2854.4	91
4.42	8.393	1.047	0.009	5.301	250.7	2856.8	88
4.80	8.493	1.146	0.010	5.298	236.6	2859.3	83
5.17	8.589	1.242	0.011	5.295	223.9	2861.7	78
5.55	8.689	1.342	0.012	5.292	206.9	2864.2	72
5.92	8.793	1.446	0.013	5.290	198.4	2866.8	69

Unconfined Compressive Strength:

92



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63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND **INVESTIGATION**

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	28-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Depth: 40.14 - 40.43m Borehole: BH-M03 Sample Number: UCS07

Test Performed on: rock / whole soil

Sample History: disturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

> **Initial Diameter:** 60.04 mm **Initial Length:** 114.86 **Initial Mass:** 660.65

Initial Bulk Density: 2.03 t/m³

Initial Dry Density: 1.65 t/m³

Water Content After Test: 23.4

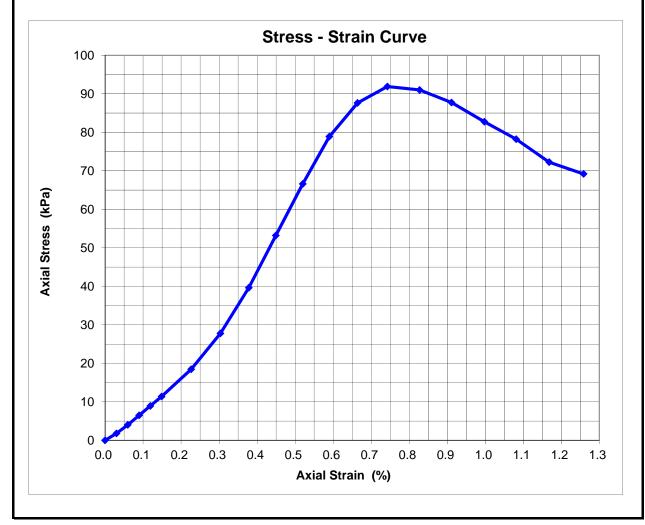
Failure Conditions:

0.74 Strain at failure:

0.85 Compression at failure: mm

Rate of Compression: 0.23 mm / minute

Mode of Failure: plastic





Job No:	Reg. No:	Report No:	Page 63 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 28-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS07 Depth: 40.14 – 40.43m

Sample Description (not part of BGL IANZ Accreditation):

SANDSTONE, fine to medium, extremely weak, dark orange, uncemented.

SAMPLE BEFORE TEST





Job No:	Reg. No:	Report No:	Page 64 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

 Tested By:
 WEC
 28-Sep-23

 Compiled By:
 WEC
 2-Oct-23

 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS08 Depth: 41.15 - 41.43m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	10.723	0.000	0.000	5.249	0.0	2914.3	0
0.37	10.791	0.068	0.001	5.257	43.0	2916.0	15
0.75	10.855	0.133	0.001	5.267	89.7	2917.6	31
1.12	10.907	0.185	0.002	5.285	181.8	2918.9	62
1.50	10.953	0.230	0.002	5.308	295.4	2920.1	101
1.87	10.994	0.271	0.002	5.332	419.8	2921.1	144
2.23	11.015	0.293	0.003	5.345	482.5	2921.6	165
2.62	11.053	0.330	0.003	5.364	577.7	2922.6	198
2.98	11.099	0.376	0.003	5.388	701.2	2923.7	240
3.27	11.134	0.411	0.004	5.408	796.8	2924.6	272
3.53	11.168	0.445	0.004	5.428	899.7	2925.5	308
3.82	11.201	0.478	0.004	5.449	1003.2	2926.3	343
3.95	11.219	0.496	0.004	5.459	1056.8	2926.7	361
4.23	11.254	0.531	0.005	5.480	1161.6	2927.6	397
4.52	11.289	0.567	0.005	5.500	1263.3	2928.5	431
4.65	11.307	0.584	0.005	5.511	1315.4	2929.0	449
4.78	11.325	0.602	0.005	5.521	1366.7	2929.4	467
4.93	11.343	0.620	0.005	5.531	1419.0	2929.9	484
5.07	11.361	0.638	0.005	5.542	1470.3	2930.3	502
5.20	11.378	0.655	0.006	5.552	1522.3	2930.7	519
5.35	11.396	0.673	0.006	5.562	1573.4	2931.2	537
5.48	11.414	0.691	0.006	5.572	1623.3	2931.7	554
5.63	11.432	0.709	0.006	5.582	1673.5	2932.1	571
5.77	11.452	0.729	0.006	5.592	1720.6	2932.6	587
5.90	11.471	0.748	0.006	5.601	1769.1	2933.1	603
6.05	11.491	0.768	0.007	5.610	1814.7	2933.6	619
6.18	11.510	0.787	0.007	5.619	1859.9	2934.1	634
6.32	11.530	0.807	0.007	5.629	1907.0	2934.6	650
6.47	11.551	0.828	0.007	5.637	1948.9	2935.1	664
6.60	11.571	0.848	0.007	5.645	1988.8	2935.6	677
6.75	11.593	0.870	0.007	5.651	2020.2	2936.2	688
6.88	11.616	0.893	0.008	5.659	2058.3	2936.8	701
7.02	11.641	0.918	0.008	5.663	2081.5	2937.4	709
7.17	11.666	0.943	0.008	5.667	2101.4	2938.0	715
7.30	11.693	0.970	0.008	5.666	2096.0	2938.7	713
7.43	11.726	1.003	0.009	5.656	2046.6	2939.5	696
7.58	11.893	1.170	0.010	5.490	1212.5	2943.8	412
7.72	11.970	1.247	0.011	5.433	923.8	2945.7	314
7.87	12.025	1.302	0.011	5.421	863.6	2947.1	293
8.00	12.069	1.347	0.012	5.413	825.6	2948.3	280
8.13	12.106	1.383	0.012	5.408	800.0	2949.2	271

Unconfined Compressive Strength: 720



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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	28-Sep-23
Compiled By:	WEC	2-Oct-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS08 Depth: 41.15 – 41.43m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 60.92 mm

Initial Length: 116.96 mm

Initial Mass: 585.46

Initial Bulk Density: 1.72 t/m³

Initial Dry Density: 1.15 t/m³

Water Content After Test: 49.9 %

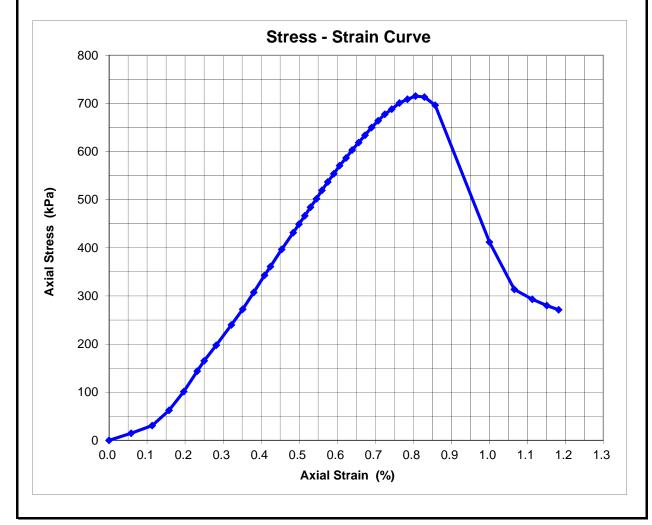
Failure Conditions:

Strain at failure: 0.81 %

Compression at failure: 0.94 mm

Rate of Compression: 0.13 mm / minute

Mode of Failure: planar





Job No:	Reg. No:	Report No:	Page 66 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 28-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 2-Oct-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

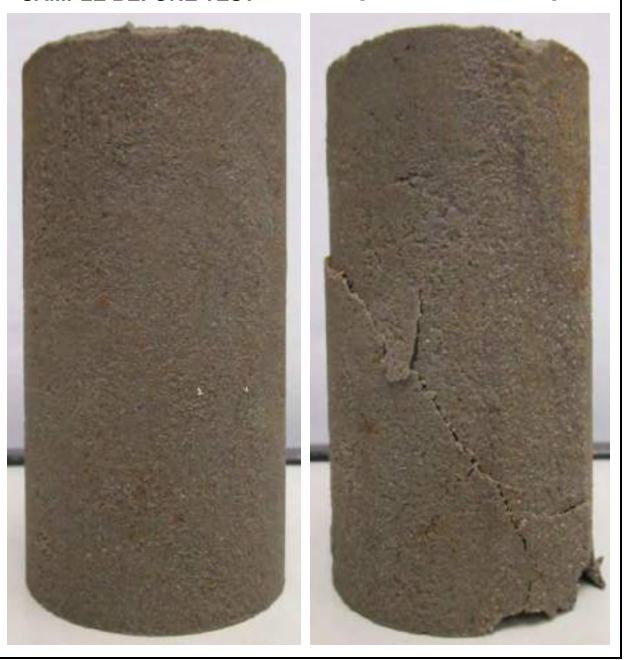
Borehole: BH-M03 Sample Number: UCS08 Depth: 41.15 - 41.43m

Sample Description (not part of BGL IANZ Accreditation):

SILTSTONE, extremely weak, grey.

SAMPLE BEFORE TEST

SAMPLE AFTER TEST





Job No:	Reg. No:	Report No:	Page 67 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Tested By:

Unconfined Compressive Strength of Cohesive Soils

 Compiled By:
 WEC
 28-Sep-23

 Checked By:
 JF
 2-Oct-23

WEC

28-Sep-23

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Borehole: BH-M03 Sample Number: UCS09 Depth: 50.73 - 51.00m

Time (minutes)	Compression Gauge (mm)	Specimen Compression (mm)	Strain	Load Gauge (mm)	Axial Force (N)	Corrected Area (mm²)	Axial Stress (kPa)
0.00	2.137	0.000	0.000	5.253	0.0	2801.8	0
0.13	2.174	0.037	0.000	5.257 19.6		2802.7	7
0.52	2.267	0.130	0.001	5.270	87.2	2804.8	31
0.88	2.353	0.216	0.002	5.288	177.0	2806.9	63
1.27	2.437	0.300	0.003	5.309	282.7	2808.8	101
1.63	2.478	0.341	0.003	5.331	392.2	2809.8	140
2.00	2.494	0.357	0.003	5.348	477.4	2810.2	170
2.38	2.536	0.399	0.003	5.381	641.6	2811.2	228
2.75	2.580	0.444	0.004	5.419	832.4	2812.2	296
3.12	2.622	0.485	0.004	5.460	1041.1	2813.2	370
3.50	2.665	0.528	0.004	5.504	1262.1	2814.2	448
3.87	2.704	0.567	0.005	5.551	1495.8	2815.1	531
4.25	2.744	0.607	0.005	5.598	1730.3	2816.1	614
4.62	2.784	0.647	0.005	5.645	1966.2	2817.0	698
4.98	2.826	0.689	0.006	5.691	2199.5	2818.0	781
5.37	2.882	0.745	0.006	5.728	2383.7	2819.3	846
5.73	3.458	1.321	0.011	5.302	244.1	2833.0	86
6.10	3.562	1.425	0.012	5.300	237.1	2835.5	84

Unconfined Compressive Strength:

850

kPa



Job No:	Reg. No:	Report No:	Page 68 of 69
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WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

Unconfined Compressive Strength of Cohesive Soils

Test Methods: NZS4402: 1986: Test 2.1 / Test 6.3.1

Tested By:	WEC	28-Sep-23
Compiled By:	WEC	28-Sep-23
Checked By:	JF	2-Oct-23

Borehole: BH-M03 Sample Number: UCS09 Depth: 50.73 - 51.00m

Test Performed on: rock / whole soil

Sample History: disturbed / undisturbed / remoulded / recompacted / unknown

Sample Method & Type: from core sample / from tube sample

Initial Diameter: 59.73 mm

Initial Length: 119.88 mm

Initial Mass: 652.28 g

Initial Bulk Density: 1.94 t/m³

Initial Dry Density: 1.60 t/m³

Water Content After Test: 20.2 %

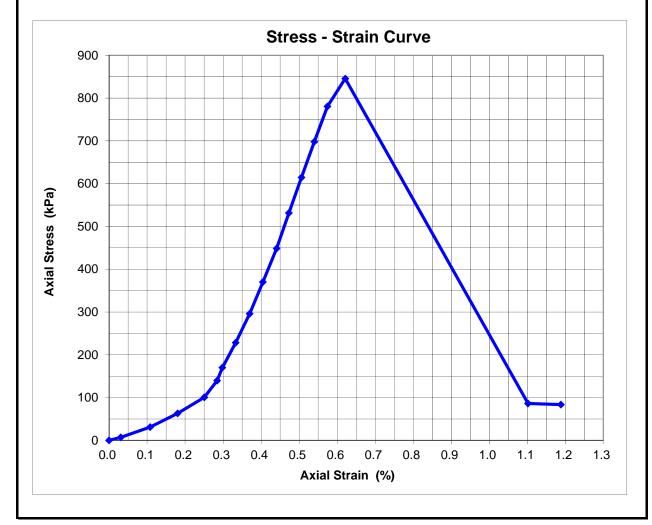
Failure Conditions:

Strain at failure: 0.62 %

Compression at failure: 0.74 mm

Rate of Compression: 0.14 mm / minute

Mode of Failure: brittle





Job No:	Reg. No:	Report No:	Page 69 of 69
63532#L	2806	63532#L/UCS Waitakere LHRA	Version 3, July 2022

WAITAKERE LHRA - MURIWAI GROUND INVESTIGATION

 Unconfined Compressive Strength of
 Tested By:
 WEC
 28-Sep-23

 Cohesive Soils
 Compiled By:
 WEC
 28-Sep-23

 Test Methods:
 NZS4402: 1986: Test 2.1 / Test 6.3.1
 Checked By:
 JF
 2-Oct-23

Borehole: BH-M03 Sample Number: UCS09 Depth: 50.73 - 51.00m

Sample Description (not part of BGL IANZ Accreditation):

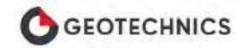
SANDSTONE, fine to medium, extremely weak, dark orange, weakly cemented.

SAMPLE BEFORE TEST

SAMPLE AFTER TEST







18 October 2023

Our Ref: 1092481.0.1.0 & 1092481.0.2.0/Rep1

Customer Ref: 12612462

GHD Limited Level 2, GHD Centre 27 Napier Street Freemans Bay Auckland 1011

Attention: John Southworth

Dear John

Muriwai

Laboratory Test Report

Customer's Instructions

The detailed testing instructions were provided with a schedule from Mr. John Southworth.

Sampling Procedure

Samples have been tested as received from the customer.

Sample Location Plan

Not applicable.

Samples

Three core samples were received. All samples were labelled with Borehole number, sample reference, and depth.

Date of Sample Receipt

27 September 2023

Test Method(s)

ASTM D4647-13 (2020) - Pinhole

BS 1377: Part 5: 1990 Clause 6.3 - Dispersibility by the Crumb Method (not IANZ accredited)

NZS 4402: 1986 Test 2.1 - Water Content

Material Description

Descriptions are provided in the attached presentation pages.

Test Results

Test results are attached.

Test Remarks

Test remarks are detailed on the presentation pages.

General Remarks

Samples not destroyed during testing, will be retained for one month from the date of this report before being discarded.

Descriptions are enclosed for your information but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of GHD Limited, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

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If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of the letterhead page.

GEOTECHNICS LTD

Report approved by: Authorised for Geotechnics by:

Helen Wang

Triaxial Laboratory Manager

Key Technical Person

Melen Way

Corey Papu-Gread
Project Director



G OTECHNICS 1 Hill Street Onehunga

Auckland New Zealand

QESTLab Work Orde

Geotechnics Project ID: QESTLab Work Order ID:

QESTLab Work Order ID:

Customer Project ID: 12612462

p. +64 9 356 3510

Site/Location: Muriwai
Sample Ref.: C5

Location ID: BH-M01

Depth: 2.02 - 2.06 (m)

1092481.0.1.0

Test Method Used: ASTM D4647-13 (2020) Pinhole Test (Method A)

NZS 4402:1986 Test 2.1 Determination of Water Content

Initial Water Content 48.7 (%) Initial Bulk Density 1.65 (t/m³)

Final Water Content 61.5 (%) Initial Dry Density 1.11 (t/m³)

indi water content	01.0	(70)	initial Dig	2011011	1.11	(6/111/
Hydraulic	Duration of	Rate of flow	CI	loudiness of flow		
head H (mm)	flow (min)	q (mL/sec)	From side		From top	
		1.14	Dark	Very dark		
50	5	1.25	Dark	Very dark		
		1.28	Dark	Very dark		
50						
180						
380						
1020						
Hole diameter after test:		2.2	(mm) Disper	sion Category:	D1	

Sample Description: Clayey SILT, dark brown; very soft, wet, high plasticity.

Sample History: Undisturbed core trimmed at natural water content.

Test Remarks: 1. The pinhole was formed with 1.1 mm diameter pin.

2. Distilled water was used in test.

3. Classification:

D1, D2 -- Dispersive;

ND4, ND3 -- Moderately to slightly dispersive;

ND2, ND1 -- Non-dispersive.

4. The soil classified as non-dispersive still can erode in some circumstances.

Tested by: PIHE Date: 12/10/2023 Approved by KTP: \(\sigma\) Date: 18/10/2023

OTECHNICS

Sample Ref.:

1 Hill Street Onehunga

Auckland

Geotechnics Project ID: QESTLab Work Order ID: Customer Project ID: 1092481.0.1.0

12612462

BH-M02

New Zealand

p. +64 9 356 3510

Site/Location: Muriwai

Muriwai Location ID: C15 Depr

Depth: 1.96 - 2.00 (m)

Test Method Used: ASTM D4647-13 (2020) Pinhole Test (Method A)

NZS 4402:1986 Test 2.1 Determination of Water Content

Initial Water Content 52.3 (%) Initial Bulk Density 1.69 (t/m³)

Final Water Content 47.9 (%) Initial Dry Density 1.11 (t/m³)

Hydraulic	Duration of	Rate of flow		Cloudiness of flow		
head H (mm)	flow (min)	q (mL/sec)	From side		From top	
		0.36	Perfectly clear	Perfectly cle	ear	
50	5	0.36	Perfectly clear	Perfectly cle	ear	
		0.35	Perfectly clear	Perfectly cle	ear	
		0.33	Perfectly clear	Perfectly cle	ear	
50	5	0.34 Perfectly clear Perfectly cl		Perfectly cle	ear	
		0.34	Perfectly clear	Perfectly cle	ear	
	0.75	Perfectly clear	Perfectly cle	ear		
180	5	0.76	Perfectly clear	Perfectly cle	Perfectly clear	
		0.74	Perfectly clear	Perfectly cle	Perfectly clear	
		1.20	Perfectly clear	Perfectly cle	ear	
380	5	1.16	Perfectly clear	Perfectly cle	ear	
		1.15	Perfectly clear	Perfectly cle	ear	
		2.39	Perfectly clear	Perfectly cle	ear	
1020	5	2.43	Perfectly clear	Perfectly clear		
		2.38	Perfectly clear	Perfectly clear		
Hole diameter after test:		1.0	(mm) D	Dispersion Category:	ND1	

Sample Description: Silty CLAY, orange brown; very soft, wet, high plasticity.

Sample History: Undisturbed core trimmed at natural water content.

Test Remarks: 1. The pinhole was formed with 1.1 mm diameter pin.

2. Distilled water was used in test.

3. Classification:

D1, D2 -- Dispersive;

ND4, ND3 -- Moderately to slightly dispersive;

ND2, ND1 -- Non-dispersive.

4. The soil classified as non-dispersive still can erode in some circumstances.

Tested by: PIHE Date: 10/10/2023 Approved by KTP: 18/10/2023 Date: 18/10/2023



1 Hill Street, Onehunga, Auckland 1061

J	P 64 09 356 3510							
GEOTECHNICS	www.geotechnics.co.n							
		Determination of Dispersibilty - Crumb Method - BS 1377: Part 5: 1990 Clause	6.3					
iite:	Muriwai		Job No:	1092481.0000.2.0				
Fest Pit/BH No:	BH-M01 / C5	Sample No: AKL657.1	Depth (m):	2.0 m				
stopwatch ID:	S0596							
Sample Description:	ample Description: clayey SILT, dark brown; very soft, wet, high plasticity							
Descriptive behaviour of the cru lfter allowing to stand for 5 to 1								
Observations:		Grade 4 - Strong reaction						
he soil classified as	dispersive	according to this test method.						
lemarks:								
Fest Pit/BH No:	BH-M02 / C15	Sample No: AKL657.2	Depth (m):	1.95 m				
Stopwatch ID:	S0596							
ample Description:	silty CLAY, orange I	orown; very soft, wet, high plasticity						
Descriptive behaviour of the cru ofter allowing to stand for 5 to 1								
Observations:		Grade 4 - Strong reaction						
The soil classified as	dispersive	according to this test method.						
temarks:								
salance ID:		B0012						
leagent Used: 0.001M solution of Sodi	um Hydroxide: Dissolve	0.04g of anhydrous sodium hydroxide in distilled water to make 1L of solution.						
Drop the crumbs into a beak	er about one-third full o	ameter, from a representative portions of the soil at the natural moisture content. f the sodium hydroxide solution. Observe the reaction after allowing to stand for						
by colloids in suspension. Grade 2: Slight reaction: A very slight cl Grade 3: Moderate reaction: There is an of the beaker	e or run out to form a sh oudiness can be seen in n easily recognizable clo oud covers most of the b sive reaction.	allow heap on the bottom of the beaker, but there is no sign of cloudiness caused						
ested by: KESA I	Date: 10/10/202	3 Checked by: GEGO Date: 10/10/2023						

Appendix F4

Calibration Certificates for Shear Vane and SPT Hammer



Calibration Certificate

Certificate No: M720664.01

Certificate Issued To	GHD Limited				3/27 Napier Street Freemans Bay Auckland		
Purchase Order No			Address				
Manufacturer	Geotechnics	Model	Geovane		S/No	902	
ivialiulacturei	Geotechnics	Model			Unique ID		
Description	Handheld shear var	ne with matching l	blade(s)				
Calibration Date	3/04/2023	3/04/2023		Temp During Test 19.7 to 20.1 °C		· °C	
Method	MCC 5.51c.01 – Handheld Soil Shear Vane Testers (2021), Guideline for Hand Held Shear Vane Test (NZGS, 2001) was used as a guide.						
Results							

19 mm Ø Vane Blade

Shear Strength = A × Reading	A (kPa/div)	1.446		Area Ratio	23.3%
------------------------------	-------------	-------	--	------------	-------

Reading	Shear	Reading	Shear	Reading	Shear	Reading	Shear	Reading (div)	Shear
(div)	Strength (kPa)	(div)	Strength (kPa)	(div)	Strength (kPa)	(div)	Strength (kPa)	(uiv)	Strength (kPa)
0	0	30	43	60	87	90	130	120	174
2	3	32	46	62	90	92	133	122	176
4	6	34	49	64	93	94	136	124	179
6	9	36	52	66	95	96	139	126	182
8	12	38	55	68	98	98	142	128	185
10	14	40	58	70	101	100	145	130	188
12	17	42	61	72	104	102	148	132	191
14	20	44	64	74	107	104	150	134	194
16	23	46	67	76	110	106	153	136	197
18	26	48	69	78	113	108	156	138	200
20	29	50	72	80	116	110	159	140	202
22	32	52	75	82	119	112	162		
24	35	54	78	84	121	114	165		
26	38	56	81	86	124	116	168		
28	40	58	84	88	127	118	171		
					confidence lev		l	e factor (k) is	2.

Remarks

When received, this equipment was in good condition.

Measurement results are traceable to the International System of Units (SI), or other recognised references via an unbroken chain of comparisons to the New Zealand National Standards or to the National Standards of other Signatories to the CIPM MRA.

This certificate has been prepared for the benefit of GHD Limited, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This calibration was performed at 1 Hill Street, Onehunga, Auckland, NZ.

Prepared by

Ivan Caresosa

Checked by

Senior Metrologist

Key Technical Person

Agnelo Vaz Senior Metrolog





Calibration Certificate

Certificate No: M720829.03

Certificate Issued To	GHD Limited - Auckland		Address	3, GHD Centre 27 Napier Street Freemans Bay				
Purchase Order No	11910201_BG-01.BG-01-0	4	Address	Auckland 1011				
Manufacturer	Geotechnics	Model	Coovens		S/No	1060		
Manufacturer	Geotechnics		Geovane		Unique ID			
Description	Handheld shear vane with	matching bla	ide(s)					
Calibration Date	15/05/2023		Temp During	g Test	19.1 to 19.5 °C			
Method		MCC 5.51c.01 – Handheld Soil Shear Vane Testers (2021), Guideline for Hand Held Shear Vane Test (2001) was used as a guide.						

19 mm Ø Vane Blade

Shear Strength = A × Reading	A (kPa/div)	1.547	Area	a Ratio	23.5%
------------------------------	-------------	-------	------	---------	-------

Reading (div)	Shear Strength (kPa)	Reading (div)	Shear Strength (kPa)	Reading (div)	Shear Strength (kPa)	Reading (div)	Shear Strength (kPa)	Reading (div)	Shear Strength (kPa)
0	0	30	46	60	93	90	139	120	186
2	3	32	49	62	96	92	142	122	189
4	6	34	53	64	99	94	145	124	192
6	9	36	56	66	102	96	148	126	195
8	12	38	59	68	105	98	152	128	198
10	15	40	62	70	108	100	155	130	201
12	19	42	65	72	111	102	158	132	204
14	22	44	68	74	114	104	161	134	207
16	25	46	71	76	118	106	164	136	210
18	28	48	74	78	121	108	167	138	213
20	31	50	77	80	124	110	170	140	217
22	34	52	80	82	127	112	173		
24	37	54	84	84	130	114	176		
26	40	56	87	86	133	116	179		
28	43	58	90	88	136	118	183		

Remarks

Results

When received, this equipment was in good condition.

Measurement results are traceable to the International System of Units (SI), or other recognised references via an unbroken chain of comparisons to the New Zealand National Standards or to the National Standards of other Signatories to the CIPM MRA.

This certificate has been prepared for the benefit of GHD Limited - Auckland, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This calibration was performed at 1 Hill Street, Onehunga, Auckland, NZ.

Prepared by

Ivan Caresosa

Checked by

Annalyse Ryan

Key Technical Person

Annalyse Ryan

Metrologist | Team Leade



V9.6: 05 May 2023 Date Issued: 16/05/2023



NZBN: 9429050784509

Job No.: 1015 2302

Date: 30 March 2023

Attention: Dave Penney

Organisation: DCN Drilling Limited

Email: dave@dcndrilling.co.nz

Letter Report:

SPT Energy Measurements on 5No. SPT Trip Hammers

1. Introduction

This letter report summarises the results of the Standard Penetration Test (SPT) energy measurements on 5No. SPT trip hammers for DCN Drilling Limited on 9 February 2023, at the site of 70A Maxwell Road, Maramarua, Waikato.

The SPT energy measurements were carried out to determine the average energy transfer ratio from the SPT hammer to the SPT rods during the Standard Penetration Tests. The SPT energy measurements were undertaken in accordance with ASTM D4633-16: Standard Test Method for Energy Measurement for Dynamic Penetrometers.

A Pile Driving Analyzer (PDA) Model 8G with add on SPT Analyzer software and a NW size instrumented SPT rod (manufactured by Pile Dynamics, Inc.) were used to acquire the test data. Adaptors from NW thread to tapered API thread were used on both ends of the instrumented rod to connect to the SPT rods.

The PDA system uses the Case Method equations to evaluate the test data. The maximum energy transfer (EMX) at the gauge location was obtained as the maximum value from integrating the product of force (F) and velocity (v) over time: EMX = $max \int F(t)v(t)dt$.

In summary, the measured energy transfer ratios (ETR) for the 5No. SPT trip hammers are:

- Trip Hammer #1, average ETR of 68.1%.
- Trip Hammer #2, average ETR of 69.0%.
- Trip Hammer #3, average ETR of 68.5%.
- Trip Hammer #4, average ETR of 73.5%.
- Trip Hammer #5, average ETR of 63.9%.

The calibration certificates of the instruments used for SPT energy measurements are attached in Appendix A. The results of energy measurements are attached in Appendix B. The representative force and velocity plots are attached in Appendix C.



NZBN: 9429050784509

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2. Drill Rigs

The Morooka drill rig and approximate 61 mm outer diameter SPT rods were used for energy measurements on the trip hammers #1 and #2. The trailer mounted drill rig and approximate 60 mm outer diameter SPT rods were used for energy measurements on the trip hammers #3, #4 and #5. Photos of the two rigs are presented in Figures 2-1 and 2-2 below.





Figure 2-1: Photos of the Morooka drill rig and the instrumented SPT rod assembly.





Figure 2-2: Photos of the trailer mounted drill rig and the instrumented SPT rod assembly.



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3. Energy Measurements of SPT Trip Hammer #1

Photos of the SPT trip hammer #1 are presented in Figure 3-1 below.





Figure 3-1: Photos of SPT trip hammer #1

A summary of energy measurements on the trip hammer #1 is presented in Table 3-1 below.

Table 3-1: Summary of energy measurements on SPT trip hammer #1

SPT Hammer No.	Test No.	Depth below ground level (m)	SPT 'N'	Range of Transferred Energy (kN-m)	Average Transferred Energy (kN-m)	Range of Energy Transfer Ratio	Average Energy Transfe Ratio
Trip Hammer #1	1	13.5	35	0.281 - 0.351	0.303	59.2% - 73.9%	63.9%
	2	15	35	0.306 - 0.380	0.339	64.4% - 80.1%	71.3%
	3	16.5	44	0.311 - 0.352	0.327	65.5% - 74.1%	69.0%
		Overall		14	0.323	2	68.1%



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4. Energy Measurements of SPT Trip Hammer #2

Photos of the SPT trip hammer #2 are presented in Figure 4-1 below.





Figure 4-1: Photos of SPT trip hammer #2

A summary of energy measurements on the trip hammer #2 is presented in Table 4-1 below.

Table 4-1: Summary of energy measurements on SPT trip hammer #2

SPT Hammer No.	Test No.	Depth below ground level (m)	SPT 'N'	Range of Transferred Energy (kN-m)	Average Transferred Energy (kN-m)	Range of Energy Transfer Ratio	Average Energy Transfe Ratio
	1	9	31	0.265 - 0.330	0.299	55.8% - 69.6%	63.0%
T-i- 11	2	10.5	37	0.329 - 0.364	0.347	69.2% - 76.7%	73.1%
Trip Hammer #2	3	12	29	0.319 - 0.363	0.336	67.2% - 76.5%	70.8%
		Overall		150	0.327	2	69.0%



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5. Energy Measurements of SPT Trip Hammer #3

Photos of the SPT trip hammer #3 are presented in Figure 5-1 below.





Figure 5-1: Photos of SPT trip hammer #3

A summary of energy measurements on the trip hammer #3 is presented in Table 5-1 below.

Table 5-1: Summary of energy measurements on SPT trip hammer #3

SPT Hammer No.	Test No.	Depth below ground level (m)	SPT 'N'	Range of Transferred Energy (kN-m)	Average Transferred Energy (kN-m)	Range of Energy Transfer Ratio	Average Energy Transfer Ratio
Trip Hammer #3	1	9	19	0.336 - 0.401	0.360	70.7% - 84.4%	75.9%
	2	10.5	34	0.292 - 0.336	0.312	61.5% - 70.9%	65.7%
	3	12	50	0.277 - 0.323	0.304	58,5& - 68,1%	64.0%
		Overall		-	0.325	9-1	68.5%



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Date: 30 March 2023

6. Energy Measurements of SPT Trip Hammer #4

Photos of the SPT trip hammer #4 are presented in Figure 6-1 below.





Figure 6-1: Photos of SPT trip hammer #4

A summary of energy measurements on the trip hammer #4 is presented in Table 6-1 below.

Table 6-1: Summary of energy measurements on SPT trip hammer #4

SPT Hammer No.	Test No.	Depth below ground level (m)	SPT 'N'	Range of Transferred Energy (kN-m)	Average Transferred Energy (kN-m)	Range of Energy Transfer Ratio	Average Energy Transfe Ratio
Trip Hammer #4	1	9	32	0.321 - 0.376	0.354	67.7% - 79.2%	74.7%
	2	10.5	35	0.335 - 0.377	0.359	70.6% - 79.4%	75.6%
	3	12	50	0.288 - 0.372	0.334	60.6% - 78.4%	70.3%
		Overall		14	0.349		73.5%



NZBN: 9429050784509

Job No.:1015_2302

Date: 30 March 2023

7. Energy Measurements of SPT Trip Hammer #5

Photos of the SPT trip hammer #5 are presented in Figure 7-1 below.





Figure 7-1: Photos of SPT trip hammer #5

A summary of energy measurements on the trip hammer #5 is presented in Table 7-1 below.

Table 7-1: Summary of energy measurements on SPT trip hammer #5

SPT Hammer No.	Test No.	Depth below ground leyel (m)	SPT 'N'	Range of Transferred Energy (kN-m)	Average Transferred Energy (kN-m)	Range of Energy Transfer Ratio	Average Energy Transfe Ratio
Trip Hammer #5	1	9	49	0.274 - 0.340	0.301	57.6% - 71.7%	63.5%
	2	10.5	29	0.270 - 0.339	0.300	56.9% - 71.4%	63.3%
	3	12	48	0.278 - 0.330	0.309	58.5% - 69.6%	65.0%
		Overall		141	0.303		63.9%



NZBN: 9429050784509

Job No. 1015 2302

Date: 30 March 2023

8. Limitations

This letter report has been prepared solely for the benefit of our client DCN Drilling Limited with respect to the particular instructions and relevant information provided to us. This letter report shall not be relied upon by any third parties or for any other purposes without our prior review and written agreement.

Authorised for Roc Consulting Limited by:

Richard (Liqiang) Zhang

Director | Principal Geotechnical Engineer

Email: Richard@rocconsulting.co.nz Phone: +64 27 506 5893

Appendix:

- A. Instrument Calibration Certificates
- B. SPT Energy Measurements Results
- C. Representative Force and Velocity Plots



NZBN: 9429050784509

Job No.:1015_2302

Date: 30 March 2023

Appendix A

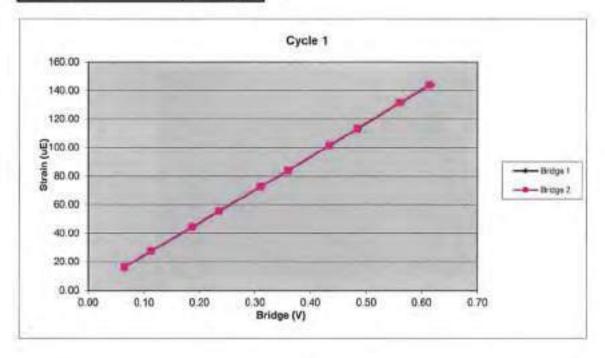
Instrument Calibration Certificates



680NW		Cycle 1		
Sample	Force (lb)	Strain (µE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1047.49	16,11	0.07	0.06
3	1838.02	27.52	0.11	0.11
4	3029,38	44.17	0.19	0.19
5	3792.43	55.49	0.24	0.23
6	4997.05	72.74	0.31	0.31
7	5790.22	84.07	0.36	0.36
8	6984.70	101.62	0.44	0.43
9	7812.18	113.27	0.49	0.48
10	9035.41	131.64	0.56	0.56
11	9892.03	143.89	0.62	0.61

Bridge 1		Bridge 2	
Force Calibration (lb/V)	16069.95	Force Calibration (lb/V)	16102.53
Offset	-7.33	Offset	12.05
Correlation	0.999998	Correlation	0.999997
Strain Calibration (µE/V)	232.27	Strain Calibration (µE/V)	232.74
Offset	0.58	Offset	0.86
Correlation	0.999985	Correlation	0.999981

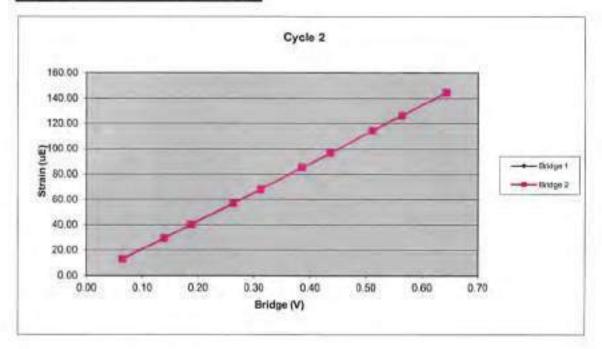
Force Strain Calibration	Lamorovo
EA (Kips)	69183.82
Offset	-47.26
Correlation	0.999980



680NW		Cycle 2		
Sample	Force (lb)	Strain (µE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1021.07	12.60	0.06	0.06
3	2216.04	29.05	0.14	0.14
4	2992.44	40.06	0.19	0.19
5	4197.45	56.78	0.26	0.26
.6	4972.97	67.81	0.31	0.31
7	6170.08	84.96	0.39	0.39
8	6996.98	96.33	0.44	0.44
9	8196.33	113.89	0.51	0.51
10	9059.10	125.94	0.57	0.56
11	10316.06	143.97	0.64	0.64

Bridge 1		Bridge 2	
Force Calibration (lb/V)	16051.95	Force Calibration (lb/V)	16067.32
Offset	-10.90	Offset	-22.23
Correlation	0.999998	Correlation	0.999998
Strain Calibration (µE/V)	227.16	Strain Calibration (µE/V)	227.38
Offset	-2.46	Offset	-2.62
Correlation	0.999971	Correlation	0.999975

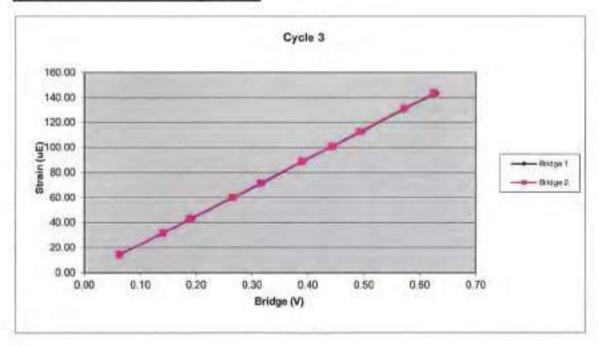
Force Strain Calibration	Landa or morning
EA (Kips)	70660.67
Offset	163.19
Correlation	0.999981



680NW		Cycle 3		
Sample	Force (lb)	Strain (µE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1020.49	14.40	0.06	0.06
3	2263.02	31.58	0.14	0.14
4	3049.95	43.03	0.19	0.19
5	4268.70	60.16	0.27	0.27
6	5085.36	71.61	0.32	0.32
7	6271.27	88.94	0.39	0.39
8	7122.33	100.84	0.44	0.44
9	7937.92	112.58	0.50	0.49
10	9201.80	131.04	0.57	0.57
11	10082.99	143,34	0.63	0.62

Bridge 1		Bridge 2	
Force Calibration (lb/V)	16048.19	Force Calibration (lb/V)	16118.06
Offset	-13.64	Offset	2.18
Correlation	0.999997	Correlation	0.999996
Strain Calibration (µE/V)	228.89	Strain Calibration (µE/V)	229.89
Offset	-0.75	Offset	-0.52
Correlation	0.999975	Correlation	0.999975

Force Strain Calibration	Variable and the
EA (Kips)	70109.18
Offset	39.07
Correlation	0.999984



Bridge Excitation (V) Shunt Resitor (ohm)

60.4k

Calibration Factors	680NW		
Bridge 1 (µE/V)	229.44	Bridge 2 (µE/V)	230.00
EA Factor (Kips)	69984.56	Area (in^2)	2.33

Calibrated by: __ Calibrated Date:

1/12/2023

Pile Dynamics Inc 30725 Aurora Rd Solon, OH 44139

Traceable to N.I.S.T.

Accelerometer Calibration Certificate Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc. 1 4 JAN 2023 Calibration performed on

Serial No:

K12864

Temperature: 73.0 °F

Model:

PR

Humidity:

49%

Calibrated on: Channel 3 on 8G 5161 LE

Ref Acc 1:

72505

1035 g's/volt

Cal on:

24Mar2022

Ref Acc 2:

72517! 1049 g's/volt Cal on:

24Mar2022

Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

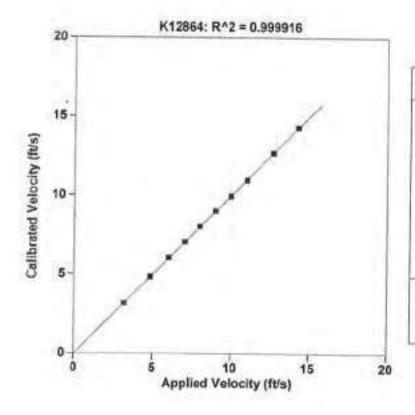
PDA CALIBRATION FACTOR

416.1 mv/5000g

(83.2 µv/g)

R^2: 0.999916 [Chip programmed]

Operator, William Johnson



Reference	S/N K12864
 Velocity	Velocity
ft/s	ft/s
3.178	3.180
4,832	4.851
6.009	6.063
7.063	7.059
8.019	8.055
9.010	9.034
9.990	9.952
11.010	10.962
12.703	12.691
14,307	14.318

Accelerometer Calibration Certificate Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc. Calibration performed on 1 4 JAN 2023

Serial No:

K12865

Temperature: 73.0 °F

Model:

PR

Humidity:

50%

Calibrated on: Channel 3 on 8G 5161 LE

Ref Acc 1:

72505!

1035 g's/volt

Cal on:

24Mar2022

Ref Acc 2:

725171 1049 g's/volt

Cal on:

24Mar2022

Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

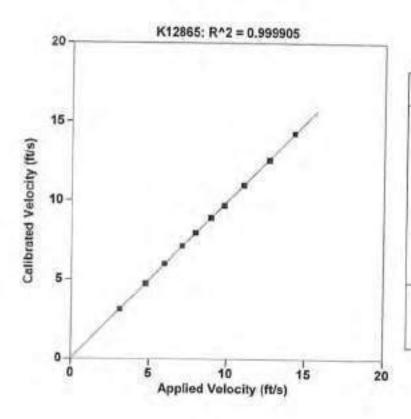


430.9 mv/5000g (86.2 µv/g)

R^2: 0.999905 [Chip programmed]

Operator: William Johnson

Signed



Molanitu	S/N K12865
Velocity	Velocity
ft/s	ft/s
3.173	3,138
4.769	4,760
5.982	6.019
7.127	7.146
7.959	7.988
8.938	8.943
9.775	9.724
11.013	11.001
12.641	12.601
14.249	14.294
14.248	14.294



NZBN: 9429050784509

Job No.:1015_2302

Date: 30 March 2023

Appendix B

SPT Energy Measurements Results

Case Method & ICAP® Results

2023-02-09 DC	N Drilling - SPT	Drop Hammer No.1

BH02 Test 1 at 13.5m OP: RZ Date: 09-February-2023 15.03 cm2 SP: 77.3 kN/m3 EM: 206,843 MPa LE: 15.2 m WS: 5,123.0 m/s JC: 0.90

EMX: Maximum Energy AMX: Maximum Acceleration ETR: Energy Transfer Ratio - Rated DMX: Maximum Displacement CSX: Compression Stress Maximum FMX: Maximum Force VT1: Velocity at time 1 FVP: Force/Velocity Proportionality

BPM:	Blows/Mi						FVI	. ruice	velocity	Fropulati	lanty
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP
	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa	
14	13.5	0	284.7	60.0	140	2.24	21.0	2,170	15	92.8	0.5
15	13.5	0	293.1	61.8	161	2.42	23.0	2,208	10	107.0	1.1
16	13.5	0	289.2	60.9	140	2.21	22.8	2,040	18	93.3	0.5
17	13.5	0	310,3	65.4	152	2.31	21.7	2.223	24	101.0	0.4
18	13.5	0	309.9	65.3	155	2.43	21.2	2,237	25	103.0	0.9
19	13.5	0	305.3	64.3	159	2.44	21.0	2,295	20	105.5	1.0
20	13.5	0	317.4	66.9	156	2.70	21.6	2,377	25	103.7	0.9
21	13.5	0	332.1	70.0	153	2.31	20.9	2,298	42	101.7	0.6
22	13.5	0	280.8	59.2	145	2.24	21.0	2,152	21	96.4	0.4
23	13.5	0	350.6	73.9	152	2.37	20.5	2,358	71	101.1	0.4
24	13.5	0	301.4	63.5	144	2.30	12.2	2,283	31	95.5	0.5
25	13.5	0	334.0	70.4	161	2.51	18.2	2,405	41	107.4	0.3
26	13.5	0	280.8	59.2	149	2.29	21.3	2,250	12	99.3	0.3
27	13.5	0	288.6	60.8	150	2.31	21.8	2,294	13	99.9	0.5
28	13.5	0	300.1	63.2	151	2.29	21.8	2,220	28	100.4	0.2
29	13.5	0	304.3	64.1	162	2.49	22.1	2,254	16	107.7	0.9
30	13.5	0	317.5	66.9	175	2.80	21.7	2,344	29	116.6	0.7
31	13.5	0	308.1	64.9	157	2.49	12.7	2,112	18	104.3	1.0
32	13.5	0	322.6	68.0	159	2.41	21.6	2,190	33	106.0	0.5
33	13.5	0	299.1	63.0	156	2.72	21.5	2,228	8	104.0	0.8
34	13.5	0	292.0	61.5	157	2.28	21.1	2,092	10	104.4	0.8
35	13.5	0	300.1	63.2	161	2.69	21.4	2,145	12	107.2	0.7
36	13.5	0	299.7	63.2	170	2.77	20.7	2,045	8	113.2	0.8
37	13.5	0	311.7	65.7	162	2.51	21.4	2,095	36	107.8	0.8
38	13.5	0	300.9	63.4	165	2.39	20.8	2,033	25	109.8	0.9
39	13.5	0	302.9	63.8	160	2.45	21.9	2,017	16	106.3	1.0
40	13.5	0	301.4	63.5	165	2.62	22.3	1,846	8	109.9	0.8
41	13.5	0	304.4	64.2	149	2.32	21.1	1,818	19	99.4	0.8
42	13.5	0	290.0	61.1	151	2,32	21.3	1.861	18	100.7	1.1
43	13.5	0	287.3	60.5	145	2.29	21.5	1,860	14	96.8	0.7
44	13.5	0	306.6	64.6	161	2.65	22.4	1,851	25	106.9	0.9
45	13.5	0	283.6	59.8	163	2.19	22.5	1,836	22	108.3	0.5
46	13.5	0	301.2	63.5	165	2.52	22.5	1,875	10	109.7	1.0
47	13.5	0	294.6	62.1	146	2.31	21.4	1,750	10	97.4	0.7
48	13.5	0	312.1	65.8	160	2.80	20.9	1,898	15	106.5	0.7
		verage	303.4	63.9	156	2.44	20.9	2,113	21	103.7	0.7
				Takal and			Long de 191				-

Total number of blows analyzed: 35

BL# Sensors

14-48 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

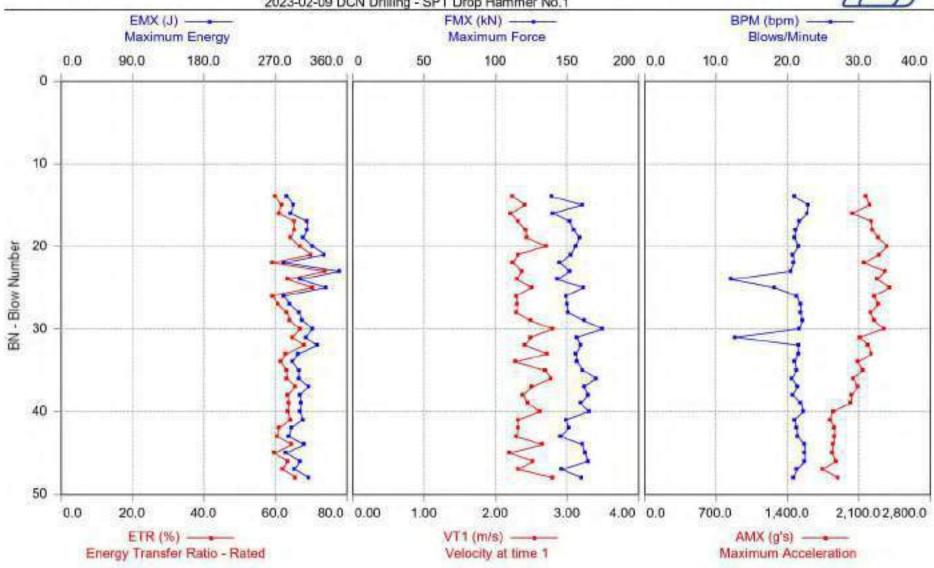
Time Summary

Drive 2 minutes 19 seconds 12:16 pm - 12:18 pm BN 1 - 48

Roc Consulting Limited - PDIPLOT2 Ver 2021,1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

Test started: 09-February-2023 2023-02-09 DCN Drilling - SPT Drop Hammer No.1



Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.1_1 OP: RZ	BH02 Test 2 at 15m Date: 09-February-2023
AR: 15,03 cm ²	SP: 77.3 kN/m ³
LE: 16.7 m	EM: 206,843 MPa
WC. E 103.0 m/s	10 0.00

EMX: Maximum Energy	AMX: Maximum Acceleration
ETR: Energy Transfer Ratio - Rated	DMX: Maximum Displacement
FMX: Maximum Force	CSX: Compression Stress Maximum
VT1: Velocity at time 1	FVP: Force/Velocity Proportionality
DOLL D. A	

VT1:	Velocity a		FVP: Force/Velocity Proportionality								
	Blows/Mi		m			1.001					-
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP
10.00	m	bl/m	J	(%)	kN	m/s	bpm	9'5	mm	MPa	10365
16	15.0	0	349.9	73.7	151	2.75	21.3	2,928	36	100.3	0.5
17	15.0	0	351.4	74.1	156	2.79	21.8	3,026	30	103.5	0.7
18	15.0	0	379.9	80.1	157	2.76	23.0	2,919	50	104.3	0.6
19	15.0	0	362.2	76.3	147	2.71	22.8	2,782	47	97.5	0.6
20	15.0	0	336,4	70.9	150	2.74	21.3	2,909	34	99.8	0.5
21	15.0	0	335.8	70.8	145	2.68	21.2	2,754	34	96.8	0.6
22	15.0	0	360.9	76.1	152	2.71	21.1	2,915	39	101.2	0.6
23	15.0	0	366.7	77.3	152	2.70	20.9	2,829	38	101.2	0.6
24	15.0	0	344.4	72.6	161	2.70	22.0	2,940	27	107.3	0.6
25	15.0	0	340.2	71.7	150	2.71	20.4	2,861	34	100.1	0.6
26	15.0	0	349.4	73.6	153	2.73	9.2	2,982	33	102.0	0.7
27	15.0	0	342.0	72.1	150	2.63	21.8	2,826	32	99.5	0.7
28	15.0	0	313.5	66.1	143	2.59	22.9	2,668	31	95.0	0.6
29	15.0	0	343.0	72.3	145	2.62	21.5	2,763	39	96.5	0.6
30	15.0	0	338.3	71.3	147	2.63	21.3	2,721	41	98.0	0.6
31	15.0	0	334.4	70.5	158	2.74	22.0	2,952	31	105.2	0.6
32	15.0	0	374.1	78.8	149	2.68	22.0	2,892	38	99.5	0.5
33	15.0	0	343.9	72.5	152	2.67	22.2	2,891	32	101.2	0.6
34	15.0	0	342.9	72.3	141	2.63	22.3	2,633	40	94.1	0.6
35	15.0	0	311.1	65.6	149	2.62	22.4	2,762	31	98.8	0.6
36	15.0	0	338.7	71.4	147	2.64	22.3	2,690	43	97.8	0.6
37	15.0	0	348.5	73.4	145	2.60	22.1	2,629	38	96.4	0.6
38	15.0	0	315.0	66.4	147	2.62	21.6	2,704	32	98.1	0.6
39	15.0	0	334.4	70.5	147	2.59	21.5	2,760	28	97.9	0.7
40	15.0	0	318.1	67.0	148	2.64	22.9	2,756	26	98.5	0.6
41	15.0	0	324.2	68.3	145	2.53	22.1	2,659	23	96.6	0.6
42	15.0	0	331.0	69.7	144	2.63	21.5	2,782	29	96.0	0.7
43	15.0	0	334.2	70.4	151	2.58	21.6	2,779	29	100.6	0.5
44	15.0	0	324.7	68.4	146	2.54	22.6	2,548	30	96.8	0.5
45	15.0	0	305.6	64.4	149	2.54	21.5	2,586	23	99.2	0.5
46	15.0	0	329.9	69.5	148	2.58	22.3	2,653	30	98.4	0.5
47	15.0	0	309.1	65.1	146	2.58	21.9	2,614	17	96.9	0.6
48	15.0	0	323.0	68.1	145	2.59	16.4	2,660	19	96.2	0.7
49	15.0	0	349.4	73.6	145	2.64	21.4	2,699	37	96.8	0.6
50	15.0	0	341.2	71.9	165	2.93	21.3	3.043	29	109.9	0.8
	A	verage	338.5	71.3	149	2.66	21.3	2,786	33	99.4	0.6

Total number of blows analyzed: 35

BL# Sensors

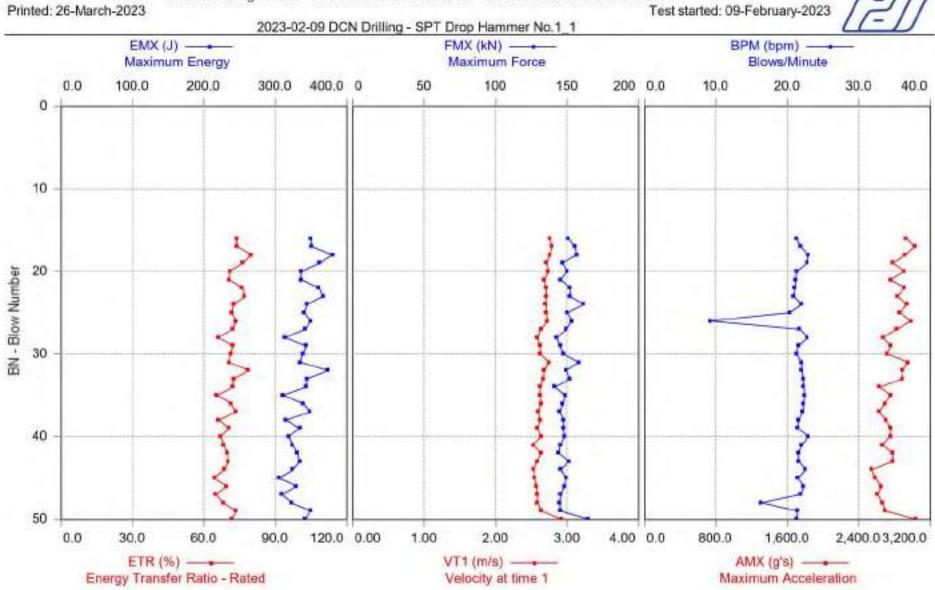
16-50 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Time Summary

Drive 2 minutes 18 seconds 12:54 pm - 12:57 pm BN 1 - 50

Roc Consulting Limited - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 26-March-2023



BH02 Test 3 at 16.5m

Case Method & ICAP® Results

2023-02-09	DCN Drilling	-SPT	Drop Hammer	No.1 2
				Carlotte Control of the Control of t

 OP: RZ
 Date: 09-February-2023

 AR: 15.03 cm²
 SP: 77.3 kN/m³

 LE: 18.2 m
 EM: 206,843 MPa

 WS: 5,123.0 m/s
 JC: 0.90

EMX: Maximum Energy
ETR: Energy Transfer Ratio - Rated
ETR: Energy Transfer Ratio - Rated
EMX: Maximum Displacement
DMX: Maximum Displacement
CSX: Compression Stress Maximum
VT1: Velocity at time 1
EVP: Force/Velocity Proportionality
EVP: Force/Velocity Proportionality

BPM:	Blows/Mir	nute					- UVSTS	WPMIN CREPOST	0 01/03/80/	Tonuck Course	UIII VOA
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP
	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa	
19	16.5	0	311.8	65.7	156	2.89	20.7	2,551	13	104.0	0.7
20	16.5	0	314.7	66.3	162	2.94	21.8	2,543	19	107.8	0.7
21	16.5	0	329.9	69.5	209	3.18	20.8	2,737	10	139.4	0.4
22	16.5	0	331.7	69.9	193	3.43	20.2	2,758	12	128.5	0.4
23	16.5	0	311.9	65.7	173	2.86	20.6	2.647	14	115.3	0.7
24	16.5	0	331.9	69.9	182	3.26	19.9	2,765	12	121.1	0.5
25	16.5	0	351.7	74.1	217	3.51	19.8	2,703	18	144.4	0.3
26	16.5	0	323.2	68.1	179	3.06	21.3	2,644	9	118.9	0.6
27	16.5	0	318.4	67.1	179	2,82	21.2	2,635	14	119.3	0.7
28	16.5	0	341.3	71.9	238	3.67	21.1	2,927	9	158.1	0.2
29	16.5	0	324.5	68.4	237	3.18	21.6	3,022	10	157.7	0.2
30	16.5	0	324.3	68.3	183	3.14	21.1	2,749	11	121.6	0.5
31	16.5	0	321.3	67.7	218	3.40	21.9	2,838	10	144.7	0.3
32	16.5	0	319.7	67.4	178	3.10	22.3	2,664	13	118.3	0.5
33	16.5	0	319.6	67.4	179	2.97	20.7	2,590	8	119.3	0.6
34	16.5	0	330.5	69.6	174	3.25	21.6	2,582	8	115.7	0.5
35	16.5	0	321.9	67.8	182	3.19	21.7	2,682	12	121.4	0.5
36	16.5	0	322.6	68.0	176	3.28	21.6	2,616	9	117.0	0.4
37	16.5	0	314.6	66.3	185	3.35	15.4	2,407	8	123.3	0.6
38	16,5	0	326.2	68.7	253	3.13	21.1	2,811	8	168.4	0.7
39	16.5	0	326.8	68.9	169	3.00	21.2	2,466	17	112.4	0.7
40	16.5	0	325.5	68.6	255	3.10	22.0	2,826	8	169.9	0.7
41	16.5	0	347.9	73.3	236	3.85	21.9	2,771	15	156.8	0.3
42	16.5	0	344.1	72.5	200	3.35	20.6	2,427	14	132.9	0.6
43	16.5	0	335.8	70.8	210	3.64	21.3	2,687	8	139.4	0.4
44	16.5	0	322.4	67.9	196	3.47	21.3	2,545	8	130.7	0.5
45	16.5	0	343.5	72.4	209	3.55	21.7	2,452	17	139.2	0.4
46	16.5	0	325.9	68.7	244	3.69	12.3	2,704	8	162.2	0.2
47	16.5	0	349.0	73.5	186	3.28	20.3	2,490	19	123.6	0.6
48	16.5	0	320.3	67.5	185	3.17	21.7	2,482	8	123.2	0.7
49	16.5	0	345.7	72.8	210	3.64	21.0	2,486	18	140.0	0.4
50	16.5	0	321.9	67.8	204	3.59	21.6	2,550	8	135.6	0.5
51	16.5	0	310.7	65.5	247	3.60	22.1	2,705	11	164.4	0.2
52	16.5	0	331.4	69.8	218	3.75	21.8	2,560	19	144.7	0.4
53	16.5	0	323.4	68.2	247	3.60	22.0	2,690	8	164.6	0.3
54	16.5	Ö	319.6	67.3	260	3.28	17.7	2,712	12	172.9	0.5
55	16.5	0	316.4	66.7	189	3.33	21.7	2,525	31	125.5	0.5
56	16.5	Ö	332.6	70.1	251	3.73	20.8	2,627	18	167.3	0.2
57	16.5	0	335.2	70.6	242	3.54	20.3	2,508	31	161.3	0.2
58	16.5	0	334.2	70.4	210	3.50	21.1	2,429	29	139.5	0.4
59 60	16.5 16.5	0	327.9 321.9	69.1	243	3.71	21.5	2,540	22	161.9 135.5	0.2
		0		67.8	204	3.62	21.0	2,408			
61	16.5 16.5	0	321.5	67.7 69.5	262	3.32	20.5	2,760	17	174.1	0.5
02			329.8		237		11.4	2,475	27	158.0	0.3
	A	verage	327.4	69.0	208	3.36	20.6	2,629	14	138.6	0.5

Roc Consulting Limited PDIPLOT2 2021.1.61.0

Case Method & iCAP® Results

Page 2 Printed 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.1_2 OP: RZ

BH02 Test 3 at 16.5m Date: 09-February-2023

BL# Sensors

19-62 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Time Summary

Drive 2 minutes 59 seconds 1:30 pm - 1:33 pm BN 1 - 62

Roc Consulting Limited - PDIPLOT2 Ver 2021, 1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

0.0

0

15

30

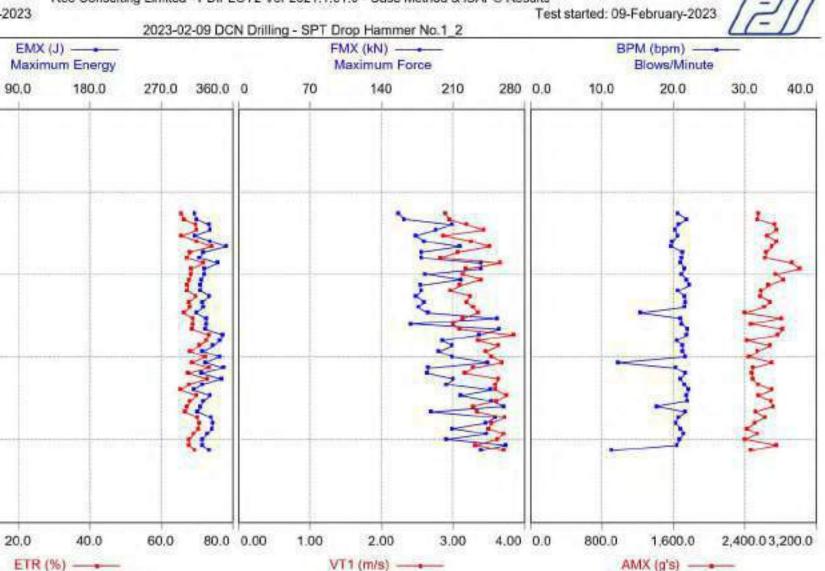
60

75

0.0

Energy Transfer Ratio - Rated

BN - Blow Number



Velocity at time 1

Maximum Acceleration

Case Method & iCAP® Results

2023- OP: F	-02-09 DC	N Drilling	g - SPT D		viethod & mer No.2		. Journa			02 Test 1 Februar	
AR:	15.03 cm	n2							SP:		kN/m
LE:	10.7 m									206,843	
	5,123.0 m	/s							JC:	0.90	
	Maximum						AM	X: Maxim			
	Energy T			ted			DM	X: Maxim	um Disp	acement	
	Maximum									tress Ma	
VT1:	Velocity a	at time 1					FVF	: Force	Velocity	Proportion	nality
	Blows/Min						- decip	(CARTINESS)	0	nerstrove,	married .
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVF
	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa	
12	9.0	0	281.0	59.2	184	2.24	13.0	1,329	18	122.7	0.6
13	9.0	0	317.7	66.9	210	3.02	10.4	1,457	21	139.9	0.6
14	9.0	0	317.3	66.9	249	3.16	12.3	1,640	19	165.7	0.5
15	9.0	0	288.4	60.8	192	2.60	19.6	1,240	21	127.9	0.7
16	9.0	0	294.9	62.2	202	2.63	14.7	1,359	16	134.3	0.6
17	9.0	0	317.1	66.8	254	3.03	18.8	1,652	21	169.3	0.6
18	9.0	0	290.8	61.3	215	2.91	18.8	1,248	19	143.1	0.6
19	9.0	0	292.1	61.5	191	2.50	19.8	1,112	19	126.9	0.5
20	9.0	0	276.7	58.3	184	2.15	17.7	1,048	18	122.6	0.4
21	9.0	0	279.3	58.9	197	2.17	19.8	1,083	16	130.9	0.8
22	9,0	0	315.5	66.5	252	3.12	21.0	1,712	18	167.7	0.6
23	9.0	0	264.6	55.B	185	2.40	18.9	1,126	16	123.1	0.7
24	9.0	0	294.5	62.1	231	2.92	11.2	1,548	16	153.5	0.6
25	9.0	0	297.0	62.6	205	2.80	19.9	1,137	14	136.5	0.6
26	9.0	0	287.0	60.5	225	2.78	18.7	1,217	17	149.5	0.6
27	9.0	0	295.2	62.2	246	2.97	19.9	1,450	15	163.9	0.7
28	9.0	0	316.8	66.8	226	2.83	11.2	1,736	20	150.2	0,€
29	9.0	0	330.4	69.6	222	3.09	11.7	1,485	17	147.9	0.5
30	9.0	0	315.6	66.5	194	3.12	15.2	1,185	11	129.2	0.5
31	9.0	0	285.0	60.1	219	2.38	16.1	1,277	15	145.4	3.0
32	9,0	0	279.7	58,9	251	2.90	10.3	1,463	16	166.9	0.6
33	9.0	0	302.1	63.7	197	2.40	18.4	1,070	19	131.2	0.6
34	9.0	0	311.2	65.6	243	3.00	19.1	1,481	12	161.6	0.7
35	9.0	0	308.3	65.0	245	3.15	16.6	1,528	15	162.8	0.6
36	9.0	0	324.3	68.3	254	3.17	17.5	1,718	19	169.1	0.6
37	9,0	0	303.9	64.0	183	2.96	16.2	1,716	19	121.8	0.5
38	9.0	0	274.9	57.9	196	2.64	15.5	1,152	15	130.3	0.6
39	9.0	0	291.6	61.4	190	2.60	19.5	1,315	13	126.1	0.6
40	9.0	0	290.8	61.3	193	2.76	14.2	1,127	15	128.5	0.6
41	9.0	0	308.1	64.9	224	3.19	20.7	1,342	16	149.2	0.6
42	9.0	0	311.9	65.7	244	3,09	14.7	1,599	15	162.1	0.6
	A	verage	298.8	63.0	216	2.79	16.5	1,373	17	143.9	0.6

BL# Sensors

12-42 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

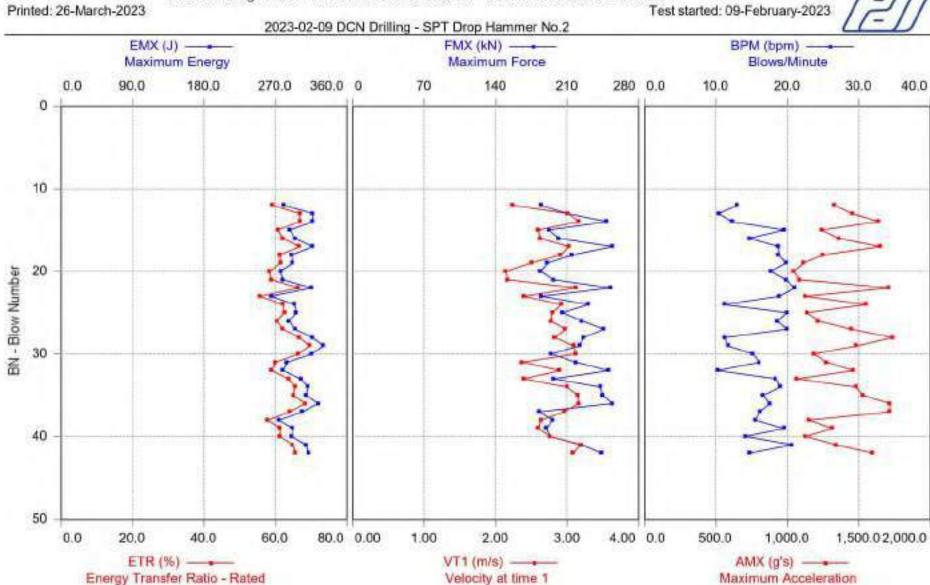
Total number of blows analyzed: 31

Time Summary

Drive 2 minutes 26 seconds 10:16 am - 10:18 am BN 3 - 42

Roc Consulting Limited - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 26-March-2023



Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.2 1

BH02 Test 2 at 10.5m Date: 09-February-2023

OP: RZ 15.03 cm² SP: 77.3 kN/m3 EM: 206,843 MPa LE: 12.2 m WS: 5,123.0 m/s JC: 0.90 EMX: Maximum Energy AMX: Maximum Acceleration

ETR: Energy Transfer Ratio - Rated DMX: Maximum Displacement CSX: Compression Stress Maximum FMX: Maximum Force VT1: Velocity at time 1 FVP: Force/Velocity Proportionality

BPM:	Blows/Mir	nute			22.4		- 00000	MPHILL ASSESSED	0.17/0.030	Tenugi Stones	Unitide .
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	EVP
	m	bl/m	J.	(%)	kN	m/s	bpm	g's	mm	MPa	
13	10.5	0	350.1	73.8	219	3.26	20.7	2,702	34	145.8	0.2
14	10.5	0	352.0	74.2	238	3.40	22.4	2,814	25	158.3	0.2
15	10.5	0	359.0	75.7	211	3.43	21.7	2,752	29	140.1	0.3
16	10.5	0	343.3	72.4	200	3.32	22.2	2,692	24	133.1	0.3
17	10.5	0	359.2	75.7	216	3.39	22.4	2,579	28	143.7	0.3
18	10.5	0	348.5	73.4	233	3.13	22.8	2,699	27	155.3	0.1
19	10.5	0	339.5	71.5	205	3.42	23.1	2,606	29	136.5	0.5
20	10.5	0	348.7	73.5	210	3.28	22.9	2,723	29	139.7	0.5
21	10.5	0	341.4	71.9	188	3.28	22.4	2,506	19	125.3	0.6
22	10.5	0	340.6	71.8	232	3.51	22.3	2,547	21	154.1	0.2
23	10.5	0	336.8	71.0	244	3.30	21.4	2,813	24	162.4	0.1
24	10.5	0	352.2	74.2	219	3.54	22.0	2,694	24	145.5	0.3
25	10.5	0	351.3	74.0	228	3.45	21.7	2,871	25	151.9	0.2
26	10.5	0	338.8	71.4	212	3.43	23.1	2,623	24	141.1	0.3
27	10.5	0	352.3	74.2	211	3.35	22.4	2,690	27	140.6	0.4
28	10.5	0	358.3	75.5	267	3.43	21.4	3,219	22	177.6	0.2
29	10.5	0	340.4	71.7	213	3.50	22.0	2,673	25	141.9	0.3
30	10.5	Ö	328.6	69.2	192	2.95	22.1	2,652	28	127.5	0.7
31	10.5	0	348.9	73.5	197	3.25	22.8	2,770	24	130.8	0.5
32	10.5	0	349.8	73.7	202	3.08	22.2	2,757	27	134.4	0.5
33	10.5	0	348.8	73.5	196	3.42	22.3	2,811	25	130.3	0.4
34	10.5	0	338.0	71.2	192	3.31	22.7	2,795	27	128.0	0.4
35	10.5	0	340.4	71.7	200	3.09	23.6	2,721	25	132.8	0.5
36	10.5	0	340.3	71.7	224	3.57	22.6	2,812	18	149.3	0.3
37	10.5	Ö	344.9	72.7	205	3.15	22.2	2,587	33	136.6	0.5
38	10.5	0	352.7	74.3	255	3.49	21.6		19	169.7	0.2
39	10.5	0	339.4	71.5	197	3.20	22.0	3,164	24		
		0	364.0				22.1	2,741		130.8 130.5	0.5
40	10.5			76.7	196	3.20		2,719	29		0.5
41	10.5	0	355.2	74.8	196	3.02	23.1	2,565	29	130.2	0.6
42	10.5	0	357.7	75,4	202	3.20	22.2	2,688	24	134.5	0.4
43	10.5	0	349.9	73.7	212	3.31	22.4	2,783	26	141.2	0.3
44	10.5	0	354.8	74.8	227	3.59	22.0	2,839	20	150.8	0.2
45	10.5	0	333.5	70.3	197	3.33	22.3	2,651	13	130.8	0.4
46	10.5	0	360.5	76.0	206	3.12	22.6	2,523	31	136.9	0.6
47	10.5	0	341.5	72.0	196	2.98	22.0	2,643	27	130.6	0.6
48	10.5	0	337.0	71.0	189	3.24	21.2	2,530	23	125.6	0.6
49	10.5	0	339.5	71.5	211	3,43	21.9	2,745	21	140.4	0.4
	A	verage	347.0	73.1	212	3.31	22.2	2,722	25	140.9	0.4
				Lotal our	wher of h	nuic one	STRACT 3	1			

Total number of blows analyzed: 37

BL# Sensors

13-49 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Roc Consulting Limited PDIPLOT2 2021.1.61.0

Case Method & ICAP® Results

Page 2 Printed 26-March-2023

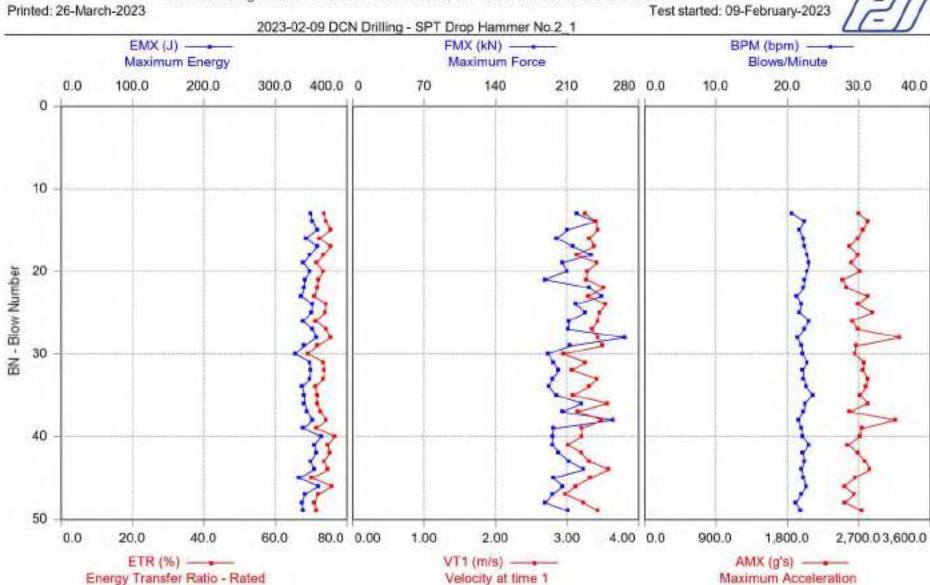
2023-02-09 DCN Drilling - SPT Drop Hammer No.2_1 OP: RZ

BH02 Test 2 at 10.5m Date: 09-February-2023

Time Summary

Drive 2 minutes 9 seconds 10:45 am - 10:47 am BN 1 - 49

Roc Consulting Limited - PDIPLOT2 Ver 2021, 1,61.0 - Case Method & iCAP® Results



Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.2_2 OP: RZ	BH02 Test 3 at 12m Date: 09-February-2023
AR: 15.03 cm ²	SP: 77.3 kN/m ³
LE: 13.7 m	EM: 206,843 MPa
WS: 5 123 0 m/s	IC: 0.90

WS:	5,123.0 m					JC: 0.90						
EMX: ETR: FMX: VT1:	Maximum Energy T Maximum Velocity a Blows/Min	Energy ransfer I Force at time 1		ted		AMX: Maximum Acceleration DMX: Maximum Displacement CSX: Compression Stress Maximum FVP: Force/Velocity Proportionality						
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP	
	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa		
10	12.0	0	336.6	70.9	252	3.39	20.8	2,896	24	167.7	0.6	
11	12.0	0	336.2	70.8	255	3.18	21.3	3,276	30	169.9	0.7	
12	12.0	0	325.6	68.6	198	3.27	20.6	2,627	24	131.8	0.6	
13	12.0	0	335.9	70.B	251	3.73	20.6	2,792	25	167.1	0.3	
14	12.0	0	352.5	74.3	213	3.48	21.9	2,577	30	141.9	0.4	
15	12.0	0	339.4	71,5	258	3.63	21.3	2,951	29	171.4	0.3	
16	12.0	0	356.7	75.2	216	3.45	21.4	2,658	29	144.0	0.3	
17	12.0	0	336.5	70.9	260	3.26	15.3	3,163	23	172.7	0.7	
18	12.0	0	344.9	72.7	229	3.51	21.8	2,761	23	152.3	0.3	
19	12.0	0	318.7	67.2	192	2.82	21.6	2,536	25	127.9	0.8	
20	12.0	0	338.4	71.3	260	3.29	21.6	3,115	25	173.3	0.6	
21	12.0	0	335.9	70.B	208	3.40	21.8	2,556	21	138.2	0.6	
22	12.0	0	346.6	73.0	248	3.69	21.3	2,699	33	165.0	0.3	
23	12.0	0	328.9	69.3	210	3.39	20.5	2,548	22	140.0	0.4	
24	12.0	0	329.0	69.3	266	3.23	21.9	2,843	22	177.1	0.6	
25	12.0	0	352.7	74.3	230	3.34	21.6	2,707	36	152.7	0.4	
26	12.0	0	340.6	71.8	258	3.23	22.3	2,937	22	171.3	0.7	
27	12.0	0	344.2	72.5	266	3.64	21.4	3,132	22	177.1	0.2	

Total number of blows analyzed: 29

BL# Sensors

28

29

30

31

32

33

34

35

36

37

38

12.0

12.0

12.0

12.0

12.0

12.0

12.0

12.0

12.0

12.0

12.0

10-38 F1; [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Time Summary

Drive 1 minute 45 seconds 11:18 am - 11:19 am BN 1 - 38

322.5

325.9

328.3

330.6

321.8

326.1

362.9

335.3

342.1

325.4

328.0

336.1

0

0

0

0

0

0

0

0

0

0

0

Average

68.0

68.7

69.2

69.7

67.8

68.7

76.5

70.7

72.1

68.6

69.1

70.8

229

259

259

213

230

256

259

253

262

198

248

239

3.74

3.60

3.43

3.53

3.58

3.39

3.70

3.79

3.41

3.09

3.66

3.44

21.7

21.1

22.1

21.7

21.6

22.6

21.7

22.2

21.7

21.2

21.8

21.3

2,627

2,771

2,742

2.657

2,615

2,535

2,792

2,753

2,777

2,370

2,617

2,760

20

17

19

21

19

14

39

23

23

23

21

24

152.2

172.4

172.0

141.5

152.8

170.1

172.0

168.0

174.2

131.8

165.3

159.1

0.3

0.3

0.5

0.4

0.3

0.5

0.3

0.2

0.3

0.7

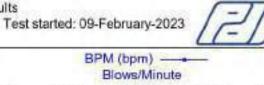
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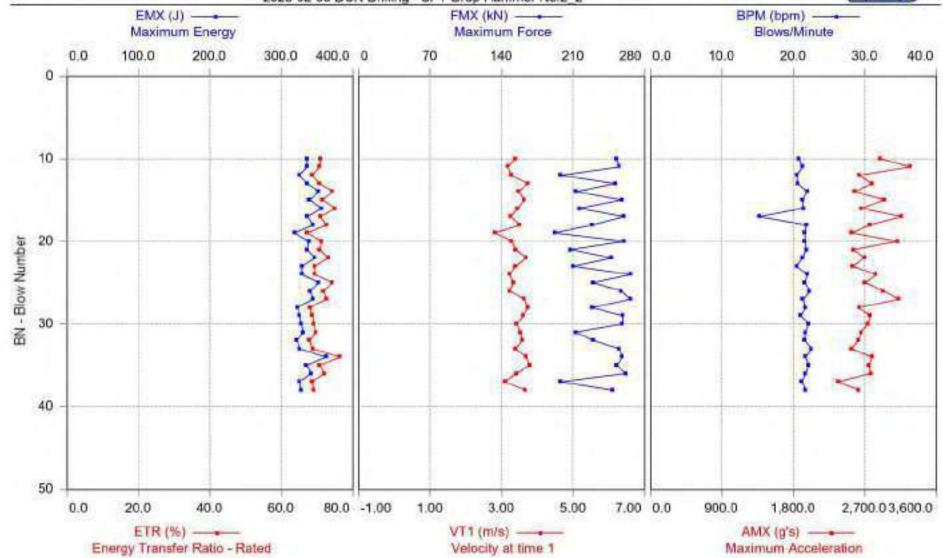
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Roc Consulting Limited - PDIPLOT2 Ver 2021,1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.2_2





and the same		06.34744110	or commence		viethod &		Results		113600	and an arrangement of	
2023- OP: F	-02-09 DC	N Drilling	g - SPT D	rop Ham	mer No.3					103 Test 1 3-Februar	
AR:	15.03 cm	n 2.							SP:		kN/m ³
LE:	10.7 m									206,843	
	5,123.0 m								JC:	0.90	
							ARA	X: Maxim			
	Maximum			had							
	Energy T		(allo - Ka	ted						lacement	
	Maximum									Stress Ma	
DOMA.	Velocity a	it time 1					FVI	- Force	velocity	Proportion	панку
	Blows/Min		EMX	ETR	FMX	VT1	BPM	ALIV	DMX	COV	FVP
BL#	Depth	BLC	EMA					AMX		CSX	FVE
	m	bl/m	2017	(%)	kN	m/s	bpm	g's	mm	MPa	0.5
8	9.0	0	361.7	76.2	226	3.75	19.0	2,910	32	150.5	0.5
9	9.0	0	366.2	77.2	219	3.94	20.6	2,749	24	145.8	0.5
10	9.0	0	348.7	73.5	276	3.53	20.6	3,211	24	183.5	0.3
11	9.0	0	349.1	73.6	197	3.33	21.1	2,718	24	131.2	0.8
12	9.0	0	400.6	84.4	206	3.77	20.0	2,654	44	136.9	0.6
13	9.0	0	359,3	75.7	223	3.99	18.3	2,859	29	148.2	0.5
14	9.0	0	353.2	74.4	243	3.85	21.0	3,051	22	161.4	0.5
15	9.0	0	354.6	74.7	188	3.58	21.2	2,601	25	124.9	0.7
16	9.0	0	343.7	72.4	192	3.43	20.2	2,668	25	127.9	0.8
17	9.0	0	360.1	75.9	236	3.97	14.0	2,844	23	156.7	0.6
18	9.0	0	367.2	77.4	199	3.93	20.8	3,131	21	132.1	0.6
19	9.0	0	363.3	76.6	209	3.92	20.0	2,563	20	138.8	0.7
20	9.0	0	370.6	78.1	210	4.07	21.4	2,653	22	139.7	0.6
21	9.0	0	357.6	75.4	263	3.91	20.2	2,882	24	175.2	0.6
22	9.0	0	368.3	77.6	233	4.22	21.3	2,711	21	155.1	0.5
23	9.0	0	347.6	73.3	201	3.69	21.0	2,595	17	133.8	0.7
24	9.0	0	358.8	75.6	248	4.33	20.7	2,636	17	164.8	0.5

224 Total number of blows analyzed: 19

3.58

4.59

3.86

21.1

19.8

20.1

2,770

2,912

2,796

25

17

24

162.1

161.9

149.0

0.5

0.5

0.6

244

243

BL# Sensors

9.0

9.0

0

0

Average

335.5

373.5

360.0

25

26

8-26 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

70.7

78.7

75.9

Time Summary

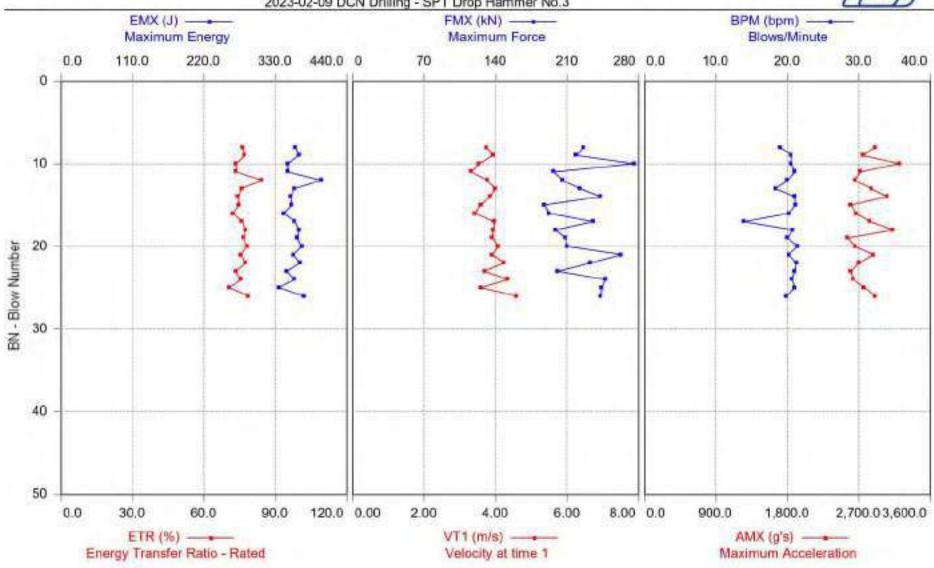
Drive 1 minute 16 seconds 11:35 am - 11:36 am BN 1 - 26

Roc Consulting Limited - PDIPLOT2 Ver 2021,1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.3

Test started: 09-February-2023



Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.3_1

BH03 Test 2 at 10.5m Date: 09-February-2023

 OP; RZ
 Date: 09-February-2023

 AR: 15.03 cm²
 SP: 77.3 kN/m³

 LE: 12.2 m
 EM: 206,843 MPa

 WS: 5,123.0 m/s
 JC: 0.90

EMX: Maximum Energy
ETR: Energy Transfer Ratio - Rated
ETMX: Maximum Force
DMX: Maximum Displacement
CSX: Compression Stress Maximum
VT1: Velocity at time 1
EVP: Force/Velocity Proportionality

BPM:	Blows/Mir						0000	(PRIVESS)	00000	Market College	1000
BL#	Depth	BLC		ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP
	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa	
11	10.5	0	336.4	70.9	219	3.51	16.9	3,086	30	145.6	0.3
12	10.5	0	301.1	63.4	191	3.06	22.9	2,665	27	126.7	0.6
13	10.5	0	296.2	62.4	181	2.72	23.0	2,513	20	120.4	0.4
14	10.5	0	318.4	67.1	215	3.25	22.3	3,115	23		0.5
15	10.5	0	304.8	64.2	233	3.15	21.4	3,315	21	155.2	0.2
16	10.5	0	299.0	63,0	184	3.44	14.7	2,607	17		
17	10.5	0	308.2	64.9	203	3.56	21.3	2,676	17	134.8	0.4
18	10.5	0	310.0	65.3	222	3.30	20.9	2,853	16		0.2
19	10.5	0	313.6	66.1	192	3.32	21.0	2,604	17		0.4
20	10.5	0	304.9	64.3	242	3.10	21.2	3,208	16		0.6
21	10.5	0	315.6	66.5	236	3.28	21.4	3,203	20		0.6
22	10.5	0	312.5	65.9	210	3.69	21.3	2,855	15	139.6	0.4
23	10.5	0	320.3	67,5	192	3,54	21.4	2,741	24	127.4	0.5
24	10.5	0	318.7	67.2	246	3.33	21.7	3,153	21	163.6	0.2
25	10.5	0	291.7	61.5	185	3.04	21.6	2,518	14	123.4	0.6
26	10.5	0	298.1	62.8	191	2.76	22.8	2,470	18	126.8	0.4
27	10.5	0	319.1	67.2	232	3.56	22.3	2,990	24	154.6	0.2
28	10.5	0	325.6	68.6	226	3.50	22.9	3,013	21	150.3	0.3
29	10.5	0	319.0	67.2	254	3.55	21.0	3,225	20	168.9	0.2
30	10.5	0	308.7	65.1	166	3.16	20.3	2,466	26	110.4	0.8
31	10,5	0	321.2	67.7	174	3.40	22.0	2,368	35	115.6	
32	10.5	0	315.2	66.4	183	3.42	21.3	2,562	25		0.4
33	10.5	0	303.4	63.9	238	3.12	21.3	3,327	19	158.5	0.3
34	10.5	0	313.3	66.0	173	3,12	22.5	2,428	22	115.3	0.5
35	10.5	0	318.3	67.1	186	3.65	20.9	2,520	16	123.6	0.4
36	10.5	0	307.0	64.7	184	3.56	21.2	2,451	14	122.2	0.5
37	10.5	0	317.8	67.0	192	3.66	20.9	2,438	17		0.5
38	10.5	0	315.5	66.5	194	3.66	21.5	2,462	16	129.2	0.5
39	10.5	0	309.8	65.3	241	3.38	20.8	3,034			0.4
40	10.5	0	316.7	66.7	233	3.41	20.5	3,042	19	155.2	0.3
41	10.5		295.5	62.3	172	2.95	20.6	2,384	18	114.6	0.6
42	10.5	0	318.7	67.2	208	3.78	20.7	2,418	17	138.3	0.3
43	10.5	0	296.9	62.6	177	2.91	15.7	2,272	16		0.7
44	10.5	0	327.8	69.1	196	3.30	20.2	2,518	32	130.4	0.5
17.00		verage	311.7	65.7	205	3.33	20.9	2,750	20	136.4	0.4

65.7 205 3.33 20.9 Total number of blows analyzed: 34

BL# Sensors

11-44 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

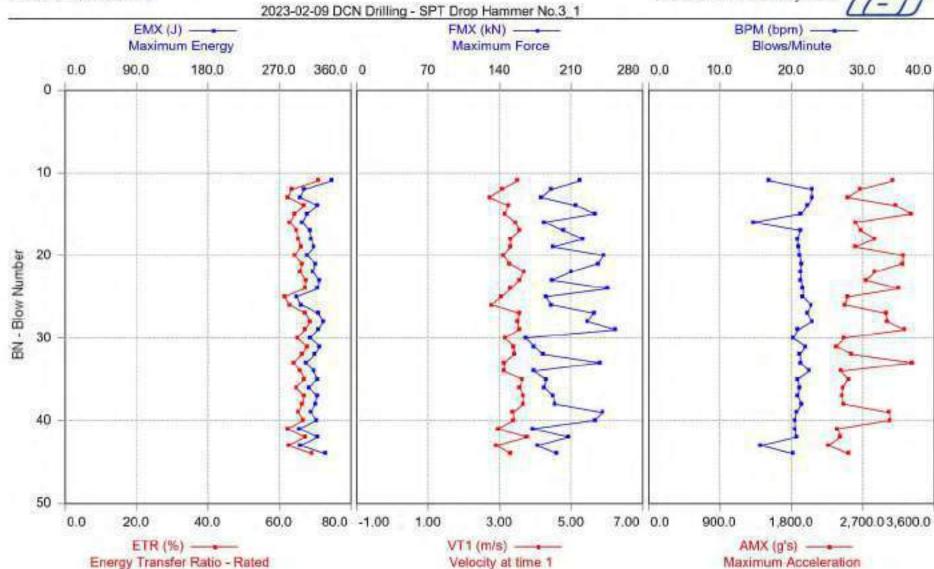
Time Summary

Drive 2 minutes 26 seconds 12:03 pm - 12:05 pm BN 1 - 44

Roc Consulting Limited - PDIPLOT2 Ver 2021,1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

Test started: 09-February-2023



Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.3_2

BH03 Test 3 at 12m Date: 09-February-2023 15.03 cm²

SP: 77.3 kN/m3 LE: 13.7 m EM: 206,843 MPa JC: WS: 5,123.0 m/s 0.90 EMX: Maximum Energy AMX: Maximum Acceleration

DMX: Maximum Displacement CSX: Compression Stress Maximum ETR: Energy Transfer Ratio - Rated FMX: Maximum Force

	Velocity a				FVP: Force/Velocity Proportionality							
	Blows/Min						100000	0.00				
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	EVE	
	m	bl/m	1	(%)	kN	m/s	bpm	g's	mm	MPa		
11	12.0	0	323.3	68.1	252	3.24	16.1	2,854	14	167.9	0.5	
12	12.0	0	318.7	67.2	251	3.33	20.0	2,831	9	166.7	0.3	
13	12.0	0	323.1	68.1	191	3.23	20.6	2,498	24	127.3	0.6	
14	12.0	0	305.7	64.4	186	3.11	20.3	2,444	9	123.9	0.5	
15	12.0	0	310.6	65.4	188	3.25	20.3	2,318	14	125.2	0.4	
16	12.0	0	319.3	67.3	197	3.45	21.6	2,464	8	131.0	0.3	
17	12.0	0	321.2	67.7	237	3.43	20.5	2,464	10	157.6	0.	
18	12.0	0	322.9	68.0	231	3.44	20.0	2,423	17	154.0	0.	
19	12.0	0	312.5	65.8	208	3.27	20.7	2,350	9	138.2	0.	
20	12.0	0	300.2	63.3	174	3.29	20.4	2,202	8	115.6	0.	
21	12.0	0	305.4	64.4	213	3.66	19.9	2,187	8	141.4	0.	
22	12.0	0	319.0	67.2	225	3.78	19.8	2,288	8	149.4	0.	
23	12.0	0	290.2	61.2	245	3,11	20.0	2,478	10	162.7	0.	
24	12.0	0	316.6	66.7	243	3.50	20.6	2,711	8	161.6	0.	
25	12.0	0	296.5	62.5	216	3.24	19.8	2,006	7	143.5	0.	
26	12.0	0	299.9	63.2	181	3.08	21.4	2,168	10	120.4	0.	
27		ő		65.4		3.45	20.2		7		Ö.	
	12.0		310.2		181			2,130	7	120.5		
28	12.0	0	296.5	62.5	166	3.12	20.7	2,093		110.4	0.	
29	12.0	0	290.9	61.3	170	3.01	19.4	2,005	7	112.9	0.	
30	12.0	0	309.5	65.2	218	3.65	19.0	2,106	7	144.7	0.	
31	12.0	0	293.9	61.9	240	3.39	19.6	2,337	7	159.8	0.	
32	12.0	0	307.7	64.8	228	3.58	20.1	2,303	7	151.8	0.	
33	12.0	0	294.5	62.1	209	3.19	20.7	1,979	10	138.9	0.	
34	12.0	0	288.0	60.7	188	3.21	20.2	1,984	7	125.4	0.	
35	12.0	0	300.2	63.3	245	3.32	19.7	2,100	7	163.0	0.	
36	12.0	0	297.8	62.8	243	3.48	19.6	2,151	7	161.4	0.	
37	12.0	0	319.6	67.3	215	3.58	22.4	2,166	15	143.2	0.	
38	12.0	0	295.4	62.2	202	3.08	16.7	1,918	7	134.5	0.	
39	12.0	0	300.1	63.2	194	3.14	20.4	1,940	7	129.2	0.	
40	12.0	0	291.4	61.4	167	2.99	21.5	1,804	7	111.1	0.	
41	12.0	0	306.9	64.7	226	3.60	20.8	1,933	7	150.3	0.	
42	12.0	0	316.1	66.6	232	3.81	21.3	2,104	7	154.1	0.	
43	12.0	0	306.4	64.6	159	2.91	15.9	1,571	12	105.8	0.	
44	12.0	0	307.9	64.9	200	3.29	20.5	1,664	7	133,1	0.	
45	12.0	0	310.8	65.5	173	3.07	20.2	1,701	9	115.4	0.	
46	12.0	0	298.9	63.0	157	3.05	14.7	1,633	9	104.5	0.	
47	12.0	0	312.3	65.8	175	3.01	19.6	1,707	11	116.2	0.	
48	12.0	0	304.1	64.1	231	3.33	20.9	2,221	7	153.9	0.	
49	12.0	0	302.1	63.7	193	3.29	19.8	1,583	7	128.3	0.	
50	12.0	0	300.7	63.4	194	3.17	20.6	1,584	9	128.9	0.	
51	12.0	0	296.0	62.4	171	2.88	20.8	1,438	8	113.5	0.	
52	12.0	0	299.9	63.2	187	3.03	19.5	1,581	9	124.5	0.	
53	12.0	0	301.4	63.5	247	3.50	20.4	2,237	7	164.2	0.	
54	12.0		311.2	65.6	248	3.45	19.4	1,980		164.8	0.	
		0	291.8						15			
55	12.0	0		61.5	213	3.30	19.8	1,517	10	141.6	0.	
56	12.0	0	285.2	60.1	235	3.06	20.9	1,381	7	156.6	0.	
57	12.0	0	277.4	58.5	224	2.88	20.4	1,593	7	148.9	0.	
58	12.0	0	293.2	61.8	188	3.06	20.7	1,340	13	125.3	0.	
59	12.0	0	295.5	62.3	239	3.24	13.5	1,853	9		0.	
60	12.0	0	277.6	58.5	224	2.93	20.5	1,408	7	149.3	0.	

Roc Consulting Limited PDIPLOT2 2021.1.61.0

Case Method & iCAP® Results

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2023-02-09 DCN Drilling - SPT Drop Hammer No.3_2

BH03 Test 3 at 12m

OP: R	Z	67.323.207.205	96. http://doi.org/10.00	1990	0.65 0.0350	AND			Date: 09	-Februar	y-2023
BL#	Depth m	BLC bl/m	EMX	ETR (%)	FMX kN	VT1 m/s	BPM	AMX g's	DMX	CSX MPa	FVP
	A	verage	303.5	64.0	208	3.27	19.8	2,035	9	138.6	0.5

Total number of blows analyzed: 50

BL# Sensors

11-60 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

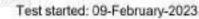
Time Summary

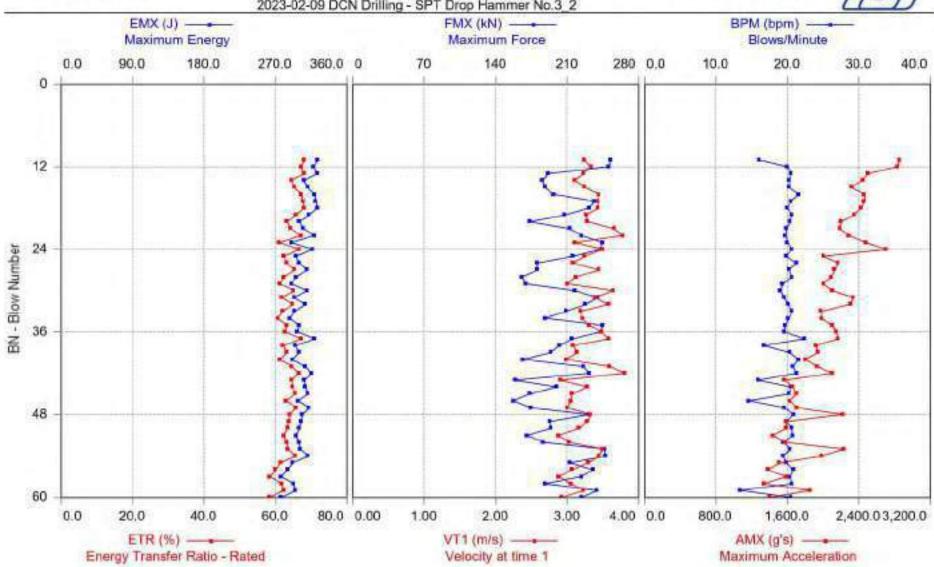
Drive 2 minutes 58 seconds 12:27 pm - 12:30 pm BN 1 - 60

Roc Consulting Limited - PDIPLOT2 Ver 2021, 1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.3_2





Case Method & ICAP® Results

2023- OP: F	-02-09 DC	N Drilling	g - SPT D		mer No.4		(COUND.			01 Test 1	
AR:	15.03 cm	n².							SP:		kN/m²
LE:	10.7 m								EM	206,843	
WS:	5,123.0 m	/s							JC:	0.90	e arresta
EMX:	Maximum	Energy	Company Ingine	ALIAN TIL				X: Maxim			
ETR:	Energy T	ransfer I	Ratio - Ra	ted						lacement	
	Maximum									Stress Ma.	
	Velocity a						FVF	: Force	/Velocity	Proportio	nality
	Blows/Mi						Julian	Marian Carlo Service	W.FE-037/07/95	Vinence Connect	UDWYCH.
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP
10/53	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa	
12	9.0	0	339.0	71.4	210	3.25	14.8	3,041	21	139.8	0.8
13	9.0	0	376.0	79.2	202	3.22	18.9	2,998	52	134.5	0.8
14	9.0	0	353.8	74.6	218	3.37	20.6	3,239	18	145.4	0.8
15	9.0	0	344.4	72.6	222	3.23	19.6	2,876	20	147.7	0.7
16	9.0	0	336.5	70.9	211	3.24	19.3	3,012	20	140.2	0.7
17	9.0	0	321.0	67.7	202	3.23	15.5	2,990	20	134.5	0.8
18	9.0	0	353.5	74.5	228	3.34	18.1	3,156	16	151.4	0.6
19	9.0	0	368.9	77.7	234	3,45	18.6	3,285	20	155.4	0.6
20	9.0	0	356.2	75.1	231	3.39	20.8	3,278	19	154.0	0.8
21	9.0	0	355,5	74.9	214	3.52	18.8	3,105	18	142.2	0.6
22	9,0	0	356.5	75.1	290	3.96	20.3	4,159	12	193.2	0.6
23	9.0	0	368.7	77.7	249	3.68	18.5	3,610	20	165.9	0.7
24	9.0	0	359.9	75.8	235	3.54	19.0	3,450	15	156.0	0.5
25	9.0	0	367.4	77.4	235	3.46	18.6	3,211	21	156.4	0.6
26	9.0	0	345.3	72.8	208	3.50	18.4	3,180	15	138.5	0.6
27	9.0	0	369.9	78.0	256	3.71	19.9	3,858	15	170.6	0.6
28	9.0	0	347.4	73.2	210	3.48	18.9	3,104	19	139.6	0.7
29	9.0	0	373.4	78.7	237	3.70	20.0	3,391	18	157.6	0.6
30	9.0	0	328.4	69.2	206	3.21	14.5	2,959	20	136.9	0.7
31	9.0	0	370.7	78.1	223	3.46	19.9	3,128	16	148.6	0.8
32	9,0	0	356.5	75.1	240	3,53	12.7	3,377	13	159.9	0.5
33	9.0	0	366.3	77.2	215	3.56	19.0	2,875	23	142.8	0.7
34	9.0	0	354.3	74.7	242	3.74	18.4	3,016	12	160.9	0.5
35	9.0	0	352.8	74.3	217	3.64	18.4	2,767	21	144.4	0.6
36	9.0	0	337.8	71.2	219	3.51	19.3	2,793	14	145.4	0.6
37	9,0	0	360.7	76.0	233	3.73	18.8	2,649	18	155.1	0.6
38	9.0	0	366.0	77.1	239	3.72	17.4	2,884	19	158.8	0.6
39	9.0	0	349.3	73.6	225	3.51	19.5	2,742	13	150.0	0.7
40	9.0	0	346.4	73.0	239	3.95	18.8	2,732	17	159.3	0.6
41	9.0	0	347.8	73.3	223	3.81	18.6	2,835	22	148.0	0.6
42	9.0	0	367.0	77.3	226	3.67	18.2	2,778	18	150.5	0.7
43	9.0	0	344.3	72.5	217	3.67	18.2	2,739	9	144.4	0.7

BL# Sensors

12-43 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

227

Total number of blows analyzed: 32

3.53

18.4

3,101

19

150.9

0.7

74.7

Time Summary

Drive 2 minutes 24 seconds 9:09 am - 9:11 am BN 1 - 43

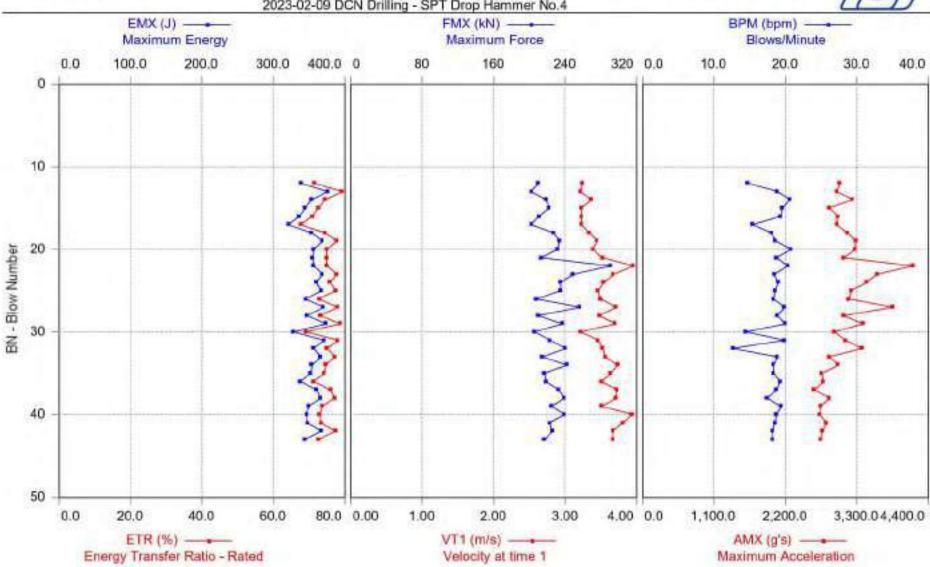
354.4

Average

Roc Consulting Limited - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

Test started: 09-February-2023 2023-02-09 DCN Drilling - SPT Drop Hammer No.4



Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.4 1	BH01 Test 2 at 10.5m
OP: RZ	Date: 09-February-2023
AR: 15.03 cm²	SP- 77.3 kN/m

AR: 15.03 cm² SP: 77.3 kN/m
LE: 12.2 m EM: 206,843 MPa
WS: 5,123.0 m/s JC: 0.90

EMX: Maximum Energy
ETR: Energy Transfer Ratio - Rated
DMX: Maximum Displacement
DMX: Maximum Displacement
CSX: Compression Stress Maximum
VT1: Velocity at time 1
FVP: Force/Velocity Proportionality

BL# Depth BLC EMX ETR FMX WT1 BPM AMX DMX CSX FVF M Depth BLC EMX C54 A,49 19,7 3,351 20 169.2 0.7	BPM:	Blows/Mi						-	. I dicci	relocity	rioperadi	idiny
13 10.5 0 376.8 79.4 254 3.49 19.7 3,351 20 169.2 0.7 14 10.5 0 362.5 76.4 231 3.47 19.6 3,022 22 153.9 0.7 15 10.5 0 359.4 75.7 267 3.66 19.7 3,594 20 177.5 0.6 16 10.5 0 369.6 77.9 236 3.45 19.5 2.948 26 156.7 0.7 18 10.5 0 374.7 79.0 237 3.47 15.3 3,226 20 157.6 0.7 19 10.5 0 374.7 79.0 237 3.47 15.3 3,226 20 157.6 0.7 20 10.5 0 350.7 75.4 279 3.90 18.5 3,483 24 166.4 0.6 21 10.5 0 346.3		THE RESERVE THE PERSON NAMED IN COLUMN 2 I	BLC				VT1			DMX		EVP
14 10.5 0 362.5 76.4 231 3.47 19.6 3.022 22 153.9 0.7 15 10.5 0 372.8 78.6 235 3.52 19.9 2.980 27 156.6 0.6 16 10.5 0 369.6 77.9 236 3.45 19.5 2.948 26 156.7 0.7 18 10.5 0 374.7 79.0 237 3.47 15.3 3.226 20 157.6 0.7 19 10.5 0 372.2 78.4 250 3.52 19.8 3.493 24 166.4 0.6 20 10.5 0 357.7 75.4 279 3.90 18.5 3.818 17 185.6 0.6 21 10.5 0 364.3 73.0 209 3.41 19.9 3.111 17 138.8 0.7 22 10.5 0 346.3 73.5 243 3.77 19.0 3.008 14 161.5 0.6			bl/m	1								
15 10.5 0 372.8 78.6 235 3.52 19.9 2,980 27 156.6 0.6 16 10.5 0 359.4 75.7 267 3.66 19.7 3,594 20 177.5 0.6 17 10.5 0 369.6 77.9 236 3.45 19.5 2.948 26 156.7 0.7 18 10.5 0 374.7 79.0 237 3.47 15.3 3.226 20 157.6 0.7 19 10.5 0 372.2 78.4 250 3.52 19.8 3.493 24 166.4 0.6 20 10.5 0 350.7 75.4 279 3.90 18.5 3,818 17 185.6 0.6 21 10.5 0 346.3 73.0 209 3.41 19.9 3,111 17 138.8 0.7 21 10.5 0 346.7	13											0.7
16 10.5 0 359.4 75.7 267 3.66 19.7 3.594 20 177.5 0.6 17 10.5 0 369.6 77.9 236 3.45 19.5 2.948 26 156.7 0.7 19 10.5 0 372.2 78.4 250 3.52 19.8 3.493 24 166.4 0.6 20 10.5 0 357.9 75.4 279 3.90 18.5 3.818 17 185.6 0.6 21 10.5 0 350.7 73.9 239 3.54 18.9 3.061 18 189.0 0.6 21 10.5 0 364.7 76.9 296 4.02 20.2 3.935 21 197.1 0.6 22 10.5 0 364.7 76.9 296 4.02 20.2 3.935 21 197.1 0.6 25 10.5 0 364.7			0									0.7
17 10.5 0 369.6 77.9 236 3.45 19.5 2.948 26 156.7 0.7 18 10.5 0 374.7 79.0 237 3.47 15.3 3.226 20 157.6 0.7 19 10.5 0 357.9 75.4 279 3.90 18.5 3.818 17 185.6 0.6 21 10.5 0 350.7 73.9 239 3.54 18.9 3.061 18 159.0 0.5 22 10.5 0 346.3 73.0 209 3.41 19.9 3.111 17 138.8 0.7 23 10.5 0 348.8 73.5 243 3.77 19.0 3.008 14 161.5 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3.008 14 161.5 0.6 25 10.5 0 370.7 78.1 257 3.88 15.8 3.160 18 170.9 0.5		10.5	0	372.8								0.6
18 10.5 0 374.7 79.0 237 3.47 15.3 3.226 20 157.6 0.7 19 10.5 0 372.2 78.4 250 3.52 19.8 3.493 24 166.4 0.6 20 10.5 0 357.9 75.4 279 3.90 18.5 3.818 17 185.6 0.6 21 10.5 0 356.7 73.9 239 3.54 18.9 3.061 18 159.0 0.5 22 10.5 0 346.3 73.0 209 3.41 19.9 3.111 17 138.8 0.7 24 10.5 0 364.7 76.9 296 4.02 20.2 3.935 21 197.1 0.6 24 10.5 0 370.7 78.1 257 3.68 16.8 3.150 18 170.9 0.5 26 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7	16	10.5		359.4		267				20	177.5	0.6
19 10.5 0 372.2 78.4 250 3.52 19.8 3,493 24 166.4 0.6 20 10.5 0 357.9 75.4 279 3.90 18.5 3,818 17 185.6 0.6 21 10.5 0 346.3 73.0 209 3,41 19.9 3,061 18 159.0 0.5 23 10.5 0 364.7 76.9 296 4.02 20.2 3,935 21 197.1 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3,008 14 161.5 0.6 25 10.5 0 370.7 78.1 257 3.85 19.6 3,000 18 170.7 0.5 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7	17		0	369.6	77.9	236		19.5		26		0.7
20 10.5 0 357.9 75.4 279 3.90 18.5 3,818 17 185.6 0.6 21 10.5 0 350.7 73.9 239 3.54 18.9 3,061 18 159.0 0.5 22 10.5 0 346.3 73.0 209 3.41 19.9 3,111 17 138.8 0.7 23 10.5 0 364.7 76.9 296 4.02 20.2 3,935 21 197.1 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3,008 14 161.5 0.6 25 10.5 0 370.7 78.1 257 3.68 15.8 3,150 18 170.7 0.5 26 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7	18							15.3	3,226	20		0.7
21 10.5 0 350.7 73.9 239 3.54 18.9 3,061 18 159.0 0.5 22 10.5 0 346.3 73.0 209 3,41 19.9 3,111 17 138.8 0.7 23 10.5 0 364.7 76.9 296 4.02 20.2 3,935 21 197.1 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3,008 14 161.5 0.6 25 10.5 0 370.7 78.1 257 3.68 15.8 3,150 18 170.9 0.5 26 10.5 0 357.2 75.3 257 3.85 19.6 3,090 18 170.7 0.5 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 28 10.5 0 341.9 72.1 200 3,26 18.8 2,803 25 132.9 0.8	19	10.5	0		78.4	250	3.52	19.8	3,493	24		0.6
22 10.5 0 346.3 73.0 209 3.41 19.9 3,111 17 138.8 0.7 23 10.5 0 364.7 76.9 296 4.02 20.2 3,935 21 197.1 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3,008 14 161.5 0.6 25 10.5 0 370.7 78.1 257 3.68 15.8 3,150 18 170.7 0.5 26 10.5 0 357.2 75.3 257 3.85 19.6 3,090 18 170.7 0.5 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 28 10.5 0 341.9 72.1 200 3,26 18.8 2,803 25 132.9 0.8 29 10.5 0 357.9 75.4 220 3,64 14.7 2,891 18 146.3 0.7	20	10.5	0	357.9	75.4	279	3.90	18.5	3,818	17	185.6	0.6
23 10.5 0 364.7 76.9 296 4.02 20.2 3,935 21 197.1 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3,008 14 161.5 0.6 25 10.5 0 377.7 78.1 257 3.68 15.8 3,150 18 170.9 0.5 26 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 27 10.5 0 341.9 72.1 200 3,26 18.8 2,803 25 132.9 0.6 29 10.5 0 357.9 75.4 220 3.64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.6	21	10.5	0	350.7		239	3.54	18.9	3,061	18	159.0	0.5
23 10.5 0 364.7 76.9 296 4.02 20.2 3,935 21 197.1 0.6 24 10.5 0 348.8 73.5 243 3.77 19.0 3,008 14 161.5 0.6 25 10.5 0 377.7 78.1 257 3.68 15.8 3,150 18 170.9 0.5 26 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 27 10.5 0 341.9 72.1 200 3,26 18.8 2,803 25 132.9 0.6 29 10.5 0 357.9 75.4 220 3.64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.6	22	10.5	0	346.3	73.0		3,41	19.9	3,111	17	138.8	0.7
25 10.5 0 370.7 78.1 257 3.68 15.8 3,150 18 170.9 0.5 26 10.5 0 357.2 75.3 257 3.85 19.6 3.090 18 170.7 0.5 27 10.5 0 348.5 73.4 215 3.19 20.3 2.820 22 143.0 0.7 28 10.5 0 341.9 72.1 200 3.64 18.8 2.803 25 132.9 0.8 29 10.5 0 357.9 75.4 220 3.64 14.7 2.891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2.920 17 172.2 0.5 31 10.5 0 362.2 76.3 220 3.69 20.5 2.985 13 146.5 0.5 32 10.5 0 362.3	23	10.5	0	364.7			4.02		3,935	21	197.1	0.6
26 10.5 0 357.2 75.3 257 3.85 19.6 3,090 18 170.7 0.5 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 28 10.5 0 341.9 72.1 200 3,26 18.8 2,803 25 132.9 0.8 29 10.5 0 357.9 75.4 220 3,64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 362.2 76.3 220 3,69 20.5 2,985 13 146.5 0.5 32 10.5 0 362.2 76.3 220 3,69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.3	24	10.5	0	348.8	73.5	243	3.77	19.0	3,008	14	161.5	0.6
26 10.5 0 357.2 75.3 257 3.85 19.6 3,090 18 170.7 0.5 27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 28 10.5 0 341.9 72.1 200 3,26 18.8 2,803 25 132.9 0.8 29 10.5 0 357.9 75.4 220 3,64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 362.2 76.3 220 3,69 20.5 2,985 13 146.5 0.5 32 10.5 0 362.2 76.3 220 3,69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.3		10.5	0	370.7	78.1			15.8		18		0.5
27 10.5 0 348.5 73.4 215 3.19 20.3 2,820 22 143.0 0.7 28 10.5 0 341.9 72.1 200 3.26 18.8 2,803 25 132.9 0.8 29 10.5 0 357.9 75.4 220 3.64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 374.4 78.9 238 3.91 19.2 2,980 19 158.5 0.6 32 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.5 34 10.5 0 346.6 73.0 285 3.61 19.2 2,728 17 145.6 0.5	26	10.5	0	357.2	75.3	257	3.85			18		0.5
28 10.5 0 341.9 72.1 200 3.26 18.8 2,803 25 132.9 0.8 29 10.5 0 357.9 75.4 220 3.64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 374.4 78.9 238 3.91 19.2 2,980 19 158.5 0.6 32 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.3 76.4 219 3.89 19.2 2,728 17 145.6 0.5 34 10.5 0 346.6 73.0 285 3.61 19.6 3,169 16 189.9 0.2 35 10.5 0 365.9 77.1 220 3.82 20.1 2,822 20 147.7 0.6	27	10.5	0	348.5	73.4		3.19	20.3	2,820	22	143.0	0.7
29 10.5 0 357.9 75.4 220 3.64 14.7 2,891 18 146.3 0.7 30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 374.4 78.9 238 3.91 19.2 2,980 19 158.5 0.6 32 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.3 76.4 219 3.89 19.2 2,728 17 145.6 0.5 34 10.5 0 346.6 73.0 285 3.61 19.6 3,169 16 189.9 0.2 35 10.5 0 365.1 76.9 222 3.82 20.1 2,822 20 147.7 0.6 36 10.5 0 365.9 77.1 220 3.94 13.3 2,840 20 146.6 0.5	28	10.5	0	341.9	72.1	200	3.26	18.8		25	132.9	0.8
30 10.5 0 355.1 74.8 259 4.00 20.4 2,920 17 172.2 0.5 31 10.5 0 374.4 78.9 238 3.91 19.2 2,980 19 158.5 0.6 32 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.3 76.4 219 3.89 19.2 2,728 17 145.6 0.5 34 10.5 0 346.6 73.0 285 3.61 19.6 3,169 16 189.9 0.2 35 10.5 0 365.1 76.9 222 3.82 20.1 2,822 20 147.7 0.6 36 10.5 0 365.9 77.1 220 3.94 13.3 2,840 20 146.6 0.5 37 10.5 0 362.2 76.3 241 4.01 19.1 2,736 18 160.0 0.6		10.5									146.3	0.7
31 10.5 0 374.4 78.9 238 3.91 19.2 2,980 19 158.5 0.6 32 10.5 0 362.2 76.3 220 3.69 20.5 2,985 13 146.5 0.5 33 10.5 0 362.3 76.4 219 3.89 19.2 2,728 17 145.6 0.5 34 10.5 0 346.6 73.0 285 3.61 19.6 3,169 16 189.9 0.2 35 10.5 0 365.1 76.9 222 3.82 20.1 2,822 20 147.7 0.6 36 10.5 0 334.9 70.6 217 3.67 20.0 2,501 15 144.6 0.6 37 10.5 0 365.9 77.1 220 3.94 13.3 2,840 20 146.6 0.5 38 10.5 0 362.2 76.3 241 4.01 19.1 2,736 18 160.0 0.6 39 10.5 0 337.7 71.2 210 3.45 19.7 2,549 17 140.0 0.7 40 </td <td>30</td> <td>10.5</td> <td>0</td> <td>355.1</td> <td>74.8</td> <td></td> <td></td> <td></td> <td></td> <td>17</td> <td>172.2</td> <td>0.5</td>	30	10.5	0	355.1	74.8					17	172.2	0.5
32 10.5 0 362.2 76.3 220 3.69 20.5 2.985 13 146.5 0.5 33 10.5 0 362.3 76.4 219 3.89 19.2 2.728 17 145.6 0.5 34 10.5 0 346.6 73.0 285 3.61 19.6 3.169 16 189.9 0.2 35 10.5 0 365.1 76.9 222 3.82 20.1 2.822 20 147.7 0.6 36 10.5 0 334.9 70.6 217 3.67 20.0 2.501 15 144.6 0.6 37 10.5 0 365.9 77.1 220 3.94 13.3 2.840 20 146.6 0.5 38 10.5 0 362.2 76.3 241 4.01 19.1 2.736 18 160.0 0.6 39 10.5 0 337.7 71.2 210 3.45 19.7 2.549 17 140.0 0.7 40 10.5 0 361.4 76.2 277 3.84 19.9 3.192 16 184.4 0.6 41 10.5 0 370.0 78.0 286 3.73 19.5 3.606 15 190.2 0.6 42 10.5 0 350.2 73.8 224 3.77 19.8 2.726 12 148.9 0.7 43 10.5 0 363.3 76.6 256 3.93 19.9 2.754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2.673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2.699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2.589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2.388 25 141.4 0.5			0									0.6
33		10.5	0	362.2						13		0.5
34 10.5 0 346.6 73.0 285 3.61 19.6 3,169 16 189.9 0.2 35 10.5 0 365.1 76.9 222 3.82 20.1 2,822 20 147.7 0.6 36 10.5 0 334.9 70.6 217 3.67 20.0 2,501 15 144.6 0.6 37 10.5 0 365.9 77.1 220 3.94 13.3 2,840 20 146.6 0.5 38 10.5 0 362.2 76.3 241 4.01 19.1 2,736 18 160.0 0.6 39 10.5 0 337.7 71.2 210 3.45 19.7 2,549 17 140.0 0.7 40 10.5 0 361.4 76.2 277 3.84 19.9 3,192 16 184.4 0.6 41 10.5 0 370.0 78.0 286 3.73 19.5 3,606 15 190.2 0.6 42 10.5 0 363.3 76.6 256 3.93 19.9 2,754 19 170.3 0.6 43 </td <td></td> <td>0.5</td>												0.5
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38 10.5 0 362.2 76.3 241 4.01 19.1 2.736 18 160.0 0.6 39 10.5 0 337.7 71.2 210 3.45 19.7 2.549 17 140.0 0.7 40 10.5 0 361.4 76.2 277 3.84 19.9 3.192 16 184.4 0.6 41 10.5 0 370.0 78.0 286 3.73 19.5 3.606 15 190.2 0.6 42 10.5 0 350.2 73.8 224 3.77 19.8 2.726 12 148.9 0.7 43 10.5 0 363.3 76.6 256 3.93 19.9 2.754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2.673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2.699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2.589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2.388 25 141.4 0.5							3.94	13.3	2.840			0.5
39 10.5 0 337.7 71.2 210 3.45 19.7 2,549 17 140.0 0.7 40 10.5 0 361.4 76.2 277 3.84 19.9 3.192 16 184.4 0.6 41 10.5 0 370.0 78.0 286 3.73 19.5 3,606 15 190.2 0.6 42 10.5 0 350.2 73.8 224 3.77 19.8 2,726 12 148.9 0.7 43 10.5 0 363.3 76.6 256 3.93 19.9 2,754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2,673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5									2.736			0.6
40 10.5 0 361.4 76.2 277 3.84 19.9 3.192 16 184.4 0.6 41 10.5 0 370.0 78.0 286 3.73 19.5 3,606 15 190.2 0.6 42 10.5 0 350.2 73.8 224 3.77 19.8 2,726 12 148.9 0.7 43 10.5 0 363.3 76.6 256 3.93 19.9 2,754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2,673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.7
41 10.5 0 370.0 78.0 286 3.73 19.5 3,606 15 190.2 0.6 42 10.5 0 350.2 73.8 224 3.77 19.8 2,726 12 148.9 0.7 43 10.5 0 363.3 76.6 256 3.93 19.9 2,754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2,673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.6
42 10.5 0 350.2 73.8 224 3.77 19.8 2,726 12 148.9 0.7 43 10.5 0 363.3 76.6 256 3.93 19.9 2,754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2,673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.6
43 10.5 0 363.3 76.6 256 3.93 19.9 2,754 19 170.3 0.6 44 10.5 0 357.0 75.2 231 3.89 18.9 2,673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.7
44 10.5 0 357.0 75.2 231 3.89 18.9 2,673 13 153.5 0.5 45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.6
45 10.5 0 357.6 75.4 240 4.08 19.5 2,699 19 160.0 0.6 46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.5
46 10.5 0 347.5 73.2 225 3.89 19.2 2,589 14 149.4 0.5 47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.5												0.6
47 10.5 0 347.9 73.3 213 3.14 18.2 2,388 25 141.4 0.9												0.5
- 17 17 17 17 17 17 17 17 17 17 17 17 17												0.9
	-47			358.7	75.6	240	3.69	19.0	3,005	19	159.8	0.6

Total number of blows analyzed: 35

BL# Sensors

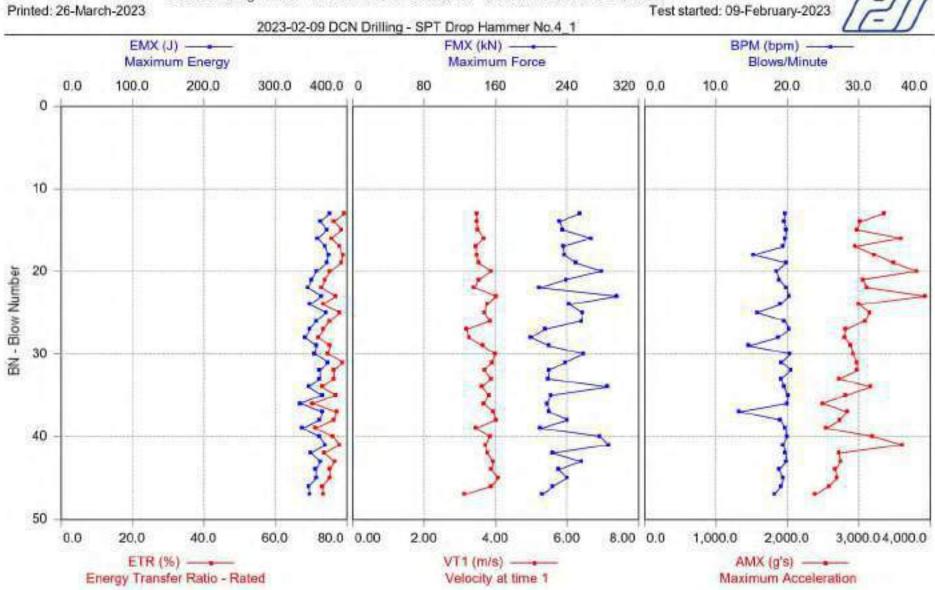
13-47 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Time Summary

Drive 2 minutes 25 seconds 9:35 am - 9:38 am BN 1 - 47

Roc Consulting Limited - PDIPLOT2 Ver 2021, 1,61.0 - Case Method & ICAP® Results

Printed: 26-March-2023



BH01 Test 3 at 12m

Case Method & ICAP® Results

2023-02-09 DCN	Drilling - SPT Dro	p Hammer No.4_2
	Committee of the Commit	TO A STATE OF THE PARTY OF THE

 OP: RZ
 Date: 09-February-2023

 AR: 15.03 cm²
 SP: 77.3 kN/m³

 LE: 13.7 m
 EM: 206,843 MPa

 WS: 5,123.0 m/s
 JC: 0.90

EMX: Maximum Energy
ETR: Energy Transfer Ratio - Rated
DMX: Maximum Displacement
DMX: Maximum Displacement
CSX: Compression Stress Maximum
VT1: Velocity at time 1
VT1: Velocity at time 1

	Velocity a Blows/Mir		FVP: Force/Velocity Proport								
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	EVP
	m	bl/m	J	(%)	kN	m/s	bpm	g's	mm	MPa	
10	12.0	0	358.9	75.6	226	3.28	20.2	2,659	17	150.3	0.7
11	12.0	0	354.2	74.6	224	3.17	20.4	2,822	19	149.2	0.5
12	12.0	0	322.2	67.9	212	2.95	16.2	2,586	23	140.9	0.5
13	12.0	0	371.9	78.4	236	3.79	20.5	3,096	17	157.3	0.6
14	12.0	0	358.4	75.5	231	3.66	20.7	2,572	25	153.7	0.6
15	12.0	0	338.3	71.3	216	3.34	21.5	2,414	20	143.7	0.7
16	12.0	0	368.5	77.6	233	3.97	21.4	2,755	22	155.1	0.6
17	12.0	0	332.9	70.2	208	2.78	21.0	2,351	27	138.3	0.7
18	12.0	0	364.0	76.7	224	3.74	21.4	2,953	18	149.2	0.6
19	12.0	0	347.2	73.2		3.34	21.9			144.0	
					216			2,324	25		0.6
20	12.0	0	357.2	75.3	235	3.81	14.8	2,925	18	156.0	0.7
21	12.0	0	347.4	73.2	203	2.80	20.8	2,562	31	135.2	0.5
22	12.0	0	358.2	75.5	228	3.72	16.7	2,984	11	151.6	0.6
23	12.0	0	344.7	72.6	219	2.84	22.4	2,286	42	145.4	0.8
24	12.0	0	353.4	74.5	242	4.01	22.8	2,790	17	160.9	0.5
25	12.0	0	342.9	72.3	239	3,98	20.0	2,514	15	158.9	0.5
26	12.0	0	330.3	69,6	255	3.47	19.9	2,761	11	169.9	0.7
27	12.0	0	346.4	73.0	233	3.80	20.6	2,468	13	154.7	0.6
28	12.0	0	348.3	73.4	222	3.62	21.1	2,186	14	147.7	0.7
29	12.0	0	341.4	71.9	235	3.71	21.7	2,268	10	156.4	0.6
30	12.0	0	344.3	72.6	257	3.98	21.5	2,583	12	171.1	0.5
31	12.0	0	347.2	73.2	258	3.89	20.9	2,314	14	171.9	0.5
32	12.0	0	356.7	75.2	244	4.02	20.4	2,300	11	162.3	0.6
33	12.0	0	342.3	72.1	230	3.55	17.6	2,133	13	152.7	0.6
34	12.0	Ö	358.3	75.5	241	4.16	19.6	2,220	10	160.2	0.5
35	12.0	ő	319.3	67.3	227	3.25	19.2	2,011	16	150.7	0.7
36	12.0	ő	304.6	64.2	211	2.75	20.0	1,792	12	140.7	0.6
37	12.0	0	348.6	73.5		4.10		2,363	11	158.3	
					238		19.6				0.5
38	12.0	0	316.5	66.7	216	2.80	19.9	2,094	9	143.4	0.6
39	12.0	0	347.9	73.3	227	3.94	20.1	2,388	15	151.2	0.5
40	12.0	0	321.7	67.8	236	3.81	16.7	2,071	9	157.1	0.5
41	12.0	0	325.0	68.5	231	3.66	12.2	1,943	13	153.9	0.6
42	12.0	0	316.2	66.6	223	3.80	19.2	2,144	9	148.4	0.5
43	12.0	0	363.6	76.6	220	3.83	20.4	2,585	22	146.3	0.6
44	12.0	0	334.1	70.4	273	3.47	19.9	2,400	10	181.6	0.6
45	12.0	0	287.8	60.6	212	2.66	19.4	1,925	10	140.9	0.6
46	12.0	0	330.4	69,6	223	3.58	19.3	1,865	10	148.3	0.5
47	12.0	0	288.2	60.7	262	2.68	20.1	1,790	8	174.3	0.8
48	12.0	0	300.0	63.2	207	2.64	20.2	1,616	8	137.4	0.4
49	12.0	0	309.6	65.3	217	2.61	20.9	1,759	12	144.1	0.5
50	12.0	0	320.9	67.6	228	2.82	16.6	1,677	12	151.7	0.6
51	12.0	0	299.9	63.2	178	2.25	19.2	1,458	18	118.1	0.7
52	12.0	0	319.5	67.3	261	2.86	19.0	1,933	12	173.9	0.8
53	12.0	0	318.6	67.1	229	2.87	20.9	1,823	12	152.1	0.6
54	12.0	0	299.3	63.1	206	2.85	20.6	1,547	12	136.9	
55	12.0	ő	297.7	62.7	204	2.81	14.3	1,558	9	135.5	0.5
56	12.0	0	328.9	69.3	207	2.84	20.7	1,566	14	137.9	
											0.6
57	12.0	0	316.0	66.6	254	2.63	21.8	1,865	13		0.6
58	12.0	0	316.2	66.6	219	2.98	20.5	1,605	11	145.6	0.6
59	12.0	0	308,8	65.1	191	2.36	20.9	1,338	9	126.9	0.6

Roc Consulting Limited PDIPLOT2 2021, 1.61.0

Case Method & ICAP® Results

Page 2 Printed 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.4_2

BH01 Test 3 at 12m

OP: R	Z	Salah Salah	185 E-500 (PC) F0	NAME OF THE OWNER OWNER OF THE OWNER OF THE OWNER OF THE OWNER OW					Date: 09-February-2023			
BL#	Depth m	BLC bl/m	EMX	ETR (%)	FMX kN	VT1 m/s	BPM	AMX g's	DMX	CSX MPa	FVP	
	A	verage			A STATE OF THE PARTY OF THE PAR		The second second	2,219	15	151.2	0.6	
		verage			and the		The second second	NAME OF PERSONS ASSESSED.	19	10114		

BL# Sensors

10-59 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Time Summary

Drive 2 minutes 57 seconds 10:05 am - 10:08 am BN 1 - 59

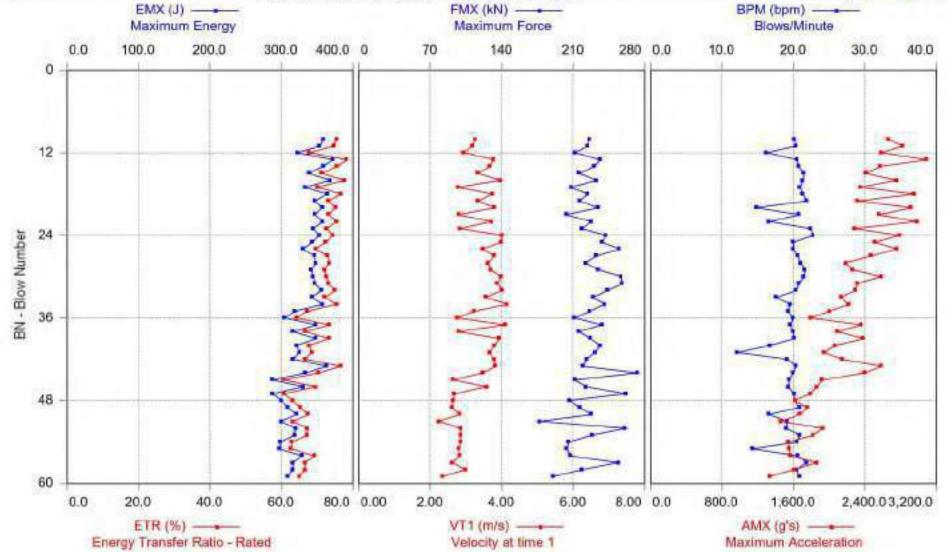
Roc Consulting Limited - PDIPLOT2 Ver 2021, 1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.4_2

Test started: 09-February-2023





WS: 5,123.0 m/s

SP:

JC:

BH04 Test 1 at 9m

EM: 206,843 MPa

0.90

77.3 kN/m3

Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.5

OP: RZ Date: 09-February-2023 15.03 cm² LE: 10.7 m

EMX: Maximum Energy AMX: Maximum Acceleration ETR: Energy Transfer Ratio - Rated FMX: Maximum Force DMX: Maximum Displacement CSX: Compression Stress Maximum

VT1:	Velocity a		FVP: Force/Velocity Proportionality								
	Blows/Mi						10000	941/252		Transport	-
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP
	m	bl/m	L	(%)	kN	m/s	bpm	g's	mm	MPa	
15	9.0	0	292.3	61.6	168	2.60	22.3	2,670	19	111.6	0.3
16	9.0	0	280.0	59.0	165	2.59	22.5	2,573	21	109.5	0.4
17	9.0	0	296.2	62.4	173	2.67	20.3	2,697	15	114.8	0.8
18	9.0	0	310.4	65.4	182	2.77	23.1	2,765	21	121.3	0.3
19	9.0	0	304.2	64.1	187	2.87	20.2	2,883	18	124.4	0.3
20	9.0	0	309.0	65.1	204	3.25	21.0	2,914	12	135.4	0.5
21	9.0	0	302.1	63.7	196	2.84	22.0	2,699	17	130.6	0.4
22	9.0	0	299.9	63.2	198	2.96	21.8	2,803	16	132.0	0.3
23	9.0	0	295.8	62.3	202	2.91	22.4	2,830	14	134.3	0.3
24	9.0	0	311.5	65.6	206	3.35	22.0	2,817	14	137.0	0.5
25	9,0	0	305.1	64.3	190	2.88	21.7	2,730	18	126.3	0.3
26	9.0	0	293.0	61.8	197	2.94	21.5	2,781	12	130.9	0.3
27	9,0	0	296.6	62.5	204	2.97	21.5	2,860	16	136.0	0.4
28	9.0	0	293.2	61.8	197	2.94	21.8	2,838	12	131.1	0.4
29	9.0	0	294.9	62.1	192	2.83	21.7	2.679	19	127.6	0.5
30	9.0	0	327.8	69.1	200	3.41	22.2	2,896	19	133.3	0.4
31	9.0	0	292.8	61.7	193	2.84	22.3	2,705	18	128.3	0.4
32	9.0	0	300.5	63.3	200	2.92	20.9	2,815	15	133.1	0.8
33	9.0	0	312.4	65.8	190	2.78	21.7	2,643	26	126.6	0.4
34	9.0	0	308.1	64.9	206	3.09	20.9	2,909	11	136.9	0.6
35	9.0	0	303.9	64.0	194	2.84	21.1	2,646	18	129.1	0.4
36	9.0	0	291.6	61.5	197	2.95	21.6	2,777	12	130.8	0.4
37	9.0	0	299.2	63.0	205	2.98	21.6	2,859	13	136.4	0.5
38	9.0	0	298.8	63.0	211	2.98	22.8	2,840	11	140.1	0.4
39	9.0	0	298.1	62.8	208	2.95	22.6	2,843	11	138.2	0.4
40	9.0	0	292.1	61.5	206	2.90	17.8	2,778	10	137.2	0.7
41	9.0	0	295.0	62.2	200	2.83	23.2	2,651	19	133.1	0.4
42	9.0	0	297.8	62.8	192	2.84	23.8	2,745	26	127.5	0.5
43	9.0	0	292.6	61.7	197	2.92	22.1	2,731	17	130.8	0.4
44	9.0	0	283.8	59.8	200	2.91	22.3	2,755	10	132,8	0.4
45	9.0	0	306.3	64.5	203	2.88	22.2	2,680	24	135.0	0.5
46	9.0	0	285.1	60.1	203	2.90	22.0	2,708	11	135.1	0.5
47	9.0	0	297.7	62.7	205	2.94	22.2	2,807	15	136.6	0.4
48	9.0	0	288.8	60.9	201	2.90	21.1	2,659	12	133.9	0.4
49	9.0	0	296.1	62.4	207	2.90	20.3	2,722	13	137.6	0.5
50	9.0	0	273.5	57.6	197	2.85	21.7	2,628	12	131.1	0.4
51	9.0	0	335.1	70.6	224	3.63	21.5	2,901	13	148.7	0.4
52	9.0	0	291.5	61.4	194	2.91	21.7	2,599	14	129.3	0.7
53	9.0	0	300.4	63.3	207	3.09	21.6	2,765	12	137.8	8.0
54	9.0	0	295.9	62.4	200	2.89	23.6	2,581	11	132.8	0.7
55	9.0	0	317.3	66.9	204	2.91	22.5	2,774	21	135.5	0.4
56	9.0	0	340.2	71.7	237	3.59	21.2	3,105	12	157.8	0.3
57	9.0	0	305.1	64.3	211	3.13	21.0	2,689	10	140.7	0.7
58	9.0	0	333.6	70.3	230	3.61	21.0	2,861	13	152.9	0.4
59	9.0	0	302.2	63.7	212	3.01	21.4	2,619	18	140.8	0.7
60	9.0	0	321.3	67.7	225	3.60	21.2	2,930	. 7	149.7	0.4
61	9.0	0	306.4	64.6	206	2.76	22.1	2,582	28	136.8	0.5
62	9.0	0	291.8	61.5	203	2.81	21.3	2,657	13	134.8	0.5
63	9.0	0	303.8	64.0	198	2.77	20.8	2,592	30	132.0	0.5
	A	verage	301.4	63.5	200	2.97	21.7	2,755	16	133.4	0.5

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Case Method & ICAP® Results.

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2023-02-09 DCN Drilling - SPT Drop Hammer No.5

BH04 Test 1 at 9m Date: 09-February-2023

OP: RZ BLC BPM AMX BL# Depth **EMX** ETR VT1 DMX CSX FVP kN MPa bl/m (%) m/s bpm g's mm Total number of blows analyzed: 49

BL# Sensors

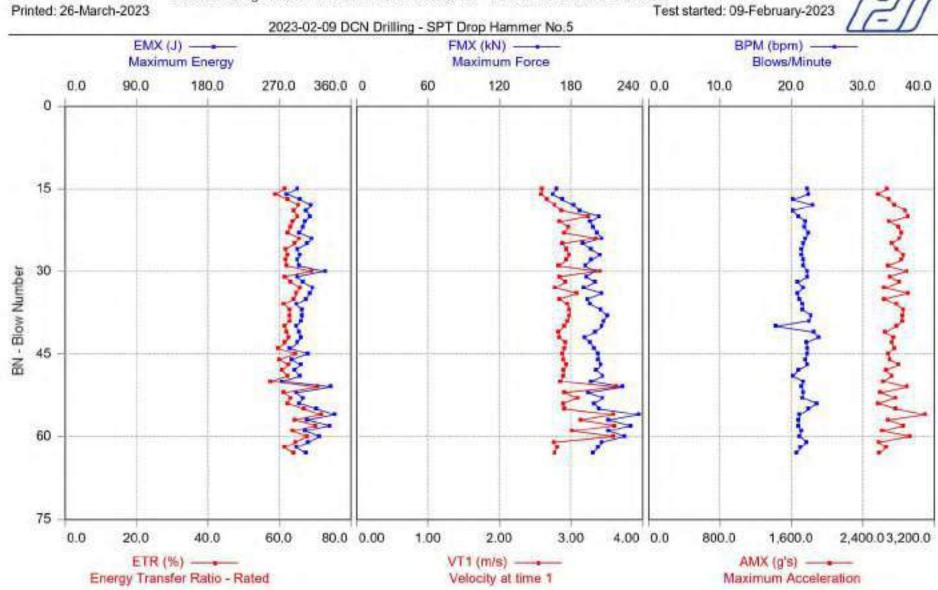
15-63 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

Time Summary

Drive 2 minutes 51 seconds 2:05 pm - 2:08 pm BN 1 - 63

Roc Consulting Limited - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 26-March-2023



WS: 5,123.0 m/s

0.90

JC:

Case Method & iCAP® Results

2023 OP: F	-02-09 DCN Drilling - SPT Drop Hammer No.5_1	BH04 Test 2 at 10.5m Date: 09-February-2023
AR:	15.03 cm²	SP: 77.3 kN/m ³
LE:	12.2 m	EM: 206,843 MPa

EMX: Maximum Energy
ETR: Energy Transfer Ratio - Rated
DMX: Maximum Displacement
DMX: Maximum Displacement
CSX: Compression Stress Maximum
VT1: Velocity at time 1
FVP: Force/Velocity Proportionality

	Velocity a Blows/Mir					FVP: Force/Velocity Proportionali						
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP	
	m	bl/m	J	(%)	kN	mis	bpm	9'5	mm	MPa		
9	10.5	0	294.4	62.0	160	2.66	19.5	2,541	46	106.5	0.5	
10	10.5	0	339.0	71.4	174	2.82	19.8	2,957	47	115.5	0.4	
11	10.5	0	318.2	67.1	168	2.64	19.8	2,705	38	111.8	0.4	
12	10.5	0	312.6	65.9	177	2.94	19.6	2,896	27	117.9	0.7	
13	10.5	0	296.9	62.6	170	2.64	19.5	2,605	29	113.3	0.5	
14	10.5	0	299.7	63.2	168	2.46	14.1	2,547	33	112.0	0.4	
15	10.5	0	280.6	59.1	178	2.77	22.1	2,662	39	118.2	0.4	
16	10.5	0	287.2	60.5	177	2.73	20.9	2,571	33	117.7	0.4	
17	10.5	0	319.7	67.4	183	2.81	19.4	2,806	34	121.8	0.5	
18	10.5	0	270.1	56.9	180	2.78	20.9	2,743	28	120.1	0.4	
19	10.5	0	320.7	67.6	190	2.96	19.7	2,978	36	126.7	0.4	
20	10.5	0	280.8	59.2	178	2.78	21.5	2,650	34	118.2	0.5	
21	10.5	0	321.8	67.8	187	3.28	16.4	2,812	25	124.5	0.6	
22	10.5	0	316.1	66.6	192	2.94	21.1	2,620	28	127.8	0.8	
23	10.5	0	315.1	66.4	189	2.77	14.8	2,698	32	125.5	0.7	
24	10.5	0	311.7	65.7	195	2.87	20.8	2,760	29	129.5	0.8	
25	10.5	0	288.5	60.8	190	2.82	19.8	2,665	19	126.4	0.4	
26	10.5	0	284.7	60.0	192	2.84	21.2	2,683	20	127.5	0.4	
27	10.5	0	285.6	60.2	195	2.87	19.3	2,691	16	130.0	0.4	
28	10.5	0	280.4	59.1	195	2.81	20.5	2,647	17	130.0	0.5	
29	10,5	0	301.1	63.5	196	2.78	20.2	2,557	20	130.5	0.4	
30	10.5	0	301.1	63.5	205	3.10	19.9	2,775	15	136.1	0.6	
31	10.5	0	287.3	60.6	192	2.76	20.8	2,591	28	127.7	0.4	
32	10.5	0	299.6	63.1	202	3.01	20.1	2,713	17	134.4	0.7	
33	10.5	0	317.7	66.9	201	3.25	20.6	2,633	20	133.9	0.7	
34	10.5	0	292.7	61.7	196	2.84	20.7	2,712	15	130.2	0.7	
35	10.5	0	294.2	62.0	204	2.99	15.8	2,642	16	135.8	8.0	
36	10.5	0	279.7	58.9	199	2.76	21.0	2,548	15	132.6	0.4	
37	10.5	0	310.7	65.5	195	3.06	16.3	2,662	24	129.6	0.8	
- 1034	A	verage	300.3	63,3	187	2.85	19.5	2,692	27	124.5	0.5	

Total number of blows analyzed: 29

BL# Sensors

9-37 F1: [680NW1] 229.4 (1.00); F2: [680NW2] 230.0 (1.00); A3: [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

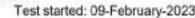
Time Summary

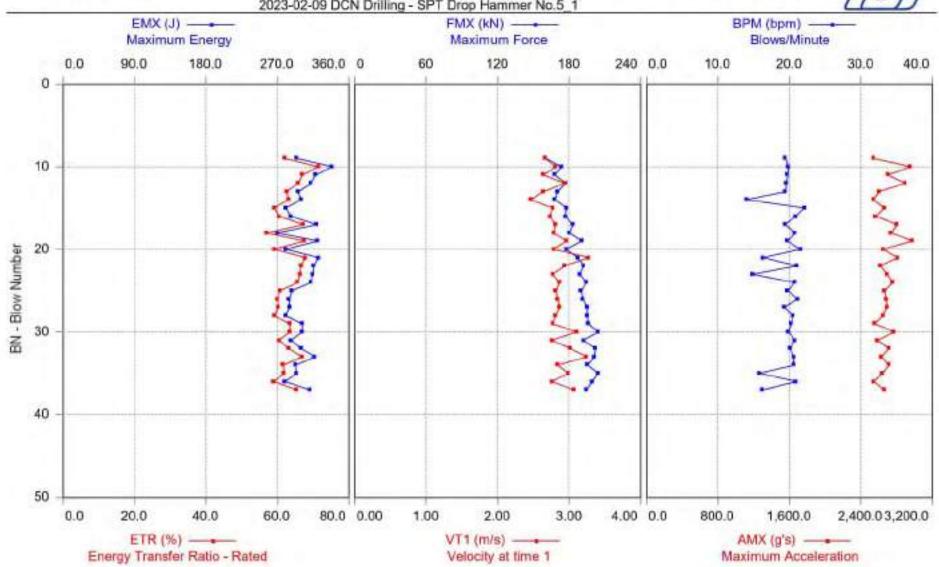
Drive 1 minute 51 seconds 2:38 pm - 2:40 pm BN 1 - 37

Roc Consulting Limited - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

2023-02-09 DCN Drilling - SPT Drop Hammer No.5_1





BH04 Test 3 at 12m

Case Method & ICAP® Results

2023-02-09 DCN Drilling - SPT Drop Hammer No.5_2

 OP: RZ
 Date: 09-February-2023

 AR: 15.03 cm²
 SP: 77.3 kN/m³

 LE: 13.7 m
 EM: 206,843 MPa

 WS: 5,123.0 m/s
 JC: 0.90

EMX: Maximum Energy
ETR: Energy Transfer Ratio - Rated
DMX: Maximum Displacement
DMX: Maximum Displacement
CSX: Compression Stress Maximum
VT1: Velocity at time 1
VT1: Velocity at time 1

	Velocity a Blows/Mir				FVP: Force/Velocity Proportionalit							
BL#	Depth	BLC	EMX	ETR	FMX	VT1	BPM	AMX	DMX	CSX	FVP	
DL#	m	bl/m	J	(%)	kN	m/s	bpm		mm	MPa	1.41	
10	12.0	0	313.0	66.0	199	2.99	20.2	g's 2,997	33	132.7	0.4	
11	12.0	0	312.5	65.9	191	2.93	21.9	2,933	26	126.9	0.4	
12	12.0	0	308.5	65.0	193	2.96	19.5	2,999	26	128.2	0.4	
13	12.0	0	289.0	60.9	186	2.88	20.1	2,838	25	123.6	0.4	
14	12.0	0	283.8	59.8	194	2.86	18.9	2,765	25	128.8	0.5	
15	12.0	0	291.0	61,3	195	2.83	19.6	2,774	27	129.4	0.5	
16	12.0	0	308.0	64.9	200	2.89	19.4	2,881	35	133.1	0.5	
17	12.0	0	307.3	64.8	200	2.98	19.5	2,968	35	132.9	0.5	
18	12.0	0	295.6	62.3	203	2.91	19.8	2,825	36	135.1	0.5	
19	12.0	0	325.8	68.7	199	3.00	20.9	2,939	35	132.5	0.4	
20	12.0	0	295.5	62.3	187	2.88	16.5	2,837	18	124.7	0.4	
21	12.0	0	299.2	63.1	181	2.84	19.2	2,758	20	120.7	0.8	
22	12.0	0	303.3	63.9	198	2.88	20.0	2,793	31	131.7	0.6	
23	12.0	0	307.7	64.8	203	2.95	19.5	2,874	25	135.3	0.7	
24	12.0	0	296.5	62.5	203	2.95	21.0	2,833	30	135.3	0.4	
25	12.0	0	314.8	66.3	206	2.97	12.6	2,890	23	137.2	0.5	
26	12.0	0	304.0	64.1	189	3.26	19.1	2,823	13	125.7	0.6	
27	12.0	0	321.8	67.8	193	3.27	19.9	2,897	13	128.4	0.7	
28	12.0	0	329.4	69.4	192	3.29	19.8	2,972	16	127.5	0.8	
29	12.0	0	314.0	66.2	208	3.40	19.2	3,069	14	138.2	0.5	
30	12.0	0	303.7	64.0	197	3.12	19.3	2,789	13	130.8	0.6	
31	12.0	0	309.1	65.1	210	3.18	19.7	2,987	13	139.5	0.6	
32	12.0	0	290.4	61.2	200	2.82	19.7	2,733	20	133.0	0.5	
33	12.0	0	291.3	61.4	185	2.52	18.2	2,603	29	122.8	0.4	
34	12.0	0	292.4	61.6	191	2.98	20.5	2,743	15	126.9	0.8	
35	12.0	0	308.4	65.0	197	2.85	21.0	2,837	25	131.0	0.5	
36	12.0	0	318.7	67.2	202	2.89	17.3	2,829	38	134.7	0.4	
37	12.0	0	310.5	65.4	206	2.96	21.5	2,838	20	137.1	0.5	
38	12.0	0	315.8	66.5	202	2.91	19.7	2,889	23	134.7	0.5	
39	12.0	0	309.3	65.2	204	2.98	21.0	3,013	15	135.7	0.5	
40	12.0	0	308.9	65.1	208	2.96	20.4	2,918	24	138.2	0.5	
41	12.0	0	310.3	65.4	201	2.94	19.8	2,800	28	133.5	0.5	
42	12.0	Ö	277.8	58.5	192	2.88	19.5	2,650	24	127.6	0.5	
43	12.0	0	308.1	64.9	201	2.93	19.6	2,879	26	133.6	0.5	
44	12.0	0		65.2							0.7	
			309.5		194	3.10	20.1	3,028	15 18	129.0		
45	12.0	0	315.8	66.5 68.3	188	3.13	17.1	2,750			8.0	
46	12.0	0	324.1		208	3.35	20.7	3,011	23	138.6	0.6	
47	12.0	0	296.9	62.6	195	2.87	19.1	2,895	16	129.6	0.5	
48	12.0	0	316.8	66.8	199	3.07	20.0	2,935	18		8.0	
49	12.0	0	323.5	68.2	210	3.30	19.4	3,144	23	139.7	0.6	
50	12.0	0	330.3	69.6	224	3.67	19.5	3,098	17	149.0	0.4	
51	12.0	0	307.0	64.7	214	3.29	20.1	2,844	17		0.6	
52	12.0	0	310.2	65.4	196	2.80	20.8	2,724	21	130.5	0.5	
53	12.0	0	328.2	69.2	203	3.27	19.2	2,830	24	134.9	0.7	
54	12.0	0	328.1	69.1	219	3.53	19.8	3,162	14	146.0	0.5	
55	12.0	0	312.5	65.9	203	2.99	19.5	2,808	21	134.8	0.8	
56	12.0	0	306.5	64.6	203	3.00	19.0	2,954	17	134.8	0.6	
57	12.0	0	327.3	69.0	200	2.85	20.1	2,754	30	132.7	0.4	
- 75	A	verage	308.6	65.0	199	3.02	19.5	2,877	23	132.6	0.6	

Total number of blows analyzed: 48

Roc Consulting Limited PDIPLOT2 2021.1.61.0

Case Method & ICAP® Results

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BH04 Test 3 at 12m

2023-02-09 DCN Drilling - SPT Drop Hammer No.5_2 OP; RZ Date: 09-February-2023 BL# Depth BLC EMX ETR FMX VT1 BPM AMX DMX CSX bl/m MPa (%) kN m/s bpm g's mm

BL# Sensors

10-57 F1; [680NW1] 229.4 (1.00); F2; [680NW2] 230.0 (1.00); A3; [K12864] 416.1 (1.00); A4: [K12865] 430.9 (1.00)

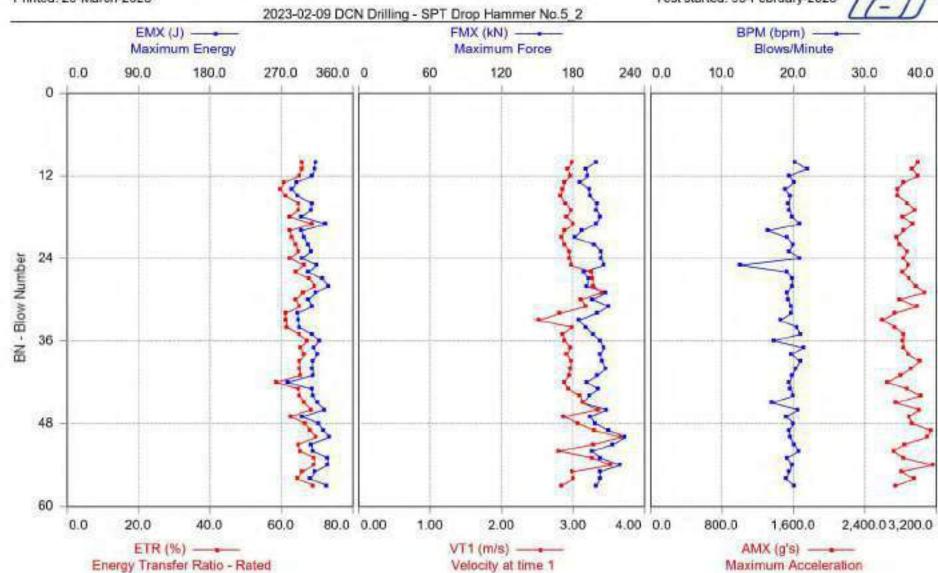
Time Summary

Drive 2 minutes 52 seconds 3:04 pm - 3:06 pm BN 1 - 57

Roc Consulting Limited - PDIPLOT2 Ver 2021, 1,61.0 - Case Method & iCAP® Results

Printed: 26-March-2023

Test started: 09-February-2023





Roc Consulting Ltd New Zealand & South Pacific

NZBN: 9429050784509

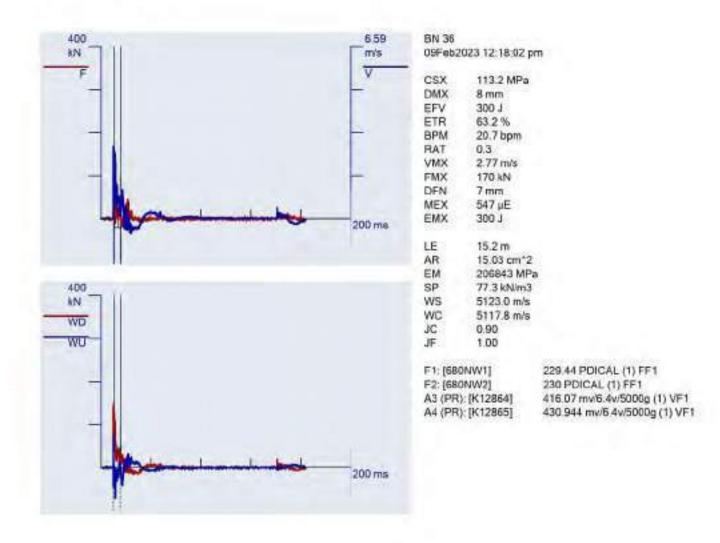
Job No.:1015_2302

Date: 30 March 2023

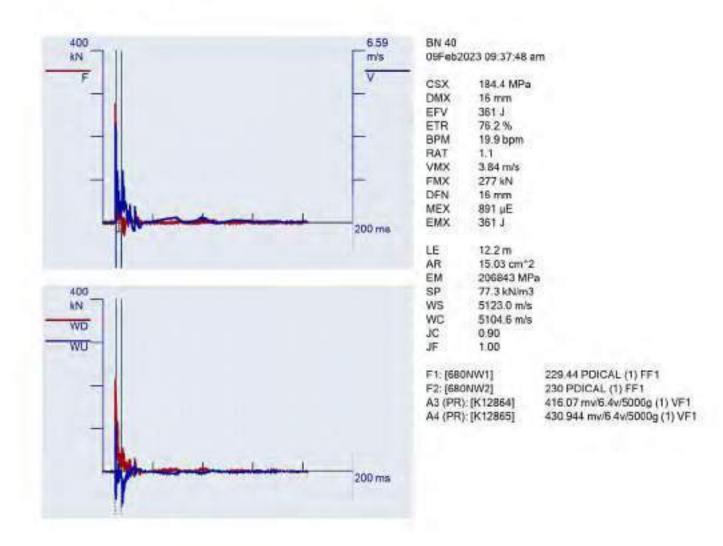
Appendix C

Representative Force and Velocity Plots

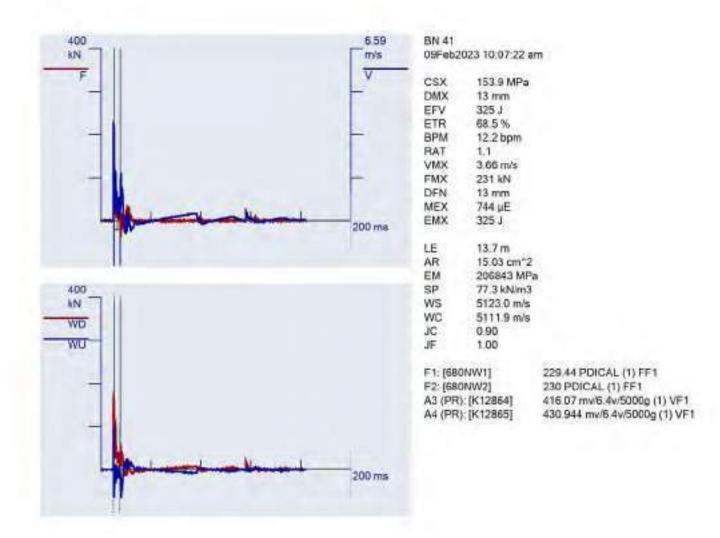
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.1 BH02 Test 1 at 13.5m PDA Operator: RZ



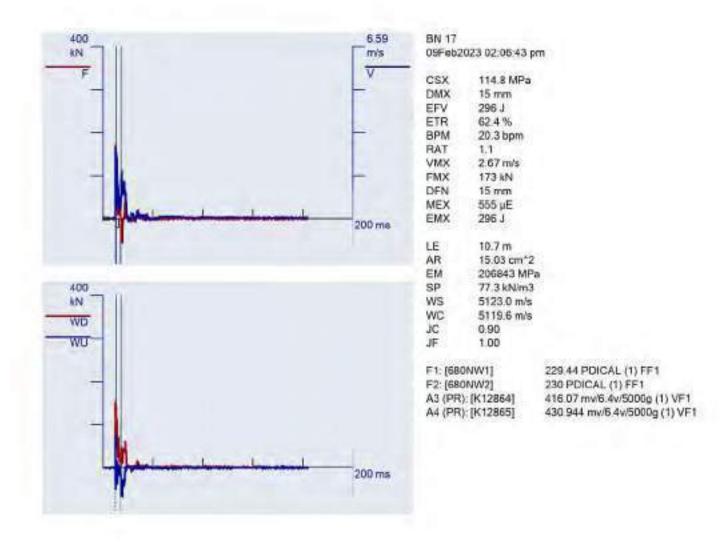
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.4_1 BH01 Test 2 at 10.5m PDA Operator: RZ



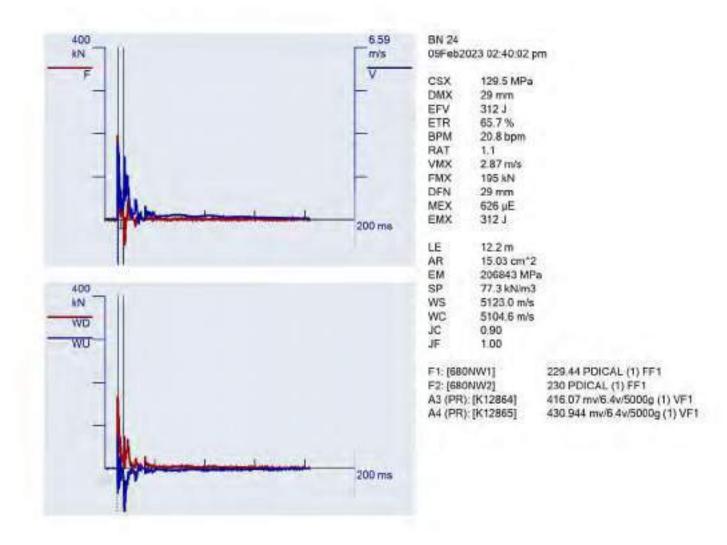
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.4_2 BH01 Test 3 at 12m PDA Operator: RZ



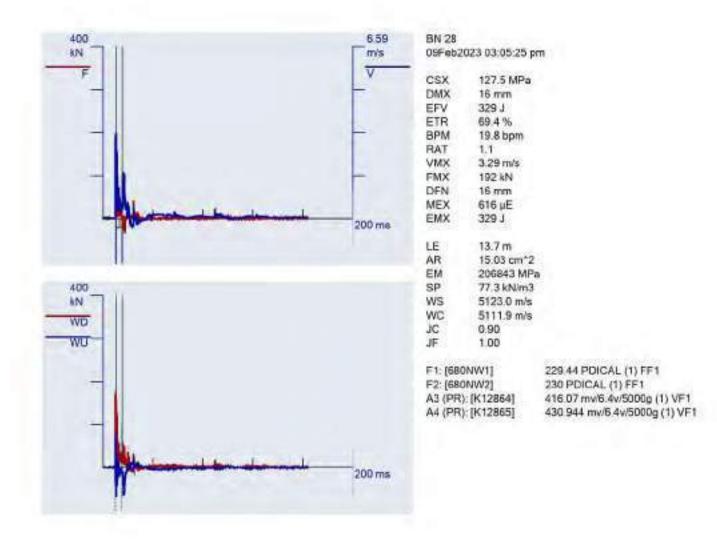
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.5 BH04 Test 1 at 9m PDA Operator: RZ



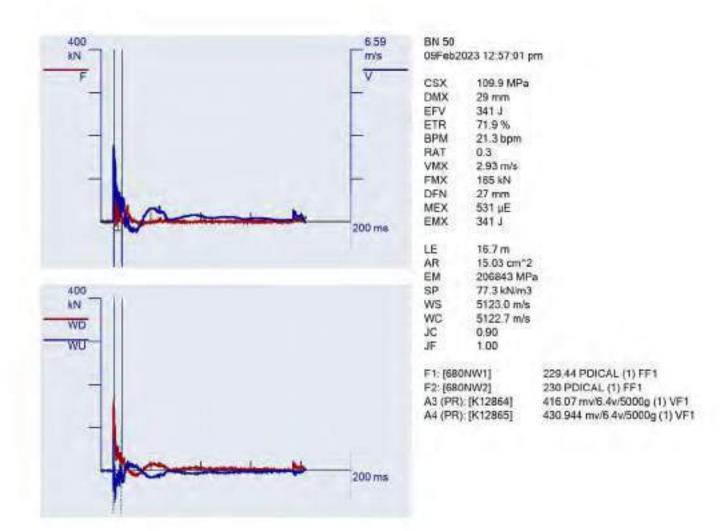
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.5_1 BH04 Test 2 at 10.5m PDA Operator: RZ



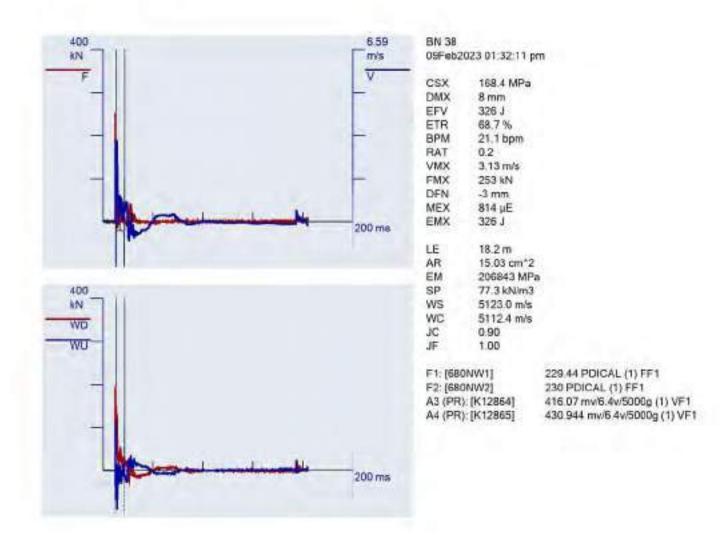
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.5_2 BH04 Test 3 at 12m PDA Operator: RZ



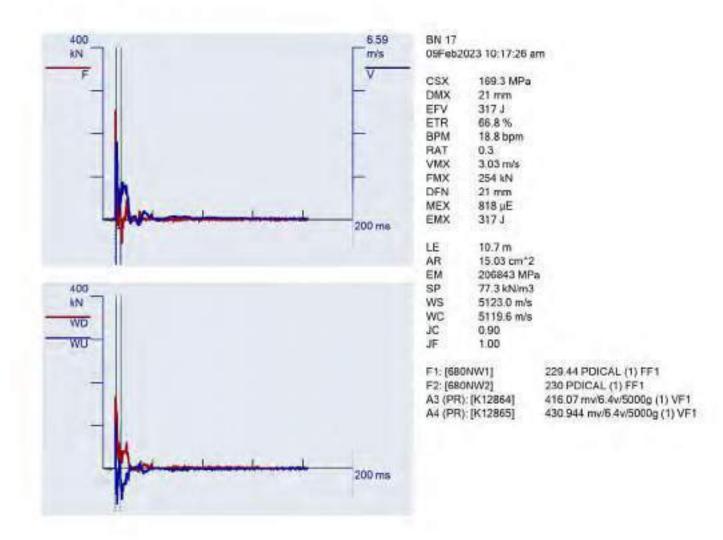
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.1_1 BH02 Test 2 at 15m PDA Operator: RZ



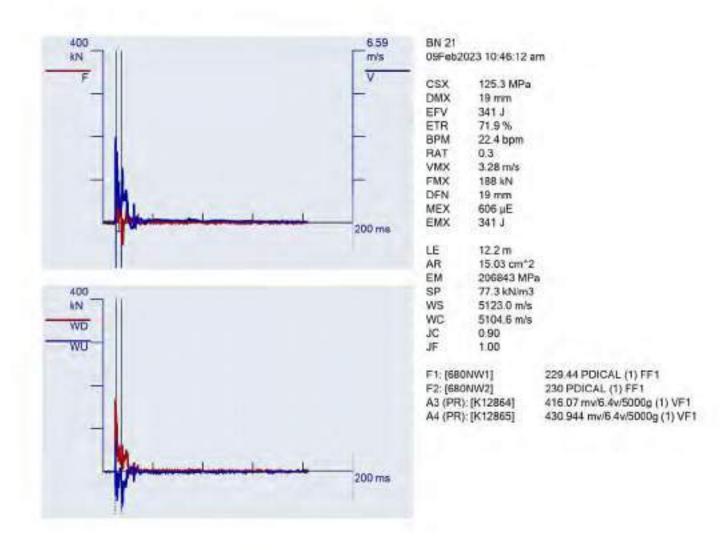
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.1_2 BH02 Test 3 at 16.5m PDA Operator: RZ



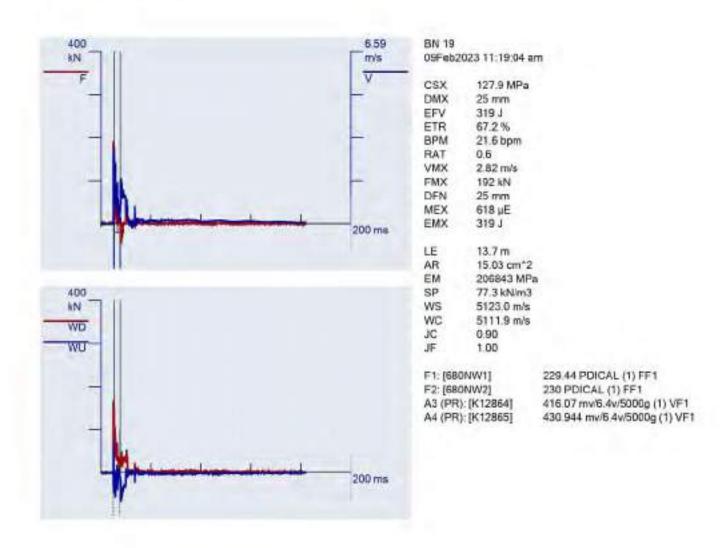
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.2 BH02 Test 1 at 9m PDA Operator: RZ



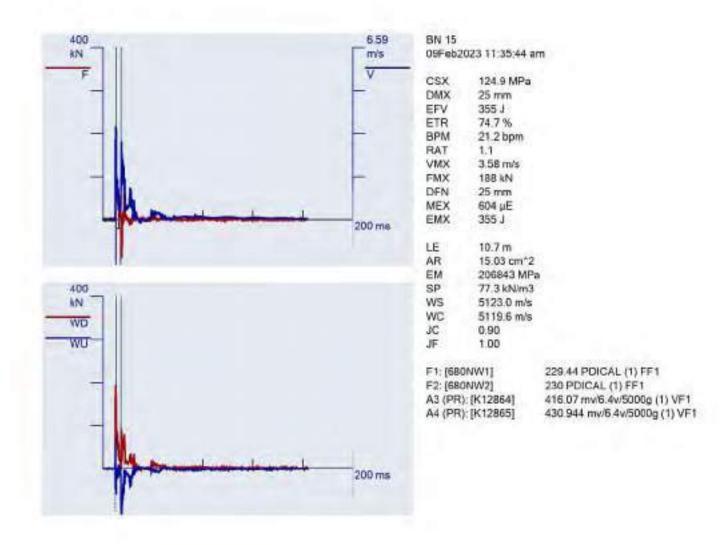
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.2_1 BH02 Test 2 at 10.5m PDA Operator: RZ



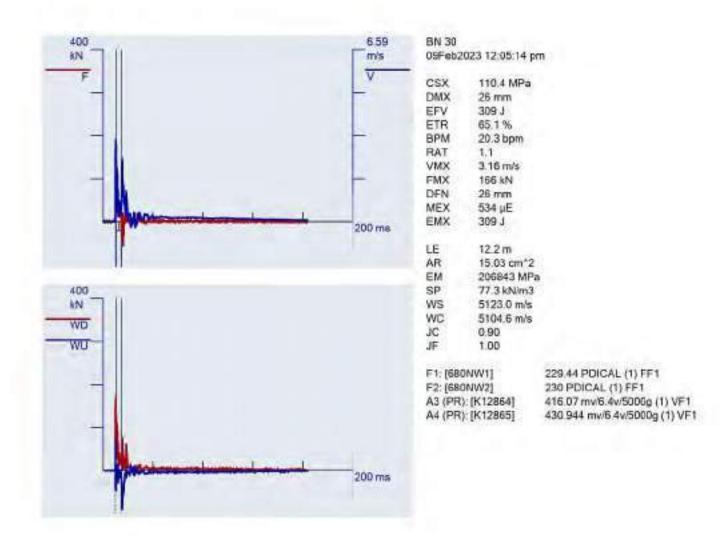
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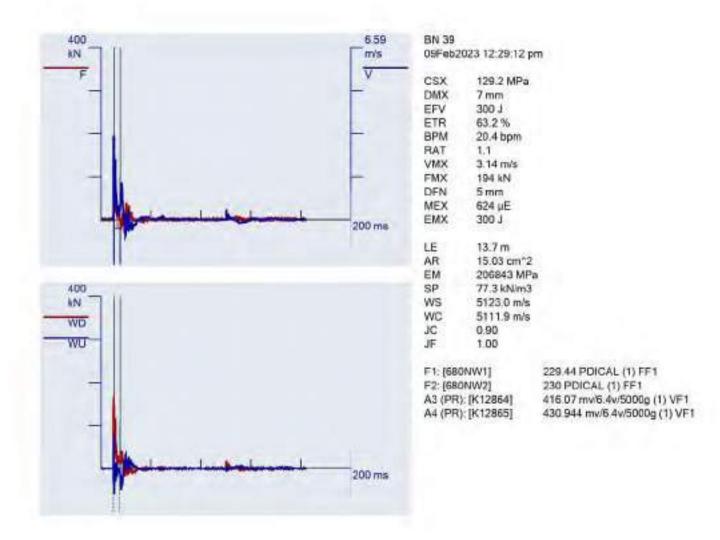
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.3 BH03 Test 1 at 9m PDA Operator: RZ



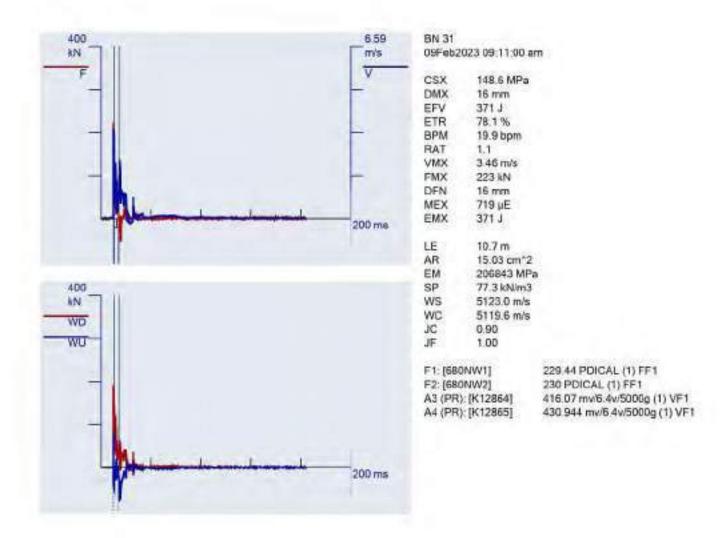
Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.3_1 BH03 Test 2 at 10.5m PDA Operator: RZ



Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.3_2 BH03 Test 3 at 12m PDA Operator: RZ



Roc Consulting Limited 2023-02-09 DCN Drilling SPT Drop Hammer No.4 BH01 Test 1 at 9m PDA Operator: RZ



Appendix F5

Telemetered Groundwater Data Plots



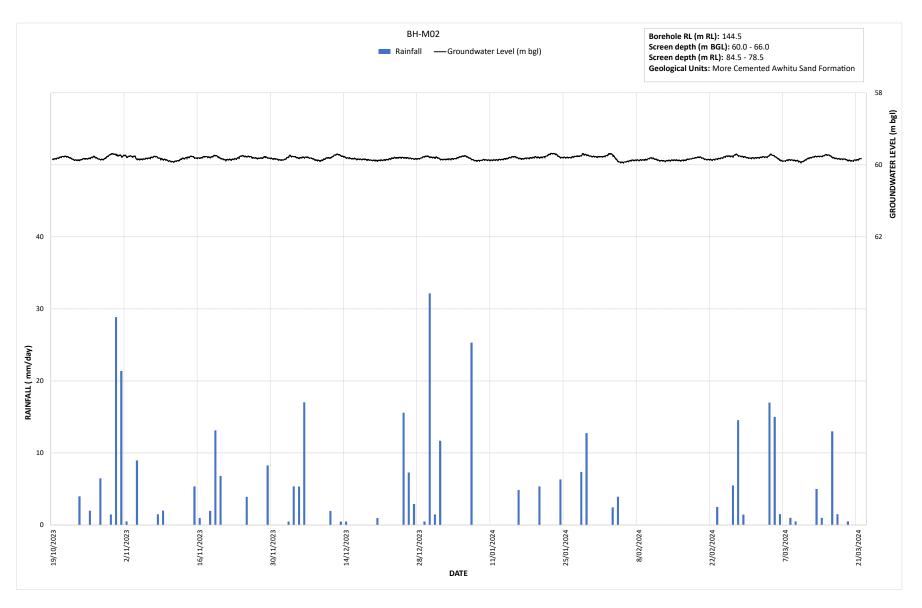
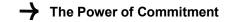


Figure F5-1: Plot of rainfall and telemetered groundwater data from BH-M02. Rainfall data sourced from Auckland Council's Environmental Data Portal





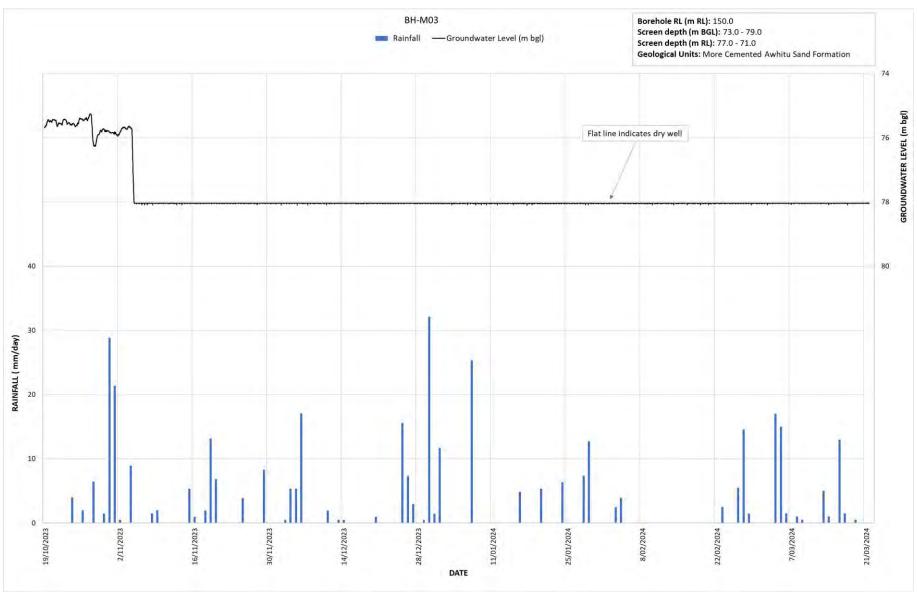


Figure F5-2: Plot of rainfall and telemetered groundwater data from BH-M03. Rainfall data sourced from Auckland Council's Environmental Data Portal



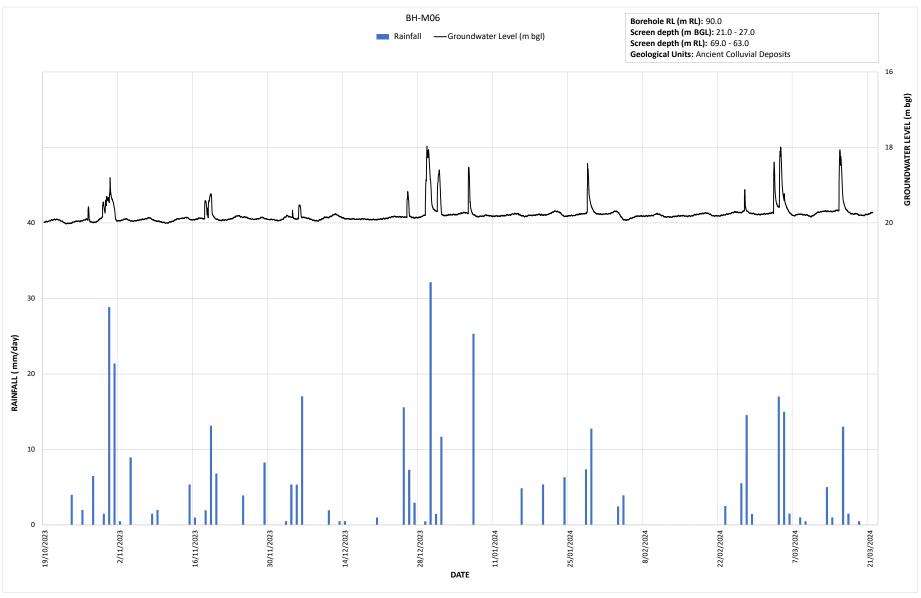


Figure F5-3: Plot of rainfall and telemetered groundwater data from BH-M06. Rainfall data sourced from Auckland Council's Environmental Data Portal



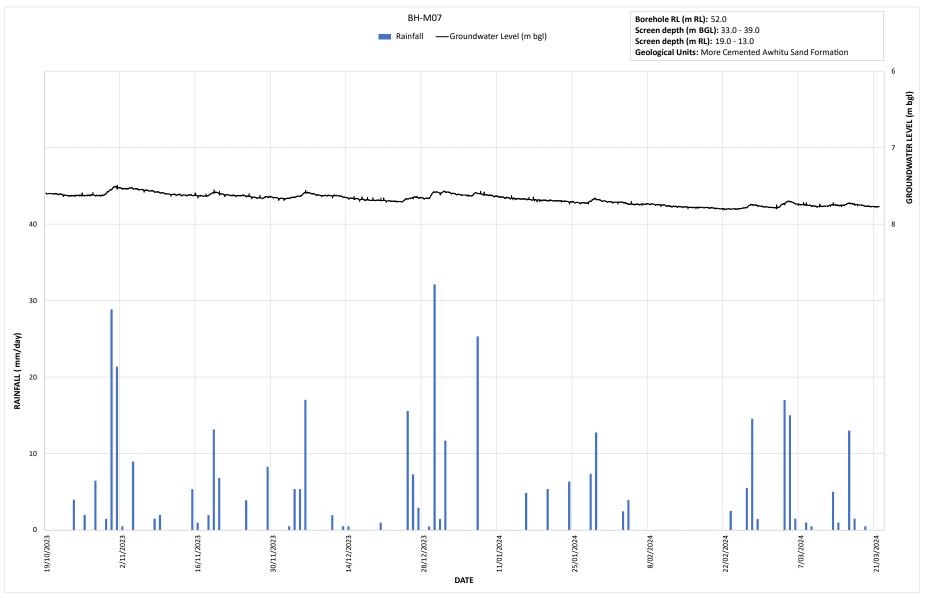


Figure F5-4: Plot of rainfall and telemetered groundwater data from BH-M07. Rainfall data sourced from Auckland Council's Environmental Data Portal