



**Contract No. GE/2021/03**  
**Marine Ground Investigation and Geophysical Surveys**  
**Task Order No. GE/2021/03.23A**  
**Agreement No. CE 26/2022 (EP)**  
**Development of Integrated Waste Management Facilities Phase 2**  
**- Investigation, Design and Construction (SA1)**

Factual Fieldwork Report

Final

21 0223 05 – GE/2021/03.23A / R001 Rev. 00 | 29 December 2023

**Civil Engineering and Development Department**  
**Geotechnical Engineering Office**

**Binnies Hong Kong Ltd.**



Checked in accordance with  
Contract No. GE/2021/03  
requirements and accepted.

Signed VT Date 11.1.2024

## Document Control

### Document Information

Project Title	Contract No. GE/2021/03 Marine Ground Investigation and Geophysical Surveys
Task Order No.	GE/2021/03.23A
Location	Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)
Document Title	Factual Fieldwork Report
Fugro Project No.	21 0223 05
Fugro Document No.	21 0223 05 – GE/2021/03.23A / R001
Issue Number	Rev. 00
Issue Status	Final
Fugro Legal Entity	Fugro Geotechnical Services Ltd.
Issuing Office Address	19/F, Fugro House – KCC2, 1 Kwai On Road, Kwai Chung, New Territories, Hong Kong


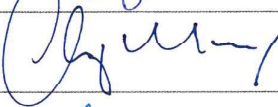


### Client Information

Employer	Civil Engineering and Development Department Geotechnical Engineering Office
Service Manager	Civil Engineering and Development Department Geotechnical Projects Division
Engineer	Binnies Hong Kong Ltd.

### Revision History

Issue	Date	Status	Comments on Content	Prepared By	Checked By	Approved By
00	29 December 2023	Final	Issued as final	SW / ML	AM	GW

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## CONTRACT DATA SUMMARY

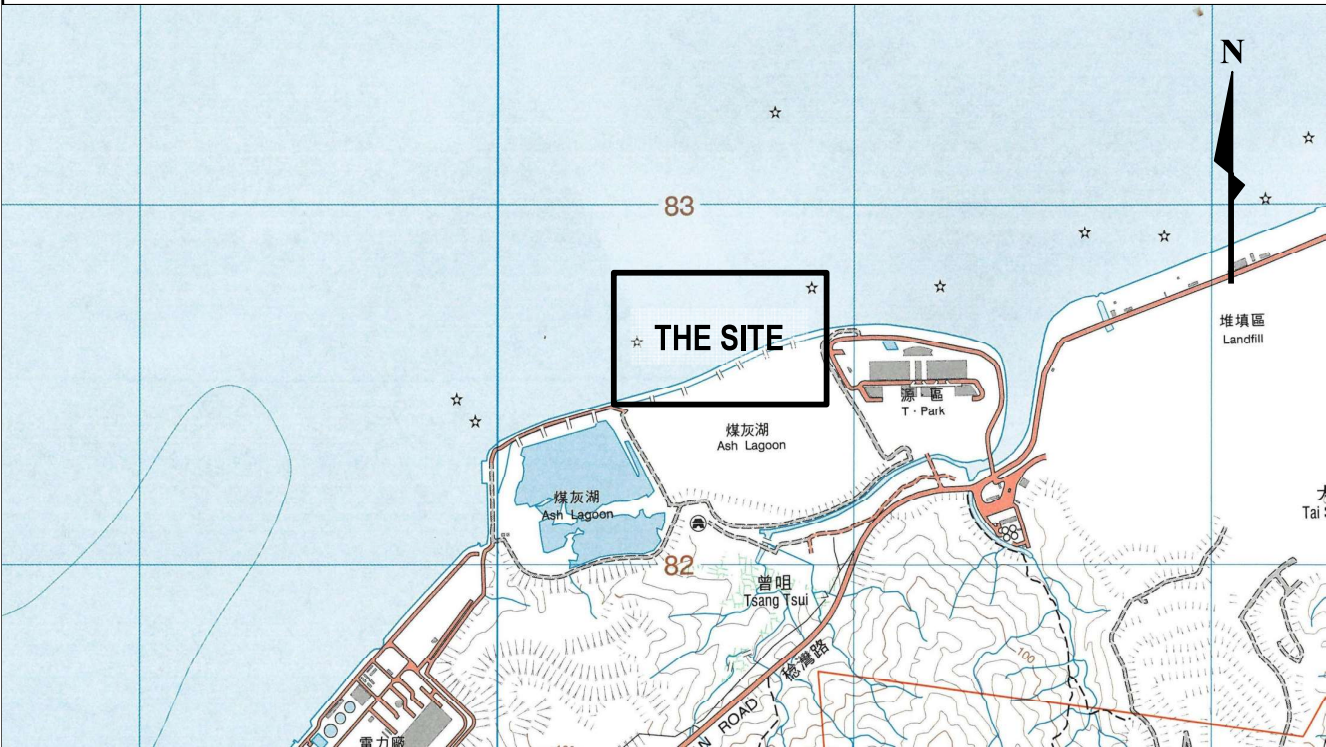
Project Name & No. : Marine Ground Investigation and Geophysical Surveys	Site Name : Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)	Date : 09/10/2023 to 09/2/2024 Official only G.E.O Data Bank No.
G.I. Contractor : Fugro Geotechnical Services Ltd.	Employer: CEDD-GEO	
Contract No. : GE/2021/03	Task Order No. GE/2021/03.23A	File Ref.

### FIELD WORK SUMMARY

Drillhole Nos. : 3	Method : Rotary	Date : 11/10/2023 to 05/12/2023
CPT Nos. : 2	Trial Pit Nos. : NIL	Slope Stripping Nos. : NIL
Probe Nos. : NIL	Trial Trenches Nos. : NIL	Strip Windows Nos. : NIL
Piezometer/Standpipe Nos. : - / -	Inspection Pit Nos. : NIL	Halcrow Bucket Nos. : NIL
In situ Test Nos. 10	Types : Vane Shear (5), Pressuremeter (5)	
Geophysics : 3	Types : Acoustic Borehole Televiwer Survey (3)	

### LABORATORY TESTING SUMMARY

Total No. of Tests :		Date : to			
Soil	Physical Properties	LL	PL	PSD	MC
		SG	$\gamma_m/\gamma_d$		
	Strength Tests	CU	CD	UU	Shear Box
	Compaction & CBR Tests	Standard	Modified		CBR
	Oedometer & Perm. Test	Cv	k		
	Others				
Rock	$\gamma$	Pt load	UC	Shear Box	US Vel.
Location Plan	Scale 1 : 20 000	Derived from: Sheet 5, Series HM20C, Edition 16, 2017			



	<b>Ground Investigation</b>	<b>Laboratory</b>	<b>GEOTECHNICAL ENGINEERING OFFICE</b>
<b>CONTRACTOR</b>	Fugro Geotechnical Services Ltd.	-	<b>CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT</b>
<b>TASK ORDER NO.</b>	GE/2021/03.23A	-	

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## 1. Introduction

In January 2022, Fugro Geotechnical Services Ltd. (Fugro) was awarded the Term Contract No. GE/2021/03, 'Marine Ground Investigation and Geophysical Surveys' by the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD).

This report presents the results of the task order number GE/2021/03.23A, for the Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1). The Works consisted of marine rotary drilling, *in situ* testing, environmental sampling, logging, marine piezocone penetration tests (CPT) and the survey of investigation locations. Fieldwork for the investigation was performed between 11 October 2023 and 05 December 2023, under the supervision of Geotechnical Projects Division, CEDD (the Service Manager) and Binnies Hong Kong Limited (the Engineer).

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## 2. Site Description

The site is located in the marine area to the north of the ash lagoons and the existing sludge treatment plant, Nim Wan, Tuen Mun. Refer to the enclosed Geotechnical Fieldwork Location Plan in Figure 1. The ground investigation site included in this report was located within an area defined by the following coordinates:

	Easting [m]	Northing [m]
1	809 700	831 480
2	809 700	831 590
3	809 970	831 480
4	809 970	831 590



### 3. Fieldwork

A programme of marine subsurface investigation, performed at the site between 11 October 2023 and 05 December 2023, included the following:

- Exploratory vertical marine drillholes with:
  - Triple tube Mazier sampling in soils
  - Undisturbed U100 sampling in soils
  - Thin-walled P100 piston sampling in soils
  - Liner sampling during standard penetration testing (SPT) in soils
  - Continuous coring in rock using double-tube core barrels
  - *In situ* vane shear tests
  - Pressuremeter tests
  - *In situ* Acoustic Borehole Televiewer surveys
- Piezocone Penetration Testing comprising:
  - Marine piezocone penetration testing (CPT)
- Environmental sampling of seabed sediment and marine water
- Surveying of investigation locations

Fieldworks were performed under the full-time supervision of suitably experienced Fugro Geotechnical Field Technicians (GFT) or carried out by Fugro's experienced CPT operators.

The following marine jack-up platform was used for the marine geotechnical investigation works, deployed as follows:-

<u>Vessel Name</u>	<u>Type</u>	<u>Work</u>
Mytilus	Four legged jack-up platform	Marine Drilling and Marine CPT

The 'Mytilus' is a four legged jack-up platform which utilises a diesel powered hydraulic system to raise and lower the legs. The jack-up platform was towed to the designated locations and then positioned by lowering the legs and elevating the platform above seawater level. A conventional land based rotary drilling rig was securely mounted on the deck of the jack-up platform. Marine drilling or marine CPTs were performed through reservation tubes passing through the deck.

Investigation locations are indicated in Figure 1, Geotechnical Fieldwork Location Plan, relative to the site layout. Field test results and observations are presented in Appendices C to I. The presentation of field work results is preceded by a checklist of rock and soil descriptions and summarised explanations of log symbols and classification systems in Appendices A and B respectively.

The soil and rock encountered in the exploratory investigation stations has been described in accordance with Geoguide 3 and the Checklist for Rock and Soil Descriptions presented in Appendix A.

The depth and thickness of strata encountered at all drillhole locations is summarised in Table 1, Summary of Drillhole Results. Co-ordinates, levels and test details of the Piezocone Penetration Testing included in this fieldwork report are present in Table 4, Summary of CPT Tests

### **3.1 Exploratory Drillholes**

Three (3) vertical marine drillholes (MH4 to MH6) were drilled on site to the depths of between 25.57 m and 30.15 m below seabed level. The drillholes were advanced through soil deposits by rotary wash boring with seawater used as the flushing medium. Rotary coring techniques were used in coreable soil, hard strata and rock. Observations of water levels above existing seabed level at start and end of every shift during drilling progress were recorded on a daily basis. The drillholes were terminated according to instructions issued by the Engineer.

#### **3.1.1 Mazier (Triple Tube Retractable Core Barrel) Samples**

Rotary coring in soil was carried out using a triple tube Mazier barrel with retractable shoe and tungsten carbide drill bit, producing a core diameter of 74 mm. During sampling, the sample barrel was advanced into the ground under controlled force and flush pressures. Samples were retained in 1m long clear plastic liners. Upon recovery, the liner samples were sealed with a layer of aluminium foil and three films of wax and then the sample tubes were sealed with tightly fitting rubber caps. Voids between the ends of the samples and the liner ends were filled with sawdust to secure the samples. The samples were labelled in accordance with the requirements of the contract and the disturbed samples recovered from the cutting shoes were stored in jars within the coreboxes to allow logging of the soil strata.

#### **3.1.2 Undisturbed U100 Samples**

The undisturbed U100 samplers consist of steel sample barrels, about 450 mm in length, of nominal diameter 100 mm with screw-on cutting shoes and drive heads. The open-tube samplers are fairly robust samplers that can be used for many Hong Kong soils. On recovery, the undisturbed samples were sealed and labelled in accordance with the requirements of the contract and the disturbed samples recovered from the cutting shoes were stored in jars within the coreboxes to allow logging of the soil strata by a suitably qualified Fugro geologist.

#### **3.1.3 Thin-walled P100 Piston Samples**

Thin-walled P100 piston samples of 100mm diameter were taken in the very soft and soft marine deposits and alluvium in marine drillholes. The thin-walled sample tubes contain a close-fitting sliding piston, which is slightly coned at the lower face. Each sample tube was fitted to the driving head, which was connected to hollow drill rods. The piston was fixed to separate rods which pass through a sliding joint in the drivehead and up inside the hollow

rods. Clamping devices, operated at ground surface, enable the piston and sample tube to be locked together or the piston to be held stationary while the sample tube is driven down. Upon recovery, the liner samples were sealed with a layer of aluminium foil and three films of wax and then sealed with tightly fitting rubber caps. The samples were labelled in accordance with the requirements of the specification.

### 3.1.4 Standard Penetration Tests

Where instructed, Standard Penetration Tests (SPTs) were conducted in the drillhole. SPTs were conducted in accordance with BS1377:1990 (Part 9 Method 3.3), amended by Geoguide 2; 'Guide to Site Investigation' and the Contract Specification. The test involves driving a 50 mm external diameter thick walled tube (split spoon sampler) into the bottom of the borehole with successive blows of a 63.5 kg hammer falling freely through 760 mm. The sampler is driven through 6 intervals of 75 mm and the number of blows required to penetrate each interval is recorded. The initial 150 mm interval is intended to ensure 'seating' of the sampler such that it penetrates beyond the zone of influence of any soil disturbance at the base of the drillhole. The aggregate number of blows to drive the sampler over the final 300 mm is termed the 'N' value and is considered indicative of the *in situ* relative soil density. The samples were labelled in accordance with the requirements of the specification.

### 3.1.5 Coring

When hard strata and competent rock was encountered, double-tube, swivel-type T6-146 and T2-101 rotary core barrels with diamond impregnated core bits were used to recover rock core from the drillhole producing nominal core diameters of 123 mm and 84 mm respectively.

All cutting-shoe samples were retained in purpose-built core boxes labelled with contract and drilling details. All samples were logged on site then transported to the contract storage facility at the Works Area and photographed. Photographs are presented with the drillhole log in Appendix C. The photographic board shown in each photograph presents contract and task order details as well as sample depths and box numbers with reference to a standard Kodak™ colour chart and scale.

## 3.2 *In situ* Vane Shear Tests

A total of five (5) *in situ* vane shear tests were carried out at depths instructed by the Engineer at the location of the drillholes, using Geonor Type H-10 vanes in accordance with BS 1377(1990) (Part 9, Test No. 4.4) and the contract specification.

Where ground conditions allowed the vane assembly was advanced through the soil using the push-in method which involves pushing the vane within its protective shoe to a distance of approximately 0.50 m above the required test depth. The vane is then pushed the remaining 0.5 m without the vane protection shoe to minimise ground disturbance and the test carried out at the required depth. After completing the test, the vane is retracted and the vane and protection shoe are advanced to a distance of 0.5 m above the next test depth and the process

is repeated until the soil becomes too stiff to advance by this method or as instructed by the Engineer.

If the soil is too stiff to advance by push-in method but further testing is required the drillhole is advanced by wash boring to 0.50 m above the required test depth, the vane shear test equipment reinstalled to the level of the base of the drillhole. The inner vane is then pushed down to the test depth and the test carried out. On completion the vane is retracted, the vane test equipment recovered from the drillhole and the drillhole once more advanced to 0.5 m above the prescribed test depth and the process repeated.

Calibration certificates of the vane head are presented in Appendix D and the results of the *in situ* vane shear tests are presented in Appendix E.

### 3.3 Pressuremeter Tests

Five (5) pressuremeter tests were performed in drillholes at depths as instructed by the Engineer. The tests were performed using a RocTest Telemac pressuremeter (G-Am) with 70 mm diameter (NX) probes. The testing provides the limit pressure of the soil, initial and unload-reload shear and deformation modules of the soil tested.

The tests were carried out by applying pressure simultaneously to the central and guard cells, the guard cell pressure being maintained slightly below the central cell, and measuring the volume injected into the central cell at set time intervals, typically 15, 30, 60, 90 and 120 seconds after application of each pressure. The difference in volume between the readings at 120 and 30 seconds was designated the creep volume and the plot of creep volume against pressure may be used to define the different phases of the test.

When the upper limit of the elastic phase was reached, the test pressure was reduced in three approximately equal increments to the lower limit of the elastic phase. Each pressure volume reading was taken at 15, 30, 60, 90 and 120 seconds after the application of the pressure. The pressure was then increased in three approximately equal increments up to the upper limit of the elastic phase and volume readings taken at 15, 30, 60, 90 and 120 seconds after the application of each pressure increment. The test was continued until the limit of water volume injected reached 600 cm<sup>3</sup>.

Collected values of pressure and volume are plotted and generally a curve was obtained with three phases; the initial, pseudo-elastic and plastic phases. The initial phase occurs as the probe expands to fill the drillhole at its original diameter. During the pseudo-elastic phase the volume of the cavity increases linearly with pressure and in the plastic phase the rate of volume increase accelerates. The elastic phase is also typified by a constant creep volume. The result with limit pressure, initial and unload-reload shear and deformation moduli is presented as graphs and tables in Appendix F.

### 3.4 Acoustic Borehole Televiwer Survey

Three (3) acoustic borehole televiwer surveys were carried out in the completed drillholes between depths specified by the Engineer.

The acoustic borehole imager uses sonic measurement techniques to map discontinuities within a borehole wall. The technique provides a 360° pseudocolour image of the borehole and identifies fractures and joints within the rock allowing determination of the dip and direction of discontinuities.

The equipment emits an acoustic pulse from a rotating transmitter / receiver. The acoustic pulse travels to the borehole wall where it is reflected. The two-way travel time of the pulse and the intensity of the reflected pulse are measured and transmitted from the tool up the wireline cable. These measurements are used to develop an acoustic image of the borehole wall. The tool is centred within the borehole by spring centralisers, which also help to minimise tool rotation. The transmitter / receiver head is located at the bottom of the tool and rotates at a rate of 12 revolutions per second, taking 256 discrete measurements per revolution.

Logging is performed whilst the tool is being pulled up the borehole, using a powered winch fitted with a depth encoder which records the tool depth to an accuracy of better than 1.5 mm. The rate the tool is raised defines the vertical sampling resolution of the acoustic scanning. At a logging rate of 2 metre / minute a full scan of the borehole wall is made every 1.4 mm.

The tool is fitted with a 3 planar magnetometer / accelerometer system which provides full orientation and inclination information every 5 mm. Acoustic borehole imager surveys were performed at a logging rate of 2 metres per minute.

The results are processed as an unwrapped 360° pseudocolour digital image of the borehole wall of both time and amplitude plots. The pseudocolour images of the borehole wall are presented, on a vertical depth scale with discontinuities marked as sine waves. Tadpole plots, calliper curves, fracture log and Polar Dip plot are also presented on the same vertical depth scale. The two images present the data as changes in colour for time and amplitude variations of the returning signal. The tadpole plots are graphical presentations of the dip and dip direction of discontinuities, the 'head' indicating the dip and the direction of the 'tail' indicating dip direction. The dip direction is also presented stereographically in the Polar Dip plot. The calliper curves indicate the borehole diameter in two directions, the true diameter being the average of the two curves. The fracture log indicates in tabular form the fracture number, dip, dip direction and start and end depth of the discontinuity with the category.

The test results with information regarding the fracture number, dip, dip direction (azimuth), start and end depth of the discontinuities and the category (type) of each discontinuity are presented in Appendix G.



### 3.5 Piezocone Penetration Testing

Two (2) marine Piezocone Penetration Tests (CPTs) were performed on site and terminated at levels between -21.67 mPD and -21.71 mPD. Testing was performed from the Fugro Jack-up platform 'Mytilus', supported by a tug boat.

#### 3.5.1 Equipment Deployment and Handling System

From the jack-up platform, CPTs were carried out using a 200 kN hydraulically controlled reaction frame (CPT Rig in Figure 2) with –

- i) A penetrometer with 37mm push rods and 55mm casing,
- ii) The hydraulic reaction frame (CPT Rig) to push rods and casing, and
- iii) A deck-mounted data acquisition and processing package.

The reaction frame is used to thrust the rods into the seabed through a reservation tube located on the deck of the jack-up platform.

The CPTs were performed using a Fugro 1,500 mm<sup>2</sup> electric cone capable of measuring cone tip resistance ( $q_c$ ), sleeve friction ( $f_s$ ), induced pore pressure ( $u$ ), and cone inclination. The cones were pushed at a constant rate of 20 mm/sec into the *in situ* sediments, and testing was carried out by an in-house test method M-Q-014 which follows ISSMGE (1999) and BS1377 (1990): (Part 9 Test 3.1) with modification. The only modification is the size of the cone which has cross sectional area of 1,500 mm<sup>2</sup>.

Strain gauges incorporated into the cone provided a direct measurement of resistance to penetration on both the combined tip and friction sleeve ( $q_c + f_s$ ), and on the cone tip alone ( $q_c$ ). The friction on the friction sleeve ( $f_s$ ) during penetration was obtained by subtraction. Testing was carried out using a 7.5 tonne calibrated range cone.

The inclusion of a porous element on the shaft above the shoulder of the cone ( $u_2$ ) allows induced pore pressure to be recorded. Further details of the cone types used are presented in Figure 3.

The inclination of the cone from the vertical during testing is measured by an inclinometer within the cone. The output was recorded at 20 mm intervals, producing a continuous record of  $q_c$ ,  $f_s$  and  $u$  during penetration. The signals from the strain gauges were transmitted via built-in amplifiers through an umbilical cable along the inside of the hollow test rods to data receivers and processors located on board the barge.

### 3.5.2 Calibration

To calibrate the cone, the penetrometer tip shall be placed into a loading frame with a suitably designed lower conical seating to receive the cone tip. The calibration procedure is based on comparing the load cell outputs against standard test loads and is performed at constant temperature. The cones are calibrated either at 18 month intervals or after each 2000m of penetration if this limit is reached before 18 months.

The cone calibration is carried out in the Dutch Fugro laboratory with accreditation under the Dutch Accreditation Council RvA (HOKLAS Mutual Recognition Arrangement (MRA) Partner). The accreditation is based on an assessment against the requirements of EN ISO/IEC 17025:2017. The registered accreditation certificate is presented in Appendix H.

Cone calibration is conducted in two consecutive calibration runs with continuous reading to 100% full range during loading and unloading. The results of the individual calibrations and calibration factors of each cone are presented in the calibration certificates which accompany each one being used on the project. Further details of the calibration certificates of the cones used are presented in Appendix H.

### 3.5.3 De-airing and Saturation of porous filter elements on piezocone

All porous filter elements were saturated by glycerine putting in vacuum airtight container for 24hrs de-airing. These filter elements were stored in airtight bottles with saturated glycerine. The pore pressure sensor of each piezocone was filled cavities with saturated glycerine by using syringe and needle before testing.

### 3.5.4 Penetration Test

The result of the CPT is generally presented in the form of a series of graphs showing various measured and derived cone parameters plotted versus depth.

The following section describes the parameters, notation and definitions adopted for the work presented in this report: -

- $q_c$  = cone resistance [**MPa**]. The presented cone resistance is relative to a ground zero reference datum. That is the hydrostatic pressures due to the water column are subtracted.
- $f_s$  = sleeve friction [**MPa**]. The presented sleeve friction is relative to a ground zero reference datum.
- $u_2$  = pore pressure [**MPa**]. The presented pore pressure is relative to a ground zero reference datum.
- $R_f$  = friction ratio [%]. The ratio of the sleeve friction to cone resistance. The ratio is calculated relative to the position of the cone tip.

$pp$  = pore pressure ratio [-]. The ratio of the excess pore pressure to net cone resistance.

$q_{net}$  = net cone resistance [**MPa**]. The cone resistance corrected for hydrostatic and dynamic pore pressures, total overburden pressure and cone geometry :-

$$q_{net} = q_t - P_o \quad (1)$$

$$q_t = q_c + (1 - \alpha) (\beta du + U_o) \quad (2)$$

where :

$q_t$  = total corrected cone resistance [MPa]

$P_o$  = total overburden pressure relative to ground level [MPa]. This calculated pressure is relative to cone tip depth and requires the input of the unit weight of water and the soil. For the work presented in this report uniform values of  $10 \text{ kN/m}^3$  and  $16 \text{ kN/m}^3$  have been adopted for water and soil respectively.

$\alpha$  = ratio of cross-sectional shaft area immediately above the base of the cone tip to the cone face area. This ratio is cone type dependent and indicates the degree of differential water pressure acting on the cone tip. For the cone types used on this project the factor = 0.58.

$U_o$  = hydrostatic pore pressure [MPa].

$\beta$  = ratio of dynamic pore pressure immediately above the base of the cone tip to the dynamic pore pressure on the cone face. For the cone types used on this project the  $\beta$  factor = 1.0.

$du$  = pore pressure in excess of the theoretical hydrostatic water pressure [MPa].

$$du = u_2 - u_o.$$

Soil descriptions have been assigned using the simplified soil classification chart (see Figure 6) and pore pressures. No attempt has been made to identify the grading of particles which are coarser than sand. This interpretation is empirical in nature.

A summary of the CPT test data is presented in Table 4 and the detailed results are presented in Appendix I. The following parameters are plotted against level (mPD) in Appendix I.

- Cone resistance  $q_c$  [MPa]
- Sleeve friction  $f_s$  [MPa]
- Pore pressure  $u_2$  [MPa]
- Net cone resistance  $q_{net}$  [MPa]
- Total cone resistance  $q_t$  [MPa]
- Pore pressure ratio  $pp$  [-]
- Friction ratio  $R_f$  [%]

The records also include the following additional information:

- Test identification number
- Date of testing
- Site location
- Coordinates of test location [m]
- Start test level [mPD]
- Cone type and serial number
- Water depth

### 3.6 Environmental Sediment Sampling Locations

Two (2) environmental sediment sampling locations (GS1 and GS2) were sampled under the task order. In addition, reference sediment samples were obtained from Port Shelter (E850234, N820057).

#### 3.6.1 Grab Samples

At each environmental sediment sampling location, seabed soil sample of 8 litres, 1 litre and a jar were collected by grabbing. The sampler has a minimum mouth width of 220mm by 140mm and an approximate weight of 14kg. Each grab sample was stored into double plastic bags or the appropriate jar with proper labelling and subsequently handled with standard procedure for environmental sampling as stipulated below.

#### 3.6.2 Marine Water Samples

A marine water sample was taken at each environmental sediment sampling location. The marine water sample was collected using Kemmerer style water sampler at 1m below water surface, mid-depth and 1m above the seabed for each location and composited on site as one sample with a total volume of 18 litres. Each water sample was stored in container provided by the designated laboratory with proper labelling. The samples were handled with standard procedure for environmental sampling as stipulated below.

### 3.7 Environmental Sample Handling Procedures

To minimize the potential of cross contamination, all equipment including digging tools and sampling tools were decontaminated prior to sampling by high-pressure water jet, then washed by laboratory grade, phosphate-free detergent and finally rinsed with water. The equipment was also cleaned between each sampling event.

The samples that required for analytical testing, as instructed by the Engineer, were recorded on a 'Chain of Custody' (COC) form along with details of the required analytical testing. The COC was then signed off by the on-site GFT and the Engineer's site supervisor.

The selected samples were then immediately placed into an ice chest to maintain the samples in darkness at a temperature of less than +4° Celsius but above freezing during the shift. The ice chest also served to protect the samples from sunlight.

At the end of each shift the samples were transported to land and then by van for road transport directly to the analytical testing laboratory. The samples were maintained in the dark in a chilled condition throughout the transportation and were accompanied by the relevant chain of custody documents.

On arrival at the laboratory the samples were checked off by the laboratory receiving staff and signed for on the COC document, a copy of which was returned to the Fugro technician responsible for the sample delivery and in turn returned to the site representative. On receipt the samples were placed into refrigerated storage maintained at 0°C to +4°C without freezing, and in darkness, at the laboratory until such time as the testing commenced. The signed COC documents are presented in Appendix J to this report.

### 3.8 Surveying Investigation Locations

Marine investigation stations were located and the final survey was undertaken using a Trimble DGPS system. The DGPS survey system utilizes 'real-time' corrections to provide a horizontal accuracy of +/- 2.0 m. The depth measurements were made using a weighted plate attached to a graduated wire marked in half metre increments. Seabed elevations were calculated using tidal data record and the water depth measured on site. The sea surface levels at the time of the water depth measurement were obtained from the real-time tide levels published by the Hong Kong Observatory via the internet.

Co-ordinates and levels of all investigation locations are summarised in Table 2, Survey Record of Investigation Locations, and presented on individual records. Co-ordinates are relative to Hong Kong Metric Grid (1980) and reduced levels are relative to the Hong Kong Principal Datum (PD).



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## 4. Subsurface Conditions

According to the geological survey map of Hong Kong, published by the Geotechnical Engineering Office entitled "Tsing Shan (Castle Peak), Sheet 5, Solid and Superficial Geology, Series HGM20, Scale 1 : 20 000. (Edition I - 1988)", the site is underlain by marine mud of Hang Hau Formation deposited during Holocene period of the Quaternary era.

Encountered subsurface conditions are detailed in the drillhole records presented in Appendix C. A summary of the strata encountered in the explanatory stations is presented below and in Table 1, Summary of Drillhole Results.

### 4.1 Marine Deposit

Marine Deposit mainly comprising CLAY with different minor constituents of silt, sand and shell fragments was encountered below seabed level at all drillhole locations.

The encountered thickness of Marine Deposit was between 3.50 m and 5.90 m, with corresponding base elevations varied between -7.19 mPD and -5.51 mPD.

### 4.2 Alluvium

Alluvium mainly comprising CLAY, SILT, SAND or GRAVEL, with different minor constituent of clay to gravel, was encountered beneath Marine Deposit at all drillhole locations.

The encountered thickness of Alluvium was between 8.20 m and 14.60 m, with corresponding base elevations of between -21.11 mPD and -14.26 mPD.

### 4.3 Saprolite

Saprolite derived from the *in situ* weathering of GRANITE was encountered beneath Alluvium at all drillhole locations. The Saprolite comprised SILT and SAND with minor constituent of clay and gravel.

The penetrated thickness of Saprolite was between 2.33 m and 4.90 m, with corresponding base elevations of between -24.41 mPD and -19.16 mPD.

### 4.4 Variably Decomposed Rock

Variably Decomposed Rock comprising moderately to highly decomposed GRANITE with less than 5 continuous metres of moderately decomposed or better rock was encountered beneath Saprolite at drillhole locations MH5 and MH6.

The encountered thickness of Variably Decomposed Rock was 2.14 m and 2.38 m at drillholes MH5 and MH6 respectively, with corresponding base elevations of -21.30 mPD and -26.79 mPD.

## 4.5 Rock

Rock comprising greater than 5 continuous metres of moderately decomposed or better GRANITE was encountered beneath Saprolite at MH4 and beneath Variably Decomposed Rock at drillhole locations MH5 and MH6. The strength of the Rock ranged between moderately strong to strong and strong to very strong.

The penetrated thickness of Rock was between 5.31 m and 5.83 m, with termination elevations of between -32.16 mPD and -27.13 mPD respectively.

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## 5. Digital Records

The CPT records have been produced using Fugro CPT analysis software, providing CPT data in ASCII and AGS format. The investigation records have been produced using gINT, a widely used commercial software package providing ground investigation data in ASCII format. The data format is in accordance with the Association of Geotechnical and Geoenvironmental Specialists (AGS) publication, 'Electronic Transfer of Geotechnical and Geoenvironmental Data' (AGS, 1999). The field headings comply with the recommendations of the AGS with local variations as recommended by the GEO.

The data is provided on a compact disk with this report and can be found in Appendix K.

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## 6. References

1. AGS (1999). Electronic Transfer of Geotechnical and Geoenvironmental Data, 3rd Edition, Association of Geotechnical and Geoenvironmental Specialists.
2. AGS (2002). AGS Digital Data Format Recommendations for Usage in Hong Kong. AGS Subcommittee of the Association of Geotechnical and Geoenvironmental Specialists (Hong Kong) Ltd.
3. BS 1377: 1990: Methods of Test for Soil for Civil Engineering Purposes, British Standards Institute, UK.
4. BS 5930:1999: Code of Practice of Site Investigations, British Standards Institute, U.K.
5. BS EN ISO 22476-3:2005: Geotechnical investigation and testing. Field testing. Standard penetration test, British Standards Institute, U.K.
6. GEO (1988). Guide to Rock and Soil Descriptions. Geoguide 3. Geotechnical Engineering Office, Hong Kong.
7. GEO (1990). Guide to Site Investigation. Geoguide 2. Geotechnical Engineering Office, Hong Kong.
8. GEO (1988). Hong Kong Geological Survey, Tsing Shan (Castle Peak), Sheet 5, Solid and Superficial Geology, Geotechnical Engineering Office, Series HGM20, Edition I - 1988.
9. ISSMGE 1999 (corrected 2001). International Reference Test Procedure for the Cone Penetration Test ( CPT ) and the Cone Penetration Test with pressure ( CPTU )
10. Meigh A C, (1986), Cone Penetration Testing: Methods and Interpretation (CIRIA Ground Engineering Report: In Situ Testing), Published by Butterworths, ISBN 0-408-2446-1.
11. Robertson P. K., Campanella, R.G., Gillespie, D. and Greig, J. (1986) "Use of Piezometer Cone Data". Proceedings of the ASCE Speciality Conference In Situ '86: Use of In Situ Tests in Geotechnical Engineering, Blacksburg, 1263-80, American Society of Engineers (ASCE)
12. Robertson P.K. 1990. Soil Classification Using the Cone Penetration Test. Canadian Geotechnical Journal, 27,951-158.
13. Macbeth (1994), Munsell Soil Colour Charts, 1994 Revised Edition published by Gretag Macbeth.

# Tables

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**Table 1**  
**Summary of Drillhole Results**

DRILLHOLE NUMBER	SEABED LEVEL	REMARKS	Depth / Levels / Thickness					ROCK
	mPD		MARINE DEPOSIT	UNCLASSIFIED (no recovery)	ALLUVIUM	SAPROLITE	VARIABLY DECOMPOSED ROCK	
	TERMINATION DEPTH							
	m.b.sb.i. (mPD)		m.b.sb.i. (mPD)	m.b.sb.i. (mPD)	m.b.sb.i. (mPD)	m.b.sb.i. (mPD)	m.b.sb.i. (mPD)	m.b.sb.i. (mPD)
MH4	-1.29	Vertical	0.00 to 5.90	5.90 to 18.50	18.50 to 20.83			20.83 to 26.14
	26.14 (-27.43)	Marine Drillhole	(-1.29 to -7.19) 5.90	(-7.19 to -19.79) 12.60	(-19.79 to -22.12) 2.33			(-22.12 to -27.43) 5.31
MH5	-1.56	Vertical	0.00 to 4.50	4.50 to 12.70	12.70 to 17.60			19.74 to 25.57
	25.57 (-27.13)	Marine Drillhole	(-1.56 to -6.06) 4.50	(-6.06 to -14.26) 8.20	(-14.26 to -19.16) 4.90		17.60 to 19.74 (-19.16 to -21.30) 2.14	(-21.30 to -27.13) 5.83
MH6	-2.01	Vertical	0.00 to 3.50	3.50 to 4.50	4.50 to 19.10			24.78 to 30.15
	30.15 (-32.16)	Marine Drillhole	(-2.01 to -5.51) 3.50	(-5.51 to -6.51) 1.00	(-6.51 to -21.11) 14.60		22.40 to 24.78 (-24.41 to -26.79) 2.38	(-26.79 to -32.16) 5.37

**Table 2**  
**Survey Records of Investigation Locations**

Investigation Station No.	As-Built Co-ordinates		Seabed Level [mPD]	Orientation	Remarks
	Easting [m]	Northing [m]			
MH4	809706.40	831481.33	-1.29	Vertical	Marine Drillhole
MH5	809835.27	831530.08	-1.56	Vertical	Marine Drillhole
MH6	809966.77	831587.39	-2.01	Vertical	Marine Drillhole
CP1	809775.60	831675.88	-2.51	Vertical	CPT
CP2	810101.94	831747.64	-3.62	Vertical	CPT
GS1	809773.35	831666.18	N/A	N/A	Sediment/Water Sample Point
GS2	810101.53	831744.10	N/A	N/A	Sediment/Water Sample Point

**Table 3**  
**Summary of Field Testing and Field Installations**

Investigation Station No.	Type of Test	Test Zone / Test Depth [m bsbl]	Type of Installation	Installation Tip / End Depth [m bsbl]	Response Zone [m bsbl]	Remarks
MH4	VANE	2.00, 3.50	-	-	-	
	Pressure	20.28 to 20.61	-	-	-	
	ABT	21.06 to 26.01	-	-	-	
MH5	VANE	2.00, 3.50	-	-	-	
	Pressure	7.90 to 8.23	-	-	-	
	ABT	20.28 to 25.46	-	-	-	
MH6	VANE	2.50	-	-	-	
	Pressure	2.95 to 3.28	-	-	-	
	Pressure	5.90 to 6.23	-	-	-	
	Pressure	12.50 to 12.83	-	-	-	
	ABT	24.85 to 30.00	-	-	-	

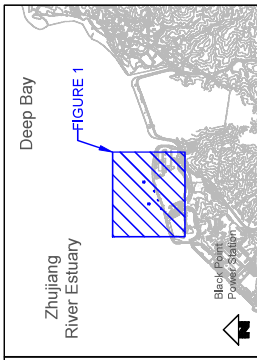
<b>Notes:</b>	WAP - Water Absorption Packer Test	Rising - Rising Head Permeability Test
	ABT - Acoustic Borehole Televiewer Survey	Constant - Constant Head Permeability Test
	VANE - Vane Shear Test	Falling - Falling Head Permeability Test
	PLT - Point Load Test	Pressure - Pressuremeter Test

**Table 4**  
**Summary of CPT Tests**

Item No.	Marine CPT No.	Date of Test [dd-mm-yyyy]	As-Built Coordinates		Tide Level (mPD)	Calculate Seabed Level (mPD)	Cone Start Level (mPD)	Corrected Test Depth (m)	Corrected Cone End Level (mPD)	Dissipation Test Depth (m)	Termination Criteria	Weather and Sea Conditions	Equipment Condition during the Test	CPT Cone SIN	CPT Operator	Jackup Barge
			Easting	Northing												
1	CP1	15-11-2023	809775.599	831675.880	+1.484	-3.62	6.18	27.85	-21.67	-	Uphrust Pressure >100Bar (20 ton reaction)	Fine	Good	3285	ML/RC	Mytilus
2	CP2	14-11-2023	810101.938	831743.639	+1.394	-2.51	6.39	28.10	-21.71	-	Uphrust Pressure >100Bar (20 ton reaction)	Fine	Good	3285	ML/RC	Mytilus

# Figures

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**LEGEND:**

	MH4	MARINE DRILLHOLE
	CP1	MARINE CPT
	GS1	ENVIRONMENTAL SAMPLE LOCATION



JOB REF: 21 0223 05

DATE: 19 Dec 2023

CONTRACT

Contract No. : GE/2021/03

Marine Ground Investigation and Geophysical Surveys

TASK ORDER

Task Order No. : GE/2021/03.23A

Agreement No. CE 26/2022 (EP)

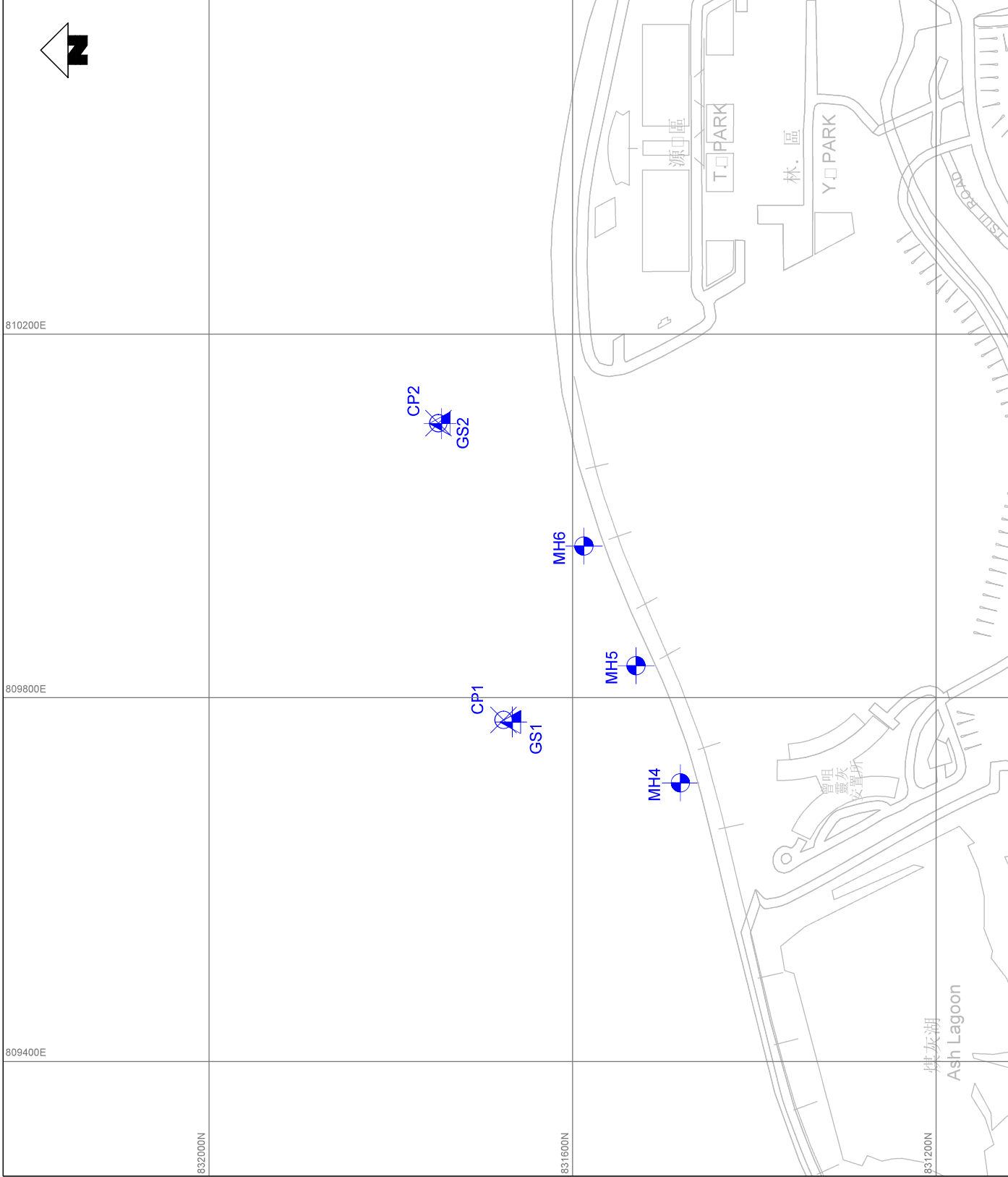
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)

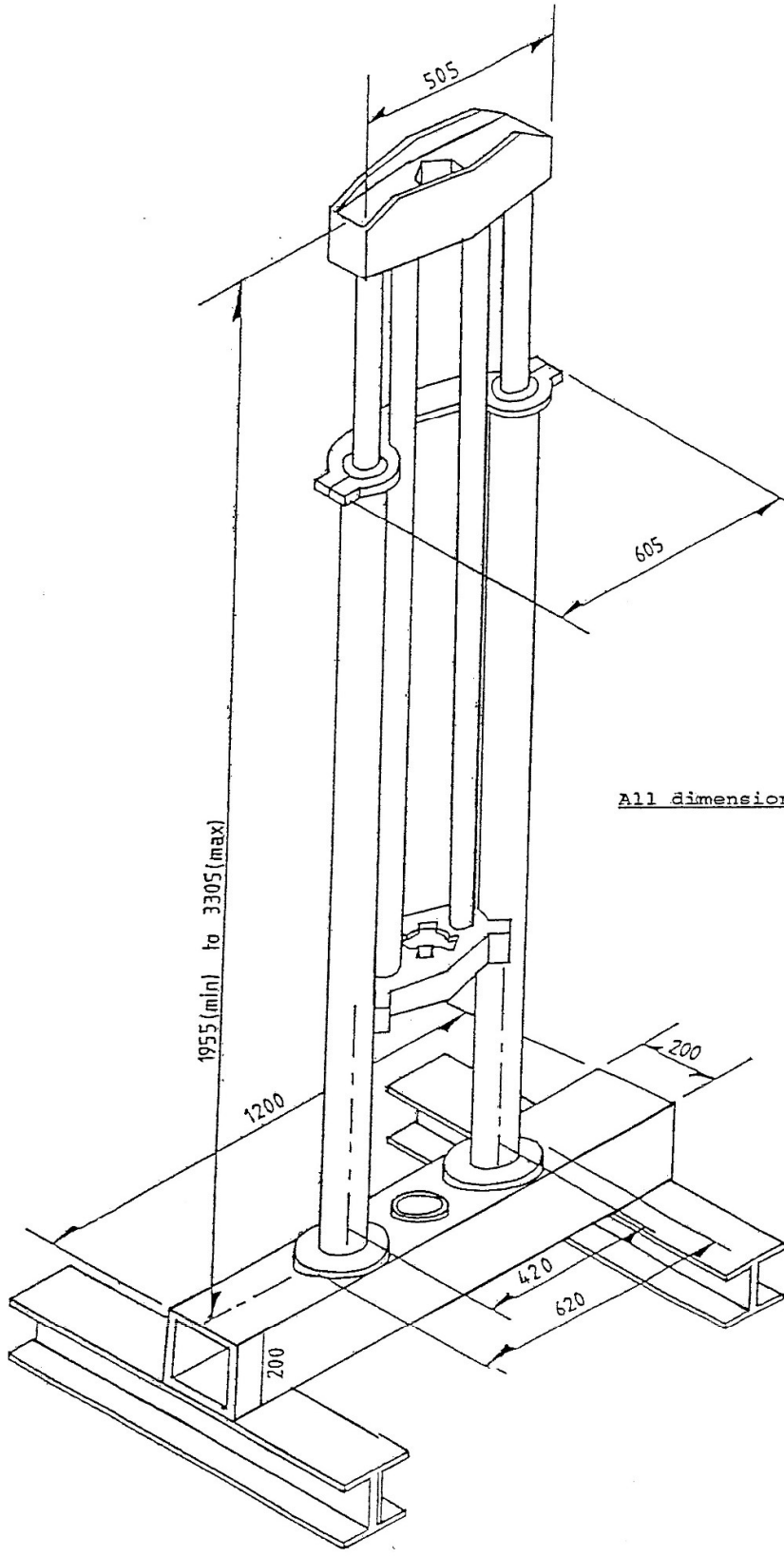
TITLE: Geotechnical Fieldwork Location Plan

SCALE: 1 : 4 000 (A3)

EMPLOYER: CEDD-Geotechnical Engineering Office

FIGURE: 1

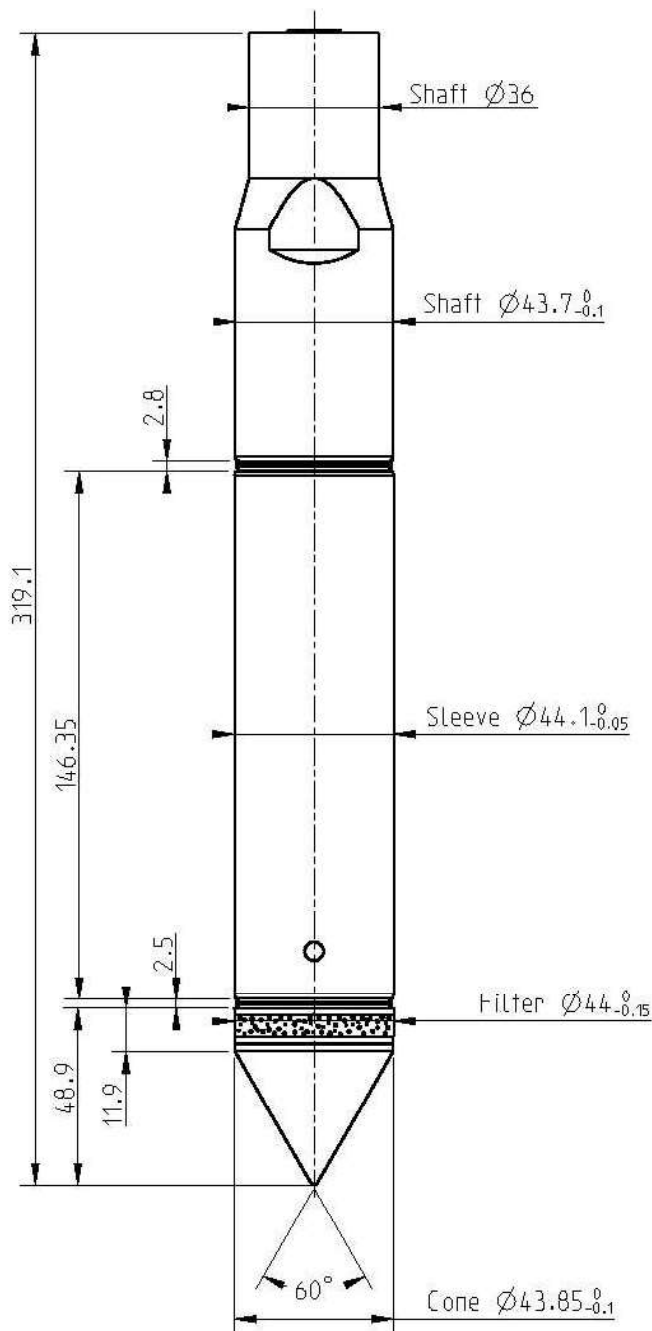




All dimensions are in millimeters

SCALE 1:15

Figure 2 – 200 kN Capacity CPT Rig System



**TYPE: F7.5CKEW2**

**DIMENSIONS**

CONE BASE AREA	( mm <sup>2</sup> )	: 1500
SLEEVE AREA	( mm <sup>2</sup> )	: 20000
$\alpha$ - FACTOR		: 0.58

**SPECIFICATIONS**

CONE LOAD CELL

- FULL SCALE RANGE (kN) : 75
- MAX. LOAD (kN) : 150

CONE PLUS FRICTION LOAD CELL

- FULL SCALE RANGE (kN) : 75
- MAX. LOAD (kN) : 150

PORE PRESSURE TRANSDUCER

- SUBJECT TO RANGE

**NOTES**

1. LOAD CELLS/ TRANSDUCERS MAY BE CALIBRATED FOR OTHER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE CONE
4. ALL DIMENSIONS IN MM
5. BUILT - IN AMPLIFIERS
6. SLOPE SENSOR INCOPORATED
7. THREADED END: INTERNAL-CONICAL
8. PORE PRESSURE TRANSDUCER RANGE AVAILABLE FROM 1.0 TO 20.0 MPa

**Figure 3 – Cross Section Showing Typical Piezocone Details for 7.5 Tonne Cone**



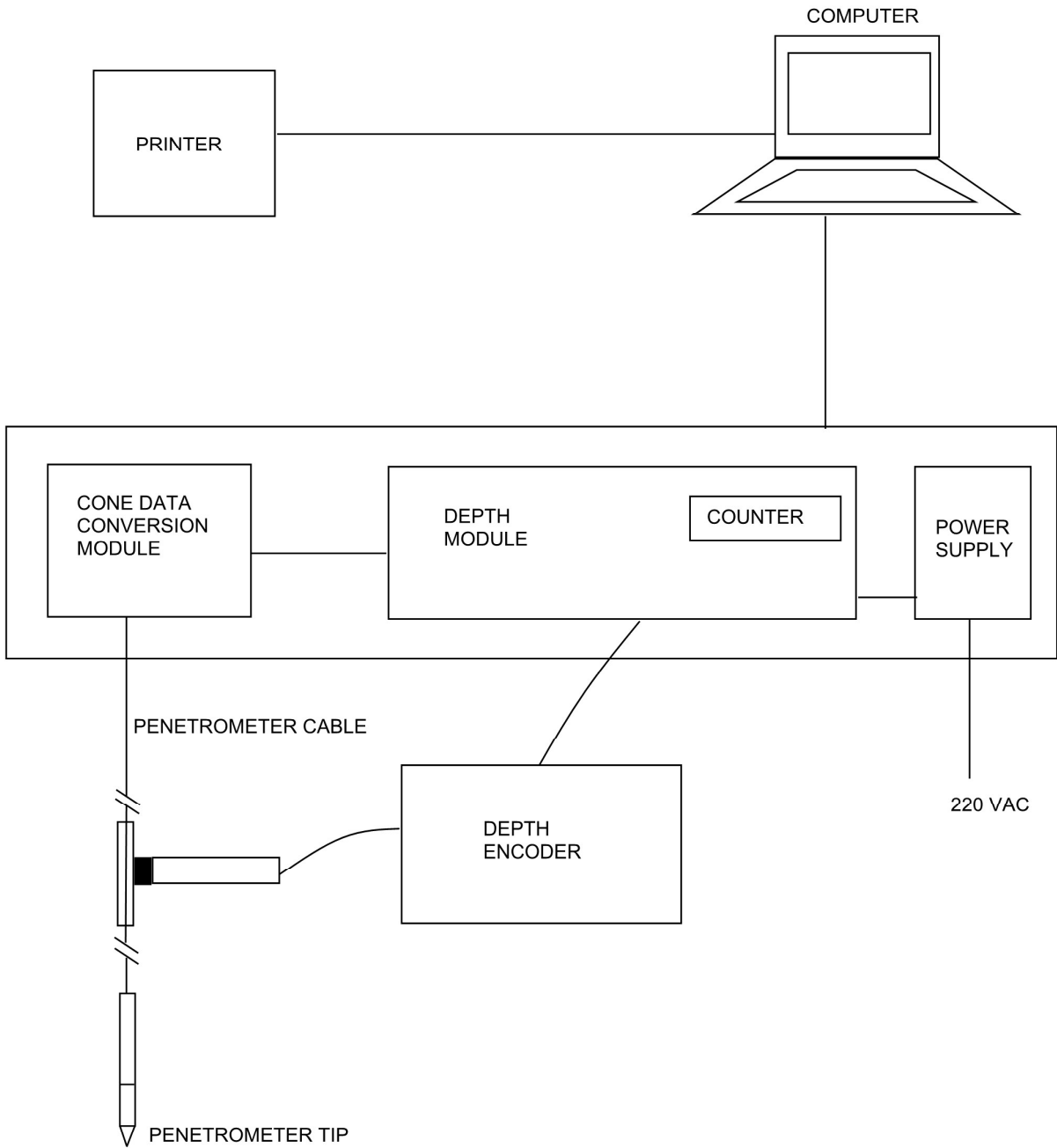


Figure 4 – Schematic Layout of Data Handling System

Program UNIPLLOT

version 05.36.00

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(c) Fugro Engineers B.V., Nootdorp, The Netherlands

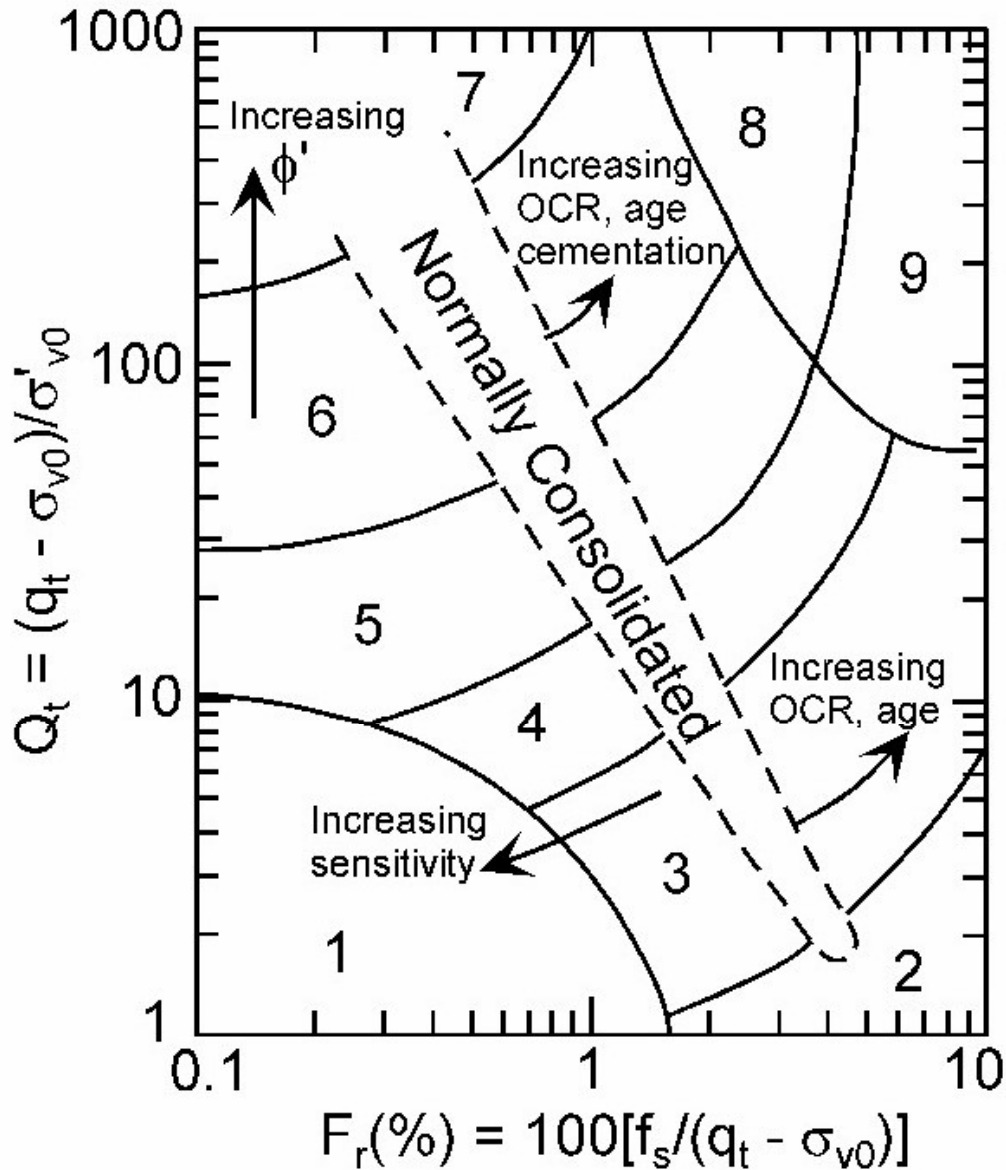
ASCII presentation of data in file :  
ASCII file created at: date :  
                                  time :  
Project number :  
Date of testing :  
Location :

Offsets relative to the depth given in column 2:

Channel name	Offset [m]
Cone	.000
Friction	.115
Pore 2	.012
Slope	.000

Reading No	Depth m	Cone MPa	Friction MPa	Pore 2 MPa	Slope X Deg	Slope Y Deg
621	0.000	0.0000			0.0000	0.0000
622	0.010	0.0025			0.0967	-0.0317
623	0.020	0.0000		0.0014	0.0267	-0.1057
624	0.030	0.0025		0.0014	-0.0500	0.0141
625	0.040	0.0025		0.0014	0.1333	-0.1163
626	0.050	0.0025		0.0014	0.0100	-0.0493
627	0.060	0.0025		0.0027	0.0567	-0.0458
628	0.070	0.0025		0.0027	0.0400	-0.0599
629	0.080	0.0025		0.0027	0.0967	-0.0670
630	0.090	0.0025		0.0027	0.0167	-0.0317
631	0.100	0.0025		0.0027	0.0400	-0.0458
632	0.110	0.0025		0.0041	0.0500	-0.0599
633	0.120	0.0025		0.0041	0.0533	-0.2573
634	0.130	0.0050		0.0041	0.0033	-0.0740
635	0.140	0.0025		0.0041	0.0200	-0.0811
636	0.150	0.0025		0.0041	-0.0133	-0.0811
637	0.160	0.0025		0.0041	-0.0267	-0.0634
638	0.170	0.0025	0.0002	0.0041	-0.0167	-0.0529
639	0.180	0.0025	0.0004	0.0041	-0.0400	-0.0740
640	0.190	0.0025	0.0002	0.0054	-0.0233	-0.0775
641	0.200	0.0025	0.0002	0.0054	-0.0367	-0.0952

Figure 5 – Format of ASCII File



Zone   Soil behaviour type

- 1. Sensitive, fine grained
- 2. Organic soils-peats
- 3. Clays-clay to silty clay
- 4. Silt mixtures; clayey silt to silty clay
- 5. Sand mixtures; silty sand to sandy silt

Zone   Soil behaviour type

- 6. Sands; clean sands to silty sands
- 7. Gravelly sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

Figure 6 - Soil Behaviour Type Classification Chart  
Based on Normalized CPT/CPTU Data  
(after Robertson et al. 1990)

# Appendices

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# Appendix A

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Checklist for Rock and Soil Descriptions

# CHECKLIST FOR ROCK DESCRIPTION

GEOTECHNICAL ENGINEERING OFFICE, HKSAR

## 1. STRENGTH

Term	Identification
Extremely weak	Easily crumbled by hand; indented deeply by thumbnail.
Very weak	Crumbled with difficulty; scratched easily by thumbnail; peeled easily by pocket knife.
Weak	Broken into pieces by hand; scratched by thumbnail; peeled by pocket knife; deep indentations (to 5 mm) by point of geological pick; hand-held specimen easily broken by single light hammer blow.
Moderately weak	Broken with difficulty in two hands; scratched with difficulty by thumbnail; difficult to peel but easily scratched by pocket knife; shallow indentations easily made by point of pick; hand-held specimen usually broken by single light hammer blow.
Moderately strong	Scratched by pocket knife; shallow indentations made by firm blow with point of pick; hand-held specimen usually broken by single firm hammer blow. Point load strength (PLS) 0.5 - 2 MPa.
Strong	Firm blows with point of pick cause only superficial surface damage; hand-held specimen requires more than one firm hammer blow to break. PLS 2 - 4 MPa.
Very strong	Many hammer blows required to break specimen. PLS 4 - 8 MPa.
Extremely strong	Specimen only chipped by hammer blows. PLS > 8 MPa.

## 2. COLOUR

Parameter	Terms
Value	Light, Dark
Chroma	Pinkish, Reddish, Yellowish, Orangish, Brownish, Greenish, Bluish, Purplish, Greyish
Hue	Pink, Red, Yellow, Orange, Brown, Green, Blue, Purple, White, Grey, Black

For uniform colour distribution, choose a hue, supplemented by a value and/or chroma if necessary.

For non-uniform distribution, repeat this procedure using one of the following descriptors: spotted, mottled, dappled, streaked, striped (e.g. light pinkish grey spotted with black).

State whether sample was wet or dry when described.

## 3. TEXTURE/FABRIC

**Texture Terms** (Applicable Mainly to Igneous Rocks)  
Equigranular, Inequigranular, Megacrystic, Porphyritic, Crystalline, Cryptocrystalline, Aphanitic

**Fabric**  
Describe preferred orientation of grains/crystals where apparent.

Describe intensity, spacing, continuity and any preferred orientation of microfractures where apparent.

## 4. MATERIAL WEATHERING/ALTERATION

Decomposition Term	Grade Symbol	Typical Characteristics
Residual Soil	VI	Original rock texture completely destroyed; can be crumbled by hand and finger pressure into constituent grains.
Completely Decomposed	V	Original rock texture preserved; can be crumbled by hand and finger pressure into constituent grains; easily indented by point of geological pick; slakes in water; completely discoloured compared with fresh rock.
Highly Decomposed	IV	Can be broken by hand into smaller pieces; makes a dull sound when struck by hammer; not easily indented by point of pick; does not slake in water; completely discoloured compared with fresh rock.
Moderately Decomposed	III	Cannot usually be broken by hand; easily broken by hammer; makes a dull or slight ringing sound when struck by hammer; completely stained throughout.
Slightly Decomposed	II	Not broken easily by hammer; makes a ringing sound when struck by hammer; fresh rock colours generally retained but stained near joint surfaces.
Fresh Rock	I	Not broken easily by hammer; makes a ringing sound when struck by hammer; no visible signs of decomposition (i.e. no discolouration).

This classification is applicable to igneous and volcanic rocks and other rocks of equivalent strength in fresh state.

**Disintegration**  
Describe small-scale cracking and fracturing caused by mechanical weathering, where apparent.

**Alteration**  
Describe state of alteration (e.g. mineralised, kaolinised) where apparent.

## 5. ROCK NAME (Including Grain Size)

Igneous	: Coarse- (6-20 mm), Medium- (2-6 mm) & Fine- (0.06-2 mm) grained GRANITE; GRANODIORITE. Very Fine-grained (< 0.06 mm) RHYOLITE; BASALT. (Common types only, see Geoguide 3 for others).
Pyroclastic	: PYROCLASTIC BRECCIA (> 60 mm), Lapilli TUFF (2-60 mm), Coarse ash TUFF (0.06-2 mm), Fine ash TUFF (< 0.06 mm).
Metamorphic	: Foliated - SCHIST (> 0.06 mm), PHYLLITE (< 0.06 mm). Non-foliated - MARBLE, QUARTZITE, FAULT BRECCIA.
Sedimentary	: CONGLOMERATE, BRECCIA (> 2 mm), SANDSTONE (0.06-2 mm), MUDSTONE (< 0.06 mm) = SILTSTONE (0.002-0.06 mm) + CLAYSTONE (< 0.002 mm). (Common types only).

If rock name cannot be identified, describe grain size quantitatively, including textural term where appropriate.

## 6. STRUCTURE

Structural Term	Rock Type
Bedded, Laminated, Massive	Sedimentary
Massive, Flow-banded	Igneous, Pyroclastic
Foliated, Banded, Cleaved	Metamorphic

**Spacing of Planar Structures**  
Very thick (> 2 m), Thick (0.6-2 m), Medium (200-600 mm), Thin (60-200 mm), Very thin (20-60 mm), Thickly-laminated (Sedimentary) (6-20 mm) or Narrow (Igneous, Metamorphic) (6-20 mm), Thinly-laminated (Sedimentary) (< 6 mm) or Very narrow (Igneous, Metamorphic) (< 6 mm).

Examples: Thickly-bedded SANDSTONE. Narrowly flow-banded RHYOLITE.

## 7. DISCONTINUITIES

Nature (Type of Discontinuity)	Location and Orientation
Fault zone	Cleavage
Fault	Schistosity
Joint	Shear plane
	Fissure
	Tension crack
	Foliation
	Bedding

Record location as co-ordinates or relative position along datum line, preferably on map or plan.

Record orientation as dip direction/dip in degrees (e.g. 032/55).

**Spacing**  
Extremely widely-spaced (> 6 m), Very widely-spaced (2-6 m), Widely-spaced (0.6-2 m), Medium-spaced (200-600 mm), Closely-spaced (60-200 mm), Very closely-spaced (20-60 mm), Extremely closely-spaced (< 20 mm).

In exposures, supplement spacing with description of rock block shape where possible. Descriptors: Blocky, Tabular, Columnar, Polyhedral.

**Persistence** (Areal extent or size of a discontinuity within a plane)  
Measured maximum persistence dimension should be used where possible (e.g. the discontinuity trace length on the surfaces of rock exposures). For general descriptions of different discontinuity sets, relative terms should be used.

**Roughness**  
Waviness (large-scale): Estimate/measure wavelength and amplitude in metres.  
Unevenness (small-scale), use one term from the following:

Rough stepped	Smooth stepped	Slickensided stepped
Rough undulating	Smooth undulating	Slickensided undulating
Rough planar	Smooth planar	Slickensided planar

**Aperture Size**  
Wide (> 200 mm), Moderately wide (60-200 mm), Moderately narrow (20-60 mm), Narrow (6-20 mm), Very narrow (2-6 mm), Extremely narrow (> 0-2 mm), Tight (zero).

**Infilling** (Nature)

Clean	Surface staining	Decomposed/ disintegrated rock
Non-cohesive soil	Cohesive soil	Quartz
Calcite	Manganese	Kaolin
Other (Specify)		

Give full description of infill materials/minerals where appropriate.

**Seepage**  
Dry Damp/wet Seepage present (estimate quantity in 1/sec or 1/min)

**Fracture State**  
In borehole cores, measure the following: Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD), Fracture Index (FI). See Geoguide 3 for definitions.

## 8. MASS WEATHERING

Term	Zone Symbol	Typical Characteristics
Residual Soil	RS	<b>Residual soil derived from insitu weathering; mass structure and material texture/fabric completely destroyed: 100% soil</b>
Partially Weathered Rock	PW 0/30	<b>Less than 30% rock</b>
		<b>Soil retains original mass structure and material texture/fabric (i.e. saprolite)</b>
	PW 30/50	Rock content does not affect shear behaviour of mass, but relict discontinuities in soil may do so.
		Rock content may be significant for investigation and construction.
		<b>30% to 50% rock</b>
PW 50/90	Both rock content and relict discontinuities may affect shear behaviour of mass.	
	<b>50% to 90% rock</b>	
PW 90/100	Interlocked structure.	
	<b>Greater than 90% rock</b>	
Unweathered Rock	UW	Small amount of the material converted to soil along discontinuities. <b>100% rock</b> May show slight discolouration along discontinuities.

## 9. ADDITIONAL GEOLOGICAL INFORMATION

Record geological formation name if known. Avoid conjecture. Refer to HKGS maps & memoirs for further information.

### NOTES:

- Rock material description normally includes: strength, colour, texture/fabric, material weathering/alteration and ROCK NAME.
- Rock mass description normally includes: strength, colour, structure, mass weathering, ROCK NAME, discontinuities and additional geological information. Can be supplemented with more detailed information on texture/fabric and material weathering/alteration of different materials within the mass where necessary.

1. STRENGTH (Compactness & Consistency)

Soil Type	Term	Identification
Very Coarse (COBBLES & BOULDERS)	Loose	By inspection of voids and particle packing in the field.
	Dense	
Coarse (SANDS & GRAVELS)	Very loose	SPT 'N' value 0-4.
	Loose	SPT 4-10; can be excavated with spade; 50 mm peg easily driven.
	Medium dense	SPT 10-30.
	Dense	SPT 30-50; requires pick for excavation; 50 mm peg hard to drive.
Fine (CLAYS & SILTS)	Very dense	SPT > 50.
	Very soft	Undrained shear strength (USS) < 20 kPa; exudes between fingers when squeezed in hand.
	Soft	USS 20-40 kPa; moulded by light finger pressure.
	Firm	USS 40-75 kPa; can be moulded by strong finger pressure.
Organic (ORGANIC CLAYS, SILTS SANDS & PEATS)	Stiff	USS 75-150 kPa; cannot be moulded by fingers; can be indented by thumb.
	Very stiff or hard	USS > 150 kPa; can be indented by thumbnail.
	Compact	Fibres already compressed together.
	Spongy	Very compressible and open structure.
	Plastic	Can be moulded in hand and smears fingers.

Terms applicable only to transported soils. For soils derived from insitu rock weathering, record actual values of quantitative tests (e.g. SPT 'N' value) as part of the description, where appropriate.

2. COLOUR

Parameter	Terms
Value	Light, Dark
Chroma	Pinkish, Reddish, Yellowish, Orangish, Brownish, Greenish, Bluish, Purplish, Greyish
Hue	Pink, Red, Yellow, Orange, Brown, Green, Blue, Purple, White, Grey, Black

For uniform colour distribution, choose a hue, supplemented by a value and/or chroma if necessary.

For non-uniform distribution, repeat this procedure using one of the following descriptors: spotted, mottled, dappled, streaked, striped (e.g. light yellowish brown mottled with red).

State whether sample was wet or dry when described.

3. PARTICLE SHAPE & COMPOSITION

Characteristic	Terms
Form	Equidimensional, Flat, Elongate, Flat & Elongate
Angularity	Angular, Subangular, Subrounded, Rounded
Surface Texture	Smooth, Rough, Glassy, Honeycombed, Pitted, Striated

Describe composition of coarse particles where appropriate. Gravel and larger particles are usually rock fragments (e.g. granite, tuff); sand particles are usually individual minerals (e.g. quartz, feldspar).

4. STRUCTURE

Soil Type	Term	Identification
Coarse & Fine	Homogenous	Deposit consists essentially of one type.
	Interstratified (Interbedded or Interlaminated)	Alternating layers of varying types or with bands or lenses of other materials.
Coarse	Heterogenous	A mixture of types.
Fine	Fissured	Breaks into polyhedral fragments along fissures.
	Intact	No fissures.
Organic	Fibrous	Plant remains recognizable & retain some strength.
	Amorphous	No recognizable plant remains.

Describe spacing of bedding planes, fissures, shell bands, etc using the spacing terms given in items 6 & 7 for rock description (see other side).

Above terms applicable only to transported soils. For soils derived from insitu rock weathering, describe relict structures in accordance with item 6 of rock description (see other side).

5. WEATHERING

Soils Derived from Insitu Weathering of Rocks

There are two main types: saprolites (rock texture/structure retained) and residual soils (rock texture/structure completely destroyed). Describe state of weathering in accordance with items 4 & 8 for rock description (see other side).

Sedimentary (Transported) Soils

Coarse soils: Describe overall discolouration of soil and degree of decomposition of gravel and larger particles (see item 4, other side). Also note any signs of disintegration of large particles where apparent.

Fine Soils: Describe overall discolouration of soil where apparent.

6. SOIL NAME

A. Basic Soil Types

Soil Type	Particle Sizes (mm)	Identification
BOULDERS	> 200	Only seen complete in pits or exposures.
COBBLES	60 - 200	Often difficult to recover from boreholes.
GRAVELS	Coarse 20 - 60	Easily visible to naked eye; particle shape and grading can be described.
	Medium 6 - 20	Well-graded: wide range of grain sizes.
	Fine 2 - 6	Poorly-graded: not well-graded (split further into uniform or gap-graded).
SANDS	Coarse 0.6 - 2	Visible to naked eye; very little or no cohesion; grading can be described.
	Medium 0.2 - 0.6	May be well-graded or poorly-graded (uniform or gap-graded) as for gravel.
	Fine 0.06 - 0.2	Only coarse silt barely visible to naked eye; exhibits little plasticity and marked dilatancy; slightly granular or silky to the touch. Disintegrates in water; lumps dry quickly; possesses cohesion but can be powdered easily between fingers.
SILTS	Coarse 0.02 - 0.06	Only coarse silt barely visible to naked eye; exhibits little plasticity and marked dilatancy; slightly granular or silky to the touch. Disintegrates in water; lumps dry quickly; possesses cohesion but can be powdered easily between fingers.
	Medium 0.006 - 0.02	
	Fine 0.002 - 0.006	
CLAYS	< 0.002	Dry lumps can be broken by hand but not powdered between the fingers. Disintegrates in water more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying, usually showing cracks. These properties more noticeable with increasing plasticity.
ORGANIC CLAYS, SILTS OR SANDS	varies	Contains much organic vegetable matter; often has a noticeable smell and changes colour on oxidation.
PEATS	varies	Predominantly plant remains; usually dark brown or black in colour, often with distinctive smell; low bulk density.

B. Composite Soil Types (Mixtures of Basic Types)

Principal Soil Type	Terminology Sequence	Term for Secondary Constituent	% of Secondary Constituent
Very coarse (BOULDERS & COBBLES) (> 50% of soil > 60 mm)	Secondary constituents (finer material) ▲ after principal	With a little	< 5
		With some	5 - 20
		With much	20 - 50
		Slightly (silty, clayey or silty/clayey) * - (silty, clayey or silty/clayey) *	< 5 5 - 15
Coarse (GRAVELS & SANDS) (> 65% gravel & sand sizes)	Secondary constituents before principal (excluding cobbles & boulders) +	Very (silty, clayey or silty/clayey) *	15 - 35
		AND/OR	
		Slightly (gravelly or sandy) * - (gravelly or sandy) *	< 5 5 - 20
		Very (gravelly or sandy) *	20 - 50
Fine (SILTS & CLAYS) (> 35% silt & clay sizes)	Secondary constituents before principal (excluding cobbles & boulders) +	Slightly (gravelly or sandy or both) * - (gravelly or sandy) *	< 35 35 - 65

▲ Full name of finer material should be given (see examples below).

\* Secondary soil type as appropriate; use 'silty/clayey' when a distinction cannot be made between the two.

+ If cobbles or boulders are also present in a coarse or fine soil, this can be indicated by using one of the following terms relating to the very coarse fraction after the principal: 'with occasional' (< 5), 'with some' (5-20), 'with many' (20-50), where figures in brackets are % very coarse material expressed as a fraction of the whole soil (see examples below).

Examples: Slightly silty/clayey, sandy GRAVEL. Slightly gravelly, sandy SILT. Very gravelly SAND. Sandy GRAVEL with occasional boulders. BOULDERS with much finer material (silty/clayey, very sandy gravel).

For fine soils, plasticity terms should also be described where possible, viz: 'non-plastic' (generally silts), 'intermediate plasticity' (lean clays), 'high plasticity' (fat clays).

7. DISCONTINUITIES

Full description of discontinuities, where necessary, should be made using the methods and terms given in item 7 for rock description (see other side).

8. ADDITIONAL GEOLOGICAL INFORMATION

Record geological name which indicates geological origin or soil type (e.g. Alluvium, Colluvium, Marine sand etc.). Refer to HKGS maps & memoirs for further information.

NOTES:

- Mass characteristics of soils (i.e. structure, weathering, discontinuities) can only be described satisfactorily in undisturbed field exposures or large undisturbed samples.
- For full descriptions of soils derived from insitu rock weathering:
  - saprolites - describe as rocks, supplemented by soil strength and soil name terms in brackets,
  - residual soils - describe as soils, supplemented by name of parent rock where apparent from field evidence.

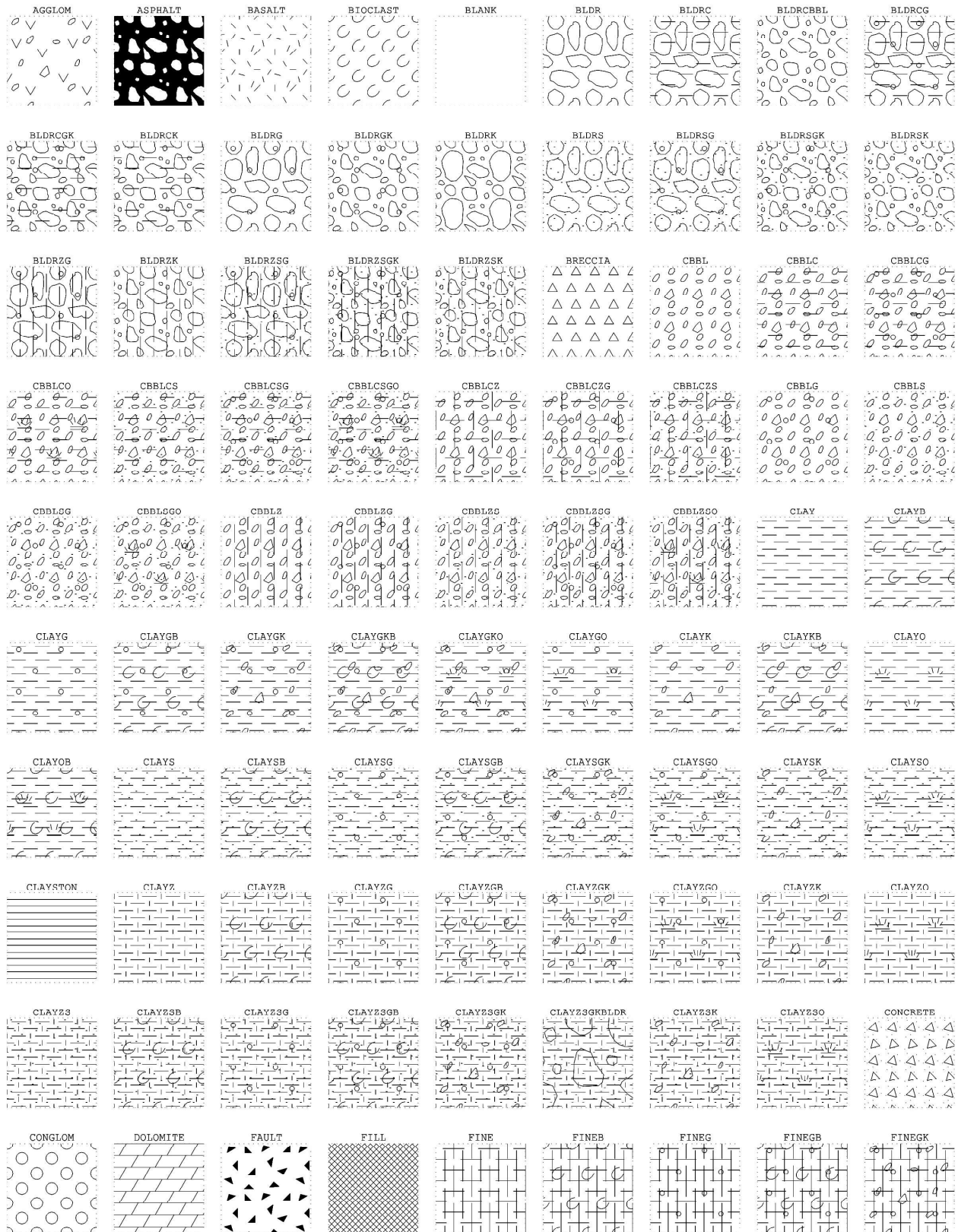
# Appendix B

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Log Symbols and Classification System



## LEGEND SYMBOLS FOR LOGS



## LEGEND SYMBOLS FOR LOGS

FINEGO	FINEK	FINEKB	FINEKO	FINEO	FINES	FINESB	FINESG	FINESGB
FINESGK	FINESGO	FINESK	FINESO	FISSIN	GABBRO	GNEISS	GRANITE	GRAV
GRAVB	GRAVC	GRAVCB	GRAVCBL	GRAVCK	GRAVCO	GRAVCS	GRAVCGB	GRAVCSK
GRAVCSO	GRAVCZ	GRAVCZB	GRAVCZK	GRAVCZS	GRAVCZSB	GRAVCZSK	GRAVK	GRAVS
GRAVGB	GRAVGK	GRAVGO	GRAVZ	GRAVZK	GRAVZO	GRAVZG	GRAVZGB	GRAVZSK
LST	LSTSLT	MARBLE	METACON	METAREG	MUDSTONE	ORGANICS	PEGMTITE	PHYLLITE
QUARTZIT	RHYOLITE	SAND	SANDB	SANDC	SANDCB	SANDCG	SANDCGB	SANDCGK
SANDCGO	SANDCK	SANDCO	SANDCZ	SANDCZB	SANDCZG	SANDCZGB	SANDCZGK	SANDCZK
SANDCZO	SANDG	SANDGB	SANDGK	SANDGO	SANDK	SANDO	SANDSTON	SANDZ
SANDZB	SANDZG	SANDZGB	SANDZGK	SANDZGO	SANDZK	SANDZO	SCHIST	SHALE







## LIST OF MATERIAL CODES FOR THE LOG LEGEND

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<u>Material Code</u>	<u>Description</u>
AGGLOM	Agglomerate
ASPHALT	Asphalt
BASALT	Basalt
BIOCLAST	Shells
BLANK	Void
BLDR	Boulders
BLDRCBBL	Boulders and Cobbles
BRECCIA	Breccia
CBBL	Cobbles
CLAY	Clay
CLAYSTON	Claystone
CONCRETE	Concrete
CONGLOM	Conglomerate
DOLOMITE	Dolomitic Limestone / Dolomite
FAULT	Fault / Fault Breccia
FILL	Artificial Fill
FISSIN	Fissure Infill
GABBRO	Gabbro, Lamprophyre
GNEISS	Gneiss
GRANITE	Granite
GRAV	Gravel
GRAVCBBL	Gravel and Cobbles
LST	Limestone
LSTSLT	Interbedded Limestone and Siltstone
MARBLE	Marble
METACON	Contact Metamorphic Rock
METAREG	Regional Metamorphic Rock
MUDSTONE	Mudstone
ORGANICS	Organic Matter / Peat
PEGMTITE	Pegmatite
PHYLLITE	Phyllite, Mylonite
QUARTZIT	Quartzite
RHYOLITE	Rhyolite
SAND	Sand
SANDSTON	Sandstone
SCHIST	Schist
SHALE	Shale
SILT	Silt
SILTSTON	Siltstone
SURFACE	Artificial Surfacing - Masonry, Stone / Brick Pitching, Shotcrete / Chunam Surface, etc.
SYENITE	Granodiorite, Syenite, Monzonite
TRACHYTE	Trachyte, Trachyandesite, Andesite, Latite and Dacite
TUFF	Coarse Ash Tuff, Lapilli Tuff
TUFFFINE	Fine Ash Tuff
VEIN	Mineral Vein or Mineral Dyke (Quartz Vein, etc.)
WASHING	Wash Boring

### Notes:

In common ground the following codes are added to the main description in the order stated below the denoted secondary constituents:

(i)	C – Clay	(v)	K – Cobbles
(ii)	Z – Silt	(vi)	O – Organic
(iii)	S – Sand	(vii)	B – Shells
(iv)	G – Gravel		

e.g. A silty CLAY with occasional shell and organic material is coded as CLAYZOB.

# Appendix C

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Drillhole Records and Photographs



**DRILLHOLE RECORD**

HOLE No. **MH4**

CONTRACT No.: **GE/2021/03**

SHEET: **1** of **3**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809706.40**  
N **831481.33**

DATE from: **11/10/2023** to **17/10/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 1.29** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
12/10/2023	SW	3.50m at 09:00		0								-1.29	0.00			No sample recovered.
1				89				2 bls	1	2	1.00	-2.29	1.00			Very soft, greyish brown (10YR/5/2) to grey (7.5YR/6/1), silty CLAY. (MARINE DEPOSIT)
2				95				∇ 8.5kPa / 3.8kPa	3	4	1.45					
3									5	6	1.50					
4				100				∇ 9.4kPa / 3.8kPa	7	8	2.00					
5				100					9	10	3.00					
6		2.50m at 17:00						6 bls	11	12	3.50					Soft, grey (5/N) to greyish brown (10YR/5/2), occasionally spotted white, slightly sandy silty CLAY with occasional shell fragments. (MARINE DEPOSIT)
12/10/2023		3.50m at 09:00						1, 1, 1, 1, 1, 1 N=4	13	14	4.40	-5.69	4.40			
7				0				51 bls	15	16	4.85					
8				0				57 bls	17	18	5.00					
9								10, 13, 13, 12, 10, 10 N=45	19	20	5.35					
6									21	22	5.90	-7.19	5.90			Dense, white (8/N), grey (7.5YR/6/1) and yellowish brown (10YR/5/6), spotted pink and black, angular to subangular fine to medium GRAVEL of moderately weak to moderately strong granite, rhyolite and quartz. (ALLUVIUM)
7									23	24	6.35					
8									25	26	6.40	-7.69	6.40			5.90 - 6.40m : With occasional angular coarse gravel of moderately strong granite.
9									27	28	6.65					
10									29	30	7.35					
8	SW	7.90m						15 bls	31	32	7.90	-9.19	7.90			Firm to stiff, light brown (7.5YR/6/3) and greyish white (8/N), mottled yellowish brown, silty CLAY. (ALLUVIUM)
9	PW							2, 2, 3, 3, 4, 5 N=15	33	34	8.20					
10									35	36	8.50					
									37	38	8.85					
									39	40	9.40					
				100					41	42	9.40					
				80					43	44	10.00	-11.29	10.00			

	Small Disturbed Sample		Standard Penetration Test
	Piston sample		In-situ Vane Shear Test
	U76 Undisturbed Sample		Permeability Test
	U100 Undisturbed Sample		Pressuremeter Test
	Mazier Sample		Televiwer Survey
	76mm Vibrocure Sample		Packer Test
	100mm Vibrocure Sample		Impression Packer Test
	Vibrocure Sub-sample		Water Sample
	SPT Liner Sample		Standpipe
			Piezometer Tip

LOGGED K.H. Lai  
DATE 25/10/2023  
CHECKED A. Mazur  
DATE 27/10/2023

REMARKS  
1. Vane shear tests were performed at 2.00m and 3.50m below existing seabed level on 12/10/2023.  
2. Pressuremeter test was performed from 20.28m to 20.61m below existing seabed level on 16/10/2023.  
3. Acoustic borehole televiwer survey was performed from 21.06m to 26.01m below existing seabed level on 17/10/2023.



**DRILLHOLE RECORD**

HOLE No. **MH4**

CONTRACT No.: **GE/2021/03**

SHEET: **2** of **3**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809706.40**  
N **831481.33**

DATE from: **11/10/2023** to **17/10/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 1.29** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
																As sheet 1 of 3.
13/10/2023 14/10/2023		2.50m at 17.00						2, 2, 2, 2, 2, 2 N=8	22 23 24	↓ ↓ ↓	10.40 10.50 10.60	-11.29	10.00			
12		3.40m at 09:00		100					25	↓	11.40	-12.69	11.40			Very stiff, grey (7.5YR/6/1), striped black, silty CLAY with occasional occasional angular fine gravel of quartz and occasional decayed wood fragments. (ALLUVIUM)
13				80				2, 3, 4, 4, 4, 4 N=16	26 27 28	↓ ↓ ↓	12.40 12.50 12.60					
14				0					29	↓	13.40	-14.69	13.40			Grey (7.5YR/6/1), light grey (10R/7/1) and greyish white (8/N), angular to subrounded fine GRAVEL of quartz with some matrix of soft, slightly sandy silty clay. (ALLUVIUM)
15				80					30	↓	14.40	-15.79	14.50			Greyish white (8/N), spotted light grey, clayey silty fine to coarse SAND with some angular fine gravel of quartz. (ALLUVIUM)
16		PW 15.60m HW		0				3, 3, 4, 6, 7, 8 N=25	31 32	↓ ↓	15.50 15.60 15.70	-16.89	15.60			Very stiff, greyish white (8/N), mottled light brown, sandy silty CLAY with occasional subangular fine gravel of quartz. (ALLUVIUM)
17				100					33	↓	16.50	-17.79	16.50			Very stiff, yellow (10YR/7/8), spotted grey, mottled white, silty CLAY with occasional angular fine gravel of quartz. (ALLUVIUM)
18				80				2, 3, 3, 4, 6, 9 N=22	34 35 36	↓ ↓ ↓	17.50 17.60 17.70					
19				100					37	↓	18.50	-19.79	18.50	V		Extremely weak, light brownish pink (2.5YR/6/3), spotted grey and black, mottled pink, completely decomposed altered medium to coarse grained GRANITE. (Slightly sandy clayey SILT)
14/10/2023		2.70m at 17.00		80				3, 6, 6, 7, 12, 16 N=41	38 39	↓ ↓	19.50 19.60 19.70	-20.89	19.60	V		Extremely weak, yellowish brown (10YR/5/6) to light brownish pink (2.5YR/6/3), spotted grey and

	Small Disturbed Sample		Standard Penetration Test
	Piston sample		In-situ Vane Shear Test
	U76 Undisturbed Sample		Permeability Test
	U100 Undisturbed Sample		Pressuremeter Test
	Mazier Sample		Televiwer Survey
	76mm Vibrocore Sample		Packer Test
	100mm Vibrocore Sample		Impression Packer Test
	Vibrocore Sub-sample		Water Sample
	SPT Liner Sample		Standpipe
			Piezometer Tip

LOGGED K.H. Lai  
DATE 25/10/2023  
CHECKED A. Mazur  
DATE 27/10/2023

REMARKS

DRILLHOLE RECORD NEW PROJECT 2



**DRILLHOLE RECORD**

HOLE No. **MH4**

CONTRACT No.: **GE/2021/03**

SHEET: **3** of **3**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809706.40**  
N **831481.33**

DATE from: **11/10/2023** to **17/10/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 1.29** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type					
16/10/2023	HWV 20.83m	3.40m at 09:00							40	↓	20.00	20.00		V	white, completely decomposed medium to coarse grained GRANITE. (Very clayey silty fine to coarse SAND with some angular to subangular fine gravel)
									41	↓	20.44				
21				80	100	89	78				20.83	-22.12	20.83	II	Strong, grey, spotted pink and black, occasionally streaked yellow, slightly decomposed altered medium to coarse grained GRANITE.  Joints are medium to widely spaced, locally very closely spaced, rough planar and rough stepped, extremely narrow, iron oxide stained, occasionally kaolin (<1mm) and chlorite coated, dipping at 20°-30°, 30°-40°, 50°-60° and 60°-70°.
22															
23		2.80m at 17:00		80	100	100	97								
16/10/2023		2.80m at 17:00													
24				80	100	100	100								
25															
26				80	100	100	100								
															End of investigation hole at 26.14m.
27															
28															
29															
30															

DRILLHOLE RECORD NEW PROJECT 2

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED K.H. Lai  
DATE 25/10/2023  
CHECKED A. Mazur  
DATE 27/10/2023

REMARKS





Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH4

Box No. : 1 of 3

Depth : 0.00 m. to 20.05 m.

Date of Photograph : 15/11/2023



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20.05





Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH4

Box No. : 2 of 3

Depth : 20.05 m. to 23.34 m.

Date of Photograph : 15/11/2023



(41)

20.05

20.83

22.03

23.34







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH4

Box No. : 3 of 3

Depth : 23.34 m. to 26.14 m.

Date of Photograph : 15/11/2023



23.34

24.86

26.14

26.14





**DRILLHOLE RECORD**

HOLE No. **MH5**

CONTRACT No.: **GE/2021/03**

SHEET: **1** of **3**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:  
E **809835.27**  
N **831530.08**

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

DATE from: **18/10/2023** to **27/10/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 1.56** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
18/10/2023	SW	2.20m at 09:00		0							-1.56	0.00			No sample recovered.	
1				0				1 bls	1	1.00	-2.56	1.00			Very soft, greenish grey (10GY/5/1), occasionally spotted white, silty CLAY with occasional shell fragments. (MARINE DEPOSIT)	
18/10/2023		4.00m at 17:00						∇ 7.5kPa / 3.8kPa	3	2.00						
19/10/2023		2.30m at 09:00		100					4							
3									5	3.00						
				100				∇ 9.4kPa / 4.7kPa	6	3.50	-5.06	3.50			3.50 - 4.50m : Slightly sandy.	
4									7							
	SW 4.50m PW			0				6 bls	8	4.50	-6.06	4.50			Stiff to very stiff, light yellow (5Y/8/6) to light yellowish brown (2.5Y/6/4), mottled greyish white, occasionally spotted red, silty CLAY. (ALLUVIUM)	
5				0				12 bls	9	4.95					4.50 - 5.50m : Slightly sandy, with some angular to subangular fine gravel of quartz.	
				0				2, 3, 4, 4, 5, 6 N=19	10	5.45	-7.06	5.50				
6									11	5.50						
				100				20 bls	13	6.50						
7		4.20m at 17:00						3, 3, 3, 3, 3, 3 N=12	14	6.95						
19/10/2023									15	7.10						
20/10/2023		2.20m at 09:00							16	7.25						
									17	7.95						
20/10/2023		2.30m at 17:00														
24/10/2023		3.00m at 09:00		80					18	8.50						
9									19	9.50	-11.16	9.60			Very stiff, white (8/N), spotted light grey, mottled light brown, silty CLAY with occasional angular to	
10				100												

	Small Disturbed Sample		Standard Penetration Test
	Piston sample		In-situ Vane Shear Test
	U76 Undisturbed Sample		Permeability Test
	U100 Undisturbed Sample		Pressuremeter Test
	Mazier Sample		Televiometer Survey
	76mm Vibrocore Sample		Packer Test
	100mm Vibrocore Sample		Impression Packer Test
	Vibrocore Sub-sample		Water Sample
	SPT Liner Sample		Standpipe
			Piezometer Tip

LOGGED K.H. Lai  
DATE 28/10/2023  
CHECKED A. Mazur  
DATE 04/11/2023

**REMARKS**  
1. Vane shear tests were performed at 2.00m and 3.50m below existing seabed level on 18/10/2023 and 19/10/2023 respectively.  
2. Pressuremeter tests were performed from 7.90m to 8.23m and 14.70m to 15.35m (attempt) below existing seabed level on 20/10/2023 and 25/10/2023 respectively.  
3. Acoustic borehole televiometer survey was performed from 20.28m to 25.46m below existing seabed level on 27/10/2023.

DRILLHOLE RECORD NEW PROJECT 2





**DRILLHOLE RECORD**

HOLE No. **MH5**

CONTRACT No.: **GE/2021/03**

SHEET: **2** of **3**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809835.27**  
N **831530.08**

DATE from: **18/10/2023** to **27/10/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 1.56** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type					
11			80					1, 2, 3, 4, 4, 5 N=16	20 21 22	10.60 10.70 10.80	-11.56	10.00			subangular fine gravel of quartz. (ALLUVIUM)
12			80	100					23	11.80	-13.16	11.60			Very stiff, white (8/N), occasionally spotted light grey, mottled red, clayey SILT with occasional subangular to subrounded fine to medium gravel of quartz. (ALLUVIUM)
13			80					2, 4, 5, 8, 11, 12 N=36	24 25 26	12.80 12.70 12.80	-14.26	12.70	V		Extremely weak, light yellowish brown (2.5Y/6/4), spotted grey, mottled white, completely decomposed medium grained GRANITE. (Slightly sandy clayey SILT)
14			80	88					27	13.80	-15.16	13.60	V		Extremely weak, light yellowish brown (2.5Y/6/4) and pinkish white (2.5YR/8/2), spotted white, pink and grey, completely decomposed medium grained GRANITE. (Very clayey silty fine to coarse SAND with occasional angular fine gravel)
15		2.30m at 17:00 3.20m at 09:00							28 29	14.60 14.70 15.03					
16		PVW 15.40m HWV							30	16.40 16.50					
17			80						31 32	17.50 17.60 17.72	-19.16	17.60		IV	Weak, yellowish brown, spotted grey and pink, highly decomposed medium to coarse grained GRANITE. Recovered as angular fine to coarse gravel.
18			80					32, 18 / 15mm, 100 / 30mm 100 bts / 30mm	33	18.50 18.66 18.76	-20.32	18.76		II	Strong, greyish pink, spotted grey and black, striped grey, slightly decomposed altered coarse grained GRANITE.
19			80	84	80	76	2.6				-21.09	19.53			Joints are medium spaced, rough planar and rough stepped, very narrow to extremely narrow, iron oxide stained and sandy silt infilled (<3mm),
20		HWV 20.07m					NR				-21.30	19.74		III	

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED K.H. Lai  
DATE 28/10/2023  
CHECKED A. Mazur  
DATE 04/11/2023

REMARKS

DRILLHOLE RECORD NEW PROJECT 2



**DRILLHOLE RECORD**

HOLE No. **MH5**

CONTRACT No.: **GE/2021/03**

SHEET: **3** of **3**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809835.27**  
N **831530.08**

DATE from: **18/10/2023** to **27/10/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 1.56** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description	
									No.	Type	Depth						
21		1.70m at 17:00	80	100	98	98	0.9					-21.56	20.00			dipping at 10°-20° and 40°-50°. 19.53 - 19.74m : No recovery. 19.74 - 20.07m : Moderately strong, moderately decomposed. At 19.74m : 30mm thick weak, highly decomposed zone, dipping at 40°-50°.  Strong to very strong, grey to light greyish pink, spotted black, striped grey, slightly decomposed altered coarse grained GRANITE.  Joints are medium to widely spaced, locally closely spaced, smooth planar, rough planar and smooth stepped, extremely narrow, iron oxide stained and occasionally chlorite coated, dipping at 10°-20°, 30°-40°, 40°-50° and 50°-60°.  At 20.07m : 60mm thick moderately weak, moderately decomposed zone, dipping at 10°-20°.	
		3.00m at 09:00	80	100	100	98	2.7		T2101	20.07	-21.63	20.07					
22			80	100	100	98	6.5		T2101	21.30							
23			80	100	98	86	2.6		T2101	22.65							
			80	100	98	86	8.7										
		1.80m at 17:00	80	100	98	86	1.9		T2101	24.00							
		3.20m at 09:00	80	100	88	62	5.3		T2101	24.93							
25			80	94	94	94	3.1		T2101	25.57							
26																	End of investigation hole at 25.57m.
27																	
28																	
29																	
30																	

DRILLHOLE RECORD NEW PROJECT 2

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED K.H. Lai  
 DATE 28/10/2023  
 CHECKED A. Mazur  
 DATE 04/11/2023

REMARKS





Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH5

Box No. : 1 of 4

Depth : 0.00 m. to 18.76 m.

Date of Photograph : 15/11/2023



(1)

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1876







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH5

Box No. : 2 of 4

Depth : 18.76 m. to 21.30 m.

Date of Photograph : 15/11/2023







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH5

Box No. : 3 of 4

Depth : 21.30 m. to 24.00 m.

Date of Photograph : 15/11/2023



21.30

22.65

24.00







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

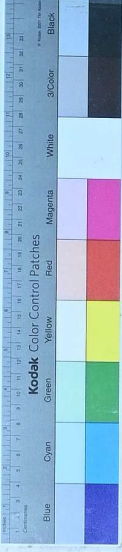
Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : **MH5**

Box No. : **4** of **4**

Depth : **24.00** m. to **25.57** m.

Date of Photograph : **15/11/2023**



24.00

24.93

25.57  
END

24.93



**DRILLHOLE RECORD**

HOLE No. **MH6**

CONTRACT No.: **GE/2021/03**

SHEET: **1** of **4**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809966.77**  
N **831587.39**

DATE from: **28/10/2023** to **04/11/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 2.01** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type					
28/10/2023	SW			0							-2.01	0.00			No sample recovered.
1				100					1	↓	-3.01	1.00			Very soft, greenish grey (10GY/5/1), occasionally spotted white, silty CLAY with occasional shell fragments. (MARINE DEPOSIT)
2									2	↓					
		3.30m at 18:00							3	↓					
28/10/2023								∇ 15.2kPa / 4.7kPa	4	±		2.50			At 3.50m : With occasional lens (40mm) of stiff, light brown, silty clay.
30/10/2023		3.50m at 08:00							5	±		3.00			
	SW 3.50m PW			0							-5.51	3.50			No sample recovered.
4				56				28 bls	6	↓	-6.51	4.50			Yellowish brown (10YR/5/6) to pale brown (10YR/6/3), spotted light grey and white, clayey silty fine to coarse SAND with some angular to subangular fine gravel of quartz. (ALLUVIUM)
5		3.20m at 18:00						1, 1, 3, 4, 7, 8 N=22	7	↓	-7.01	5.00			
30/10/2023		2.90m at 08:00							8	↓		4.85			
31/10/2023									9	↓		5.10			Very stiff, red (10R/5/8) and yellowish brown (10YR/5/6), mottled white and light grey, silty CLAY. (ALLUVIUM)
6									10	↓		5.50			
7				100					11	↓	-8.51	6.50			6.50 - 8.50m : with occasional to some angular fine gravel of quartz.
8		3.00m at 18:00		80				2, 3, 3, 3, 4, 5 N=15	12	↓		6.50			
31/10/2023		2.40m at 08:00							13	↓		7.50			Stiff to very stiff, greyish white (8/N) to light grey (10R/7/1), mottled yellowish brown, silty CLAY. (ALLUVIUM)  8.50 - 9.60m : With much angular to subangular fine to medium gravel of quartz.
9									14	↓		7.60			
01/11/2023									15	↓		7.70			
10				100					16	↓	-10.51	8.50			
									17	↓		8.50			
								2, 3, 3, 4, 4, 6 N=17	18	↓	-11.61	9.60			
											-12.01	10.00			

Small Disturbed Sample Piston sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample 76mm Vibrocore Sample 100mm Vibrocore Sample Vibrocore Sub-sample SPT Liner Sample	Standard Penetration Test In-situ Vane Shear Test Permeability Test Pressuremeter Test Televiever Survey Packer Test Impression Packer Test Water Sample Standpipe Piezometer Tip
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LOGGED K.H. Lai  
 DATE 06/11/2023  
 CHECKED A. Mazur  
 DATE 07/11/2023

**REMARKS**  
 1. Vane shear tests were performed at 2.50m below existing seabed level on 28/10/2023 respectively.  
 2. Pressuremeter tests were performed from 2.95m to 3.28m, 5.90m to 6.23m and 12.50m to 12.83m below existing seabed level on 30/10/2023 to 01/11/2023 respectively.  
 3. Acoustic borehole televiever survey was performed from 24.85m to 30.00m below existing seabed level on 04/11/2023.





**DRILLHOLE RECORD**

HOLE No. **MH6**

CONTRACT No.: **GE/2021/03**

SHEET: **2** of **4**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809966.77**  
N **831587.39**

DATE from: **28/10/2023** to **04/11/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 2.01** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description	
									No.	Type						
									19	↓	10.00 10.05	-12.01	10.00			As sheet 1 of 4.
11			80	100					20	▨	10.50	-12.51	10.50			10.50 - 12.05m : With occasional angular fine gravel of quartz.
12								1, 2, 2, 3, 3, 4 N=12	21	↓	11.50 11.60 11.70					
								▣	22	▨	12.00					
								▣	23	↓	12.50	-14.06	12.05			
									24	↓	12.55					
13		3.00m at 18:00							25	▨	13.10	-15.11	13.10			Medium dense, dark grey (5Y/4/1), spotted black, very silty clayey fine to coarse SAND with occasional decayed organic matter and angular fine gravel of quartz. (ALLUVIUM)
14		2.60m at 08:00	80	100					26	↓	14.10 14.20 14.30					
								3, 4, 4, 6, 6, 8 N=24	27	▨	14.50					
15		P.W. 15.10m HW							28	↓	14.50					
									29	▨	15.10	-17.11	15.10			Firm, light grey (10R/7/1), slightly sandy silty CLAY. (ALLUVIUM).
16			80	100					30	↓	16.10 16.20 16.30					
								2, 2, 2, 2, 2, 2 N=8	31	▨	16.50					
17									32	↓	16.50					
									33	▨	17.10	-19.11	17.10			Very stiff, white (8/N), spotted lightly grey, sandy clayey SILT with occasional to some angular fine to medium gravel of quartz. (ALLUVIUM).
18			80	100					34	↓	18.10 18.20 18.30					
								3, 5, 6, 6, 7, 8 N=27	35	▨	18.50					
19									36	↓	18.50					
									37	▨	19.10	-21.11	19.10			Very weak, light yellowish brown (2.5Y/6/4), spotted grey and white, completely decomposed coarse grained GRANITE. (Silty fine to coarse SAND with occasional angular medium gravel of quartz)
20			80	90							19.10	-22.01	20.00			

DRILLHOLE RECORD NEW PROJECT 2

- |          |                         |   |                           |
|----------|-------------------------|---|---------------------------|
| ▨        | Small Disturbed Sample  | ↓ | Standard Penetration Test |
| ▩        | Piston sample           | ∇ | In-situ Vane Shear Test   |
| ▨▨       | U76 Undisturbed Sample  | ⊥ | Permeability Test         |
| ▨▨▨      | U100 Undisturbed Sample | ⊗ | Pressuremeter Test        |
| ▨▨▨▨     | Mazier Sample           | ○ | Televiwer Survey          |
| ▨▨▨▨▨    | 76mm Vibrocore Sample   | ⊕ | Packer Test               |
| ▨▨▨▨▨▨   | 100mm Vibrocore Sample  | ⊖ | Impression Packer Test    |
| ▨▨▨▨▨▨▨  | Vibrocore Sub-sample    | ▲ | Water Sample              |
| ▨▨▨▨▨▨▨▨ | SPT Liner Sample        | ⊞ | Standpipe                 |
|          |                         | ⊚ | Piezometer Tip            |

LOGGED K.H. Lai  
DATE 06/11/2023  
CHECKED A. Mazur  
DATE 07/11/2023

REMARKS





**DRILLHOLE RECORD**

HOLE No. **MH6**

CONTRACT No.: **GE/2021/03**

SHEET: **4** of **4**

PROJECT: **Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

TASK ORDER No.: **GE/2021/03.23A**

MACHINE & No.: **Mytilus**

E **809966.77**  
N **831587.39**

DATE from: **28/10/2023** to **04/11/2023**

FLUSHING MEDIUM: **Water**

ORIENTATION: **Vertical**

SEABED LEVEL: **- 2.01** mPD

Drilling Progress	Casing size /depth	Water Depth at Shift Start/End	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Depth (m)	Legend	Grade	Description	
									No.	Type	Depth					
04/11/2023							8.5					-32.01	30.00			As sheet 3 of 4.
												-32.16	30.15			End of investigation hole at 30.15m.
31																
32																
33																
34																
35																
36																
37																
38																
39																
40													40.00			

DRILLHOLE RECORD NEW PROJECT 2

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED K.H. Lai  
DATE 06/11/2023  
CHECKED A. Mazur  
DATE 07/11/2023

REMARKS





Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH6

Box No. : 1 of 4

Depth : 0.00 m. to 22.20 m.

Date of Photograph : 15/11/2023



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22.20







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : **MH6**

Box No. : **2** of **4**

Depth : **22.20** m. to **25.12** m.

Date of Photograph : **15/11/2023**



(41)



22.20

22.40

NR  
23.36-23.58

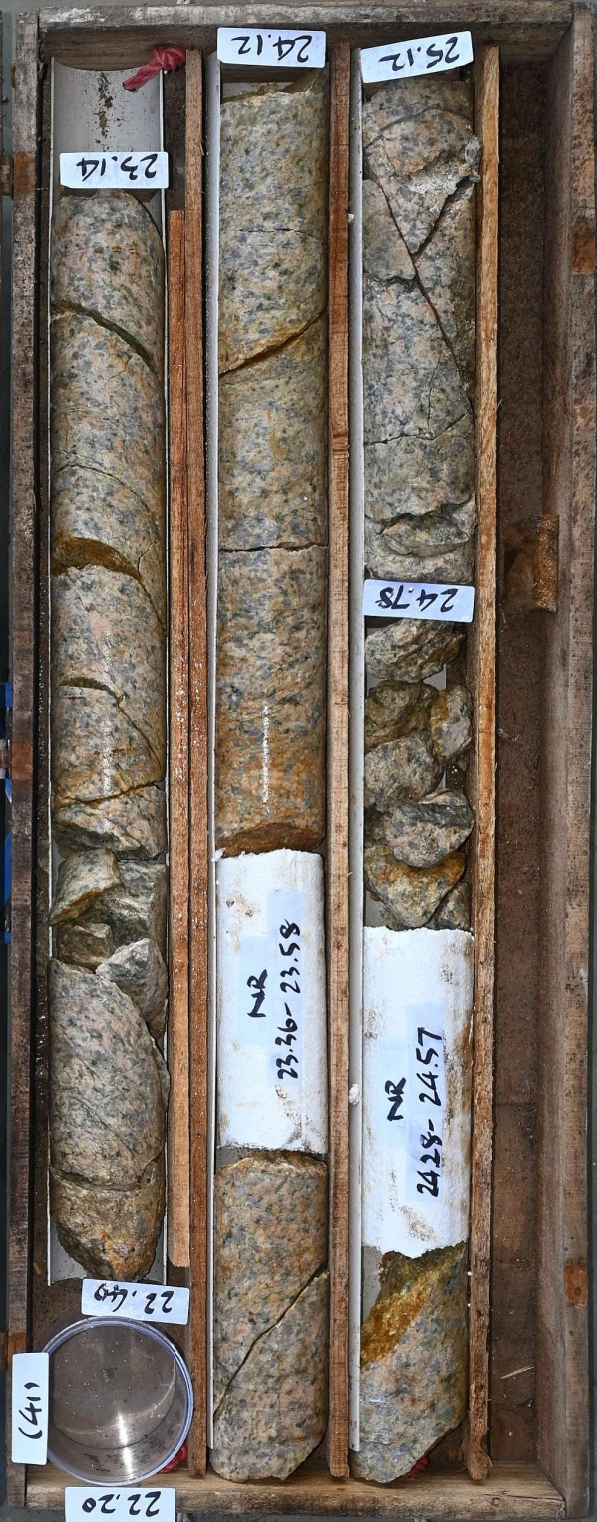
NR  
24.28-24.57

23.14

24.12

25.12

24.78







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH6

Box No. : 3 of 4

Depth : 25.12 m. to (27.70) m.

Date of Photograph : 15/11/2023



25.12

25.97

27.70

27.70







Civil Engineering and  
Development Department



Fugro Geotechnical Services Ltd.

Contract No. GE/2021/03

Task Order No. : GE/2021/03.23A

Job Title : Agreement No. CE 26/2022 (EP)  
Development of Integrated Waste  
Management Facilities Phase 2 -  
Investigation, Design and  
Construction (SA1)

Hole No. : MH6

Box No. : 4 of 4

Depth : (27.70) m. to 30.15 m.

Date of Photograph : 15/11/2023



(27.70)

28.13

29.32

30.15



# Appendix D

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Calibration Certificates of Torque

Measuring Devices





# Appendix E

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In Situ Vane Shear Test Records



# VANE SHEAR TEST RECORD SHEET

Contractor :	Fugro Geotechnical Services Limited	Drillhole No. :	MH4
Contract No. :	GE/2021/03	Date of Test :	12/10/2023
Task Order No. :	GE/2021/03.23A	Seabed Level :	-1.29 mP.D.
Project :	Agreement No. CE26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)	Co-ordinates :	E 809706.40 (m) N 831481.33 (m)
Depth of Vane below Seabed Level :	2.00 m	Level of Test :	-3.29 mP.D.
Tested / Supervised by :	S.O. Leong	Checked by :	A. Brock-Hollinshead

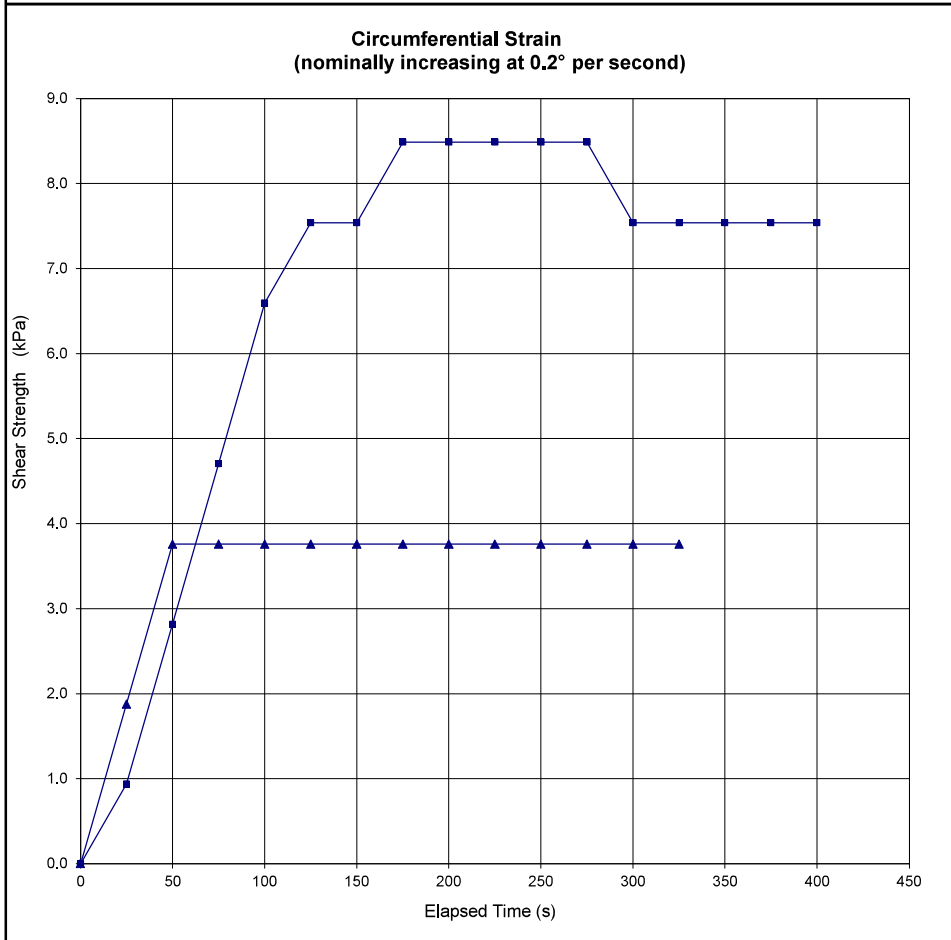
EQUIPMENT DETAILS :		DRILLHOLE DETAILS :	
Type of apparatus :	Geonor, S/N 2653		
Torque head	Number 2653	Diameter	168 mm
	Calib. date 22/02/2023	Depth of hole	1.50 m
		Depth of casing	1.00 m
Vane	Length (L) 110 mm	Depth of water above SBL	3.00 m
	Diameter (D) 55 mm		
	Ratio (L/D) 2		
	Vane Constant (K) 0.6098 (K = 3.66 D <sup>3</sup> X 10 <sup>-6</sup> When L/D=2)		

Angle (degrees)	Elapsed time (s)	Torque (X) (divisions)	Shear Strength (kPa)
<b>UNDISTURBED TEST</b>			
0	0	0.0	0.00
5	25	1.0	0.94
10	50	3.0	2.82
15	75	5.0	4.70
20	100	7.0	6.59
25	125	8.0	7.54
30	150	8.0	7.54
35	175	9.0	8.49
40	200	9.0	8.49
45	225	9.0	8.49
50	250	9.0	8.49
55	275	9.0	8.49
60	300	8.0	7.54
65	325	8.0	7.54
70	350	8.0	7.54
75	375	8.0	7.54
80	400	8.0	7.54

**Shear Strength** (To convert torque into shear strength, use the following equations)

Shear strength (kPa) = M/K  
 where M is the torque to shear the soil (in Nm) = 0.00044 X<sup>2</sup> + 0.57127 X  
 K is a constant depending on dimensions and shape of the vane  
 X is the number of divisions

Peak undrained shear strength 8.5 kPa  
 Remoulded undrained shear strength 3.8 kPa  
 Sensitivity : 2.3



<b>DISTURBED (REMOULDED) TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	4.0	3.76
20	100	4.0	3.76
25	125	4.0	3.76
30	150	4.0	3.76
35	175	4.0	3.76
40	200	4.0	3.76
45	225	4.0	3.76
50	250	4.0	3.76
55	275	4.0	3.76
60	300	4.0	3.76
65	325	4.0	3.76

**LEGEND :**

- Undisturbed test
- ▲ Disturbed (Remoulded) test

- TEST PROCEDURE :**
1. Insert vane
  2. Wait 5 minutes
  3. Conduct undisturbed test rotating at 0.2° per second
  4. Rotate vane rapidly 12 times
  5. Wait 5 minutes
  6. Conduct disturbed test rotating vane at 0.2° per second

**REMARKS :**



# VANE SHEAR TEST RECORD SHEET

Contractor :	Fugro Geotechnical Services Limited	Drillhole No. :	MH4
Contract No. :	GE/2021/03	Date of Test :	12/10/2023
Task Order No. :	GE/2021/03.23A	Seabed Level :	-1.29 mP.D.
Project :	Agreement No. CE26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)	Co-ordinates :	E 809706.40 (m) N 831481.33 (m)
Depth of Vane below Seabed Level :	3.50 m	Level of Test :	-4.79 mP.D.
Tested / Supervised by :	S.O. Leong	Checked by :	A. Brock-Hollinshead

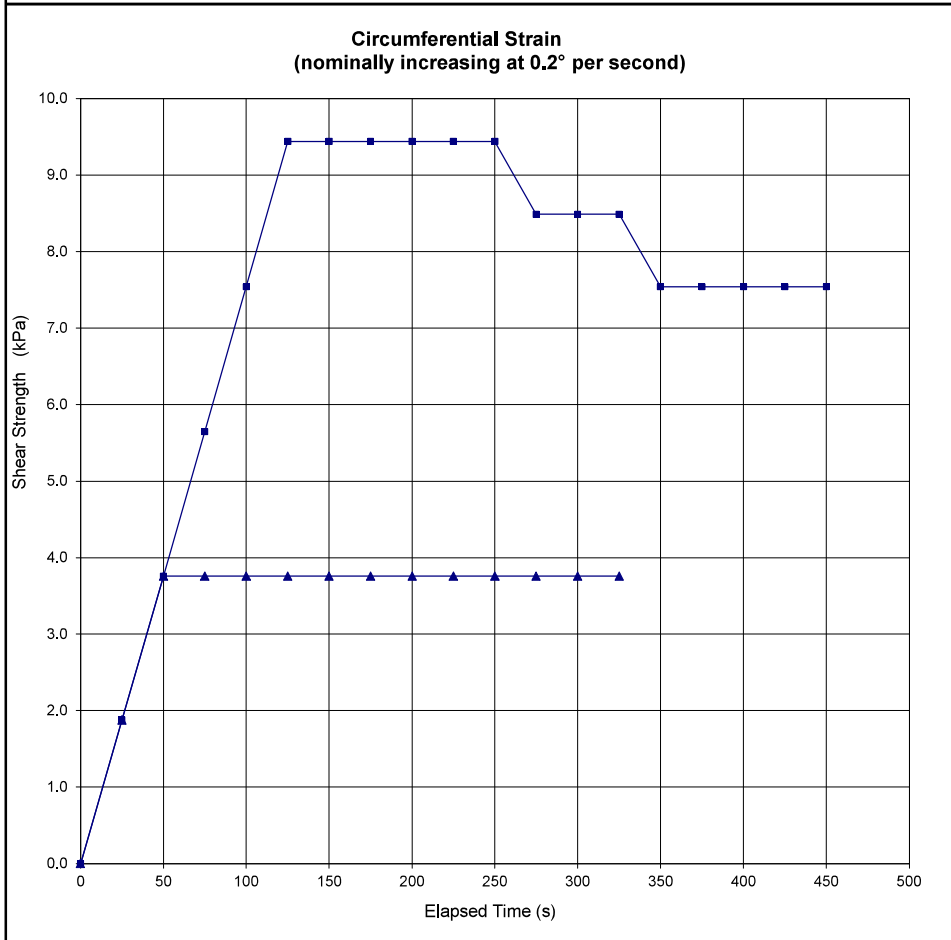
EQUIPMENT DETAILS :		DRILLHOLE DETAILS :	
Type of apparatus :	Geonor, S/N 2653		
Torque head	Number 2653	Diameter	168 mm
	Calib. date 22/02/2023	Depth of hole	3.00 m
		Depth of casing	2.00 m
Vane	Length (L) 110 mm	Depth of water above SBL	2.40 m
	Diameter (D) 55 mm		
	Ratio (L/D) 2		
	Vane Constant (K) 0.6098 (K = 3.66 D <sup>3</sup> X 10 <sup>-6</sup> When L/D=2)		

Angle (degrees)	Elapsed time (s)	Torque (X) (divisions)	Shear Strength (kPa)
<b>UNDISTURBED TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	6.0	5.65
20	100	8.0	7.54
25	125	10.0	9.44
30	150	10.0	9.44
35	175	10.0	9.44
40	200	10.0	9.44
45	225	10.0	9.44
50	250	10.0	9.44
55	275	9.0	8.49
60	300	9.0	8.49
65	325	9.0	8.49
70	350	8.0	7.54
75	375	8.0	7.54
80	400	8.0	7.54
85	425	8.0	7.54
90	450	8.0	7.54

**Shear Strength** (To convert torque into shear strength, use the following equations)

Shear strength (kPa) = M/K  
 where M is the torque to shear the soil (in Nm) = 0.00044 X<sup>2</sup> + 0.57127 X  
 K is a constant depending on dimensions and shape of the vane  
 X is the number of divisions

Peak undrained shear strength 9.4 kPa  
 Remoulded undrained shear strength 3.8 kPa  
 Sensitivity : 2.5



Angle (degrees)	Elapsed time (s)	Torque (X) (divisions)	Shear Strength (kPa)
<b>UNDISTURBED TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	6.0	5.65
20	100	8.0	7.54
25	125	10.0	9.44
30	150	10.0	9.44
35	175	10.0	9.44
40	200	10.0	9.44
45	225	10.0	9.44
50	250	10.0	9.44
55	275	9.0	8.49
60	300	9.0	8.49
65	325	9.0	8.49
70	350	8.0	7.54
75	375	8.0	7.54
80	400	8.0	7.54
85	425	8.0	7.54
90	450	8.0	7.54

<b>DISTURBED (REMOULDED) TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	4.0	3.76
20	100	4.0	3.76
25	125	4.0	3.76
30	150	4.0	3.76
35	175	4.0	3.76
40	200	4.0	3.76
45	225	4.0	3.76
50	250	4.0	3.76
55	275	4.0	3.76
60	300	4.0	3.76
65	325	4.0	3.76

**LEGEND :**

- Undisturbed test
- ▲ Disturbed (Remoulded) test

**TEST PROCEDURE :**

1. Insert vane
2. Wait 5 minutes
3. Conduct undisturbed test rotating at 0.2° per second
4. Rotate vane rapidly 12 times
5. Wait 5 minutes
6. Conduct disturbed test rotating vane at 0.2° per second

**REMARKS :**



# VANE SHEAR TEST RECORD SHEET

Contractor :	Fugro Geotechnical Services Limited	Drillhole No. :	MH5
Contract No. :	GE/2021/03	Date of Test :	18/10/2023
Task Order No. :	GE/2021/03.23A	Seabed Level :	-1.56 mP.D.
Project :	Agreement No. CE26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)	Co-ordinates :	E 809835.27 (m) N 831530.08 (m)
Depth of Vane below Seabed Level :	2.00 m	Level of Test :	-3.56 mP.D.
Tested / Supervised by :	S.O. Leong	Checked by :	A. Mazur

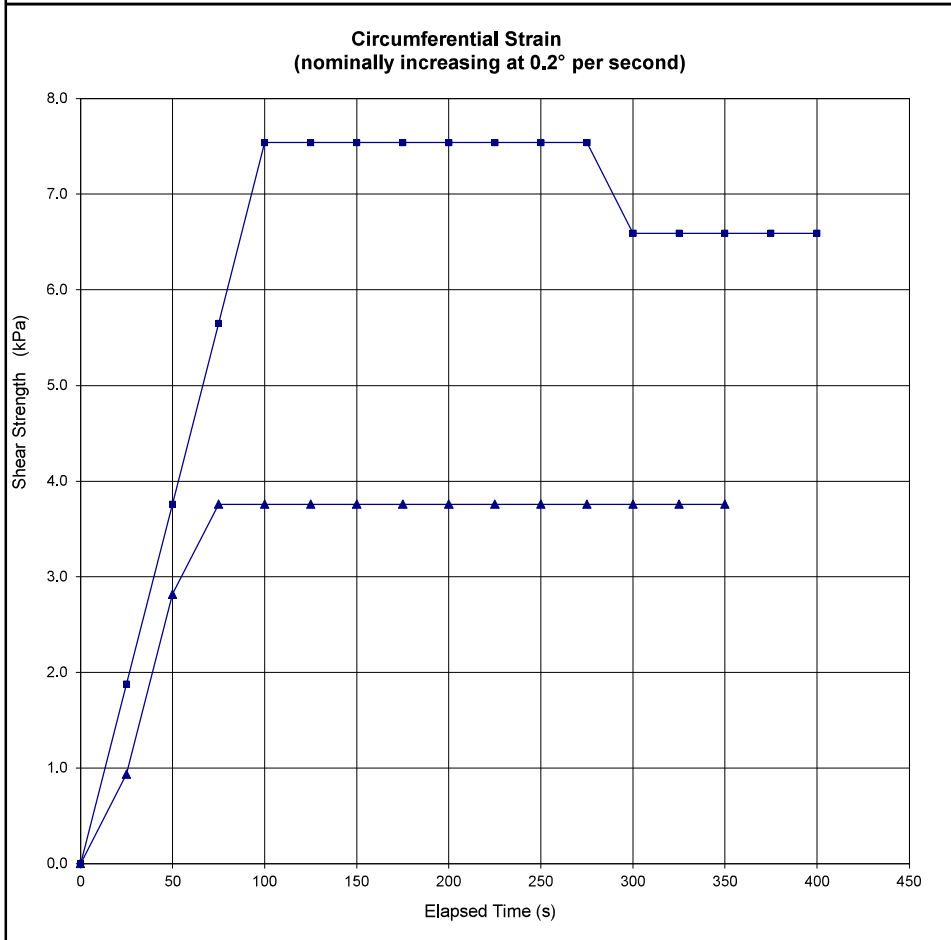
EQUIPMENT DETAILS :		DRILLHOLE DETAILS :	
Type of apparatus :	Geonor, S/N 2653		
Torque head	Number 2653	Diameter	168 mm
	Calib. date 22/02/2023	Depth of hole	1.50 m
		Depth of casing	1.00 m
Vane	Length (L) 110 mm	Depth of water above SBL	3.60 m
	Diameter (D) 55 mm		
	Ratio (L/D) 2		
	Vane Constant (K) 0.6098 (K = 3.66 D <sup>3</sup> X 10 <sup>-6</sup> When L/D=2)		

Angle (degrees)	Elapsed time (s)	Torque (X) (divisions)	Shear Strength (kPa)
<b>UNDISTURBED TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	6.0	5.65
20	100	8.0	7.54
25	125	8.0	7.54
30	150	8.0	7.54
35	175	8.0	7.54
40	200	8.0	7.54
45	225	8.0	7.54
50	250	8.0	7.54
55	275	8.0	7.54
60	300	7.0	6.59
65	325	7.0	6.59
70	350	7.0	6.59
75	375	7.0	6.59
80	400	7.0	6.59

**Shear Strength** (To convert torque into shear strength, use the following equations)

Shear strength (kPa) = M/K  
 where M is the torque to shear the soil (in Nm) = 0.00044 X<sup>2</sup> + 0.57127 X  
 K is a constant depending on dimensions and shape of the vane  
 X is the number of divisions

Peak undrained shear strength 7.5 kPa  
 Remoulded undrained shear strength 3.8 kPa  
 Sensitivity : 2.0



<b>DISTURBED (REMOULDED) TEST</b>			
0	0	0.0	0.00
5	25	1.0	0.94
10	50	3.0	2.82
15	75	4.0	3.76
20	100	4.0	3.76
25	125	4.0	3.76
30	150	4.0	3.76
35	175	4.0	3.76
40	200	4.0	3.76
45	225	4.0	3.76
50	250	4.0	3.76
55	275	4.0	3.76
60	300	4.0	3.76
65	325	4.0	3.76
70	350	4.0	3.76

<b>LEGEND :</b>	<b>TEST PROCEDURE :</b>
<ul style="list-style-type: none"> <li>■ Undisturbed test</li> <li>▲ Disturbed (Remoulded) test</li> </ul>	<ol style="list-style-type: none"> <li>1. Insert vane</li> <li>2. Wait 5 minutes</li> <li>3. Conduct undisturbed test rotating at 0.2° per second</li> <li>4. Rotate vane rapidly 12 times</li> <li>5. Wait 5 minutes</li> <li>6. Conduct disturbed test rotating vane at 0.2° per second</li> </ol>

**REMARKS :**





## VANE SHEAR TEST RECORD SHEET

Contractor : Fugro Geotechnical Services Limited	Drillhole No. : MH5
Contract No. : GE/2021/03	Date of Test : 19/10/2023
Task Order No. : GE/2021/03.23A	Seabed Level : -1.56 mP.D.
Project : Agreement No. CE26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)	Co-ordinates : E 809835.27 (m)    N 831530.08 (m)
Depth of Vane below Seabed Level : 3.50 m	Level of Test : -5.06 mP.D.
Tested / Supervised by : S.O. Leong	Checked by : A. Mazur

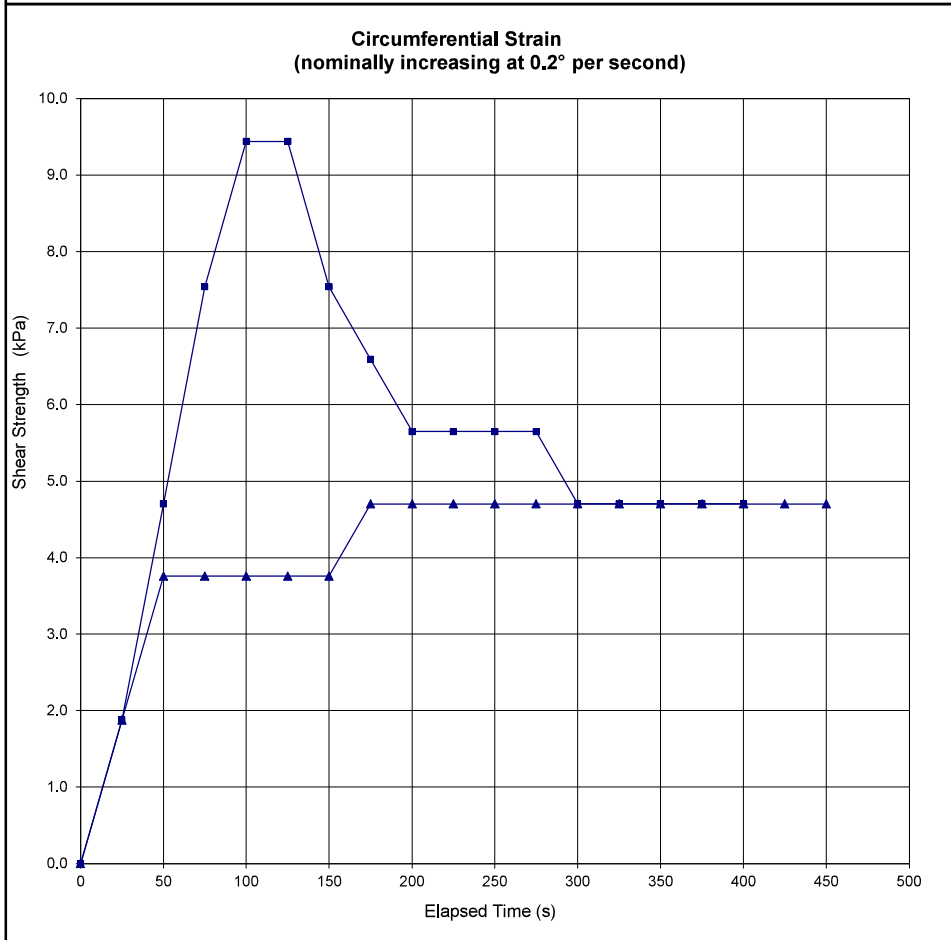
<b>EQUIPMENT DETAILS :</b>		<b>DRILLHOLE DETAILS :</b>	
Type of apparatus :	Geonor, S/N 2653	Diameter	168 mm
Torque head	Number 2653	Depth of hole	3.00 m
	Calib. date 22/02/2023	Depth of casing	2.00 m
Vane	Length (L) 110 mm	Depth of water above SBL	2.20 m
	Diameter (D) 55 mm		
	Ratio (L/D) 2		
	Vane Constant (K) 0.6098 (K = 3.66 D <sup>3</sup> X 10 <sup>-6</sup> When L/D=2)		

Angle (degrees)	Elapsed time (s)	Torque (X) (divisions)	Shear Strength (kPa)
<b>UNDISTURBED TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	5.0	4.70
15	75	8.0	7.54
20	100	10.0	9.44
25	125	10.0	9.44
30	150	8.0	7.54
35	175	7.0	6.59
40	200	6.0	5.65
45	225	6.0	5.65
50	250	6.0	5.65
55	275	6.0	5.65
60	300	5.0	4.70
65	325	5.0	4.70
70	350	5.0	4.70
75	375	5.0	4.70
80	400	5.0	4.70

**Shear Strength** (To convert torque into shear strength, use the following equations)

Shear strength (kPa) = M/K  
 where M is the torque to shear the soil (in Nm) = 0.00044 X<sup>2</sup> + 0.57127 X  
 K is a constant depending on dimensions and shape of the vane  
 X is the number of divisions

Peak undrained shear strength      9.4 kPa  
 Remoulded undrained shear strength      4.7 kPa  
 Sensitivity : 2.0



<b>DISTURBED (REMOULDED) TEST</b>			
Angle	Elapsed time	Torque	Shear Strength
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	4.0	3.76
20	100	4.0	3.76
25	125	4.0	3.76
30	150	4.0	3.76
35	175	5.0	4.70
40	200	5.0	4.70
45	225	5.0	4.70
50	250	5.0	4.70
55	275	5.0	4.70
60	300	5.0	4.70
65	325	5.0	4.70
70	350	5.0	4.70
75	375	5.0	4.70
80	400	5.0	4.70
85	425	5.0	4.70
90	450	5.0	4.70

<b>LEGEND :</b> Undisturbed test Disturbed (Remoulded) test	<b>TEST PROCEDURE :</b> 1. Insert vane 2. Wait 5 minutes 3. Conduct undisturbed test rotating at 0.2° per second 4. Rotate vane rapidly 12 times 5. Wait 5 minutes 6. Conduct disturbed test rotating vane at 0.2° per second
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**REMARKS :**



# VANE SHEAR TEST RECORD SHEET

Contractor :	Fugro Geotechnical Services Limited	Drillhole No. :	MH6
Contract No. :	GE/2021/03	Date of Test :	28/10/2023
Task Order No. :	GE/2021/03.23A	Seabed Level :	-2.01 mP.D.
Project :	Agreement No. CE26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)	Co-ordinates :	E 809966.77 (m) N 831587.39 (m)
Depth of Vane below Seabed Level :	2.50 m	Level of Test :	-4.51 mP.D.
Tested / Supervised by :	S.O. Leong	Checked by :	A. Mazur

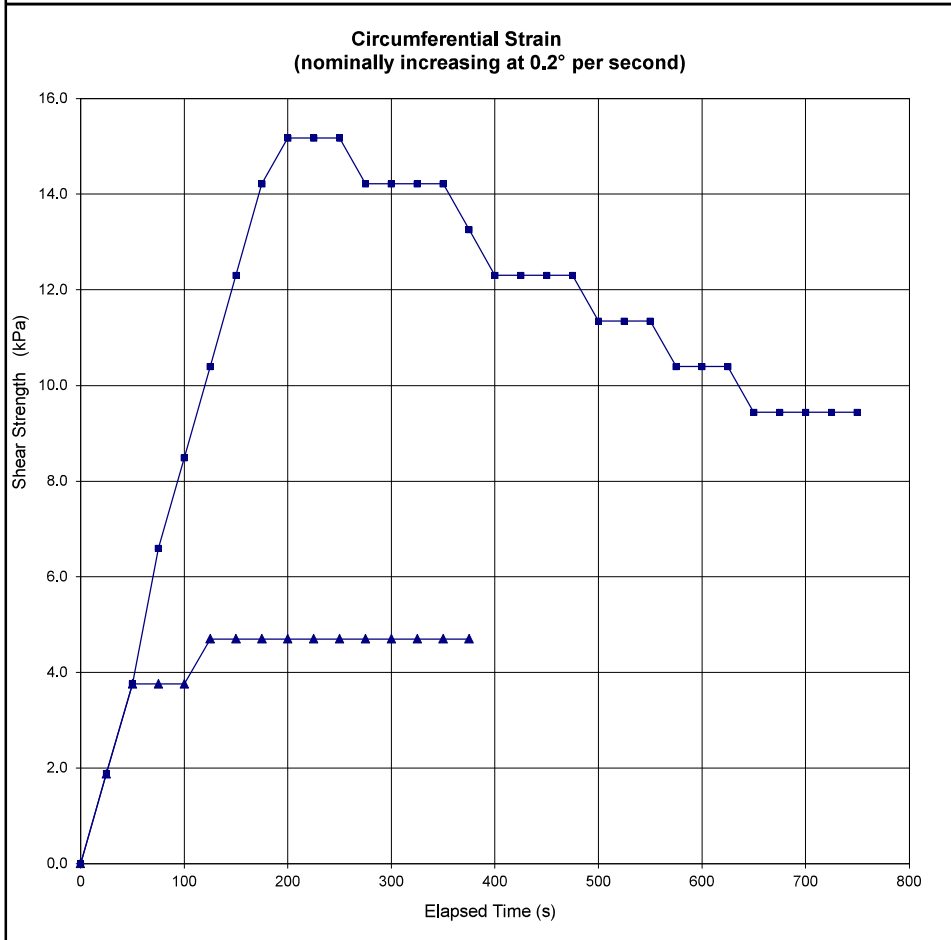
EQUIPMENT DETAILS :		DRILLHOLE DETAILS :	
Type of apparatus :	Geonor, S/N 2653		
Torque head	Number 2653	Diameter	168 mm
	Calib. date 22/02/2023	Depth of hole	2.00 m
		Depth of casing	1.00 m
Vane	Length (L) 110 mm	Depth of water above SBL	3.50 m
	Diameter (D) 55 mm		
	Ratio (L/D) 2		
	Vane Constant (K) 0.6098 (K = 3.66 D <sup>3</sup> X 10 <sup>-6</sup> When L/D=2)		

Angle (degrees)	Elapsed time (s)	Torque (X) (divisions)	Shear Strength (kPa)
<b>UNDISTURBED TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	7.0	6.59
20	100	9.0	8.49
25	125	11.0	10.39
30	150	13.0	12.30
35	175	15.0	14.21
40	200	16.0	15.17
45	225	16.0	15.17
50	250	16.0	15.17
55	275	15.0	14.21
60	300	15.0	14.21
65	325	15.0	14.21
70	350	15.0	14.21
75	375	14.0	13.26
80	400	13.0	12.30
85	425	13.0	12.30
90	450	13.0	12.30
95	475	13.0	12.30
100	500	12.0	11.35
105	525	12.0	11.35
110	550	12.0	11.35
115	575	11.0	10.39
120	600	11.0	10.39
125	625	11.0	10.39
130	650	10.0	9.44
135	675	10.0	9.44
140	700	10.0	9.44
145	725	10.0	9.44
150	750	10.0	9.44

**Shear Strength** (To convert torque into shear strength, use the following equations)

Shear strength (kPa) = M/K  
 where M is the torque to shear the soil (in Nm) = 0.00044 X<sup>2</sup> + 0.57127 X  
 K is a constant depending on dimensions and shape of the vane  
 X is the number of divisions

Peak undrained shear strength 15.2 kPa  
 Remoulded undrained shear strength 4.7 kPa  
 Sensitivity : 3.2



<b>DISTURBED (REMOULDED) TEST</b>			
0	0	0.0	0.00
5	25	2.0	1.88
10	50	4.0	3.76
15	75	4.0	3.76
20	100	4.0	3.76
25	125	5.0	4.70
30	150	5.0	4.70
35	175	5.0	4.70
40	200	5.0	4.70
45	225	5.0	4.70
50	250	5.0	4.70
55	275	5.0	4.70
60	300	5.0	4.70
65	325	5.0	4.70
70	350	5.0	4.70
75	375	5.0	4.70

<b>LEGEND :</b>	<b>TEST PROCEDURE :</b>
<ul style="list-style-type: none"> <li>■ Undisturbed test</li> <li>▲ Disturbed (Remoulded) test</li> </ul>	<ol style="list-style-type: none"> <li>1. Insert vane</li> <li>2. Wait 5 minutes</li> <li>3. Conduct undisturbed test rotating at 0.2° per second</li> <li>4. Rotate vane rapidly 12 times</li> <li>5. Wait 5 minutes</li> <li>6. Conduct disturbed test rotating vane at 0.2° per second</li> </ol>

**REMARKS :**

# Appendix F

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Pressuremeter Test Records

PRESSUREMETER TEST

Client : CEDD Project No. : 21 0223 05  
Contract No. : GE/2021/03 Equipment Type : G-AM  
Contract Title : Marine Ground Investigation and Geophysical Surveys Drillhole No. : MH4  
Task Order No. : GE/2021/03.23A  
Location : Nim Wan  
Test Date : 16-10-2023  
Test Time : 9:56  
Weather : Fine  
Operator : HA/HT

DRILLHOLE INFORMATION

Test Depth : from 20.28 m to 20.61 m  
Drilling tool diameter : 76 mm  
Drilling tool : Fugro Sampler  
Drilling fluid : Water  
Water level below barge platform : 3.20 m  
Soil description : Extremely weak, light greyish pink (7.5YR/7/2), spotted grey and white, completely decomposed medium grained GRANITE. (Very clayey silty fine to coarse SAND with some angular to subangular fine to medium gravel)

PRESSUREMETER SETTING

Gauge no. : F0009  
Probe no. : PM5  
Probe diameter : 70 mm  
Probe calibration date : 06-10-2023  
Gauge height : 0.90 m above barge platform  
Pocket length : 1.00 m  
Type of protective sheath : Metallic  
Type of inner membrane : Rubber  
Initial volume (Vo) : 786 cm<sup>3</sup>  
Differential pressure : 70 kPa

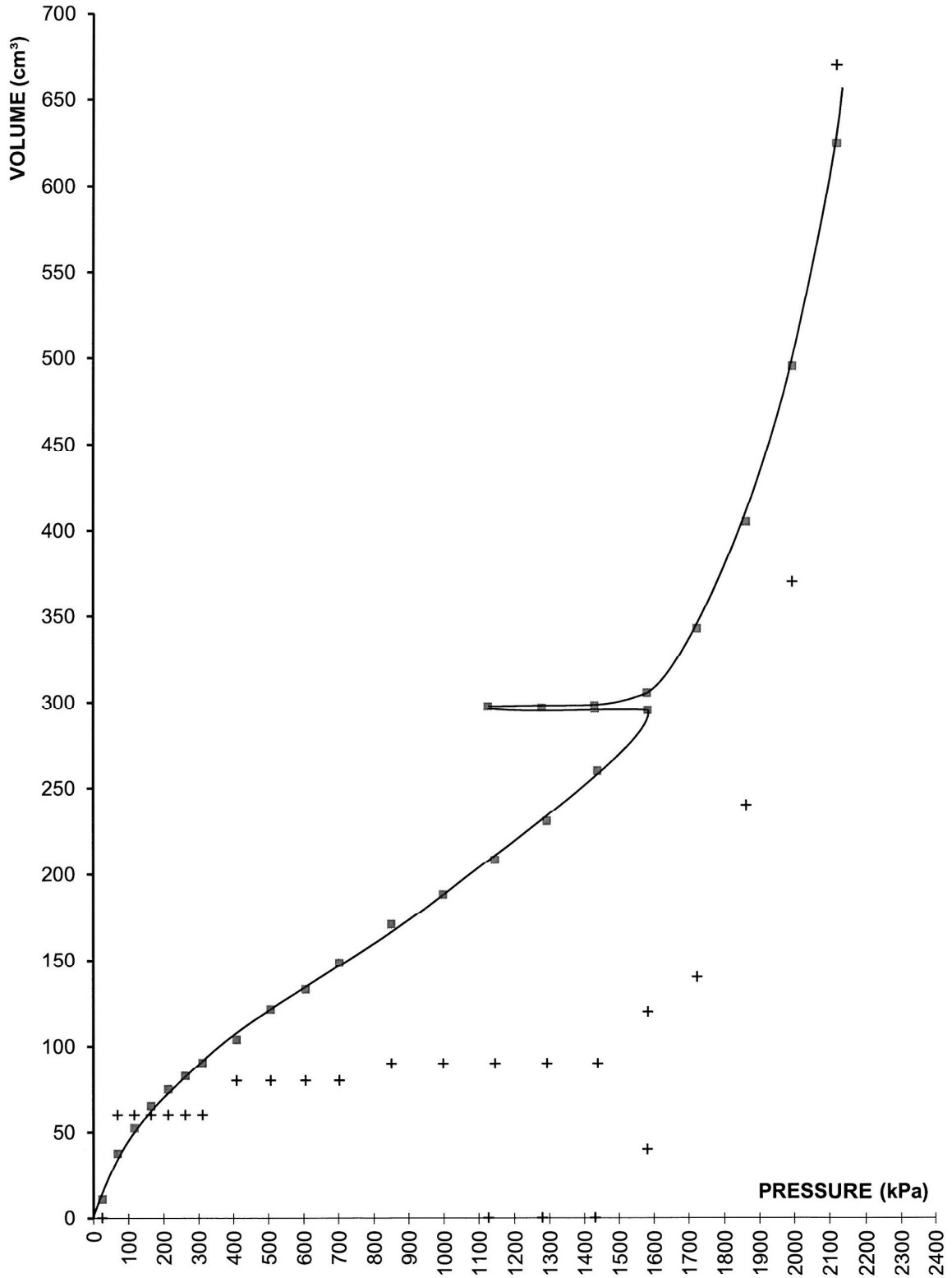
TEST RESULTS SUMMARY

Limit pressure : 2.85 MPa  
Pressure range  
- initial : 703 kPa to 1439 kPa  
- unload-reload (1) : 1127 kPa to 1506 kPa  
Shear modulus  
- initial Gi : 6.17 MPa  
- unload-reload (1) Gur : 338.57 MPa  
Deformation modulus  
- initial Ep : 16.41 MPa  
- unload-reload (1) E+ : 900.60 MPa

Remarks :  
1) All notations refer to 'Pressuremeter Testing - methods and interpretation'  
- Author : R J Mair & D M Wood.  
2) The value of Poisson's ratio used for the computation of the modulus E is 0.33.  
3) The test stopped due to equipment limit (Volume > 600cc)

Checked by :  Date : 03 NOV 2023

**VOLUME Vs PRESSURE PLOT (CORRECTED)**

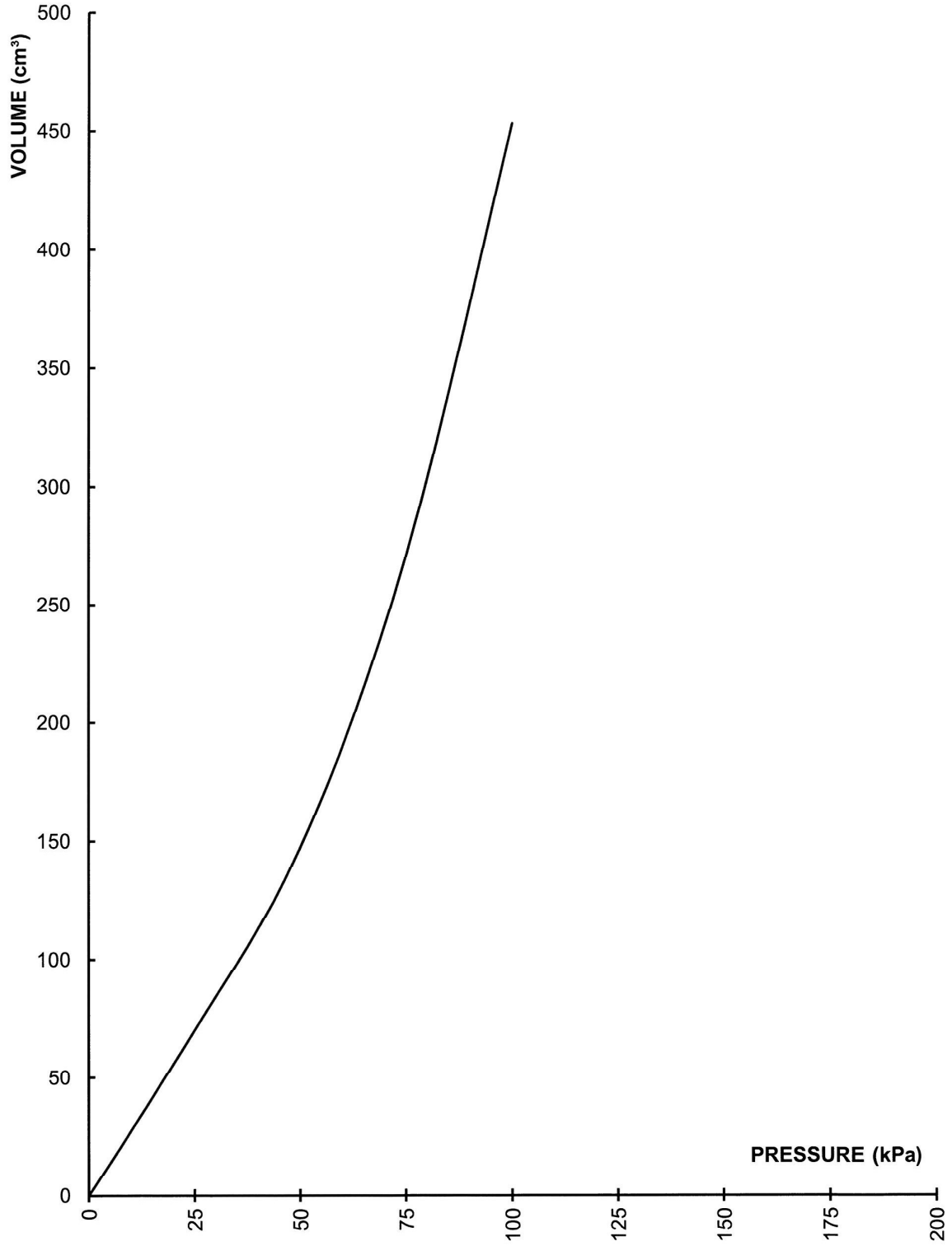


PROBE NO.: PM5  
 CALIBRATION DATE: 06-10-2023

■ CORRECTED VOLUME  
 + CREEP VOLUME x 10

JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m

**CALIBRATION CURVE**



PROBE NO.: PM5  
CALIBRATION DATE: 06-10-2023

JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m

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**PROGRAM PRESS****PRESSUREMETER TEST****JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m**

NPCAL	NUMBER OF PROBE CALIBRATION DATA	5
NP	NUMBER OF GAUGE PRESSURE AND VOLUME DATA	27
CSLOPE	SLOPE FROM CALIBRATION CURVE	0.0047 cm <sup>3</sup> /kPa
GFCOR	GAUGE CORRECTION FACTOR	1.01
GAUCOR	GAUGE CORRECTION	-4 kPa
GAUHT	GAUGE HEIGHT	0.90 m
GWL	WATER LEVEL MEASURED BELOW BARGE PLATFORM	3.20 m
HPCOR	HYDROSTATIC PRESSURE CORRECTION	40 kPa

**PROBE CALIBRATION DATA**

INIVOL	INITIAL VOLUMETER READING (AT ZERO APPLIED PRESSURE)	0.00 cm <sup>3</sup>
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No.	Pressure (kPa)	Volume (cm <sup>3</sup> )
1	0	0.00
2	25	70.00
3	50	147.00
4	75	270.00
5	100	453.00

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JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m

FIELD DATA

GAUGE PRESSURE (kPa) -----	VOLUMETER READING (cm <sup>3</sup> )				
	15S -----	30S ----	60S ----	90S ----	120S ----
0	5.00	7.00	8.00	10.00	11.00
50	28.00	32.00	35.00	36.00	38.00
100	44.00	47.00	50.00	51.00	53.00
150	58.00	60.00	62.00	63.00	66.00
200	69.00	70.00	71.00	73.00	76.00
250	77.00	78.00	79.00	80.00	84.00
300	85.00	86.00	87.00	89.00	92.00
400	95.00	98.00	101.00	103.00	106.00
500	114.00	116.00	118.00	119.00	124.00
600	126.00	128.00	130.00	132.00	136.00
700	140.00	144.00	146.00	147.00	152.00
850	164.00	166.00	167.00	168.00	175.00
1000	181.00	184.00	186.00	189.00	193.00
1150	203.00	205.00	208.00	210.00	214.00
1300	226.00	228.00	231.00	233.00	237.00
1450	255.00	258.00	262.00	264.00	267.00
1600	288.00	291.00	296.00	297.00	303.00
1450	303.00	303.00	303.00	303.00	303.00
1300	303.00	303.00	303.00	303.00	303.00
1150	303.00	303.00	303.00	303.00	303.00
1300	303.00	303.00	303.00	303.00	303.00
1450	305.00	305.00	305.00	305.00	305.00
1600	309.00	309.00	309.00	311.00	313.00
1750	332.00	337.00	345.00	348.00	351.00
1900	377.00	390.00	400.00	408.00	414.00
2050	455.00	468.00	481.00	493.00	505.00
2200	547.00	568.00	595.00	615.00	635.00



**JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
0	120	11.00	11.00	-	0.17	10.83	11.70	24.25	0.000
	15	28.00							
	30	32.00							
	60	35.00							
	90	36.00							
50	120	38.00	38.00	6.00	0.41	37.59	17.48	69.10	0.032
	15	44.00							
	30	47.00							
	60	50.00							
	90	51.00							
100	120	53.00	53.00	6.00	0.64	52.36	20.68	116.54	0.050
	15	58.00							
	30	60.00							
	60	62.00							
	90	63.00							
150	120	66.00	66.00	6.00	0.88	65.12	23.43	164.42	0.064
	15	69.00							
	30	70.00							
	60	71.00							
	90	73.00							
200	120	76.00	76.00	6.00	1.12	74.88	25.54	212.94	0.074
	15	77.00							
	30	78.00							
	60	79.00							
	90	80.00							
250	120	84.00	84.00	6.00	1.36	82.64	27.22	261.90	0.083
	15	85.00							
	30	86.00							
	60	87.00							
	90	89.00							
300	120	92.00	92.00	6.00	1.60	90.40	28.90	310.85	0.091
	15	95.00							
	30	98.00							
	60	101.00							
	90	103.00							
400	120	106.00	106.00	8.00	2.07	103.93	31.82	409.20	0.105
	15	114.00							
	30	116.00							
	60	118.00							
	90	119.00							
500	120	124.00	124.00	8.00	2.55	121.45	35.61	506.68	0.122
	15	126.00							
	30	128.00							
	60	130.00							
	90	132.00							
600	120	136.00	136.00	8.00	3.02	132.98	38.10	605.46	0.133
	15	140.00							
	30	144.00							
	60	146.00							
	90	147.00							
700	120	152.00	152.00	8.00	3.50	148.50	41.46	703.38	0.147

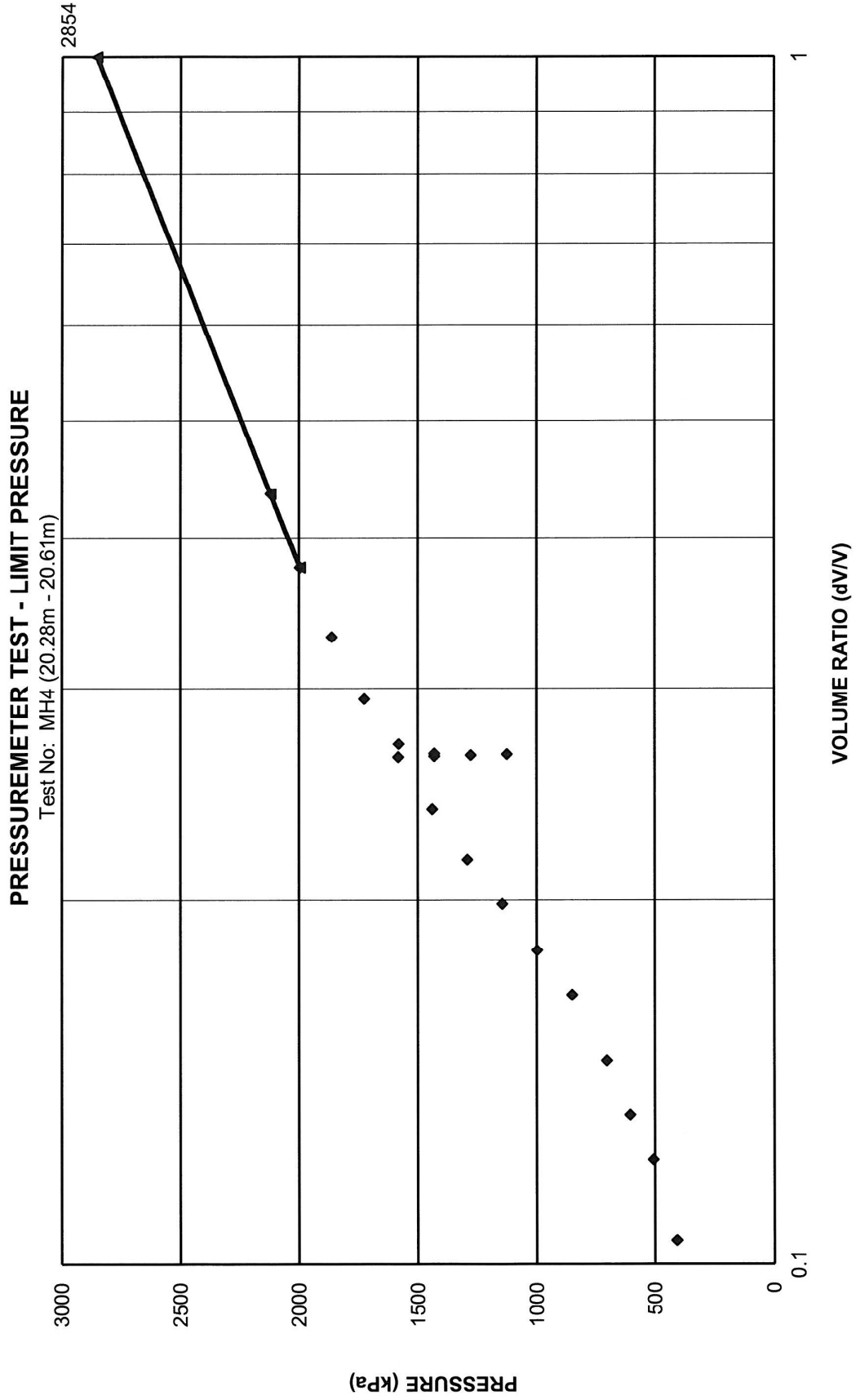
**JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
850	15	164.00							
	30	166.00							
	60	167.00							
	90	168.00							
	120	175.00	175.00	9.00	4.21	170.79	46.28	850.46	0.167
1000	15	181.00							
	30	184.00							
	60	186.00							
	90	189.00							
	120	193.00	193.00	9.00	4.93	188.07	50.02	998.63	0.182
1150	15	203.00							
	30	205.00							
	60	208.00							
	90	210.00							
	120	214.00	214.00	9.00	5.64	208.36	54.40	1146.15	0.199
1300	15	226.00							
	30	228.00							
	60	231.00							
	90	233.00							
	120	237.00	237.00	9.00	6.36	230.64	59.22	1293.24	0.216
1450	15	255.00							
	30	258.00							
	60	262.00							
	90	264.00							
	120	267.00	267.00	9.00	7.07	259.93	65.55	1438.81	0.238
1600	15	288.00							
	30	291.00							
	60	296.00							
	90	297.00							
	120	303.00	303.00	12.00	7.78	295.22	73.18	1583.09	0.263
1450	15	303.00							
	30	303.00							
	60	303.00							
	90	303.00							
	120	303.00	303.00	0.00	7.07	295.93	73.33	1431.03	0.264
1300	15	303.00							
	30	303.00							
	60	303.00							
	90	303.00							
	120	303.00	303.00	0.00	6.36	296.64	73.49	1278.97	0.264
1150	15	303.00							
	30	303.00							
	60	303.00							
	90	303.00							
	120	303.00	303.00	0.00	5.64	297.36	73.64	1126.91	0.264
1300	15	303.00							
	30	303.00							
	60	303.00							
	90	303.00							
	120	303.00	303.00	0.00	6.36	296.64	73.49	1278.97	0.264



**JOB NO: 21 0223 05 DRILLHOLE: MH4 TEST DEPTH: 20.28m-20.61m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
1450	15	305.00							
	30	305.00							
	60	305.00							
	90	305.00							
	120	305.00	305.00	0.00	7.07	297.93	73.77	1430.60	0.265
1600	15	309.00							
	30	309.00							
	60	309.00							
	90	311.00							
	120	313.00	313.00	4.00	7.78	305.22	75.34	1580.92	0.270
1750	15	332.00							
	30	337.00							
	60	345.00							
	90	348.00							
	120	351.00	351.00	14.00	8.50	342.50	83.40	1724.77	0.294
1900	15	377.00							
	30	390.00							
	60	400.00							
	90	408.00							
	120	414.00	414.00	24.00	9.21	404.79	96.87	1863.21	0.331
2050	15	455.00							
	30	468.00							
	60	481.00							
	90	493.00							
	120	505.00	505.00	37.00	9.93	495.07	116.39	1995.59	0.378
2200	15	547.00							
	30	568.00							
	60	595.00							
	90	615.00							
	120	635.00	635.00	67.00	10.64	624.36	144.34	2119.55	0.435





**PRESSUREMETER TEST**

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Client	: CEDD	Project No.	: 21 0223 05
Contract No.	: GE/2021/03	Equipment Type	: G-AM
Contract Title	: Marine Ground Investigation and Geophysical Surveys	Drillhole No.	: MH5
Task Order No.	: GE/2021/03.23A		
Location	: Nim Wan		
Test Date	: 20-10-2023		
Test Time	: 11:58		
Weather	: Fine		
Operator	: HA/HT		

**DRILLHOLE INFORMATION**

Test Depth	:	from	7.90 m	to	8.23 m
Drilling tool diameter	:		76 mm		
Drilling tool	:		Fugro Sampler		
Drilling fluid	:		Water		
Water level below barge platform	:		2.60 m		
Soil description	:		Stiff to very stiff, greyish white (8/N), mottled red, pink and yellowish brown, silty CLAY. (ALLUVIUM)		

**PRESSUREMETER SETTING**

Gauge no.	:	F0009
Probe no.	:	PM5
Probe diameter	:	70 mm
Probe calibration date	:	06-10-2023
Gauge height	:	0.90 m above barge platform
Pocket length	:	1.00 m
Type of protective sheath	:	Metallic
Type of inner membrane	:	Rubber
Initial volume (Vo)	:	786 cm <sup>3</sup>
Differential pressure	:	70 kPa

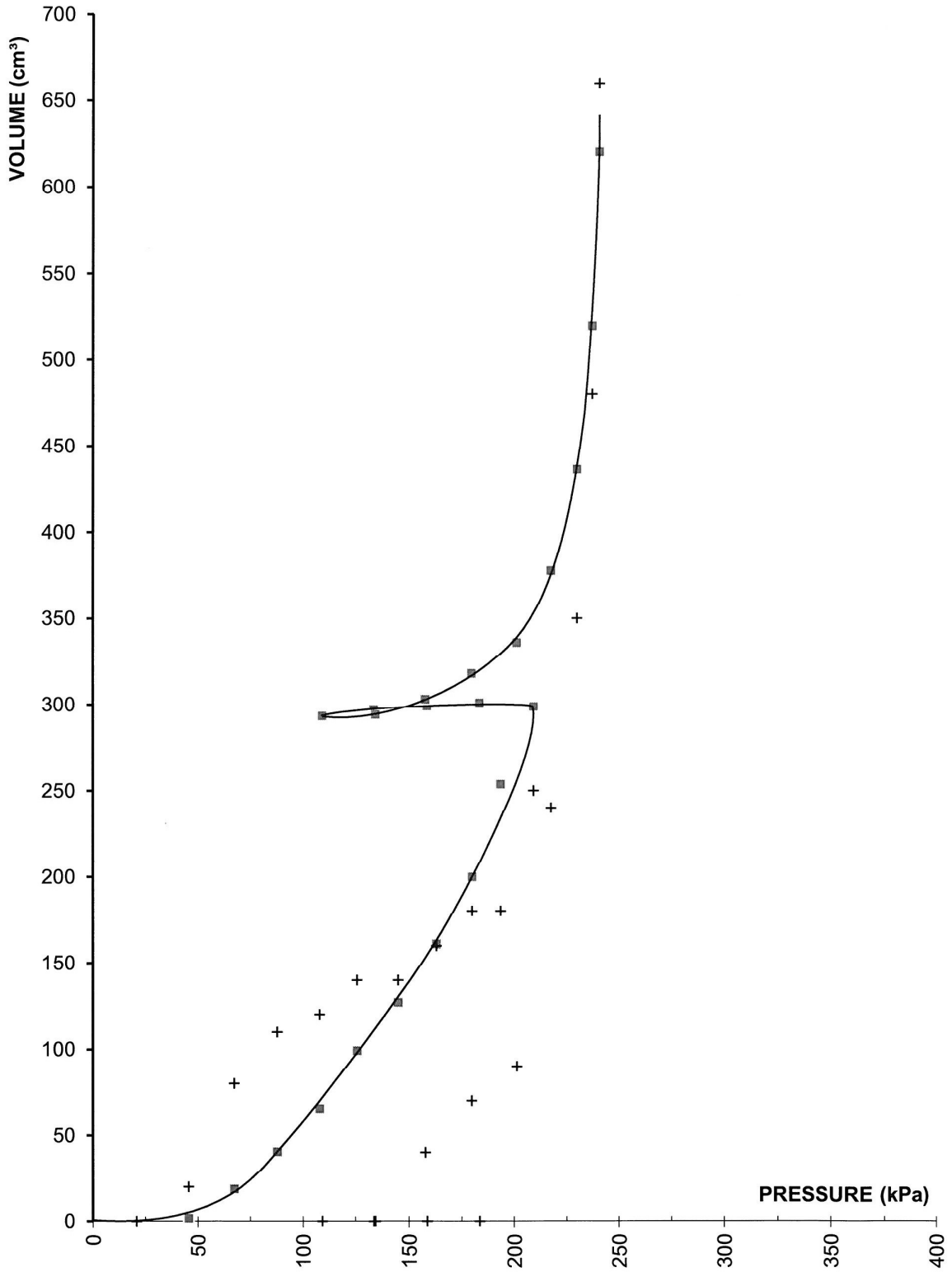
**TEST RESULTS SUMMARY**

Limit pressure	:	0.27 MPa
Pressure range	:	
- initial	:	88 kPa to 163 kPa
- unload-reload (1)	:	109 kPa to 144 kPa
Shear modulus	:	
- initial Gi	:	0.52 MPa
- unload-reload (1) Gur	:	8.10 MPa
Deformation modulus	:	
- initial Ep	:	1.38 MPa
- unload-reload (1) E+	:	21.54 MPa

Remarks :

- 1) All notations refer to 'Pressuremeter Testing - methods and interpretation'  
- Author : R J Mair & D M Wood.
- 2) The value of Poisson's ratio used for the computation of the modulus E is 0.33.
- 3) The test stopped due to equipment limit (Volume > 600cc)

**VOLUME Vs PRESSURE PLOT (CORRECTED)**

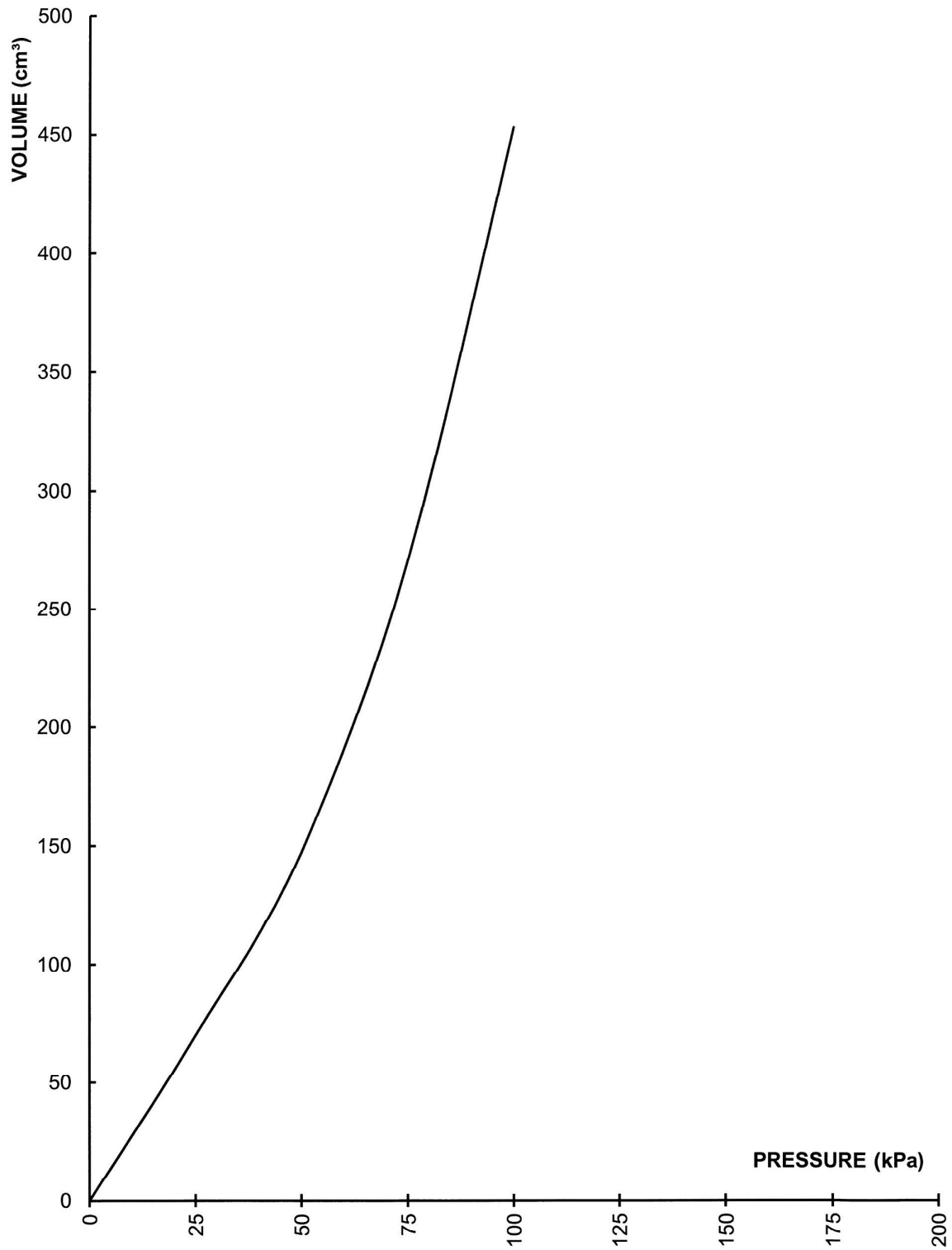


PROBE NO.: PM5  
 CALIBRATION DATE: 06-10-2023

■ CORRECTED VOLUME  
 + CREEP VOLUME x 10

JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m

**CALIBRATION CURVE**



PROBE NO.: PM5  
CALIBRATION DATE: 06-10-2023

JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m

**PROGRAM PRESS****PRESSUREMETER TEST**

JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m

NPCAL	NUMBER OF PROBE CALIBRATION DATA	5
NP	NUMBER OF GAUGE PRESSURE AND VOLUME DATA	23
CSLOPE	SLOPE FROM CALIBRATION CURVE	0.0047 cm <sup>3</sup> /kPa
GFCOR	GAUGE CORRECTION FACTOR	1.01
GAUCOR	GAUGE CORRECTION	-4 kPa
GAUHT	GAUGE HEIGHT	0.90 m
GWL	WATER LEVEL MEASURED BELOW BARGE PLATFORM	2.60 m
HPCOR	HYDROSTATIC PRESSURE CORRECTION	34 kPa

**PROBE CALIBRATION DATA**

INIVOL	INITIAL VOLUMETER READING (AT ZERO APPLIED PRESSURE)	0.00 cm <sup>3</sup>
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No.	Pressure (kPa)	Volume (cm <sup>3</sup> )
1	0	0.00
2	25	70.00
3	50	147.00
4	75	270.00
5	100	453.00

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JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m

**FIELD DATA**

GAUGE PRESSURE (kPa) -----	VOLUMETER READING (cm <sup>3</sup> )				
	15S -----	30S ----	60S ----	90S ----	120S ----
0	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	2.00
50	7.00	11.00	14.00	17.00	19.00
75	26.00	30.00	35.00	38.00	41.00
100	51.00	54.00	60.00	64.00	66.00
125	80.00	86.00	94.00	95.00	100.00
150	110.00	114.00	120.00	124.00	128.00
175	140.00	146.00	155.00	158.00	162.00
200	175.00	183.00	191.00	197.00	201.00
225	215.00	237.00	238.00	246.00	255.00
250	267.00	275.00	286.00	296.00	300.00
225	302.00	302.00	302.00	302.00	302.00
200	300.00	300.00	300.00	300.00	300.00
175	298.00	298.00	298.00	298.00	298.00
150	294.00	294.00	294.00	294.00	294.00
175	295.00	295.00	295.00	295.00	295.00
200	300.00	300.00	300.00	300.00	304.00
225	308.00	312.00	314.00	318.00	319.00
250	325.00	328.00	332.00	335.00	337.00
275	350.00	355.00	364.00	370.00	379.00
300	392.00	403.00	418.00	428.00	438.00
325	460.00	473.00	492.00	508.00	521.00
350	542.00	556.00	580.00	601.00	622.00

**JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
0	120	0.00	0.00	-	0.14	-0.14	9.33	20.73	0.000
	15	0.00							
	30	0.00							
	60	0.00							
	90	0.00							
25	120	2.00	2.00	2.00	0.26	1.74	9.73	45.64	0.002
	15	7.00							
	30	11.00							
	60	14.00							
	90	17.00							
50	120	19.00	19.00	8.00	0.38	18.62	13.38	67.31	0.023
	15	26.00							
	30	30.00							
	60	35.00							
	90	38.00							
75	120	41.00	41.00	11.00	0.50	40.50	18.11	87.90	0.049
	15	51.00							
	30	54.00							
	60	60.00							
	90	64.00							
100	120	66.00	66.00	12.00	0.62	65.38	23.49	107.84	0.077
	15	80.00							
	30	86.00							
	60	94.00							
	90	95.00							
125	120	100.00	100.00	14.00	0.74	99.26	30.82	125.83	0.112
	15	110.00							
	30	114.00							
	60	120.00							
	90	124.00							
150	120	128.00	128.00	14.00	0.86	127.14	36.84	145.12	0.139
	15	140.00							
	30	146.00							
	60	155.00							
	90	158.00							
175	120	162.00	162.00	16.00	0.97	161.03	44.17	163.11	0.170
	15	175.00							
	30	183.00							
	60	191.00							
	90	197.00							
200	120	201.00	201.00	18.00	1.09	199.91	52.57	180.03	0.203
	15	215.00							
	30	237.00							
	60	238.00							
	90	246.00							
225	120	255.00	255.00	18.00	1.21	253.79	64.22	193.69	0.244
	15	267.00							
	30	275.00							
	60	286.00							
	90	296.00							
250	120	300.00	300.00	25.00	1.33	298.67	73.93	209.31	0.275

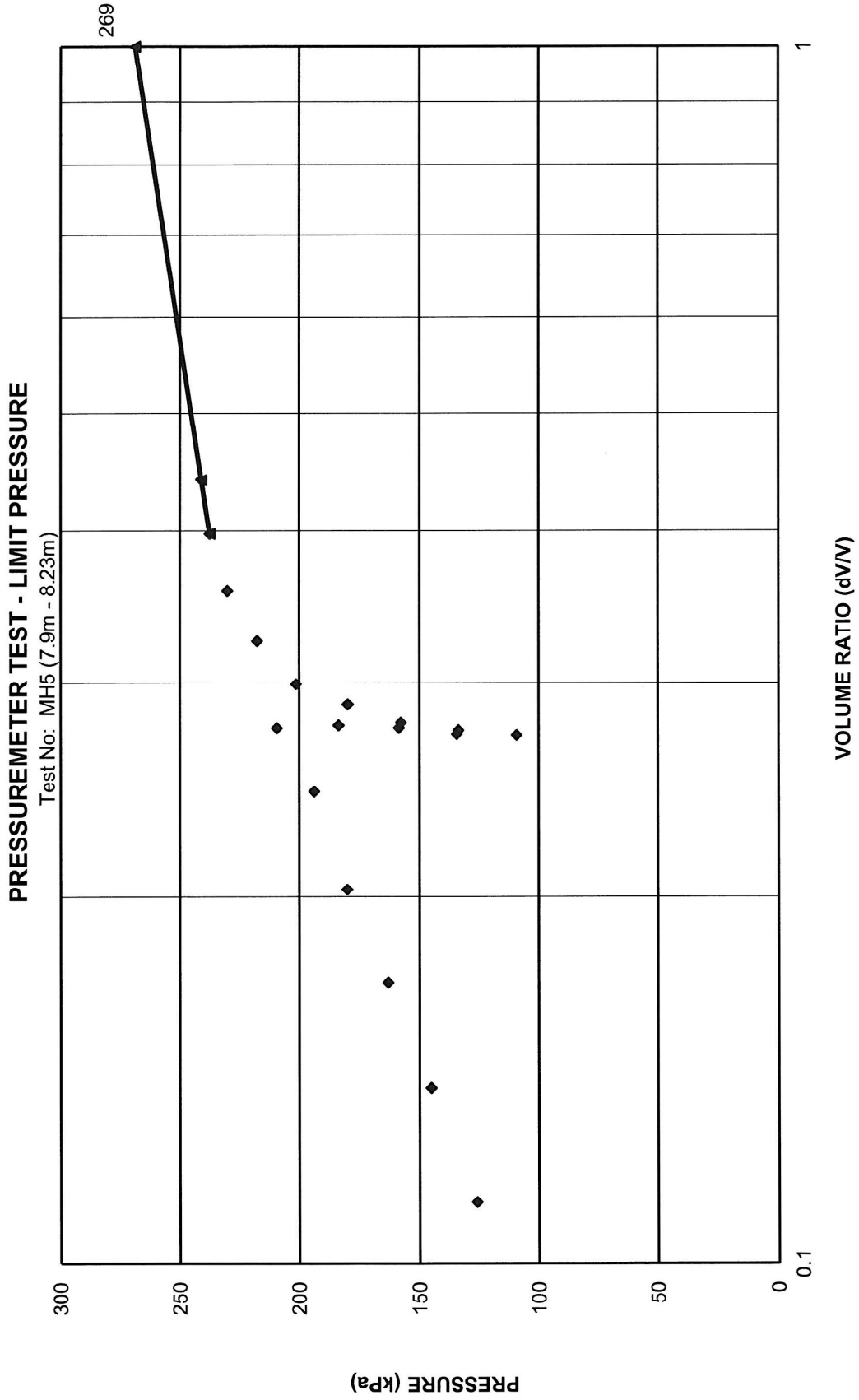


**JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
225	15	302.00							
	30	302.00							
	60	302.00							
	90	302.00							
	120	302.00	302.00	0.00	1.21	300.79	74.38	183.53	0.277
200	15	300.00							
	30	300.00							
	60	300.00							
	90	300.00							
	120	300.00	300.00	0.00	1.09	298.91	73.98	158.62	0.276
175	15	298.00							
	30	298.00							
	60	298.00							
	90	298.00							
	120	298.00	298.00	0.00	0.97	297.03	73.57	133.71	0.274
150	15	294.00							
	30	294.00							
	60	294.00							
	90	294.00							
	120	294.00	294.00	0.00	0.86	293.14	72.73	109.23	0.272
175	15	295.00							
	30	295.00							
	60	295.00							
	90	295.00							
	120	295.00	295.00	0.00	0.97	294.03	72.92	134.36	0.272
200	15	300.00							
	30	300.00							
	60	300.00							
	90	300.00							
	120	304.00	304.00	4.00	1.09	302.91	74.84	157.76	0.278
225	15	308.00							
	30	312.00							
	60	314.00							
	90	318.00							
	120	319.00	319.00	7.00	1.21	317.79	78.06	179.86	0.288
250	15	325.00							
	30	328.00							
	60	332.00							
	90	335.00							
	120	337.00	337.00	9.00	1.33	335.67	81.92	201.31	0.299
275	15	350.00							
	30	355.00							
	60	364.00							
	90	370.00							
	120	379.00	379.00	24.00	1.45	377.55	90.98	217.57	0.325
300	15	392.00							
	30	403.00							
	60	418.00							
	90	428.00							
	120	438.00	438.00	35.00	1.57	436.43	103.71	230.16	0.357

**JOB NO: 21 0223 05 DRILLHOLE: MH5 TEST DEPTH: 7.9m-8.23m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
	15	460.00							
	30	473.00							
	60	492.00							
	90	508.00							
325	120	521.00	521.00	48.00	1.69	519.31	121.63	237.56	0.398
	15	542.00							
	30	556.00							
	60	580.00							
	90	601.00							
350	120	622.00	622.00	66.00	1.81	620.19	143.43	241.07	0.441





PRESSUREMETER TEST

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Client	: CEDD	Project No.	: 21 0223 05
Contract No.	: GE/2021/03	Equipment Type	: G-AM
Contract Title	: Marine Ground Investigation and Geophysical Surveys	Drillhole No.	: MH5
Task Order No.	: GE/2021/03.23A		
Location	: Nim Wan		
Test Date	: 25-10-2023		
Test Time	: 9:30		
Weather	: Fine		
Operator	: HT/GC/CF		

DRILLHOLE INFORMATION

Test Depth	:	from	14.70 m	to	15.35 m
Drilling tool diameter	:		76 mm		
Drilling tool	:		Fugro Sampler		
Drilling fluid	:		Water		
Water level below barge platform	:		4.20 m		
Soil description	:		Very weak, yellowish brown (10YR/5/6), spotted grey and white, completely decomposed medium to coarse grained GRANITE. (Silty fine to coarse SAND with occasional angular to subangular fine to medium gravel)		

PRESSUREMETER SETTING

Gauge no.	:	F0009
Probe no.	:	PM5
Probe diameter	:	70 mm
Probe calibration date	:	06-10-2023
Gauge height	:	- m above barge platform
Pocket length	:	1.00 m
Type of protective sheath	:	Metallic
Type of inner membrane	:	Rubber
Initial volume (Vo)	:	786 cm <sup>3</sup>
Differential pressure	:	- kPa

Remarks :

- 1) All notations refer to 'Pressuremeter Testing - methods and interpretation' - Author : R J Mair & D M Wood.
- 2) The value of Poisson's ratio used for the computation of the modulus E is 0.33.
- 3) Test pocket was attempted to be formed at 14.70m to 15.70m but failed due to excessive hardness of the soil material (over 300 blows)

Checked by : 

Date : 03 NOV 2023

**PRESSUREMETER TEST**

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Client	: CEDD	Project No.	: 21 0223 05
Contract No.	: GE/2021/03	Equipment Type	: G-AM
Contract Title	: Marine Ground Investigation and Geophysical Surveys	Drillhole No.	: MH6
Task Order No.	: GE/2021/03.23A		
Location	: Nim Wan		
Test Date	: 30-10-2023		
Test Time	: 9:50		
Weather	: Fine		
Operator	: HA/HT		

**DRILLHOLE INFORMATION**

Test Depth	:	from	2.95 m	to	3.28 m
Drilling tool diameter	:		76 mm		
Drilling tool	:		Fugro Sampler		
Drilling fluid	:		Water		
Water level below barge platform	:		3.90 m		
Soil description	:		Very soft, grey (7.5YR/6/1) to greyish brown (10YR/5/2), silty CLAY with occasional shell fragments. (MARINE DEPOSIT)		

**PRESSUREMETER SETTING**

Gauge no.	:	F0009
Probe no.	:	PM5
Probe diameter	:	70 mm
Probe calibration date	:	06-10-2023
Gauge height	:	0.90 m above barge platform
Pocket length	:	1.00 m
Type of protective sheath	:	Metallic
Type of inner membrane	:	Rubber
Initial volume (Vo)	:	786 cm <sup>3</sup>
Differential pressure	:	60 kPa

**TEST RESULTS SUMMARY**

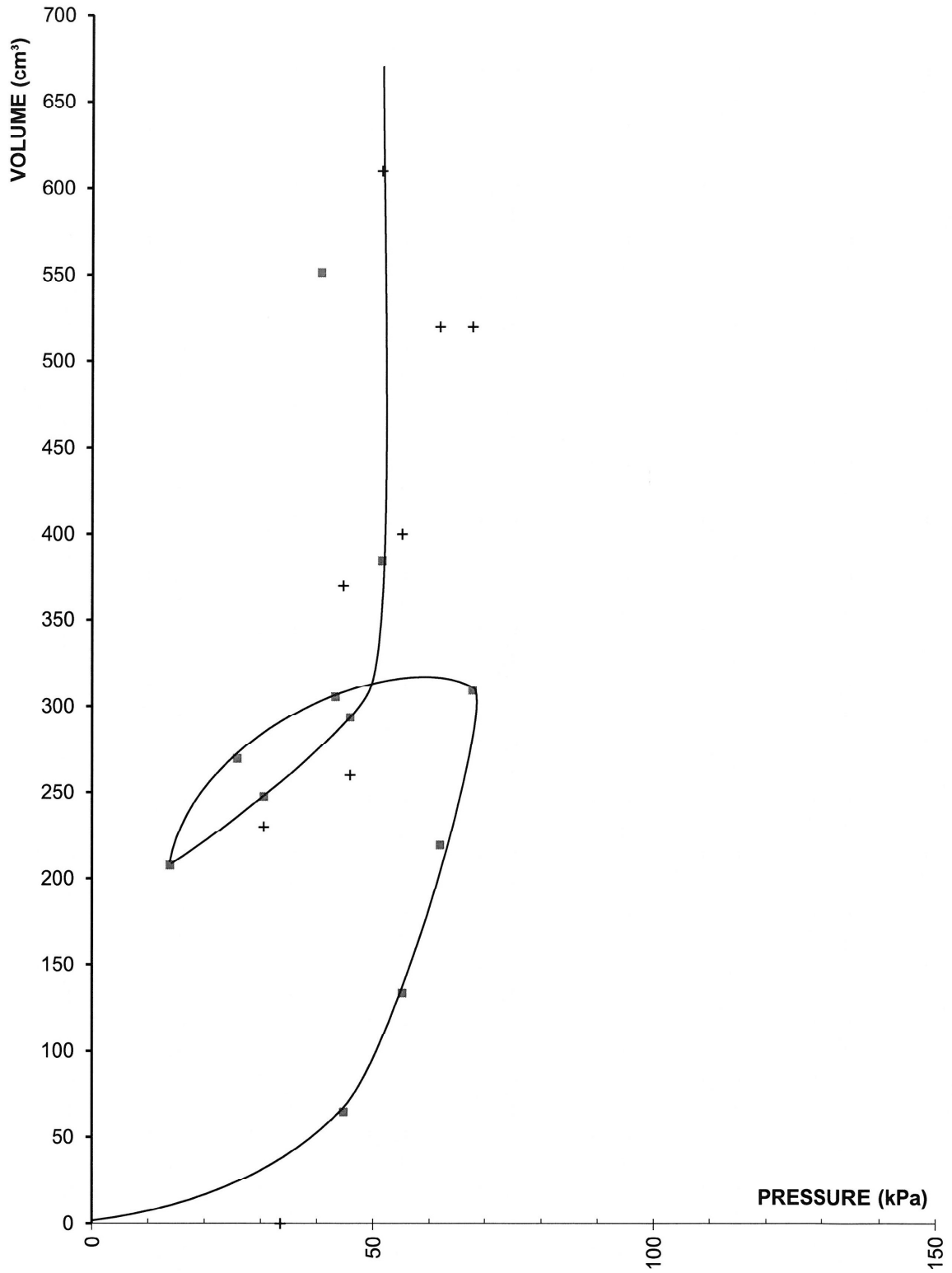
Limit pressure	:	0.09 MPa
Pressure range	:	
- initial	:	45 kPa to 62 kPa
- unload-reload (1)	:	14 kPa to 47 kPa
Shear modulus	:	
- initial Gi	:	0.09 MPa
- unload-reload (1) Gur	:	0.35 MPa
Deformation modulus	:	
- initial Ep	:	0.25 MPa
- unload-reload (1) E+	:	0.93 MPa

Remarks :

- 1) All notations refer to 'Pressuremeter Testing - methods and interpretation' - Author : R J Mair & D M Wood.
- 2) The value of Poisson's ratio used for the computation of the modulus E is 0.33.
- 3) The test stopped due to equipment limit (Volume > 600cc)

Checked by :  Date : 11/11/23

**VOLUME Vs PRESSURE PLOT (CORRECTED)**

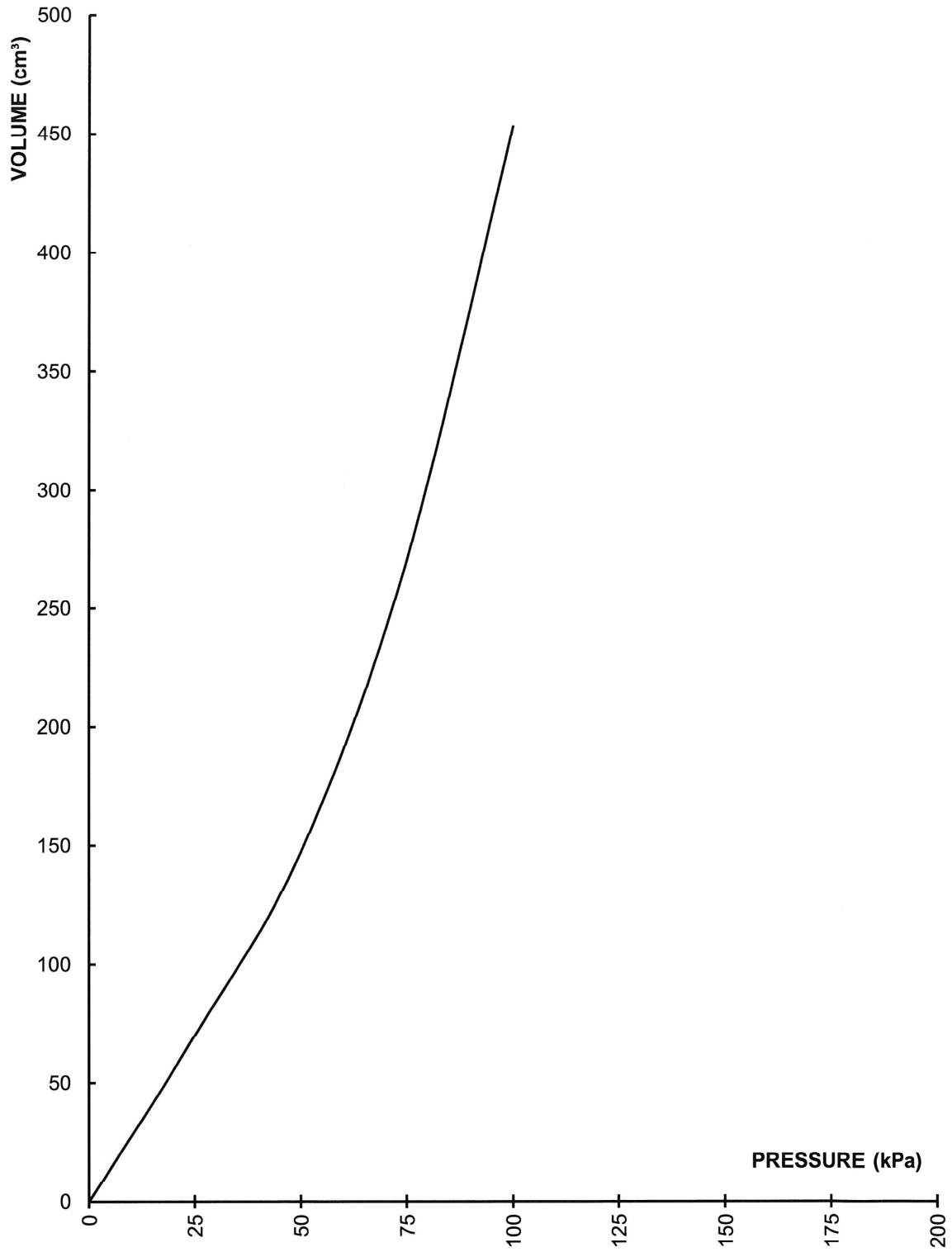


PROBE NO.: PM5  
 CALIBRATION DATE: 06-10-2023

■ CORRECTED VOLUME  
 + CREEP VOLUME x 10

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 2.95m-3.28m

**CALIBRATION CURVE**



PROBE NO.: PM5  
CALIBRATION DATE: 06-10-2023

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 2.95m-3.28m

**PROGRAM PRESS****PRESSUREMETER TEST****JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 2.95m-3.28m**

NPCAL	NUMBER OF PROBE CALIBRATION DATA	5
NP	NUMBER OF GAUGE PRESSURE AND VOLUME DATA	12
CSLOPE	SLOPE FROM CALIBRATION CURVE	0.0047 cm <sup>3</sup> /kPa
GFCOR	GAUGE CORRECTION FACTOR	1.01
GAUCOR	GAUGE CORRECTION	-4 kPa
GAUHT	GAUGE HEIGHT	0.90 m
GWL	WATER LEVEL MEASURED BELOW BARGE PLATFORM	3.90 m
HPCOR	HYDROSTATIC PRESSURE CORRECTION	47 kPa

**PROBE CALIBRATION DATA**

INIVOL	INITIAL VOLUMETER READING (AT ZERO APPLIED PRESSURE)	0.00 cm <sup>3</sup>
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No.	Pressure (kPa)	Volume (cm <sup>3</sup> )
1	0	0.00
2	25	70.00
3	50	147.00
4	75	270.00
5	100	453.00

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JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 2.95m-3.28m

FIELD DATA

GAUGE PRESSURE (kPa)	VOLUMETER READING (cm <sup>3</sup> )				
	15S	30S	60S	90S	120S
0	0.00	0.00	0.00	0.00	0.00
25	15.00	28.00	43.00	60.00	65.00
50	82.00	94.00	108.00	122.00	134.00
75	155.00	168.00	188.00	204.00	220.00
100	246.00	258.00	276.00	292.00	310.00
75	312.00	309.00	307.00	306.00	306.00
50	294.00	287.00	280.00	276.00	270.00
25	248.00	243.00	234.00	225.00	208.00
50	214.00	225.00	240.00	246.00	248.00
75	262.00	268.00	278.00	288.00	294.00
100	315.00	324.00	345.00	367.00	385.00
125	425.00	445.00	486.00	524.00	552.00
150	590.00	615.00	658.00		

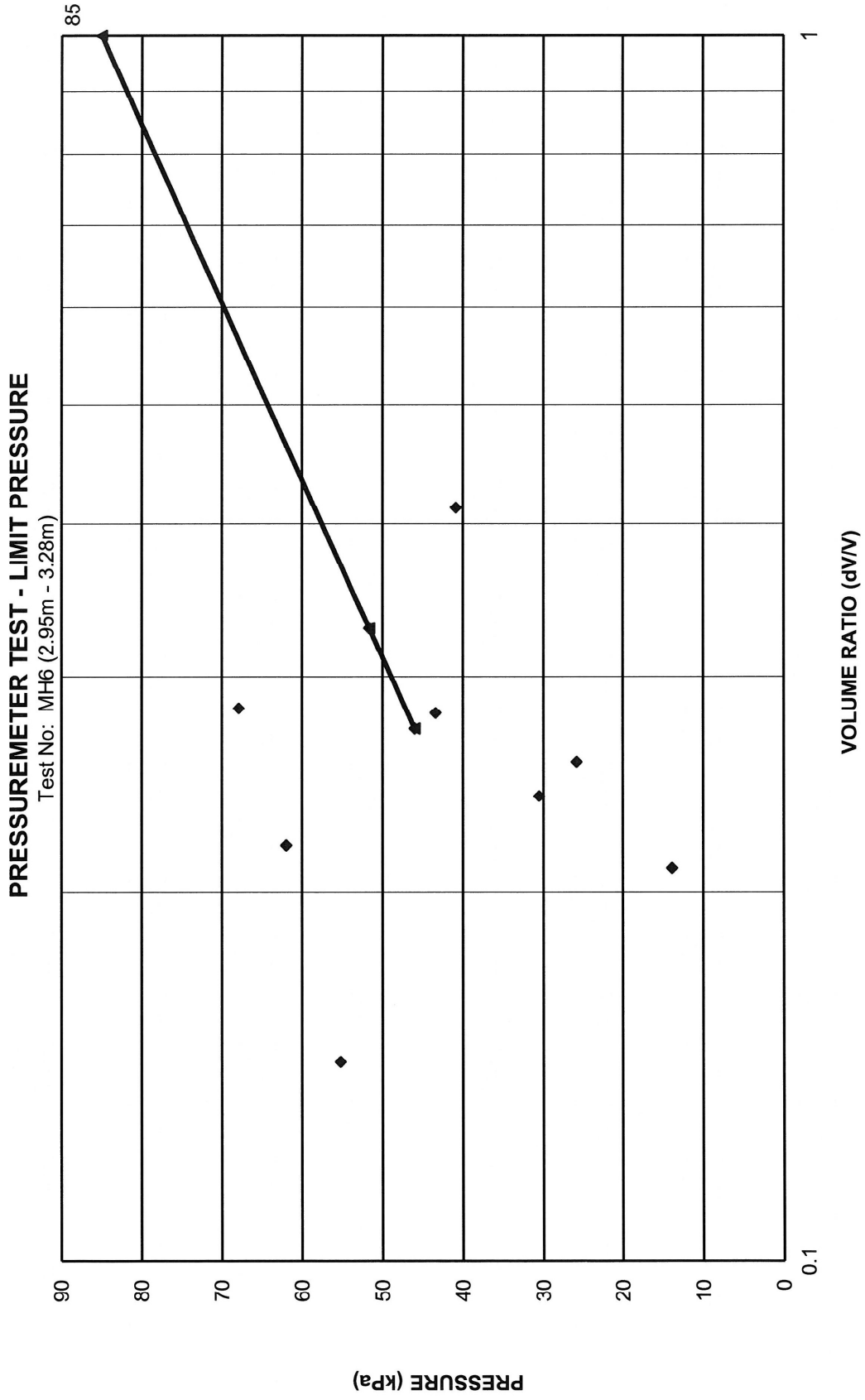


**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 2.95m-3.28m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
0	120	0.00	0.00	-	0.20	-0.20	9.31	33.50	0.000
	15	15.00							
	30	28.00							
	60	43.00							
	90	60.00							
25	120	65.00	65.00	37.00	0.32	64.68	23.34	44.79	0.076
	15	82.00							
	30	94.00							
	60	108.00							
	90	122.00							
50	120	134.00	134.00	40.00	0.44	133.56	38.23	55.22	0.145
	15	155.00							
	30	168.00							
	60	188.00							
	90	204.00							
75	120	220.00	220.00	52.00	0.56	219.44	56.80	61.97	0.218
	15	246.00							
	30	258.00							
	60	276.00							
	90	292.00							
100	120	310.00	310.00	52.00	0.68	309.32	76.23	67.85	0.283
	15	312.00							
	30	309.00							
	60	307.00							
	90	306.00							
75	120	306.00	306.00	-3.00	0.56	305.44	75.39	43.38	0.280
	15	294.00							
	30	287.00							
	60	280.00							
	90	276.00							
50	120	270.00	270.00	-17.00	0.44	269.56	67.63	25.82	0.256
	15	248.00							
	30	243.00							
	60	234.00							
	90	225.00							
25	120	208.00	208.00	-35.00	0.32	207.68	54.25	13.88	0.209
	15	214.00							
	30	225.00							
	60	240.00							
	90	246.00							
50	120	248.00	248.00	23.00	0.44	247.56	62.88	30.57	0.240
	15	262.00							
	30	268.00							
	60	278.00							
	90	288.00							
75	120	294.00	294.00	26.00	0.56	293.44	72.80	45.97	0.272
	15	315.00							
	30	324.00							
	60	345.00							
	90	367.00							
100	120	385.00	385.00	61.00	0.68	384.32	92.44	51.64	0.329

**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 2.95m-3.28m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
	15	425.00							
	30	445.00							
	60	486.00							
	90	524.00							
125	120	552.00	552.00	107.00	0.80	551.20	128.52	40.88	0.412



PRESSUREMETER TEST

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Client	: CEDD	Project No.	: 21 0223 05
Contract No.	: GE/2021/03	Equipment Type	: G-AM
Contract Title	: Marine Ground Investigation and Geophysical Surveys	Drillhole No.	: MH6
Task Order No.	: GE/2021/03.23A		
Location	: Nim Wan		
Test Date	: 31-10-2023		
Test Time	: 11:25		
Weather	: Fine		
Operator	: HA/HT		

DRILLHOLE INFORMATION

Test Depth	:	from	5.90 m	to	6.23 m
Drilling tool diameter	:		76 mm		
Drilling tool	:		Fugro Sampler		
Drilling fluid	:		Water		
Water level below barge platform	:		3.70 m		
Soil description	:		Stiff, red (10R/5/8), mottled light grey and yellowish brown, silty CLAY. (ALLUVIUM)		

PRESSUREMETER SETTING

Gauge no.	:	F0009
Probe no.	:	PM5
Probe diameter	:	70 mm
Probe calibration date	:	06-10-2023
Gauge height	:	0.90 m above barge platform
Pocket length	:	1.00 m
Type of protective sheath	:	Metallic
Type of inner membrane	:	Rubber
Initial volume (Vo)	:	786 cm <sup>3</sup>
Differential pressure	:	50 kPa

TEST RESULTS SUMMARY

Limit pressure	:	0.66 MPa		
Pressure range	:			
- initial	:	240 kPa	to	432 kPa
- unload-reload (1)	:	273 kPa	to	420 kPa
Shear modulus	:			
- initial Gi	:	1.03 MPa		
- unload-reload (1) Gur	:	7.16 MPa		
Deformation modulus	:			
- initial Ep	:	2.74 MPa		
- unload-reload (1) E+	:	19.05 MPa		

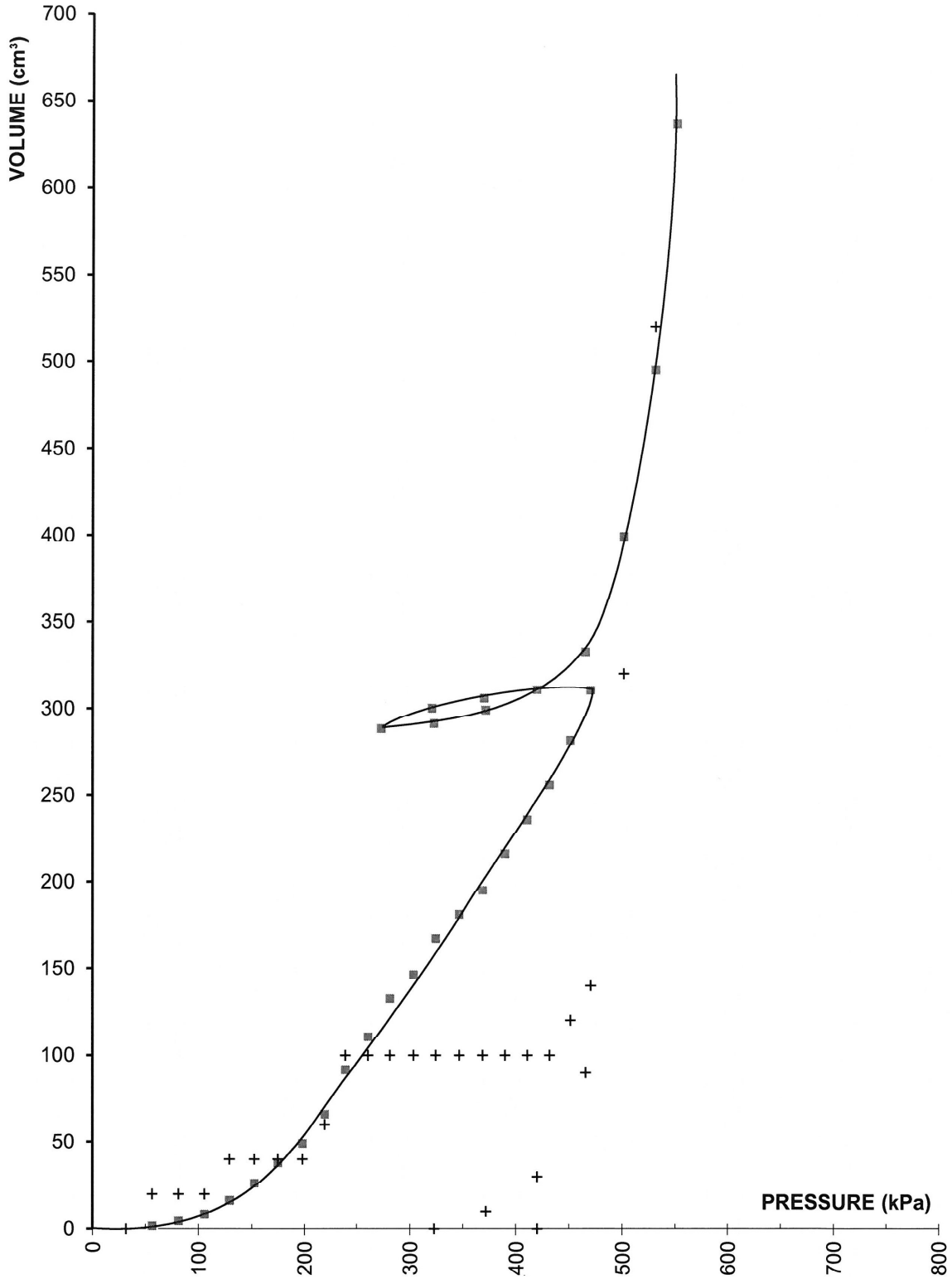
Remarks :

- 1) All notations refer to 'Pressuremeter Testing - methods and interpretation' - Author : R J Mair & D M Wood.
- 2) The value of Poisson's ratio used for the computation of the modulus E is 0.33.
- 3) The test stopped due to equipment limit (Volume > 600cc)

Checked by :  Date : 11/11/23



**VOLUME Vs PRESSURE PLOT (CORRECTED)**

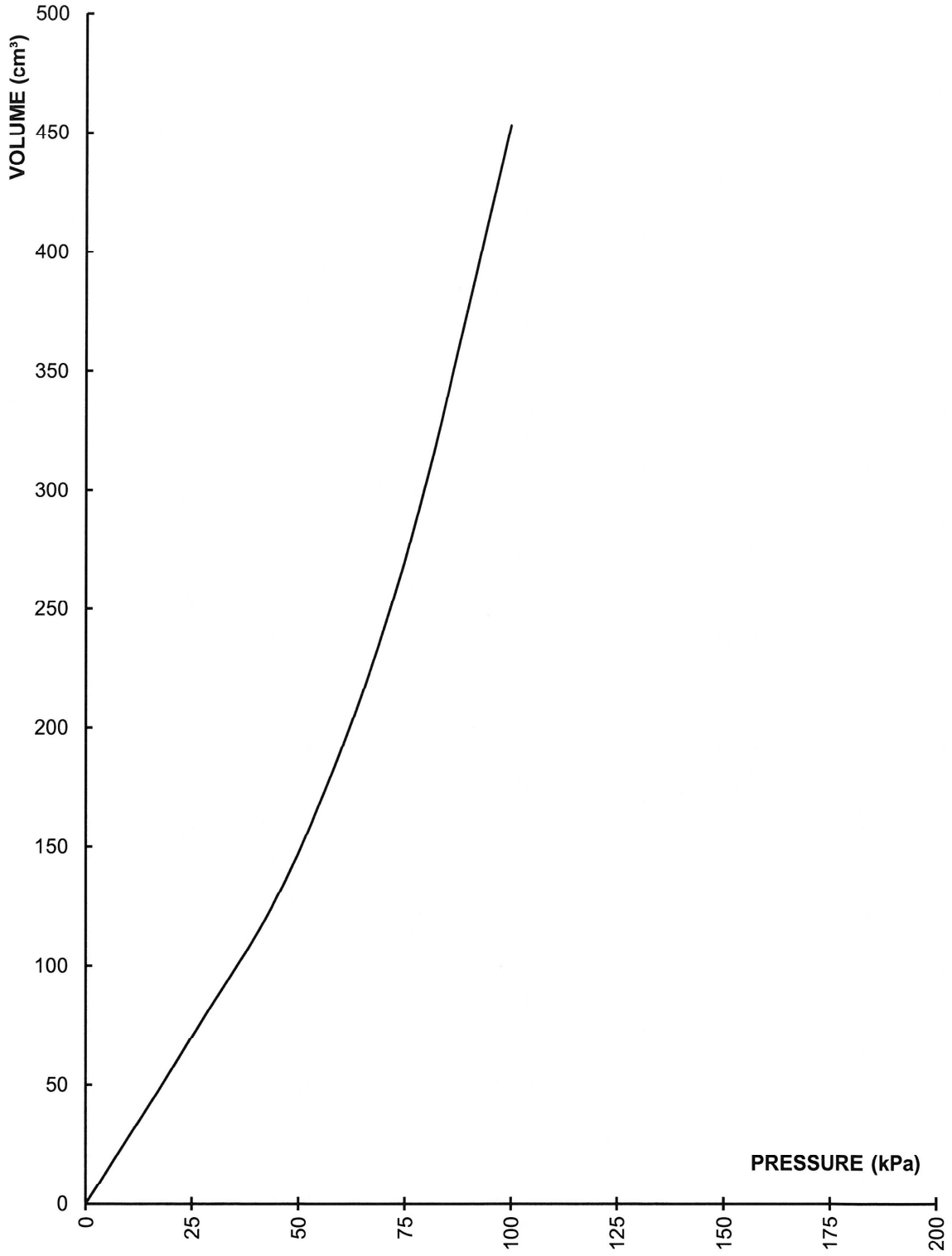


PROBE NO.: PM5  
 CALIBRATION DATE: 06-10-2023

■ CORRECTED VOLUME  
 + CREEP VOLUME x 10

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m

**CALIBRATION CURVE**



PROBE NO.: PM5  
CALIBRATION DATE: 06-10-2023

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m

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**PROGRAM PRESS****PRESSUREMETER TEST**

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m

NPCAL	NUMBER OF PROBE CALIBRATION DATA	5
NP	NUMBER OF GAUGE PRESSURE AND VOLUME DATA	32
CSLOPE	SLOPE FROM CALIBRATION CURVE	0.0047 cm <sup>3</sup> /kPa
GFCOR	GAUGE CORRECTION FACTOR	1.01
GAUCOR	GAUGE CORRECTION	-4 kPa
GAUHT	GAUGE HEIGHT	0.90 m
GWL	WATER LEVEL MEASURED BELOW BARGE PLATFORM	3.70 m
HPCOR	HYDROSTATIC PRESSURE CORRECTION	45 kPa

**PROBE CALIBRATION DATA**

INIVOL	INITIAL VOLUMETER READING (AT ZERO APPLIED PRESSURE)	0.00 cm <sup>3</sup>
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No.	Pressure (kPa)	Volume (cm <sup>3</sup> )
1	0	0.00
2	25	70.00
3	50	147.00
4	75	270.00
5	100	453.00

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m

FIELD DATA

GAUGE PRESSURE (kPa) -----	VOLUMETER READING (cm <sup>3</sup> )				
	15S -----	30S ----	60S ----	90S ----	120S ----
0	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	2.00	2.00	2.00
50	2.00	3.00	3.00	4.00	5.00
75	6.00	7.00	7.00	8.00	9.00
100	11.00	13.00	15.00	16.00	17.00
125	21.00	23.00	25.00	26.00	27.00
150	32.00	35.00	36.00	38.00	39.00
175	43.00	46.00	48.00	49.00	50.00
200	56.00	61.00	63.00	65.00	67.00
225	76.00	83.00	89.00	91.00	93.00
250	99.00	102.00	104.00	106.00	112.00
275	118.00	124.00	127.00	129.00	134.00
300	136.00	138.00	140.00	141.00	148.00
325	156.00	159.00	160.00	162.00	169.00
350	171.00	173.00	179.00	181.00	183.00
375	185.00	187.00	192.00	195.00	197.00
400	204.00	208.00	212.00	216.00	218.00
425	223.00	228.00	234.00	236.00	238.00
450	245.00	248.00	252.00	256.00	258.00
475	267.00	272.00	277.00	281.00	284.00
500	291.00	299.00	305.00	308.00	313.00
450	313.00	313.00	313.00	313.00	313.00
400	310.00	310.00	308.00	308.00	308.00
350	304.00	304.00	302.00	302.00	302.00
300	294.00	294.00	290.00	290.00	290.00
350	293.00	293.00	293.00	293.00	293.00
400	298.00	300.00	301.00	301.00	301.00
450	310.00	310.00	311.00	313.00	313.00
500	324.00	326.00	331.00	333.00	335.00
550	360.00	370.00	386.00	394.00	402.00

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m

**FIELD DATA**

GAUGE PRESSURE (kPa) -----	VOLUMETER READING (cm <sup>3</sup> )				
	15S -----	30S ----	60S ----	90S ----	120S ----
600	432.00	446.00	467.00	485.00	498.00
650	535.00	560.00	593.00	620.00	640.00



**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
0	120	0.00	0.00	-	0.19	-0.19	9.32	31.54	0.000
	15	0.00							
	30	0.00							
	60	2.00							
	90	2.00							
25	120	2.00	2.00	2.00	0.31	1.69	9.72	56.45	0.002
	15	2.00							
	30	3.00							
	60	3.00							
	90	4.00							
50	120	5.00	5.00	2.00	0.43	4.57	10.34	81.14	0.006
	15	6.00							
	30	7.00							
	60	7.00							
	90	8.00							
75	120	9.00	9.00	2.00	0.55	8.45	11.18	105.62	0.011
	15	11.00							
	30	13.00							
	60	15.00							
	90	16.00							
100	120	17.00	17.00	4.00	0.67	16.33	12.89	129.23	0.021
	15	21.00							
	30	23.00							
	60	25.00							
	90	26.00							
125	120	27.00	27.00	4.00	0.79	26.21	15.02	152.41	0.033
	15	32.00							
	30	35.00							
	60	36.00							
	90	38.00							
150	120	39.00	39.00	4.00	0.91	38.09	17.59	175.16	0.046
	15	43.00							
	30	46.00							
	60	48.00							
	90	49.00							
175	120	50.00	50.00	4.00	1.02	48.98	19.94	198.13	0.059
	15	56.00							
	30	61.00							
	60	63.00							
	90	65.00							
200	120	67.00	67.00	6.00	1.14	65.86	23.59	219.80	0.078
	15	76.00							
	30	83.00							
	60	89.00							
	90	91.00							
225	120	93.00	93.00	10.00	1.26	91.74	29.19	239.52	0.105
	15	99.00							
	30	102.00							
	60	104.00							
	90	106.00							
250	120	112.00	112.00	10.00	1.38	110.62	33.27	260.75	0.124

**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
275	15	118.00							
	30	124.00							
	60	127.00							
	90	129.00							
	120	134.00	134.00	10.00	1.50	132.50	38.00	281.34	0.144
300	15	136.00							
	30	138.00							
	60	140.00							
	90	141.00							
	120	148.00	148.00	10.00	1.62	146.38	41.00	303.66	0.157
325	15	156.00							
	30	159.00							
	60	160.00							
	90	162.00							
	120	169.00	169.00	10.00	1.74	167.26	45.52	324.46	0.176
350	15	171.00							
	30	173.00							
	60	179.00							
	90	181.00							
	120	183.00	183.00	10.00	1.86	181.14	48.52	346.78	0.187
375	15	185.00							
	30	187.00							
	60	192.00							
	90	195.00							
	120	197.00	197.00	10.00	1.98	195.02	51.52	369.09	0.199
400	15	204.00							
	30	208.00							
	60	212.00							
	90	216.00							
	120	218.00	218.00	10.00	2.10	215.90	56.03	389.90	0.216
425	15	223.00							
	30	228.00							
	60	234.00							
	90	236.00							
	120	238.00	238.00	10.00	2.21	235.79	60.33	410.92	0.231
450	15	245.00							
	30	248.00							
	60	252.00							
	90	256.00							
	120	258.00	258.00	10.00	2.33	255.67	64.63	431.94	0.246
475	15	267.00							
	30	272.00							
	60	277.00							
	90	281.00							
	120	284.00	284.00	12.00	2.45	281.55	70.22	451.66	0.264
500	15	291.00							
	30	299.00							
	60	305.00							
	90	308.00							
	120	313.00	313.00	14.00	2.57	310.43	76.47	470.73	0.283

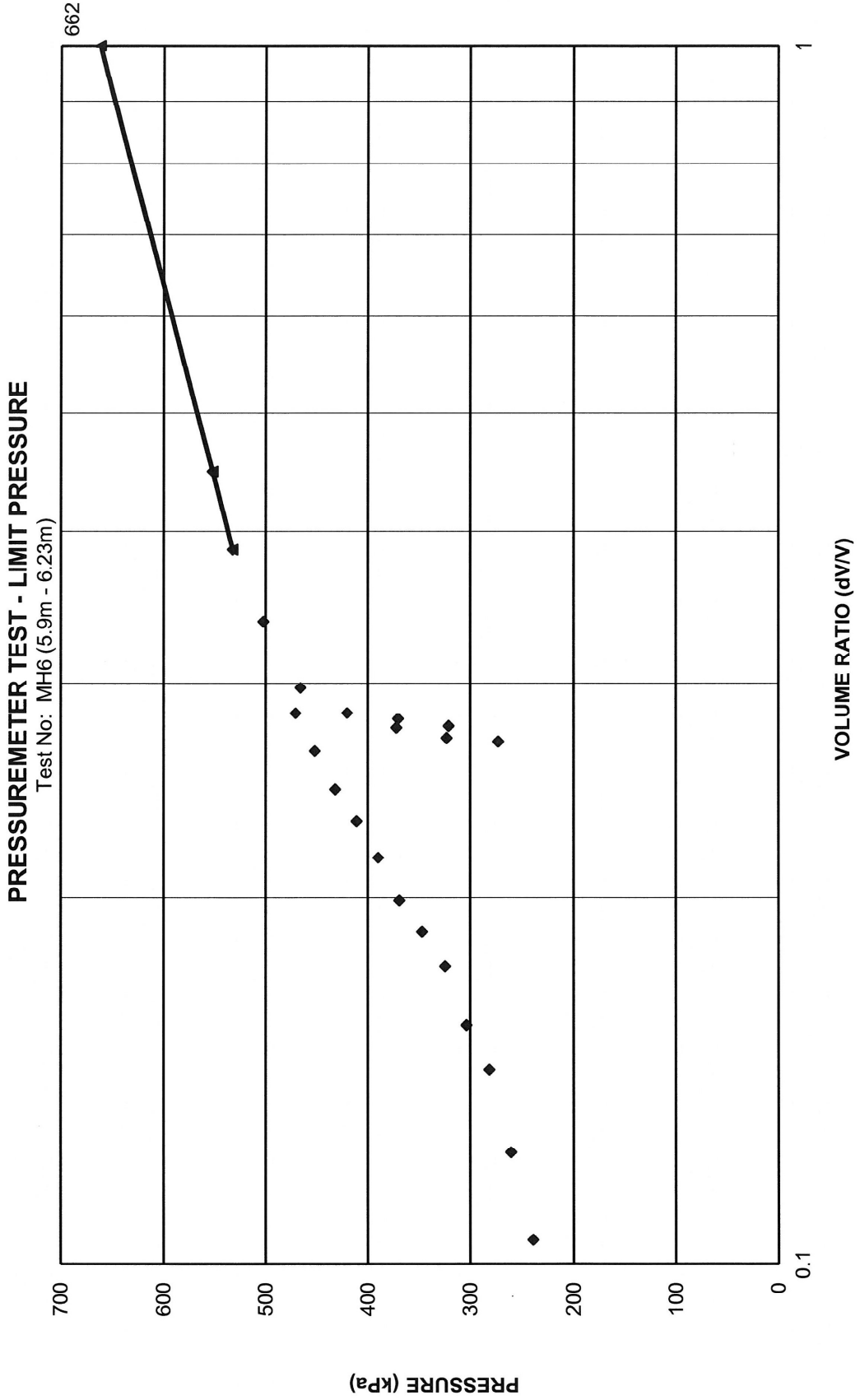


**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
450	15	313.00							
	30	313.00							
	60	313.00							
	90	313.00							
	120	313.00	313.00	0.00	2.33	310.67	76.52	420.05	0.283
400	15	310.00							
	30	310.00							
	60	308.00							
	90	308.00							
	120	308.00	308.00	-2.00	2.10	305.90	75.49	370.44	0.280
350	15	304.00							
	30	304.00							
	60	302.00							
	90	302.00							
	120	302.00	302.00	-2.00	1.86	300.14	74.24	321.05	0.277
300	15	294.00							
	30	294.00							
	60	290.00							
	90	290.00							
	120	290.00	290.00	-4.00	1.62	288.38	71.70	272.96	0.269
350	15	293.00							
	30	293.00							
	60	293.00							
	90	293.00							
	120	293.00	293.00	0.00	1.86	291.14	72.30	323.00	0.270
400	15	298.00							
	30	300.00							
	60	301.00							
	90	301.00							
	120	301.00	301.00	1.00	2.10	298.90	73.98	371.95	0.276
450	15	310.00							
	30	310.00							
	60	311.00							
	90	313.00							
	120	313.00	313.00	3.00	2.33	310.67	76.52	420.05	0.283
500	15	324.00							
	30	326.00							
	60	331.00							
	90	333.00							
	120	335.00	335.00	9.00	2.57	332.43	81.22	465.98	0.297
550	15	360.00							
	30	370.00							
	60	386.00							
	90	394.00							
	120	402.00	402.00	32.00	2.81	399.19	95.66	502.18	0.337
600	15	432.00							
	30	446.00							
	60	467.00							
	90	485.00							
	120	498.00	498.00	52.00	3.05	494.95	116.36	532.11	0.387

**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 5.9m-6.23m**

PRESSURE	TIME	VOLUME	VOLUME	CREEP	VOLUME	CORRECTED	ATM. PRESS	CORRECTED	CORRECTED
(kPa)	(S)	(cm <sup>3</sup> )	120 S	VOLUME	CORRECTION	VOLUME	CORRECTION	PRESSURE	VOLUME
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	15	535.00							
	30	560.00							
	60	593.00							
	90	620.00							
650	120	640.00	640.00	80.00	3.29	636.71	147.01	552.10	0.448





**PRESSUREMETER TEST**

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Client	: CEDD	Project No.	: 21 0223 05
Contract No.	: GE/2021/03	Equipment Type	: G-AM
Contract Title	: Marine Ground Investigation and Geophysical Surveys	Drillhole No.	: MH6
Task Order No.	: GE/2021/03.23A		
Location	: Nim Wan		
Test Date	: 01-11-2023		
Test Time	: 10:30		
Weather	: Fine		
Operator	: HA/HT		

**DRILLHOLE INFORMATION**

Test Depth	:	from	12.50 m	to	12.83 m
Drilling tool diameter	:		76 mm		
Drilling tool	:		Fugro Sampler		
Drilling fluid	:		Water		
Water level below barge platform	:		2.90 m		
Soil description	:		Very stiff, light grey (10R/7/1), silty CLAY with occasional angular to subangular fine gravel of quartz. (ALLUVIUM)		

**PRESSUREMETER SETTING**

Gauge no.	:	F0009
Probe no.	:	PM5
Probe diameter	:	70 mm
Probe calibration date	:	06-10-2023
Gauge height	:	0.90 m above barge platform
Pocket length	:	1.00 m
Type of protective sheath	:	Metallic
Type of inner membrane	:	Rubber
Initial volume (Vo)	:	786 cm <sup>3</sup>
Differential pressure	:	70 kPa

**TEST RESULTS SUMMARY**

Limit pressure	:	0.50 MPa
Pressure range	:	
- initial	:	222 kPa to 319 kPa
- unload-reload (1)	:	211 kPa to 260 kPa
Shear modulus	:	
- initial Gi	:	0.66 MPa
- unload-reload (1) Gur	:	6.07 MPa
Deformation modulus	:	
- initial Ep	:	1.77 MPa
- unload-reload (1) E+	:	16.16 MPa

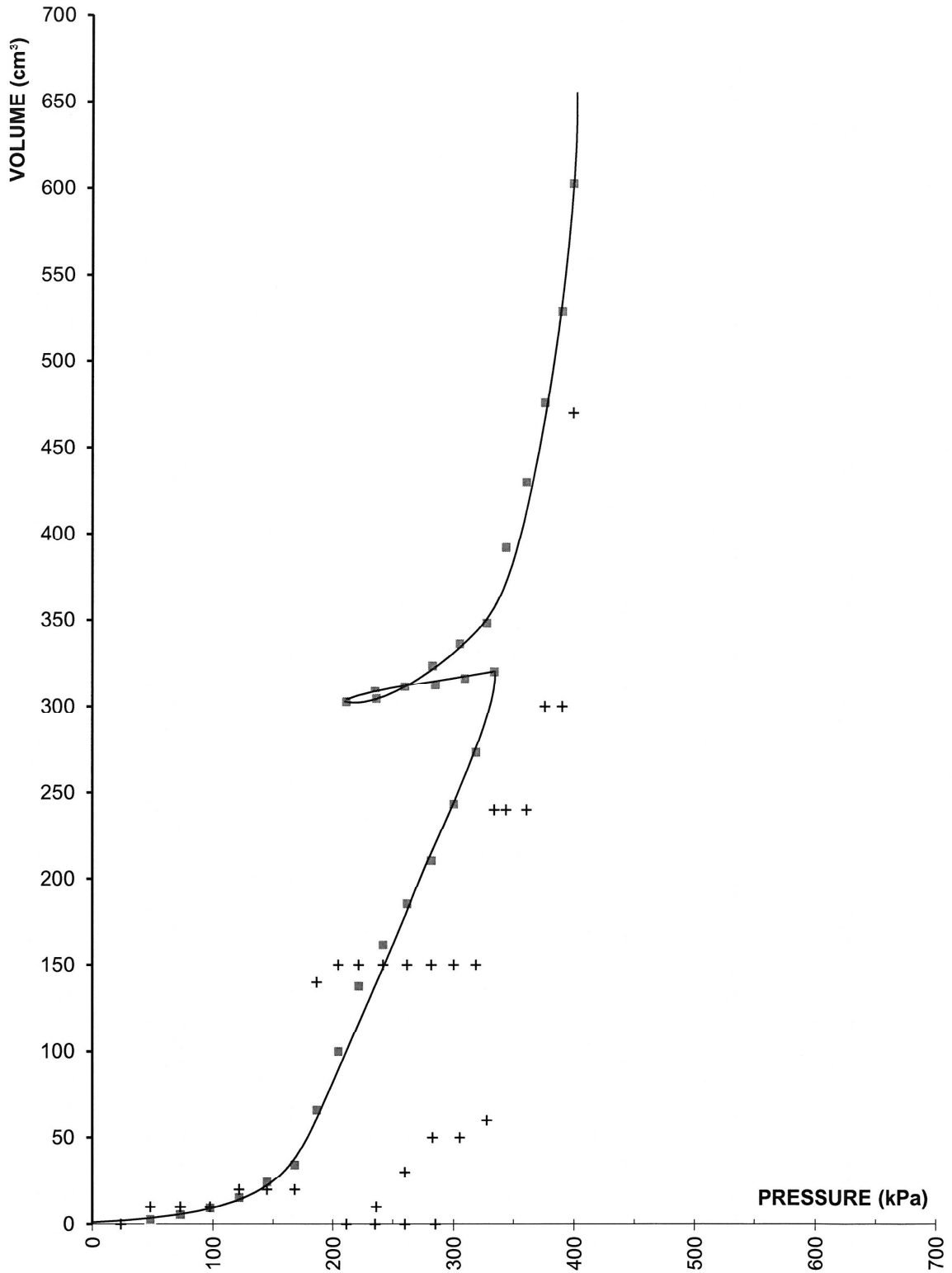
Remarks :

- 1) All notations refer to 'Pressuremeter Testing - methods and interpretation'  
- Author : R J Mair & D M Wood.
- 2) The value of Poisson's ratio used for the computation of the modulus E is 0.33.
- 3) The test stopped due to equipment limit (Volume > 600cc)

Checked by : 

Date : 11/11/23.

**VOLUME Vs PRESSURE PLOT (CORRECTED)**

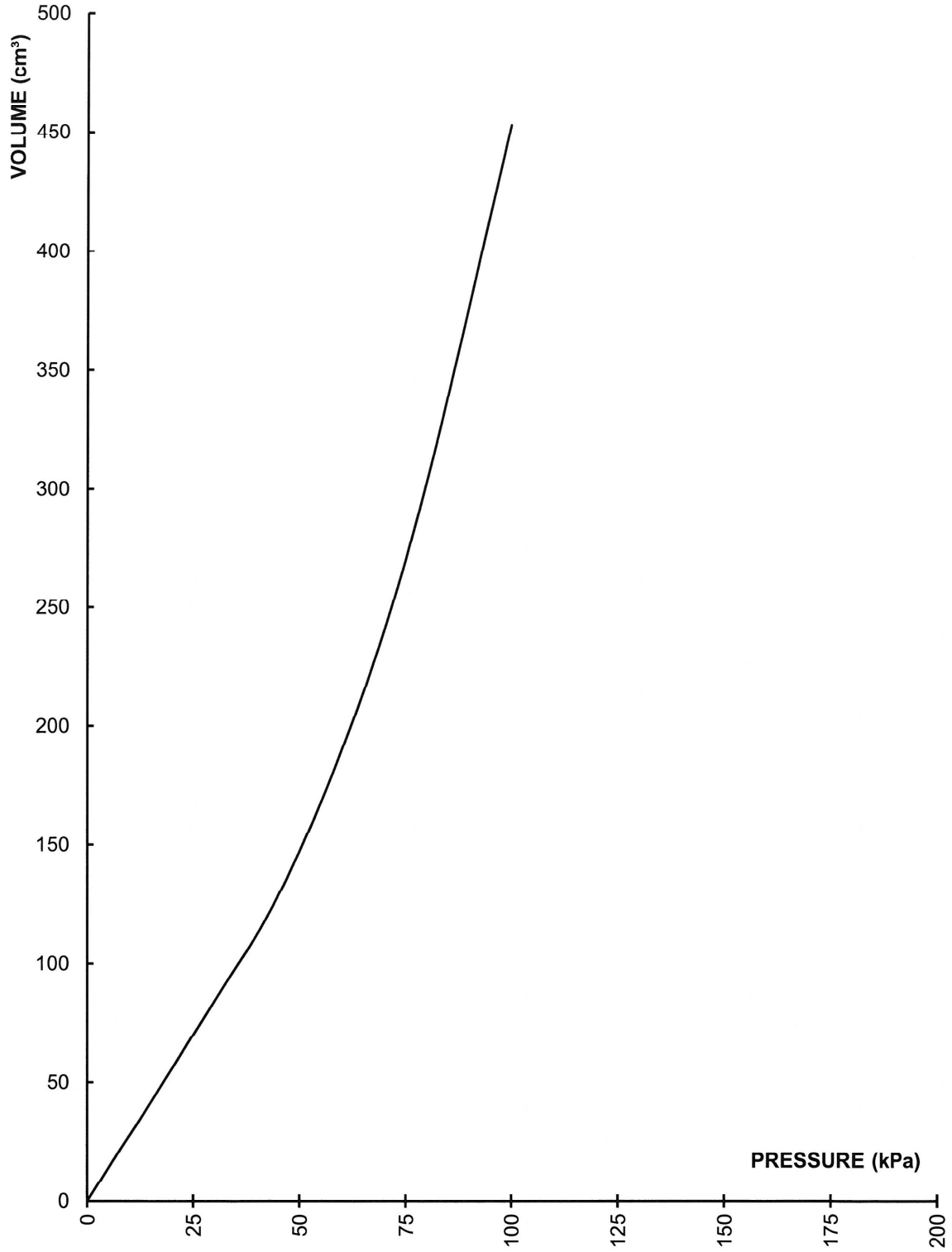


PROBE NO.: PM5  
 CALIBRATION DATE: 06-10-2023

■ CORRECTED VOLUME  
 + CREEP VOLUME x 10

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m

**CALIBRATION CURVE**



PROBE NO.: PM5  
CALIBRATION DATE: 06-10-2023

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m

**PROGRAM PRESS****PRESSUREMETER TEST**

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m

NPCAL	NUMBER OF PROBE CALIBRATION DATA	5
NP	NUMBER OF GAUGE PRESSURE AND VOLUME DATA	31
CSLOPE	SLOPE FROM CALIBRATION CURVE	0.0047 cm <sup>3</sup> /kPa
GFCOR	GAUGE CORRECTION FACTOR	1.01
GAUCOR	GAUGE CORRECTION	-4 kPa
GAUHT	GAUGE HEIGHT	0.90 m
GWL	WATER LEVEL MEASURED BELOW BARGE PLATFORM	2.90 m
HPCOR	HYDROSTATIC PRESSURE CORRECTION	37 kPa

**PROBE CALIBRATION DATA**

INIVOL	INITIAL VOLUMETER READING (AT ZERO APPLIED PRESSURE)	0.00 cm <sup>3</sup>
--------	---	----------------------

No.	Pressure (kPa)	Volume (cm <sup>3</sup> )
1	0	0.00
2	25	70.00
3	50	147.00
4	75	270.00
5	100	453.00

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m

**FIELD DATA**

GAUGE PRESSURE (kPa) -----	VOLUMETER READING (cm <sup>3</sup> )				
	15S -----	30S ----	60S ----	90S ----	120S ----
0	0.00	0.00	0.00	0.00	0.00
25	1.00	2.00	2.00	2.00	3.00
50	4.00	5.00	5.00	5.00	6.00
75	8.00	9.00	9.00	9.00	10.00
100	12.00	14.00	15.00	16.00	16.00
125	21.00	23.00	23.00	24.00	25.00
150	31.00	33.00	35.00	35.00	35.00
175	46.00	53.00	61.00	64.00	67.00
200	81.00	86.00	94.00	98.00	101.00
225	116.00	124.00	128.00	134.00	139.00
250	146.00	148.00	154.00	157.00	163.00
275	168.00	172.00	179.00	183.00	187.00
300	194.00	197.00	206.00	210.00	212.00
325	224.00	230.00	237.00	243.00	245.00
350	256.00	260.00	265.00	272.00	275.00
375	291.00	298.00	310.00	318.00	322.00
350	322.00	322.00	320.00	318.00	318.00
325	315.00	314.00	314.00	314.00	314.00
300	313.00	313.00	313.00	313.00	313.00
275	310.00	310.00	310.00	310.00	310.00
250	304.00	304.00	304.00	304.00	304.00
275	305.00	305.00	305.00	305.00	306.00
300	310.00	310.00	313.00	313.00	313.00
325	320.00	320.00	322.00	324.00	325.00
350	333.00	333.00	334.00	336.00	338.00
375	342.00	344.00	347.00	348.00	350.00
400	365.00	370.00	380.00	387.00	394.00
425	403.00	408.00	414.00	423.00	432.00
450	442.00	448.00	462.00	470.00	478.00
475	492.00	501.00	513.00	524.00	531.00

JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m

**FIELD DATA**

GAUGE PRESSURE (kPa) -----	VOLUMETER READING (cm <sup>3</sup> )				
	15S -----	30S ----	60S ----	90S ----	120S ----
500	550.00	558.00	576.00	592.00	605.00
525	640.00				



**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m**

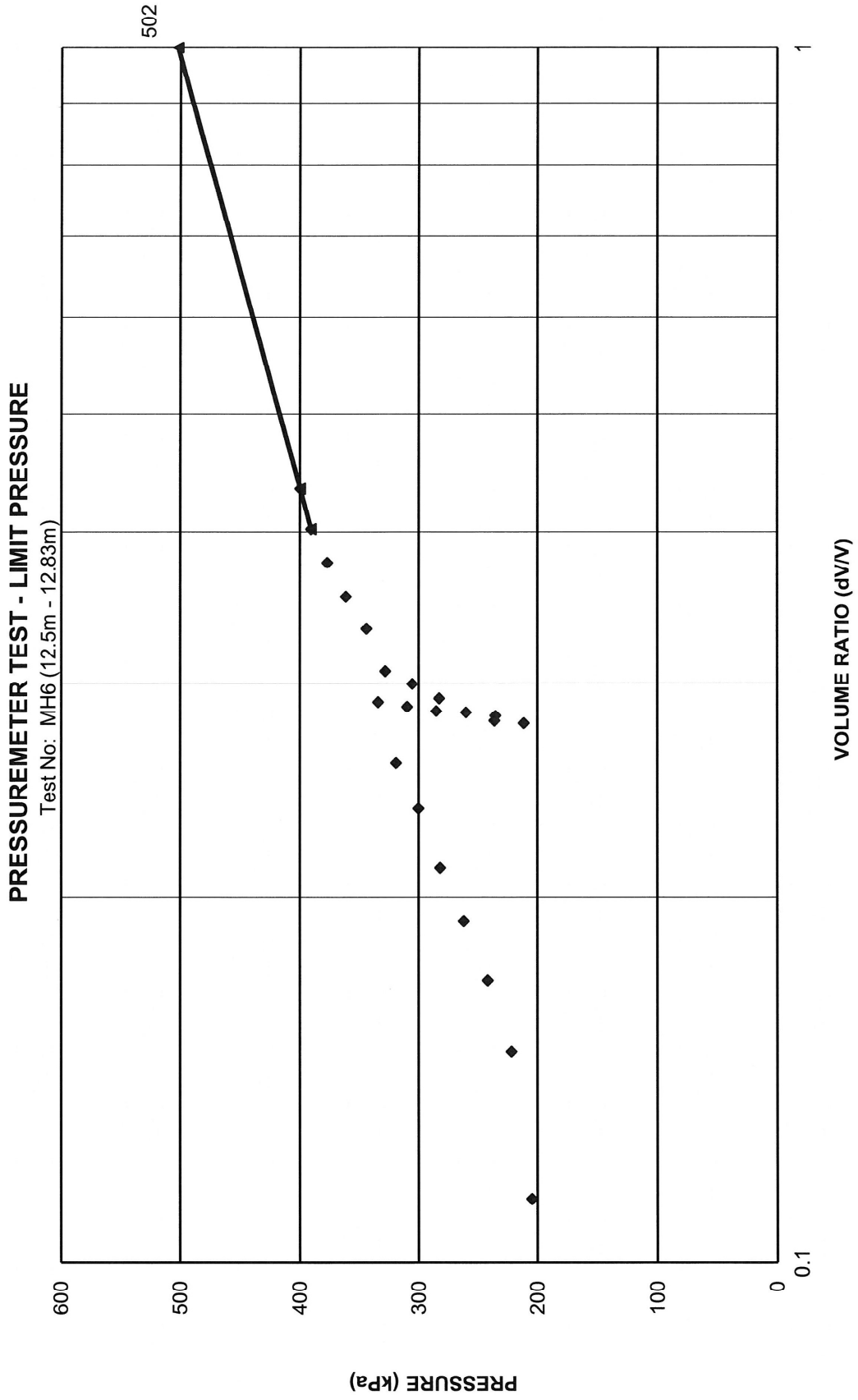
PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
0	120	0.00	0.00	-	0.16	-0.16	9.32	23.68	0.000
	15	1.00							
	30	2.00							
	60	2.00							
	90	2.00							
25	120	3.00	3.00	1.00	0.27	2.73	9.95	48.37	0.004
	15	4.00							
	30	5.00							
	60	5.00							
	90	5.00							
50	120	6.00	6.00	1.00	0.39	5.61	10.57	73.07	0.007
	15	8.00							
	30	9.00							
	60	9.00							
	90	9.00							
75	120	10.00	10.00	1.00	0.51	9.49	11.41	97.55	0.012
	15	12.00							
	30	14.00							
	60	15.00							
	90	16.00							
100	120	16.00	16.00	2.00	0.63	15.37	12.68	121.59	0.019
	15	21.00							
	30	23.00							
	60	23.00							
	90	24.00							
125	120	25.00	25.00	2.00	0.75	24.25	14.60	144.99	0.030
	15	31.00							
	30	33.00							
	60	35.00							
	90	35.00							
150	120	35.00	35.00	2.00	0.87	34.13	16.74	168.17	0.042
	15	46.00							
	30	53.00							
	60	61.00							
	90	64.00							
175	120	67.00	67.00	14.00	0.99	66.01	23.63	186.60	0.078
	15	81.00							
	30	86.00							
	60	94.00							
	90	98.00							
200	120	101.00	101.00	15.00	1.11	99.89	30.95	204.59	0.113
	15	116.00							
	30	124.00							
	60	128.00							
	90	134.00							
225	120	139.00	139.00	15.00	1.23	137.77	39.14	221.72	0.149
	15	146.00							
	30	148.00							
	60	154.00							
	90	157.00							
250	120	163.00	163.00	15.00	1.35	161.65	44.30	241.87	0.171

**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
275	15	168.00							
	30	172.00							
	60	179.00							
	90	183.00							
	120	187.00	187.00	15.00	1.46	185.54	49.47	262.03	0.191
300	15	194.00							
	30	197.00							
	60	206.00							
	90	210.00							
	120	212.00	212.00	15.00	1.58	210.42	54.85	281.97	0.211
325	15	224.00							
	30	230.00							
	60	237.00							
	90	243.00							
	120	245.00	245.00	15.00	1.70	243.30	61.95	300.18	0.237
350	15	256.00							
	30	260.00							
	60	265.00							
	90	272.00							
	120	275.00	275.00	15.00	1.82	273.18	68.41	319.03	0.258
375	15	291.00							
	30	298.00							
	60	310.00							
	90	318.00							
	120	322.00	322.00	24.00	1.94	320.06	78.55	334.22	0.290
350	15	322.00							
	30	322.00							
	60	320.00							
	90	318.00							
	120	318.00	318.00	-4.00	1.82	316.18	77.71	309.74	0.287
325	15	315.00							
	30	314.00							
	60	314.00							
	90	314.00							
	120	314.00	314.00	0.00	1.70	312.30	76.87	285.26	0.284
300	15	313.00							
	30	313.00							
	60	313.00							
	90	313.00							
	120	313.00	313.00	0.00	1.58	311.42	76.68	260.13	0.284
275	15	310.00							
	30	310.00							
	60	310.00							
	90	310.00							
	120	310.00	310.00	0.00	1.46	308.54	76.06	235.44	0.282
250	15	304.00							
	30	304.00							
	60	304.00							
	90	304.00							
	120	304.00	304.00	0.00	1.35	302.65	74.79	211.39	0.278

**JOB NO: 21 0223 05 DRILLHOLE: MH6 TEST DEPTH: 12.5m-12.83m**

PRESSURE (kPa)	TIME (S)	VOLUME (cm <sup>3</sup> )	VOLUME 120 S (cm <sup>3</sup> )	CREEP VOLUME (cm <sup>3</sup> )	VOLUME CORRECTION (cm <sup>3</sup> )	CORRECTED VOLUME (cm <sup>3</sup> )	ATM. PRESS CORRECTION (kPa)	CORRECTED PRESSURE (kPa)	CORRECTED VOLUME RATIO
275	15	305.00							
	30	305.00							
	60	305.00							
	90	305.00							
	120	306.00	306.00	1.00	1.46	304.54	75.19	236.30	0.279
300	15	310.00							
	30	310.00							
	60	313.00							
	90	313.00							
	120	313.00	313.00	3.00	1.58	311.42	76.68	260.13	0.284
325	15	320.00							
	30	320.00							
	60	322.00							
	90	324.00							
	120	325.00	325.00	5.00	1.70	323.30	79.25	282.88	0.292
350	15	333.00							
	30	333.00							
	60	334.00							
	90	336.00							
	120	338.00	338.00	5.00	1.82	336.18	82.03	305.41	0.300
375	15	342.00							
	30	344.00							
	60	347.00							
	90	348.00							
	120	350.00	350.00	6.00	1.94	348.06	84.60	328.16	0.307
400	15	365.00							
	30	370.00							
	60	380.00							
	90	387.00							
	120	394.00	394.00	24.00	2.06	391.94	94.09	343.99	0.333
425	15	403.00							
	30	408.00							
	60	414.00							
	90	423.00							
	120	432.00	432.00	24.00	2.18	429.82	102.28	361.12	0.354
450	15	442.00							
	30	448.00							
	60	462.00							
	90	470.00							
	120	478.00	478.00	30.00	2.30	475.70	112.20	376.52	0.377
475	15	492.00							
	30	501.00							
	60	513.00							
	90	524.00							
	120	531.00	531.00	30.00	2.42	528.58	123.63	390.40	0.402
500	15	550.00							
	30	558.00							
	60	576.00							
	90	592.00							
	120	605.00	605.00	47.00	2.53	602.47	139.60	399.75	0.434



# Appendix G

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Acoustic Borehole Televiewer Survey

Records

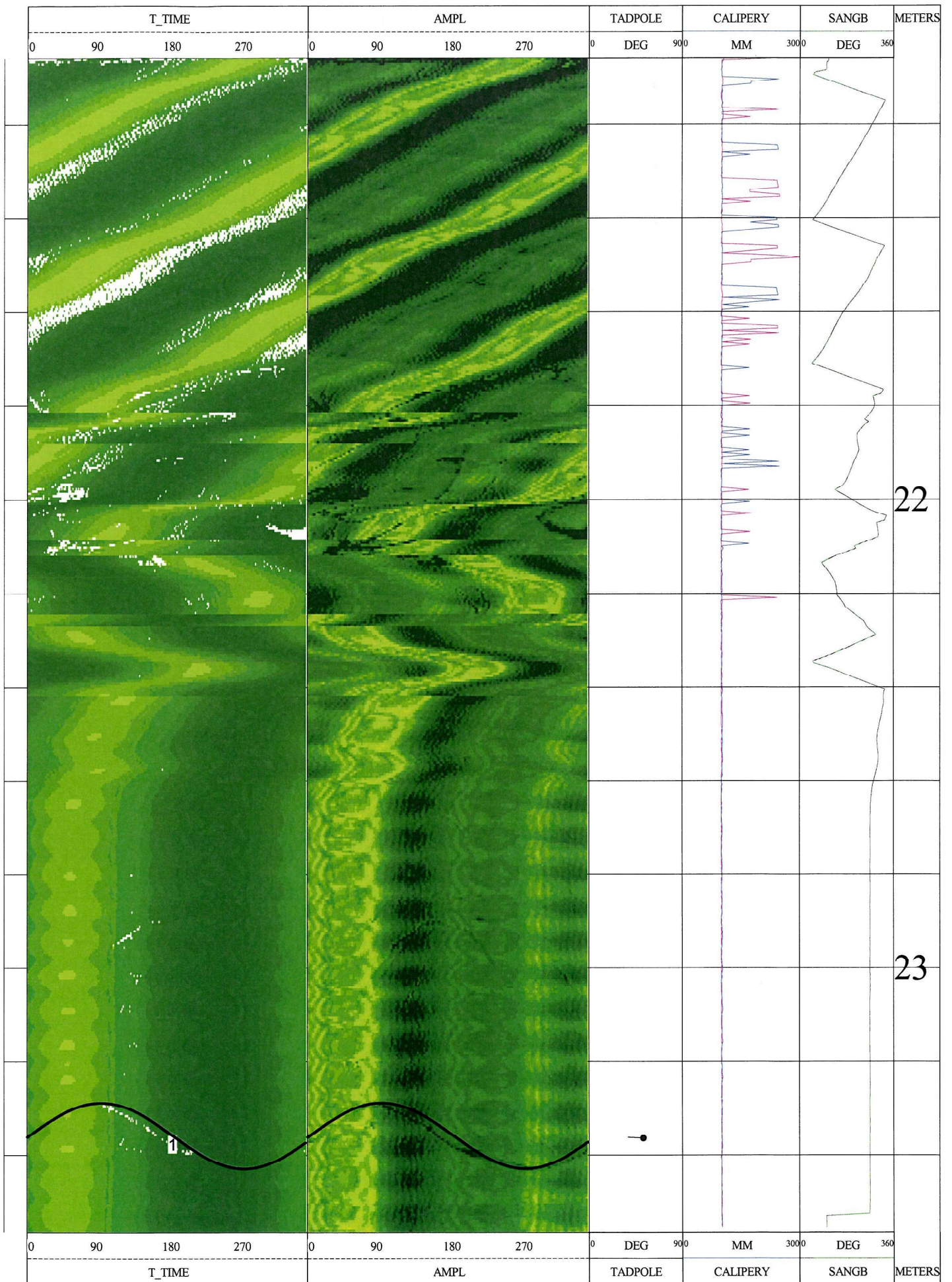


Company : Fugro Geotechnical Services Ltd.  
Drillhole No. : MH4  
Contract No. : GE/2021/03  
Contract Title : Marine Ground Investigation and Geophysical Surveys  
Task Order No. : GE/2021/03.23A  
Agreement No. : CE26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)  
Location : Nim Wan  
Test Date : 17-10-2023  
Depth Driller : 26.14m  
Log Bottom : 26.01m  
Log Top : 21.06m  
Casing Driller : 21.06m  
Casing Type : N/A  
Casing Thickness : N/A  
Bit Size : 10.10cm  
Magnetic Decl. : -2  
Remark : All directions are relative to magnetic north from Hong Kong Metric Grid System North  
Permanent Datum : None  
Elev.Perm.Datum : None  
Log Measured From : Seabed Level  
Drl Measured From : Seabed Level  
Logging Unit : S/N 2960  
Field Office : F.G.S  
Recorded by : HA/HT  
Borehole Fluid : Water  
Sonde Type : 8804A

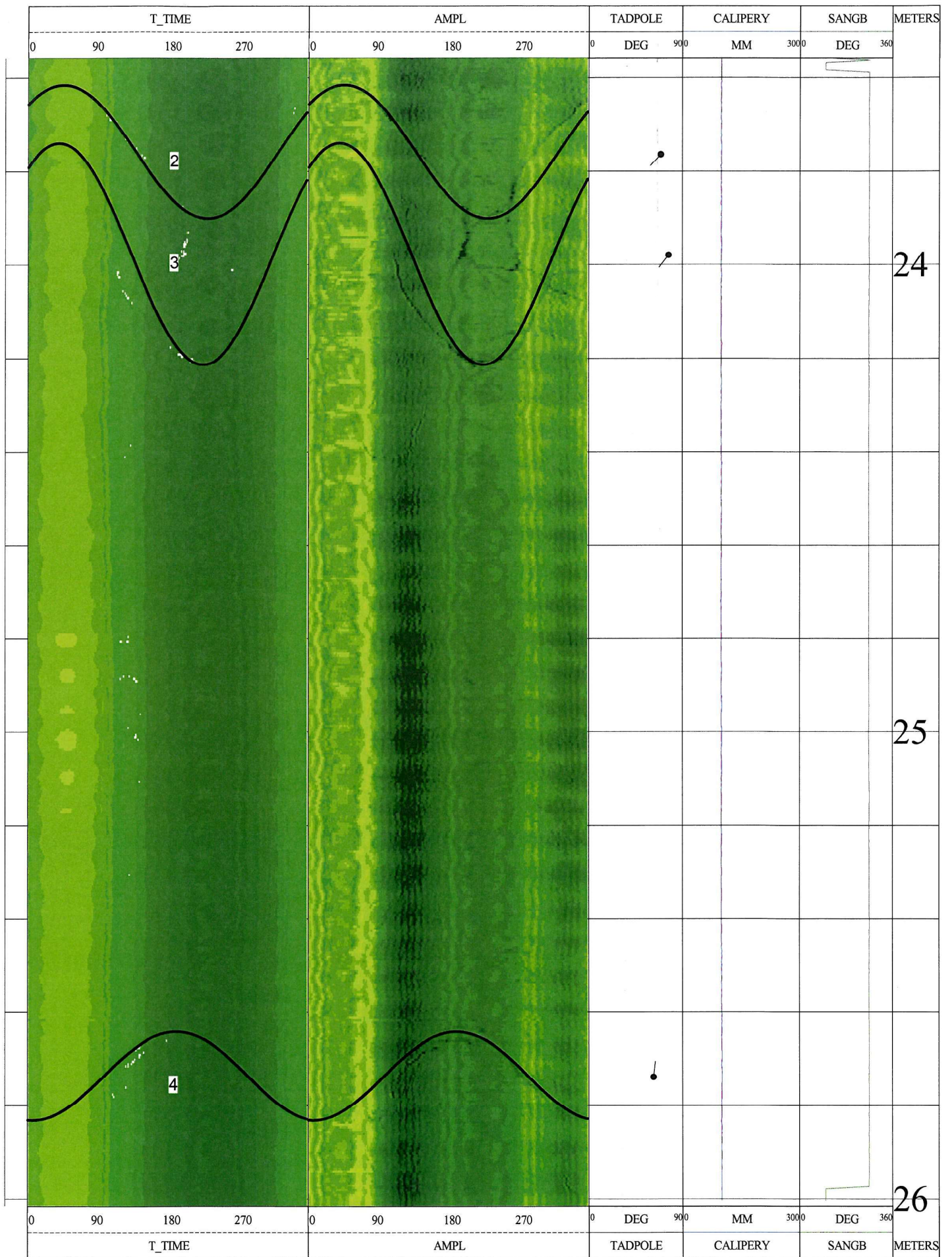
Fracture Number	Dip ( deg )	Azimuth ( deg )	To ( m )	From ( m )	Diameter ( cm )	Deviation ( deg )	Dir. of Deviation ( deg )	Category
1	53	273	23.29	23.43	10.09	1.7	267.6	Joint
2	69	224	23.62	23.90	10.16	1.6	268.1	Incipient Joint
3	77	218	23.74	24.21	10.16	1.8	264.8	Joint
4	62	006	25.64	25.83	10.20	1.7	264.7	Incipient Joint

Checked by: 

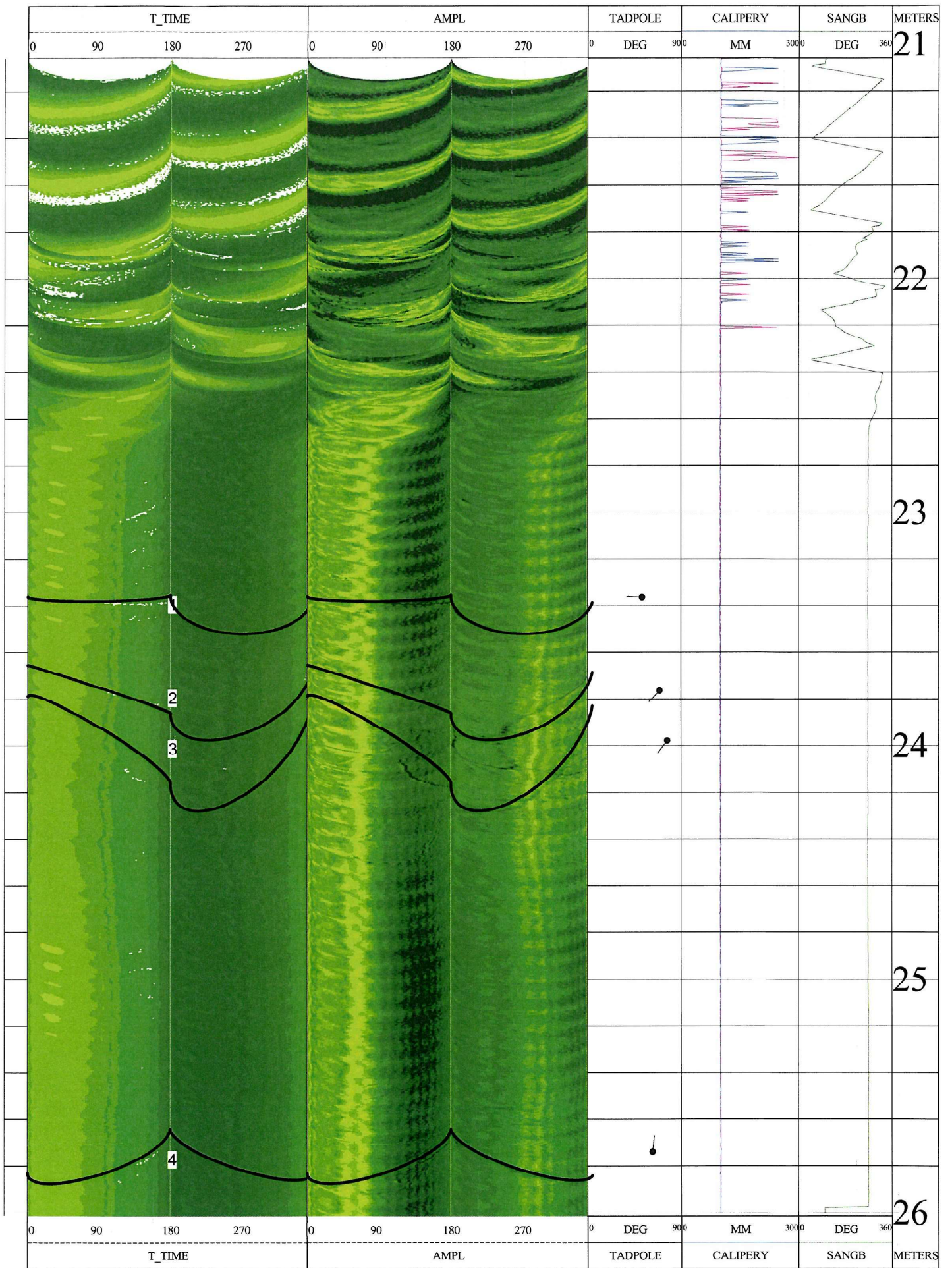


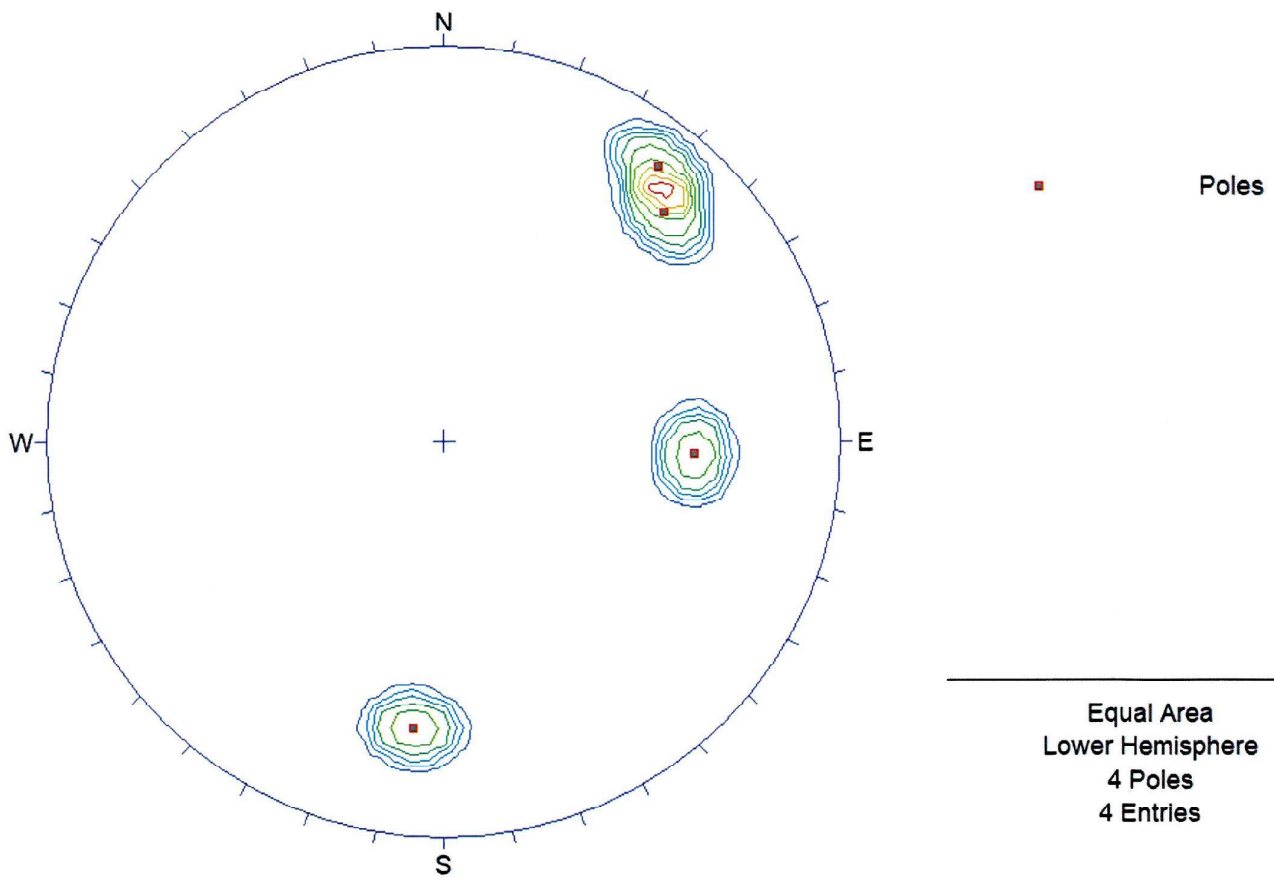












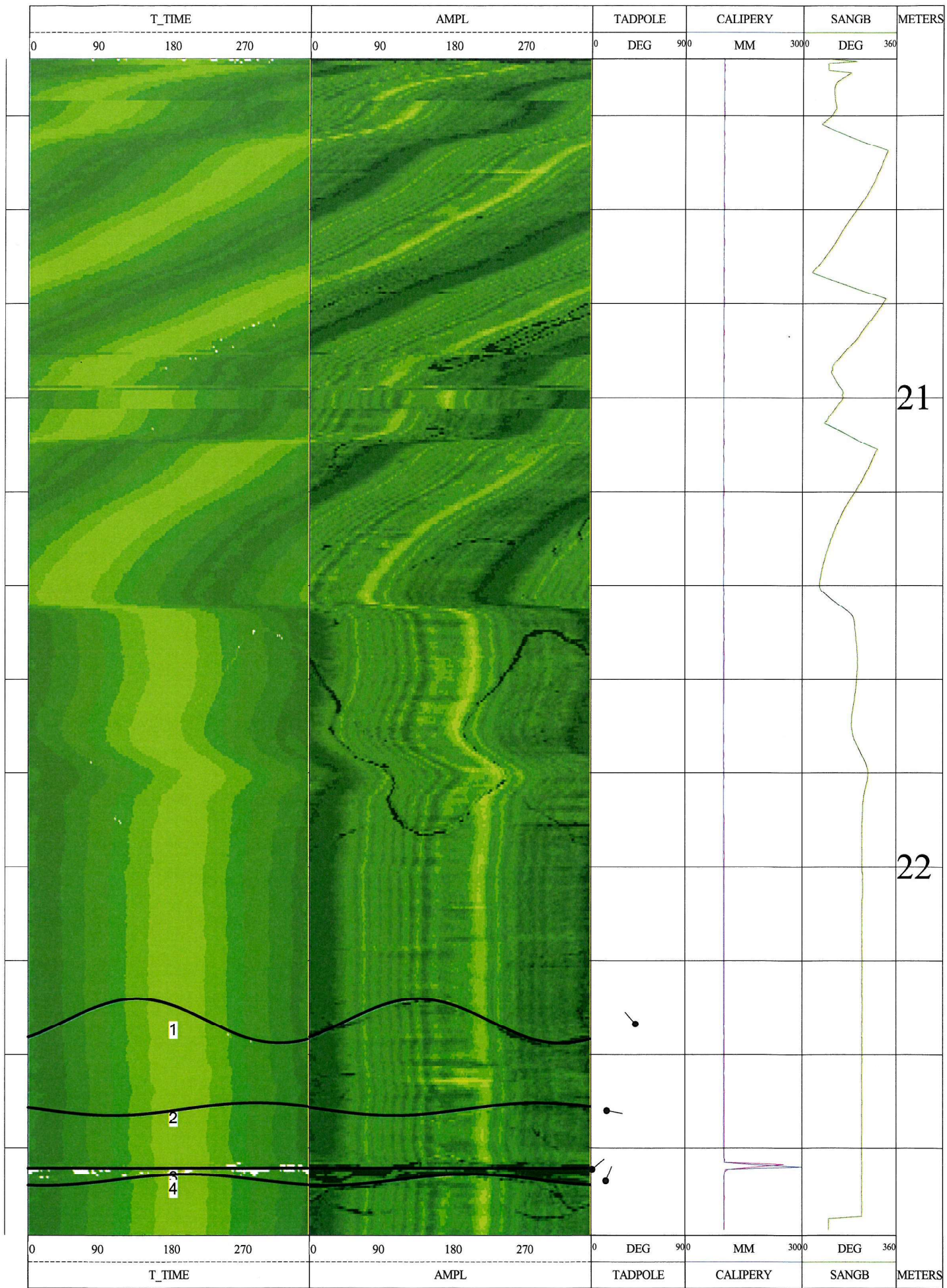
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Contract Title : Marine Ground Investigation and Geophysical Surveys  
Task Order No. : GE/2021/03.23A  
Agreement No. : CE26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)  
Location : Nim Wan  
Drillhole No. : MH4

Company : Fugro Geotechnical Services Ltd.  
 Drillhole No. : MH5  
 Contract No. : GE/2021/03  
 Contract Title : Marine Ground Investigation and Geophysical Surveys  
 Task Order No. : GE/2021/03.23A  
 Agreement No. : CE26/2022 (EP)  
 Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)  
 Location : Nim Wan  
 Test Date : 27-10-2023  
 Depth Driller : 25.57m  
 Log Bottom : 25.46m  
 Log Top : 20.28m  
 Casing Driller : 20.28m  
 Casing Type : N/A  
 Casing Thickness : N/A  
 Bit Size : 10.10cm  
 Magnetic Decl. : -2  
 Remark : All directions are relative to magnetic north from Hong Kong Metric Grid System North  
 Permanent Datum : None  
 Elev.Perm.Datum : None  
 Log Measured From : Seabed Level  
 Drl Measured From : Seabed Level  
 Logging Unit : S/N 2960  
 Field Office : F.G.S  
 Recorded by : HA/HT  
 Borehole Fluid : Water  
 Sonde Type : 8804A

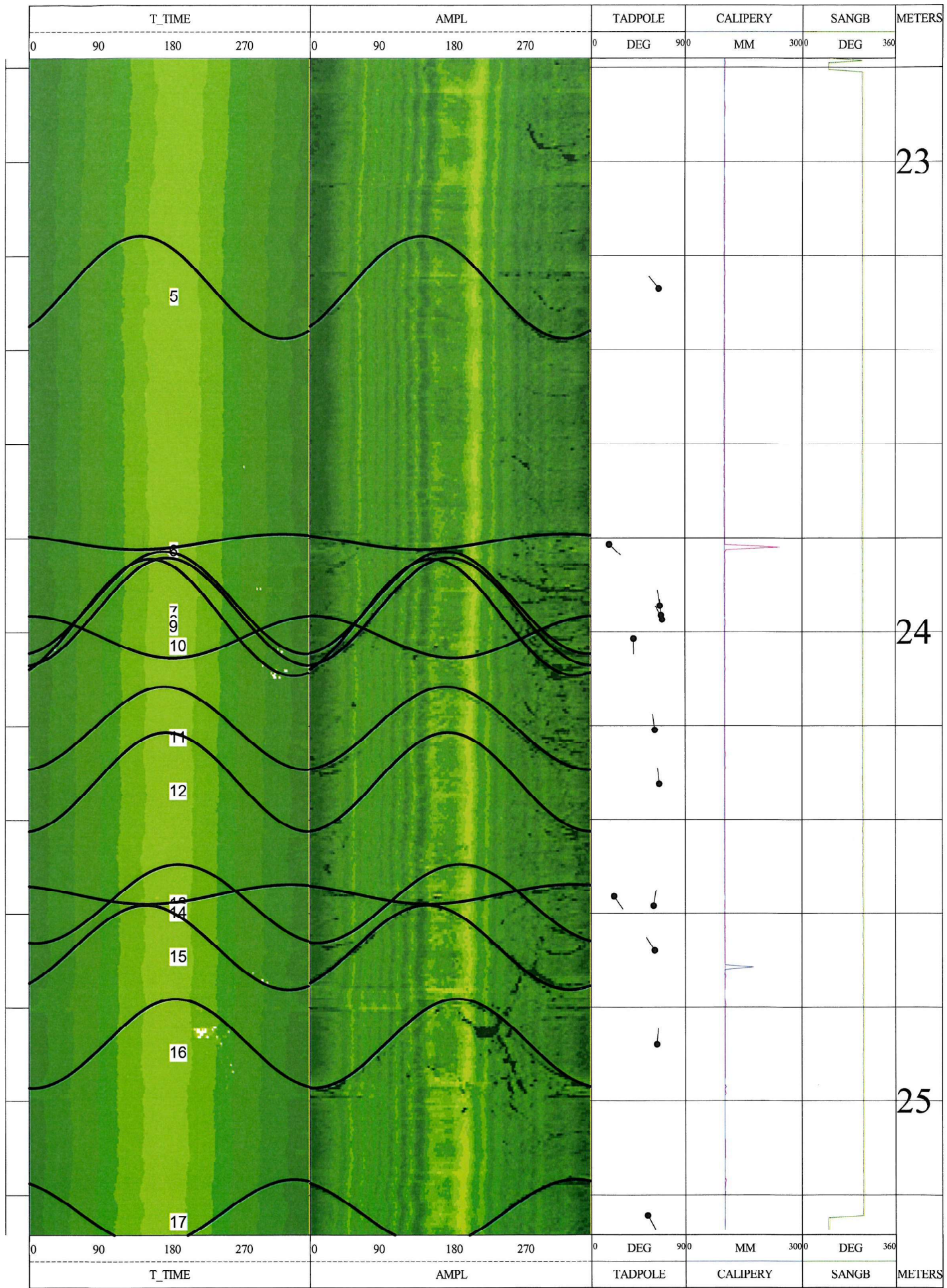
Fracture Number	Dip ( deg )	Azimuth ( deg )	To ( m )	From ( m )	Diameter ( cm )	Deviation ( deg )	Dir. of Deviation ( deg )	Category
1	43	317	22.28	22.38	10.16	1.3	228.9	Joint
2	15	102	22.50	22.53	10.16	1.3	226.5	Joint
3	01	050	22.64	22.64	10.33	1.3	230.3	Joint
4	14	022	22.66	22.68	10.13	1.2	230.7	Joint
5	65	320	23.16	23.38	10.13	1.4	233.4	Joint
6	18	134	23.79	23.82	10.13	1.2	227.8	Joint
7	66	350	23.83	24.05	10.16	1.4	228.7	Joint
8	67	354	23.84	24.07	10.13	1.4	228.2	Joint
9	68	333	23.85	24.09	10.16	1.2	228.4	Joint
10	41	180	23.97	24.06	10.13	1.3	228.3	Incipient Joint
11	61	351	24.12	24.29	10.09	1.3	230.9	Joint
12	65	353	24.22	24.43	10.13	1.5	230.6	Incipient Joint
13	22	146	24.54	24.58	10.09	1.3	233.7	Joint
14	60	009	24.50	24.66	10.13	1.3	230.5	Incipient Joint
15	61	327	24.58	24.76	10.13	1.4	232.8	Joint
16	63	005	24.78	24.97	10.13	1.5	233.8	Joint
17	54	152	25.17	25.31	10.09	1.5	229.6	Joint

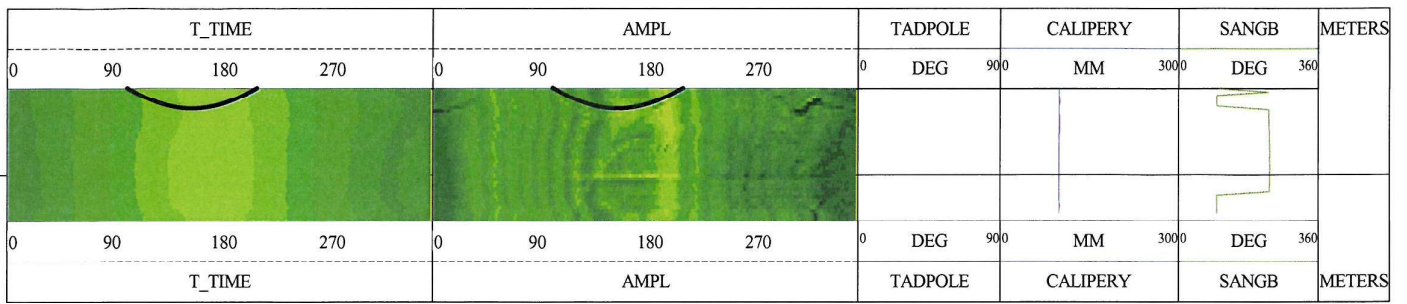
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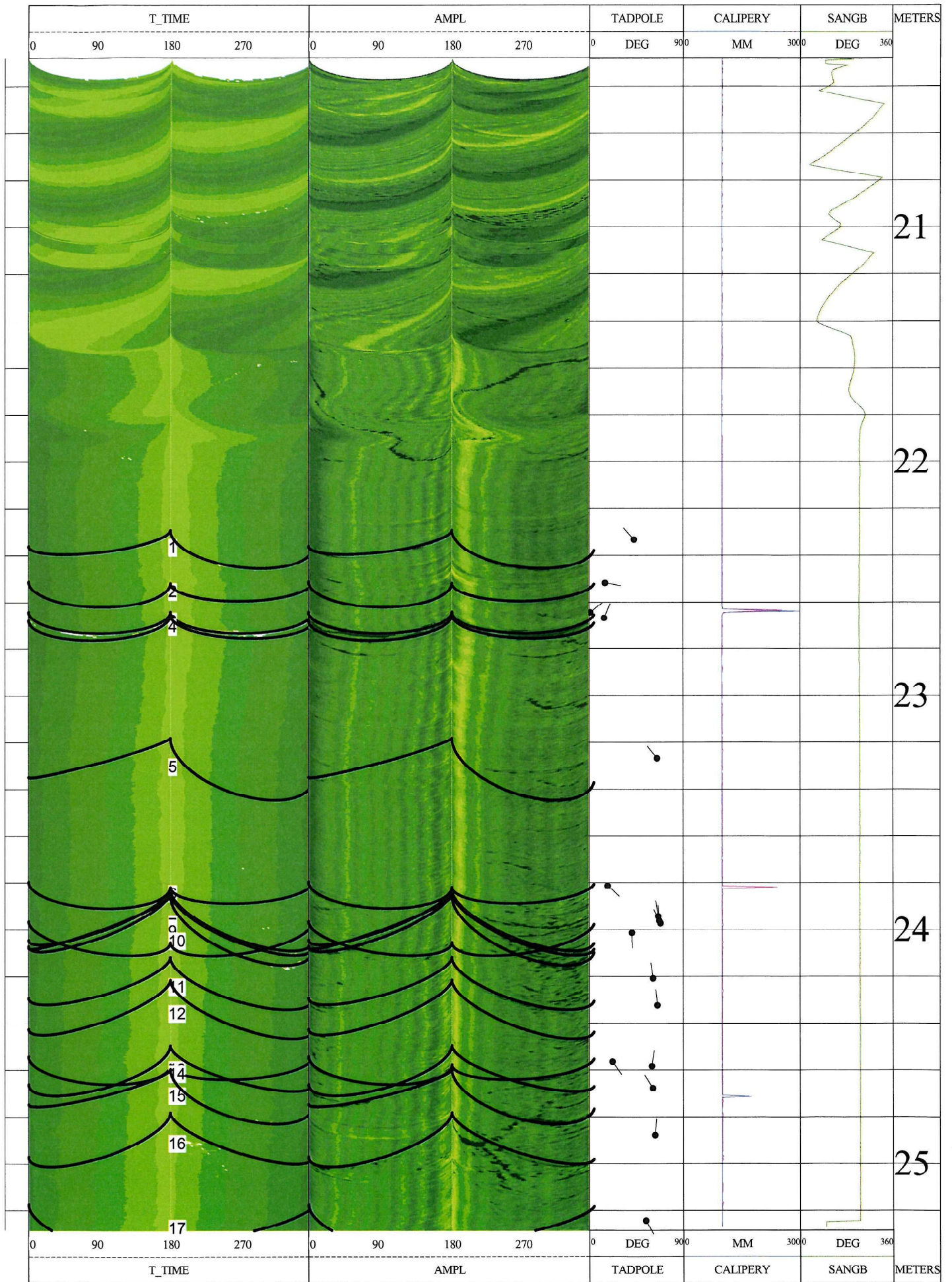


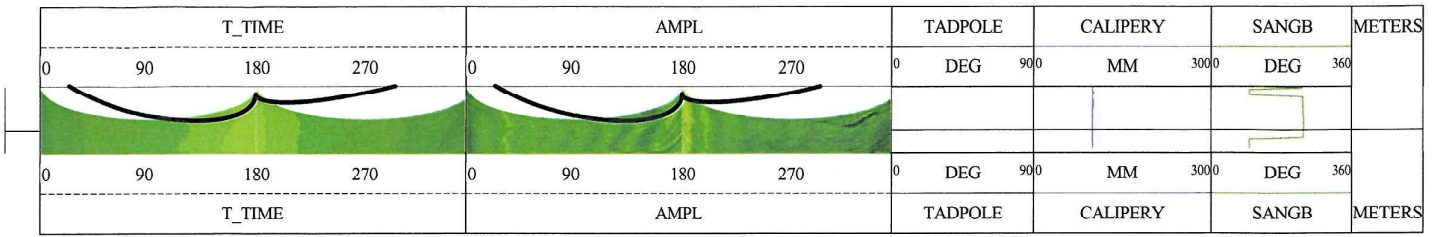


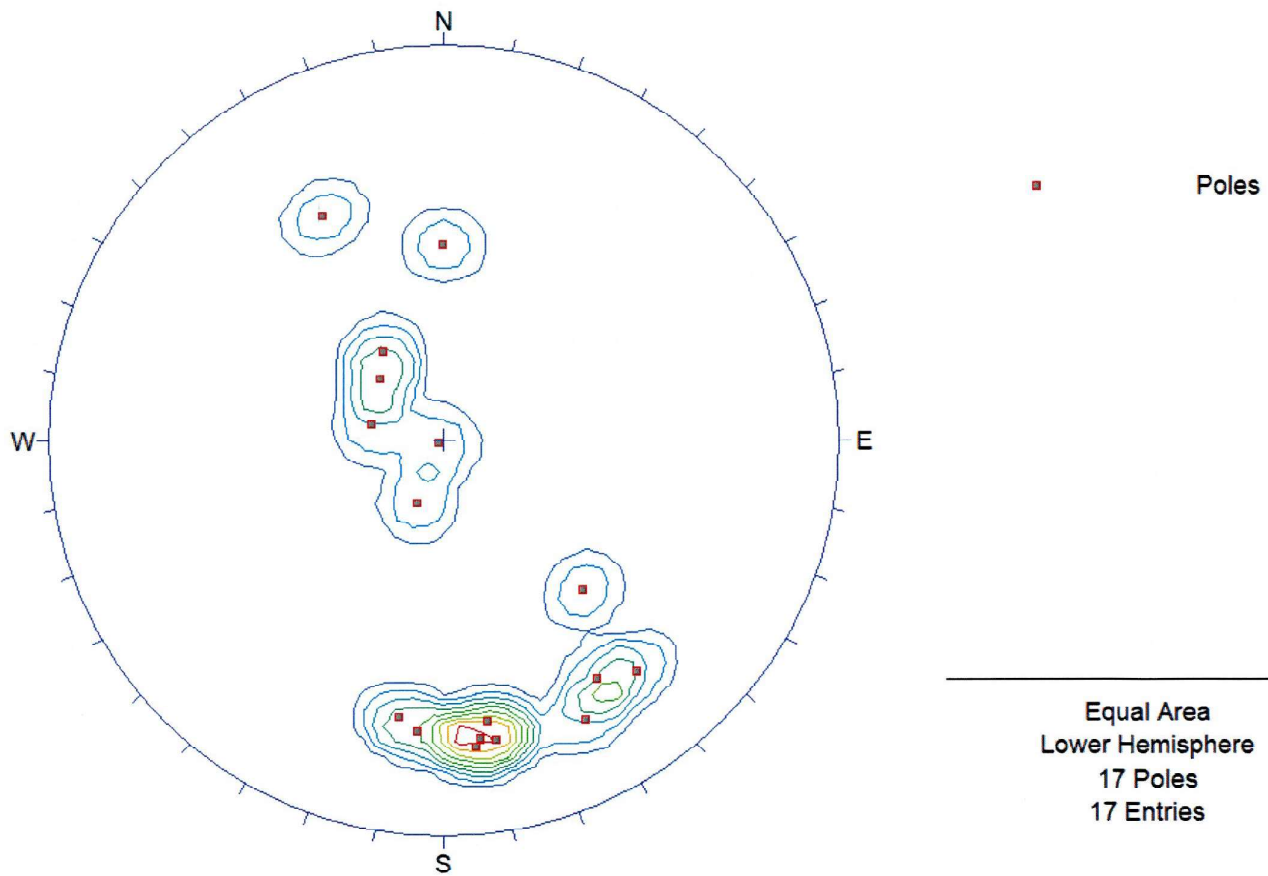








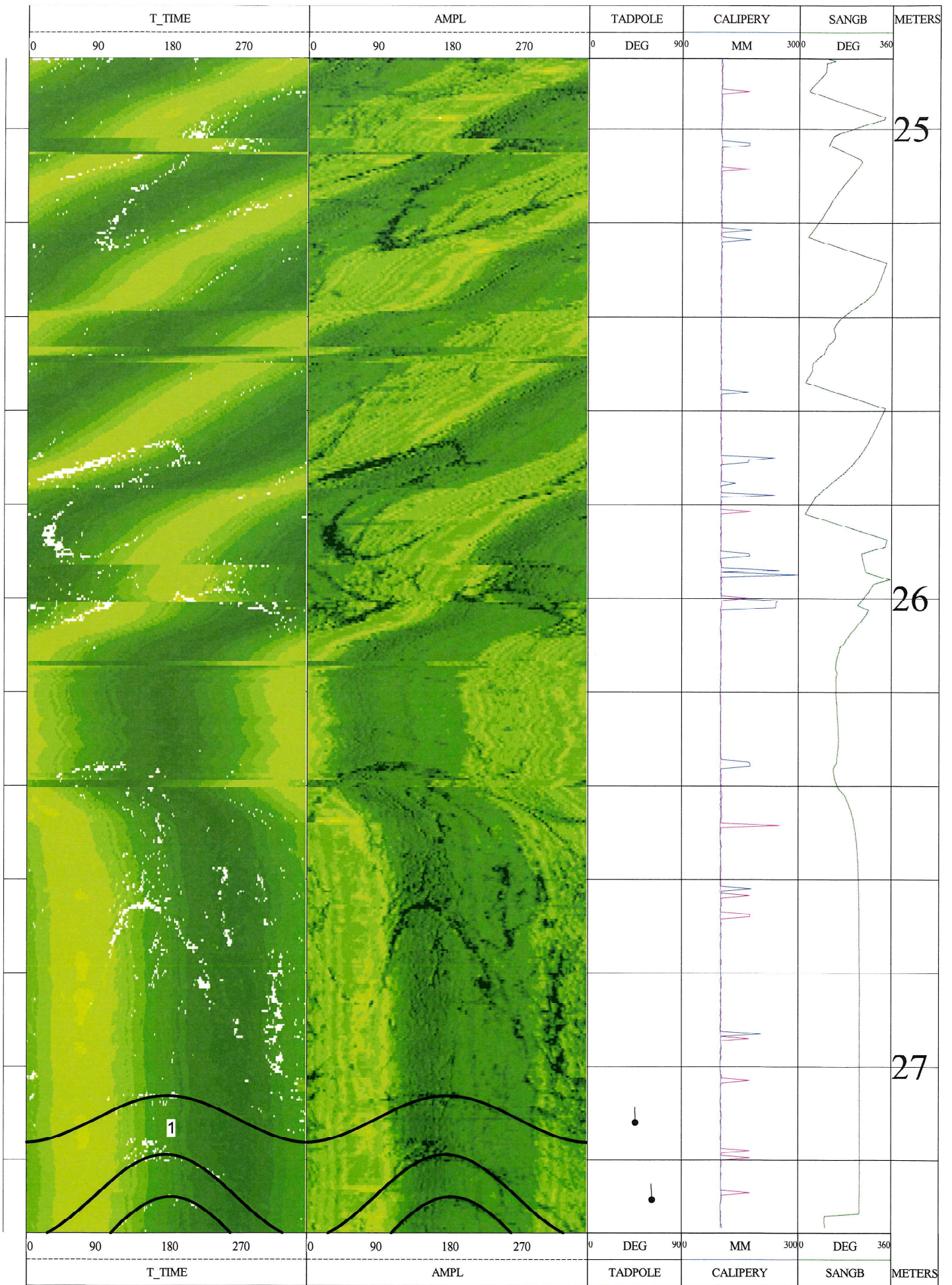




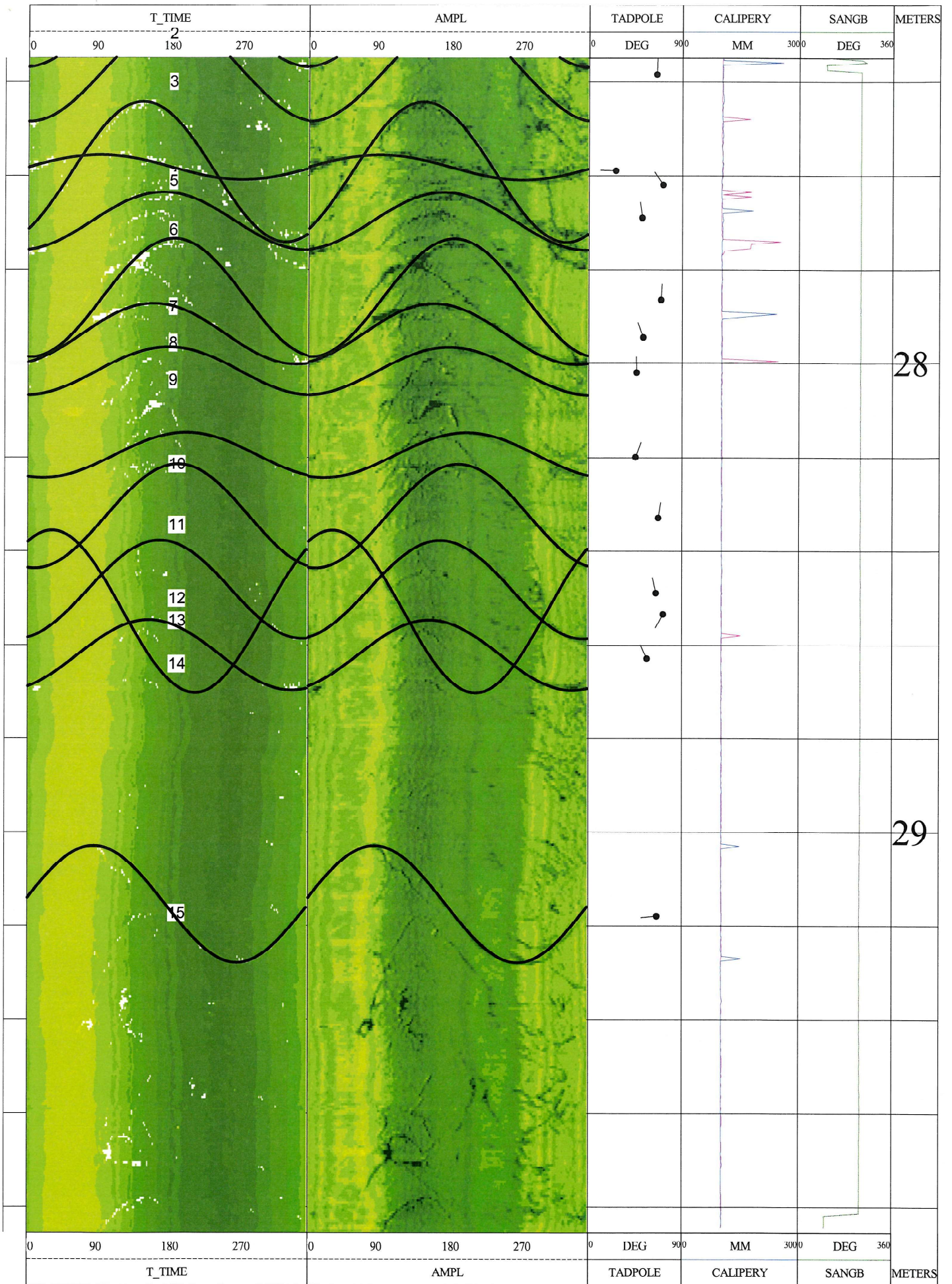
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Contract Title : Marine Ground Investigation and Geophysical Surveys  
Task Order No. : GE/2021/03.23A  
Agreement No. : CE26/2022 (EP)  
Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)  
Location : Nim Wan  
Drillhole No. : MH5





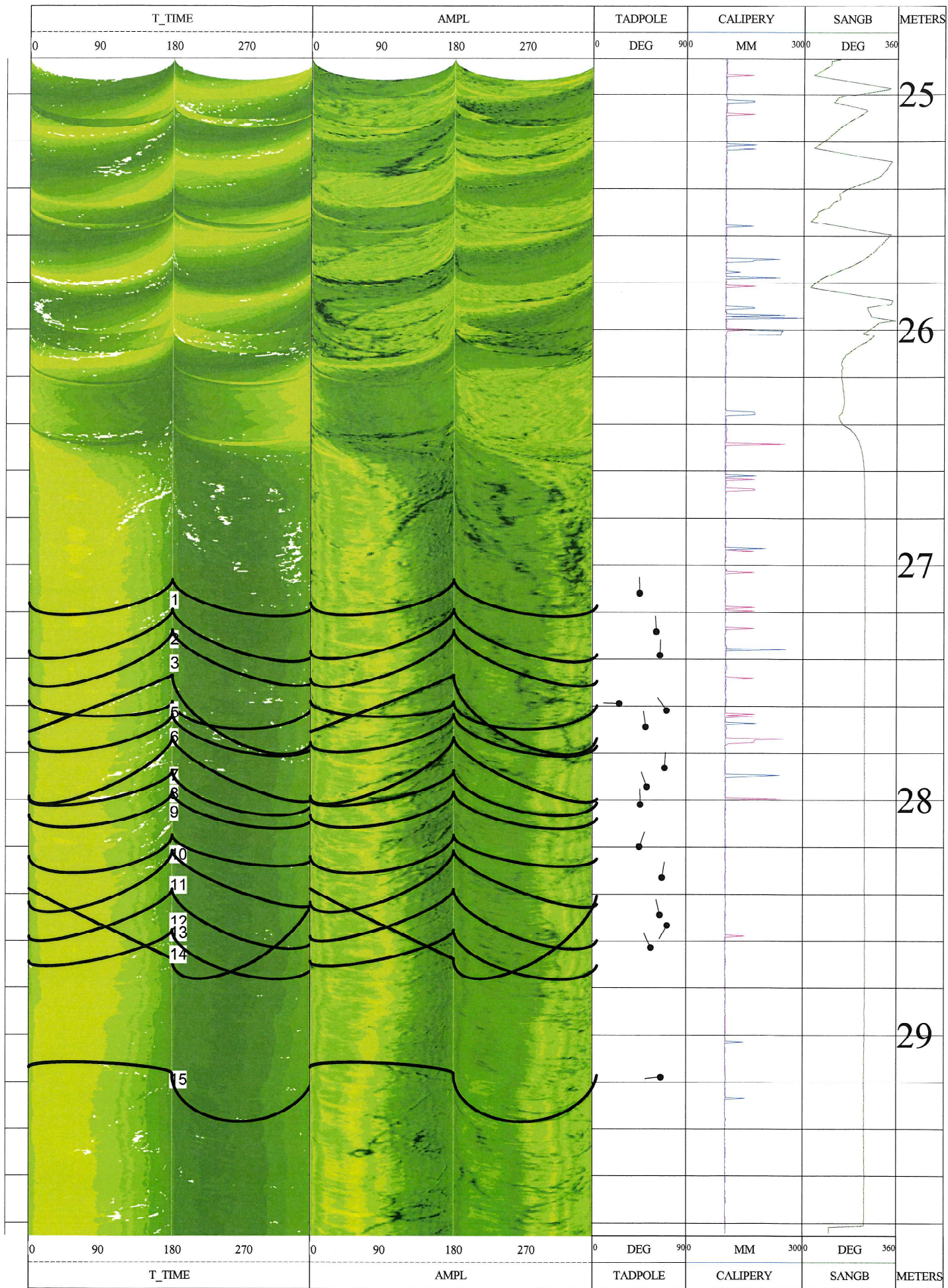






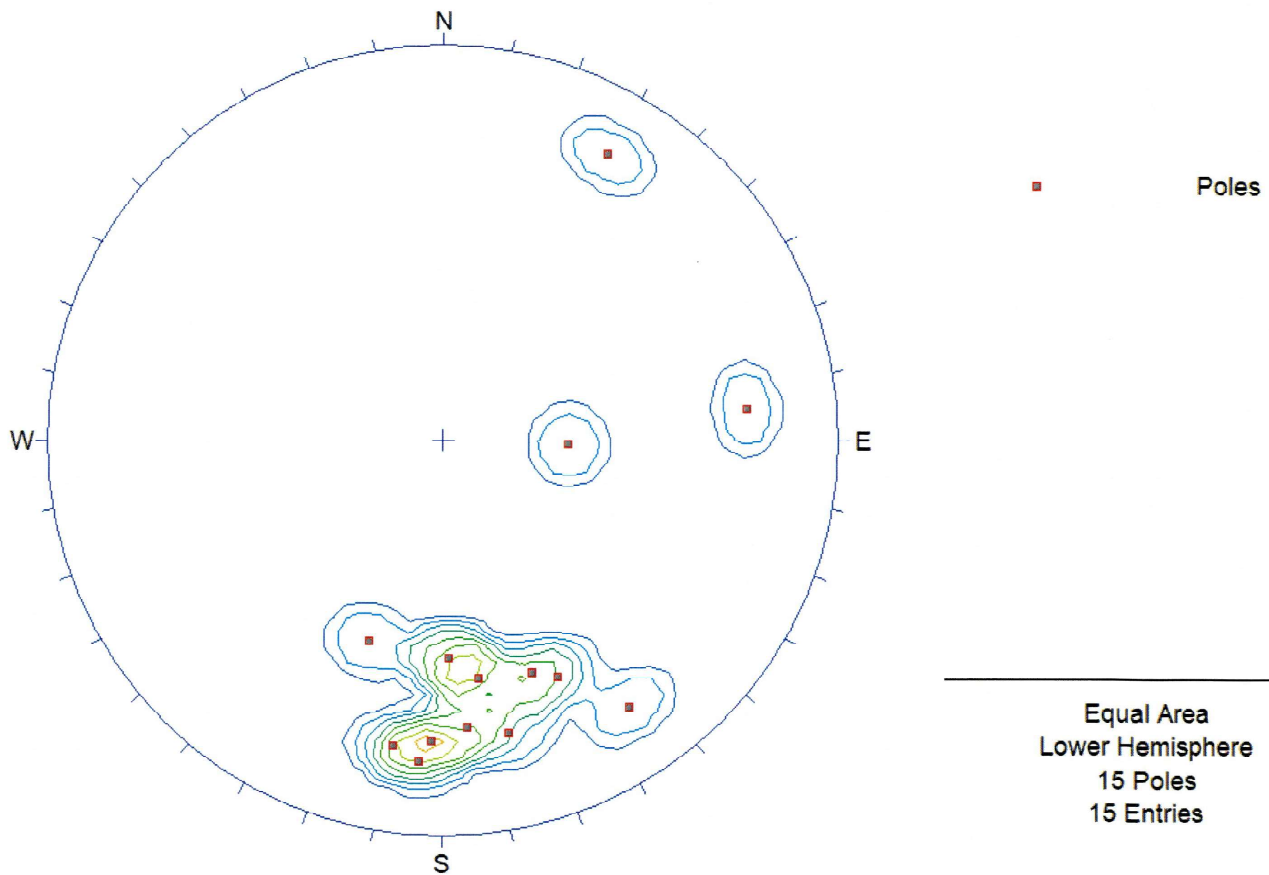
T_TIME				AMPL				TADPOLE		CALIPERY		SANGB		METERS
0	90	180	270	0	90	180	270	0	90	0	300	0	360	
														30
0	90	180	270	0	90	180	270	0	90	0	300	0	360	
T_TIME				AMPL				TADPOLE		CALIPERY		SANGB		METERS







T_TIME				AMPL				TADPOLE		CALIPERY		SANGB		METERS
0	90	180	270	0	90	180	270	0	DEG	900	MM	3000	DEG	
														30
0	90	180	270	0	90	180	270	0	DEG	900	MM	3000	DEG	
T_TIME				AMPL				TADPOLE		CALIPERY		SANGB		METERS



Contract No. : GE/2021/03  
 Contract Title : Marine Ground Investigation and Geophysical Surveys  
 Task Order No. : GE/2021/03.23A  
 Agreement No. : CE26/2022 (EP)  
                   Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design  
                   and Construction (SA1)  
 Location : Nim Wan  
 Drillhole No. : MH6

# Appendix H

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Cone Penetrometer Accreditation and  
Calibration Certificates



The Dutch Accreditation Council RvA, by law appointed as the national accreditation body for The Netherlands, hereby declares that accreditation has been granted to:

**Fugro Netherlands Marine B.V.  
Transducer Workshop  
Nootdorp**

The organisation has demonstrated to be able to generate technical valid results in a competent way and work according to a management system.

This accreditation is based on an assessment against the requirements as laid down in EN ISO/IEC 17025:2017.

The accreditation covers the activities as specified in the authorized annex bearing the registration number.

The accreditation is valid provided that the organisation continues to meet the requirements.

The accreditation with registration number:

**K 167**

is granted on 26 October 2016

This declaration is valid until  
**1 November 2024**

The board of the Dutch Accreditation Council,  
on its behalf,

  
mr. J.A.W.M. de Haas

# Calibration Certificate

**Applicant** Fugro Geotechnical Services Ltd (HK)  
19/F, Fugro House - KCC2  
1 Kwai On Rd, Kwai Chung, NT  
Hong Kong



**Instrument** Cone Penetrometer  
**Manufacturer** Fugro  
**Type** CP15-CF5PB7SO2-P1ETM4-V5  
**Serial Number** 1701-3285

**Certificate Number**  
FCN23028747

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

## Environmental Conditions

Temperature during calibration 20.5 ± 3 °C  
Atmospheric pressure during calibration 1000 ± 100 mbar

## Result

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

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

## Uncertainty

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

## Traceability

The measurements have been executed using standards for which the traceability is (international) standards has been demonstrated towards the RVA (Raad voor Accreditatie).

## Calibration date

24-Jan-2023

## Calibrate before

24-Jul-2024

Calibrated Sensor	Manufacturer / Type	Calibrated Range	Maximum Rating	Procedure
Cone [Force]	Fugro Loadcell	0 to 75 kN	0 to 150 kN	EUAF-FNLM-CAL-PR-003
Cone+ Fric. [Force]	Fugro Loadcell	0 to 75 kN	0 to 150 kN	EUAF-FNLM-CAL-PR-003
Pore 2 [Pressure]	Kistler-4043A7DV0438	0 to 7 MPa	0 to 16.5 MPa	EUAF-FNLM-CAL-PR-004
Slope x [Inclination]	ADXL	-10 to 10 Deg	-20 to 20 Deg	EUAF-FNLM-CAL-PR-005
Slope y [Inclination]	ADXL	-10 to 10 Deg	-20 to 20 Deg	EUAF-FNLM-CAL-PR-005

Noordorp, 25-Jan-2023

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

**Ruud Schrijvers**  
Deputy Manager Transducer Workshop

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

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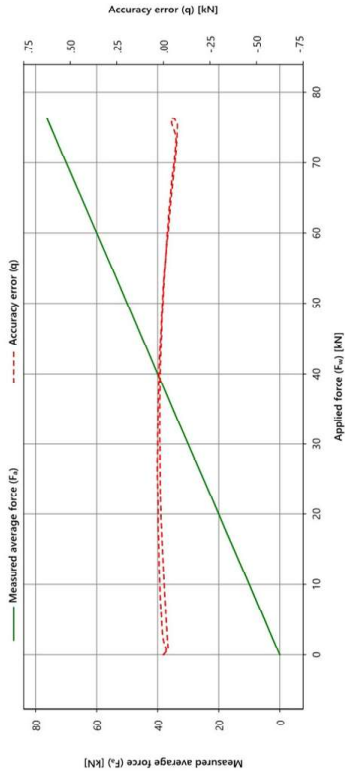
## Cone Calibration Result [Force]

Instrument		Reference	
Manufacturer	Figro	Manufacturer	Zwick/Roell
Type	CF15-CF15PB7/SO2-P1	Serial Number	6034-0003
	EIM4-V5	Uncertainty	0.003·F <sub>m</sub> -0.015 kN
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 11:50:21
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-003
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

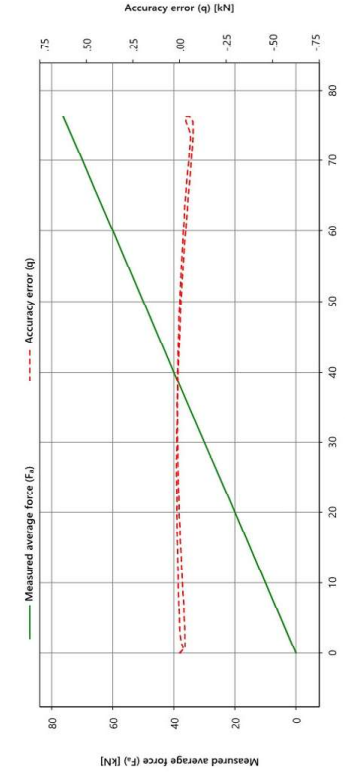
Instrument		Reference	
Manufacturer	Figro	Manufacturer	Zwick/Roell
Type	CF15-CF15PB7/SO2-P1	Serial Number	6034-0003
	EIM4-V5	Uncertainty	0.003·F <sub>m</sub> -0.015 kN
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 11:50:22
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-003
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

Sensor		Characteristics	
Channel	Cone+Fric. (Force)	Unit	Value
Manufacturer	Figro Loadcell	Max accuracy error (q)	[kN] 0.052
Calibrated Range	0 to 150 kN	Max repeatability error (b)	[kN] 0.011
Maximum Rating	0 to 150 kN	Max reversibility error (v)	[kN] 0.019
		Zero load error (f <sub>z0</sub> )	[kN] 0.002
		Zero load offset (f <sub>z</sub> )	[kN] -0.002
		Resolution	[kN] 5.65E-05
		Noise RMS	[kN] 0.001

Sensor		Characteristics	
Channel	Cone+Fric. (Force)	Unit	Value
Manufacturer	Figro Loadcell	Max accuracy error (q)	[kN] 0.043
Calibrated Range	0 to 150 kN	Max repeatability error (b)	[kN] 0.012
Maximum Rating	0 to 150 kN	Max reversibility error (v)	[kN] 0.017
		Zero load error (f <sub>z0</sub> )	[kN] 0.005
		Zero load offset (f <sub>z</sub> )	[kN] 0.008
		Resolution	[kN] 5.64E-05
		Noise RMS	[kN] 0.001
		Tip-Sleeve Interaction %	[kN] 0.042



Applied force (F <sub>a</sub> ) [kN]	Measured force 1 (F <sub>a1</sub> ) [kN]	Measured force 2 (F <sub>a2</sub> ) [kN]	Measured force 3 (F <sub>a3</sub> ) [kN]	Measured average force (F <sub>a</sub> ) [kN]	Accuracy error (q) [kN]	Repeatability error (b) [kN]	Reversibility error (v) [kN]	Expanded Uncertainty (U) [kN]
0.000	0.001	-0.001	-0.001	0.000	0.000	0.002	0.000	0.016
15.000	15.006	15.004	15.006	15.005	0.005	0.002	0.019	0.066
30.000	30.019	30.018	30.020	30.019	0.019	0.002	0.012	0.109
45.000	45.010	45.010	45.013	45.011	0.011	0.003	0.004	0.154
60.000	59.979	59.981	59.977	59.979	-0.021	0.003	-0.004	0.200
75.000	74.948	74.943	74.953	74.948	-0.052	0.011	-0.004	0.246
60.000	59.974	59.977	59.974	59.975	-0.025	0.003	-0.004	0.200
45.000	45.016	45.014	45.014	45.015	0.015	0.001	0.004	0.154
30.000	30.031	30.030	30.031	30.031	0.031	0.001	0.012	0.109
15.000	15.025	15.025	15.024	15.024	0.024	0.001	0.019	0.066
0.000	-0.002	-0.002	-0.002	-0.002	-0.002	0.000	0.019	0.016



Applied force (F <sub>a</sub> ) [kN]	Measured force 1 (F <sub>a1</sub> ) [kN]	Measured force 2 (F <sub>a2</sub> ) [kN]	Measured force 3 (F <sub>a3</sub> ) [kN]	Measured average force (F <sub>a</sub> ) [kN]	Accuracy error (q) [kN]	Repeatability error (b) [kN]	Reversibility error (v) [kN]	Expanded Uncertainty (U) [kN]
0.000	0.003	-0.001	-0.002	0.000	0.000	0.005	0.000	0.018
15.000	14.996	14.993	14.993	14.994	-0.006	0.003	0.017	0.065
30.000	30.012	30.010	30.010	30.010	0.010	0.002	0.004	0.108
45.000	45.005	45.006	45.005	45.005	0.005	0.001	-0.006	0.154
60.000	59.981	59.982	59.977	59.980	-0.020	0.005	-0.013	0.201
75.000	74.957	74.951	74.963	74.957	-0.043	0.012	-0.013	0.246
60.000	59.966	59.967	59.966	59.967	-0.033	0.001	-0.013	0.201
45.000	45.001	44.999	44.998	44.999	-0.001	0.004	-0.006	0.154
30.000	30.017	30.013	30.013	30.014	0.014	0.004	0.004	0.108
15.000	15.013	15.012	15.009	15.011	0.011	0.004	0.017	0.065
0.000	-0.004	-0.005	-0.006	-0.005	-0.005	0.002	0.017	0.017

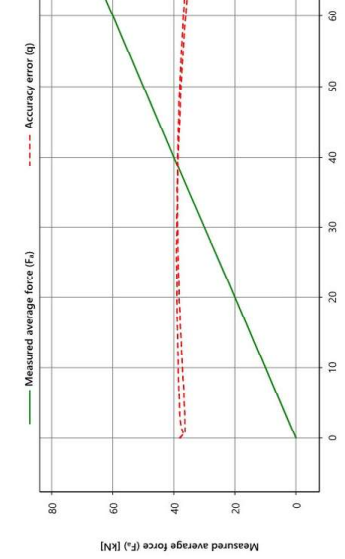
## Cone+Fric. Calibration Result [Force]

Instrument		Reference	
Manufacturer	Figro	Manufacturer	Zwick/Roell
Type	CF15-CF15PB7/SO2-P1	Serial Number	6034-0003
	EIM4-V5	Uncertainty	0.003·F <sub>m</sub> -0.015 kN
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 11:50:22
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-003
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

Instrument		Reference	
Manufacturer	Figro	Manufacturer	Zwick/Roell
Type	CF15-CF15PB7/SO2-P1	Serial Number	6034-0003
	EIM4-V5	Uncertainty	0.003·F <sub>m</sub> -0.015 kN
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 11:50:22
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-003
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

Sensor		Characteristics	
Channel	Cone+Fric. (Force)	Unit	Value
Manufacturer	Figro Loadcell	Max accuracy error (q)	[kN] 0.043
Calibrated Range	0 to 150 kN	Max repeatability error (b)	[kN] 0.012
Maximum Rating	0 to 150 kN	Max reversibility error (v)	[kN] 0.017
		Zero load error (f <sub>z0</sub> )	[kN] 0.005
		Zero load offset (f <sub>z</sub> )	[kN] 0.008
		Resolution	[kN] 5.64E-05
		Noise RMS	[kN] 0.001
		Tip-Sleeve Interaction %	[kN] 0.042

Sensor		Characteristics	
Channel	Cone+Fric. (Force)	Unit	Value
Manufacturer	Figro Loadcell	Max accuracy error (q)	[kN] 0.043
Calibrated Range	0 to 150 kN	Max repeatability error (b)	[kN] 0.012
Maximum Rating	0 to 150 kN	Max reversibility error (v)	[kN] 0.017
		Zero load error (f <sub>z0</sub> )	[kN] 0.005
		Zero load offset (f <sub>z</sub> )	[kN] 0.008
		Resolution	[kN] 5.64E-05
		Noise RMS	[kN] 0.001
		Tip-Sleeve Interaction %	[kN] 0.042



Applied force (F <sub>a</sub> ) [kN]	Measured force 1 (F <sub>a1</sub> ) [kN]	Measured force 2 (F <sub>a2</sub> ) [kN]	Measured force 3 (F <sub>a3</sub> ) [kN]	Measured average force (F <sub>a</sub> ) [kN]	Accuracy error (q) [kN]	Repeatability error (b) [kN]	Reversibility error (v) [kN]	Expanded Uncertainty (U) [kN]
0.000	0.003	-0.001	-0.002	0.000	0.000	0.005	0.000	0.018
15.000	14.996	14.993	14.993	14.994	-0.006	0.003	0.017	0.065
30.000	30.012	30.010	30.010	30.010	0.010	0.002	0.004	0.108
45.000	45.005	45.006	45.005	45.005	0.005	0.001	-0.006	0.154
60.000	59.981	59.982	59.977	59.980	-0.020	0.005	-0.013	0.201
75.000	74.957	74.951	74.963	74.957	-0.043	0.012	-0.013	0.246
60.000	59.966	59.967	59.966	59.967	-0.033	0.001	-0.013	0.201
45.000	45.001	44.999	44.998	44.999	-0.001	0.004	-0.006	0.154
30.000	30.017	30.013	30.013	30.014	0.014	0.004	0.004	0.108
15.000	15.013	15.012	15.009	15.011	0.011	0.004	0.017	0.065
0.000	-0.004	-0.005	-0.006	-0.005	-0.005	0.002	0.017	0.017

## Pore 2 Calibration Result [Pressure]

Instrument		Reference	
Manufacturer	Figro	Manufacturer	Keller PA-33X
Type	CF15-CF75P87/SO2-P1	Serial Number	3257-0002
	EIM4-V5	Uncertainty	0.0005 P <sub>2</sub> +0.002 [MPa]
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 12:19:15
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-004
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

Sensor		Characteristics	
Channel	Pore 2 [Pressure]	Max accuracy error (q)	[MPa]
Manufacturer	Kieler 4033A70V0408	Max repeatability error (b)	0.014
Calibrated Range	0 to 7 MPa	Max reversibility error (v)	0.003
Maximum Rating	0 to 10.5 MPa	Zero load error (P <sub>0</sub> )	0.002
		Zero load offset (P <sub>0</sub> )	0.002
		Resolution	[MPa]
		Noise RMS	2.69E-06
			0.000

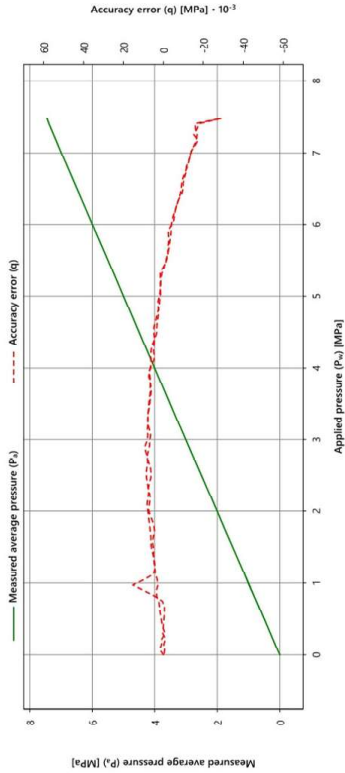
Sensor		Characteristics	
Channel	Slope x [Inclination]	Max accuracy error (q)	[Deg]
Manufacturer	ADXL	Max repeatability error (b)	0.0
Calibrated Range	-10 to 10 Deg	Zero load error (S <sub>0</sub> )	0.1
Maximum Rating	-20 to 20 Deg	Zero load offset (S <sub>0</sub> )	0.0
		Resolution	[Deg]
		Noise RMS	1.3E-05
			0.0

Instrument		Reference	
Manufacturer	Figro	Manufacturer	Hoek-O-Mat
Type	CF15-CF75P87/SO2-P1	Serial Number	2109-0002
	EIM4-V5	Uncertainty	0.6 [Deg]
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 07:34:16
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-005
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

Sensor		Characteristics	
Channel	Slope x [Inclination]	Max accuracy error (q)	[Deg]
Manufacturer	ADXL	Max repeatability error (b)	0.0
Calibrated Range	-10 to 10 Deg	Zero load error (S <sub>0</sub> )	0.1
Maximum Rating	-20 to 20 Deg	Zero load offset (S <sub>0</sub> )	0.0
		Resolution	[Deg]
		Noise RMS	1.3E-05
			0.0



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Applied pressure (P <sub>a</sub> ) [MPa]	Measured pressure 1 (P <sub>1</sub> ) [MPa]	Measured pressure 2 (P <sub>2</sub> ) [MPa]	Measured pressure 3 (P <sub>3</sub> ) [MPa]	Measured average pressure (P <sub>a</sub> ) [MPa]	Accuracy error (q) [MPa]	Repeatability error (b) [MPa]	Reversibility error (v) [MPa]	Expanded Uncertainty (U) [MPa]
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.400	1.406	1.404	1.405	1.405	0.005	0.002	0.000	0.004
2.800	2.808	2.807	2.809	2.808	0.008	0.002	0.001	0.005
4.200	4.206	4.206	4.203	4.205	0.005	0.002	0.002	0.006
5.600	5.597	5.597	5.590	5.598	-0.002	0.003	0.000	0.007
7.000	6.985	6.987	6.987	6.986	-0.014	0.002	0.000	0.006
8.400	8.399	8.397	8.397	8.398	-0.002	0.002	0.000	0.006
9.800	9.799	9.799	9.799	9.799	0.000	0.002	0.000	0.006
11.200	11.199	11.199	11.199	11.199	0.000	0.002	0.000	0.006
12.600	12.599	12.599	12.599	12.599	0.000	0.002	0.000	0.006
14.000	13.999	13.999	13.999	13.999	0.000	0.002	0.000	0.006
15.400	15.399	15.399	15.399	15.399	0.000	0.002	0.000	0.006
16.800	16.799	16.799	16.799	16.799	0.000	0.002	0.000	0.006
18.200	18.199	18.199	18.199	18.199	0.000	0.002	0.000	0.006
19.600	19.599	19.599	19.599	19.599	0.000	0.002	0.000	0.006
21.000	21.000	21.000	21.000	21.000	0.000	0.000	0.000	0.002

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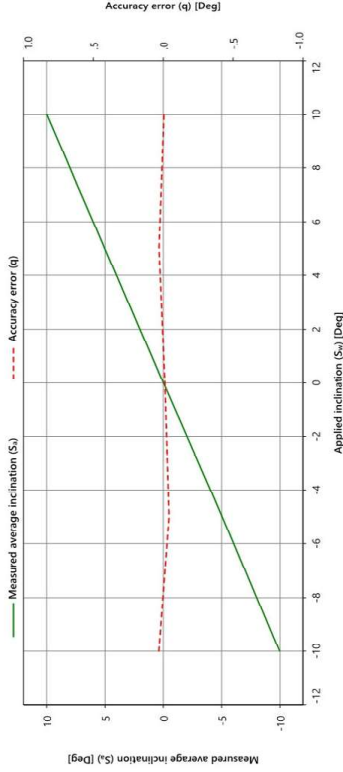
## Slope x Calibration Result [Inclination]

Instrument		Reference	
Manufacturer	Figro	Manufacturer	Hoek-O-Mat
Type	CF15-CF75P87/SO2-P1	Serial Number	2109-0002
	EIM4-V5	Uncertainty	0.6 [Deg]
Serial Number	1701-3285	Calibration Details	
Electronics	7217	Calibration Date	24 Jan 2023 07:34:16
Node Type	7001	Procedure	EUIAF-FNL.M-CAL-PR-005
Hardware Version	5.01	Software Version	3.9.0.53137
Software Version	8.01		

Sensor		Characteristics	
Channel	Slope x [Inclination]	Max accuracy error (q)	[Deg]
Manufacturer	ADXL	Max repeatability error (b)	0.0
Calibrated Range	-10 to 10 Deg	Zero load error (S <sub>0</sub> )	0.1
Maximum Rating	-20 to 20 Deg	Zero load offset (S <sub>0</sub> )	0.0
		Resolution	[Deg]
		Noise RMS	1.3E-05
			0.0



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Applied inclination (S <sub>a</sub> ) [Deg]	Measured inclination 1 (S <sub>1</sub> ) [Deg]	Measured inclination 2 (S <sub>2</sub> ) [Deg]	Measured inclination 3 (S <sub>3</sub> ) [Deg]	Measured average inclination (S <sub>a</sub> ) [Deg]	Accuracy error (q) [Deg]	Repeatability error (b) [Deg]	Expanded Uncertainty (U) [Deg]
-10.0	-10.0	-10.0	-10.0	-10.0	0.0	0.0	0.7
-5.0	-5.0	-5.1	-5.0	-5.0	0.0	0.0	0.7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
5.0	5.0	5.0	5.0	5.0	0.0	0.0	0.7
10.0	10.0	10.0	10.0	10.0	0.0	0.0	0.7

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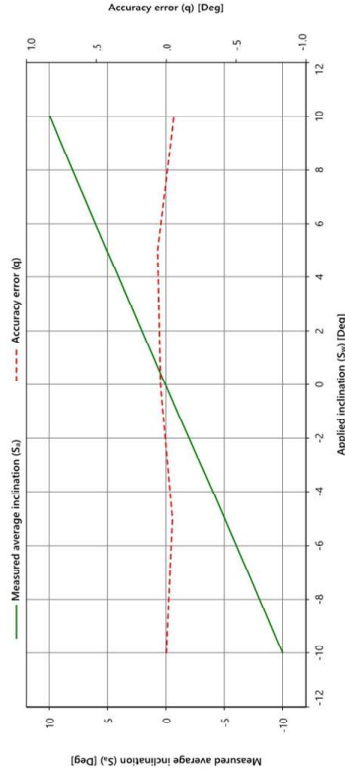
## Slope y Calibration Result [Inclination]



Certificate Number  
FCN23028747

Instrument		Reference	
Manufacturer	Fugro	Manufacturer	Hoek-O-Mat
Type	CP15-CF7SP87/SO2-P1	Serial Number	2109-00C2
Serial Number	1701-3285	Uncertainty	0.6 [Deg]
Electronics	7217	<b>Calibration Details</b>	
Node Type	7001	Calibration Date	24 Jan 2023 07:54:16
Hardware Version	5.01	Procedure	EIAF-FNL.M- CAL-PR-005
Software Version	8.01	Software Version	3.9.0.53137

Channel	Slope y [Inclination]	Unit	Value
Manufacturer	ADXL	[Deg]	0.1
Calibrated Range	-10 to 10 Deg	[Deg]	0.1
Maximum Rating	-20 to 20 Deg	[Deg]	-0.1
Resolution		[Deg]	0.0
Noise RMS		[Deg]	1.32E-05
		[Deg]	0.0



Applied inclination (Sx) [Deg]	Measured inclination 1 (Sx,1) [Deg]	Measured inclination 2 (Sx,2) [Deg]	Measured inclination 3 (Sx,3) [Deg]	Measured average inclination (Sx) [Deg]	Accuracy error (q) [Deg]	Repeatability error (b) [Deg]	Expanded Uncertainty (U) [Deg]
-10.0	-10.0	-10.0	-10.0	-10.0	0.0	0.1	0.7
-5.0	-5.1	-5.0	-5.0	-5.0	0.0	0.0	0.7
0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.7
5.0	5.1	5.1	5.0	5.1	0.1	0.0	0.7
10.0	9.9	10.0	10.0	9.9	-0.1	0.0	0.7

## Symbols, Definitions and References



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- Symbols and Definitions (general)**
- b** Repeatability error, defined as the maximum difference between the measurements of the instrument at the applied value.
  - Noise RMS** Signal noise, defined as the quadratic mean when the sensor is not subjected to load.
  - q** Accuracy error, defined as the difference between the average indicated value by the instrument and the applied value.
  - Resolution** Smallest change in a quantity being measured that causes a perceptible change in the corresponding indication.
  - U** The stated uncertainty is that of the average indicated quantity, and includes the entire calibration method, including the reference and calibrated sensor, but excludes the difference between average indicated value by the instrument and the applied value.
  - v** Reversibility error, defined as the difference between the average indicated value by the instrument at a certain applied value when it was increased and when it was decreased.

- Symbols and Definitions (quantity specific, Q may be substituted for F, P or S, as appropriate)**
- Q<sub>0</sub>** Zero load offset, instrument output when the specified measured quantity value is zero.
  - Q<sub>a</sub>** Average indicated quantity value by the instrument.
  - Q<sub>ax</sub>** Quantity value indicated by the instrument at measurement x.
  - Q<sub>ae</sub>** Zero load error, defined as the difference between the average indicated value by the instrument before and after the load cycle has been applied.
  - Q<sub>w</sub>** Applied reference quantity value.

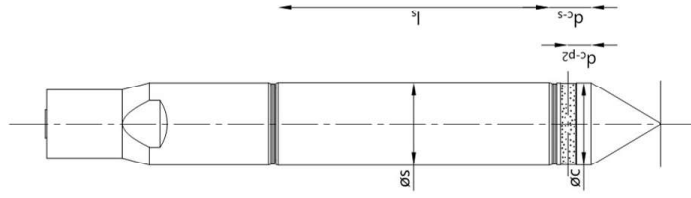
Quantities	
F	Force
P	Pressure
S	Inclination

- References**
- International Organization for Standardization, 2012, ISO 22476-1:2012 Geotechnical investigation and testing, Field testing, Electrical cone and piezocene penetration test. Geneva: ISO.
  - European Co-operation For Accreditation, 2013, Evaluation of the uncertainty of measurement in calibration. European Co-operation For Accreditation, Publication: EA-4/02 M2013.

## Typical Dimensions

<b>Instrument</b>	Fugro
<b>Manufacturer</b>	CP15-CF15PB7502-P1E1M4-V5
<b>Type</b>	1701-3285
<b>Serial Number</b>	

Appendix Applicable to  
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### Typical Dimensions

A <sub>c</sub>	Cross-sectional projected area of the cone	0.0015 m <sup>2</sup>
A <sub>s</sub>	Surface area of the friction sleeve	0.02 m <sup>2</sup>
af	Cone net area ratio	0.58
bf	Friction sleeve net area ratio	0.01392
øc	Diameter of the cylindrical part of the cone	43.85 mm
øS	Diameter of the friction sleeve	44.1 mm
l <sub>s</sub>	Length of the friction sleeve	143.6 mm
d <sub>c-1</sub>	Cone - friction sleeve distance	16 mm
d <sub>c-p2</sub>	Cone - pore 2 distance	6.9 mm

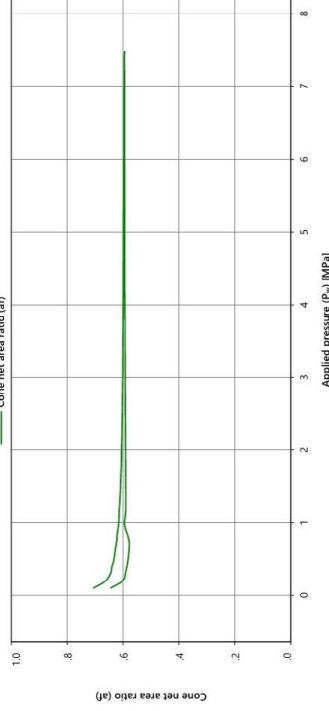
## Cone Net Area Ratio Result

<b>Instrument</b>	Fugro	<b>Reference</b>	Keller PA-33X
<b>Manufacturer</b>	CF15-CF15PB7502-P1	<b>Serial Number</b>	3257-0002
<b>Type</b>	E1M4-V5	<b>Uncertainty</b>	0.0005·P <sub>cs</sub> +0.002 [MPa]
<b>Serial Number</b>	1701-3285	<b>Measurement Details</b>	
<b>Electronics</b>	7217	<b>Measurement Date</b>	24 Jan 2023 12:19:15
<b>Node Type</b>	7001	<b>Procedure</b>	EUIAF-FNL.M-CAL-PR-003
<b>Hardware Version</b>	5.01	<b>Software Version</b>	33.0.53137
<b>Software Version</b>	8.01		

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<b>Characteristics</b>	<b>Unit</b>	<b>Value</b>
Cone net area ratio (af)		0.59

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



Applied pressure (P <sub>cs</sub> ) [MPa]	Measured cone net area ratio 1 (af1)	Measured cone net area ratio 2 (af2)	Measured cone net area ratio 3 (af3)	Measured average cone net area ratio (af)
1.400	0.609	0.610	0.611	0.610
2.800	0.601	0.602	0.603	0.602
4.200	0.599	0.599	0.599	0.599
5.600	0.597	0.597	0.598	0.598
7.000	0.596	0.597	0.597	0.597
5.600	0.594	0.594	0.594	0.594
4.200	0.593	0.594	0.594	0.594
2.800	0.592	0.593	0.593	0.592
1.400	0.589	0.591	0.591	0.590

Diagram is not to scale

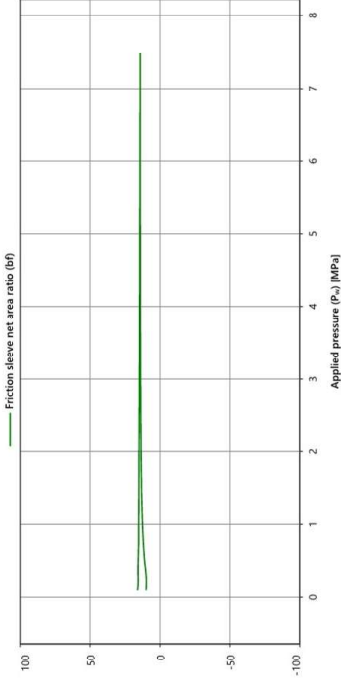
## Friction Sleeve Net Area Ratio Result

Instrument		Reference	
Friction sleeve net area ratio (bf)	Figuro	Manufacturer	Keller PA-33X
Type	CP15-CF7SP87S02-P1	Serial Number	3257-00C2
	ETM4-V5	Uncertainty	0.0005·P <sub>a</sub> +0.002 [MPa]
Serial Number	1701-3285		
Electronics	7217		
Node Type	7001		
Hardware Version	5.01		
Software Version	8.01		

Appendix Applicable to Certificate Number FCN23028747

Characteristics	Unit	Value
Friction sleeve net area ratio (bf)	[ ]	0.01420

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



Applied pressure (Pa) [MPa]	Measured friction sleeve net area ratio (bf) 1 (bf1)	Measured friction sleeve net area ratio (bf) 2 (bf2)	Measured friction sleeve net area ratio (bf) 3 (bf3)	Measured average Friction sleeve net area ratio (bf)
1.400	0.013	0.013	0.013	0.013
2.800	0.014	0.014	0.014	0.014
4.200	0.014	0.014	0.014	0.014
5.600	0.014	0.014	0.014	0.014
7.000	0.014	0.014	0.014	0.014
5.600	0.014	0.014	0.014	0.014
4.200	0.015	0.015	0.015	0.015
2.800	0.015	0.015	0.015	0.015
1.400	0.015	0.015	0.015	0.015

## Symbols and Definitions

Appendix Applicable to Certificate Number FCN23028747

Symbols and Definitions (general)

- af Cone net area ratio, defined as the factor between the applied pressure to the instrument and the indicated cone resistance.
- af,x Measured cone net area ratio at measurement x.
- bf Friction sleeve net area ratio, defined as the factor between the applied pressure to the instrument and the indicated sleeve friction.
- bf,x The measured friction sleeve net area ratio at measurement x.

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

Q<sub>a</sub> Applied reference quantity value.

Quantities

P Pressure

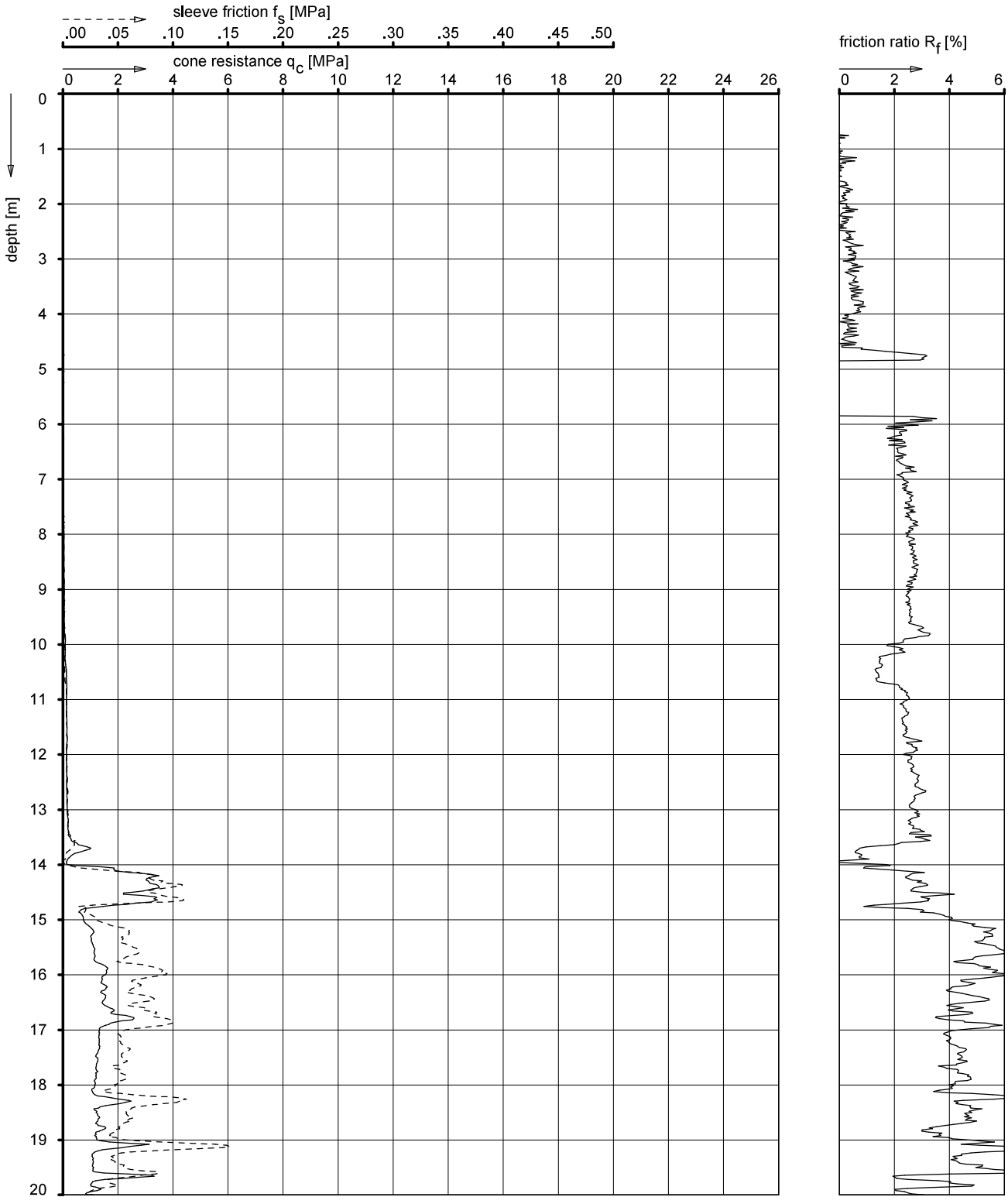


# Appendix I

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Piezocone Penetration Test (CPT) Detail

Results



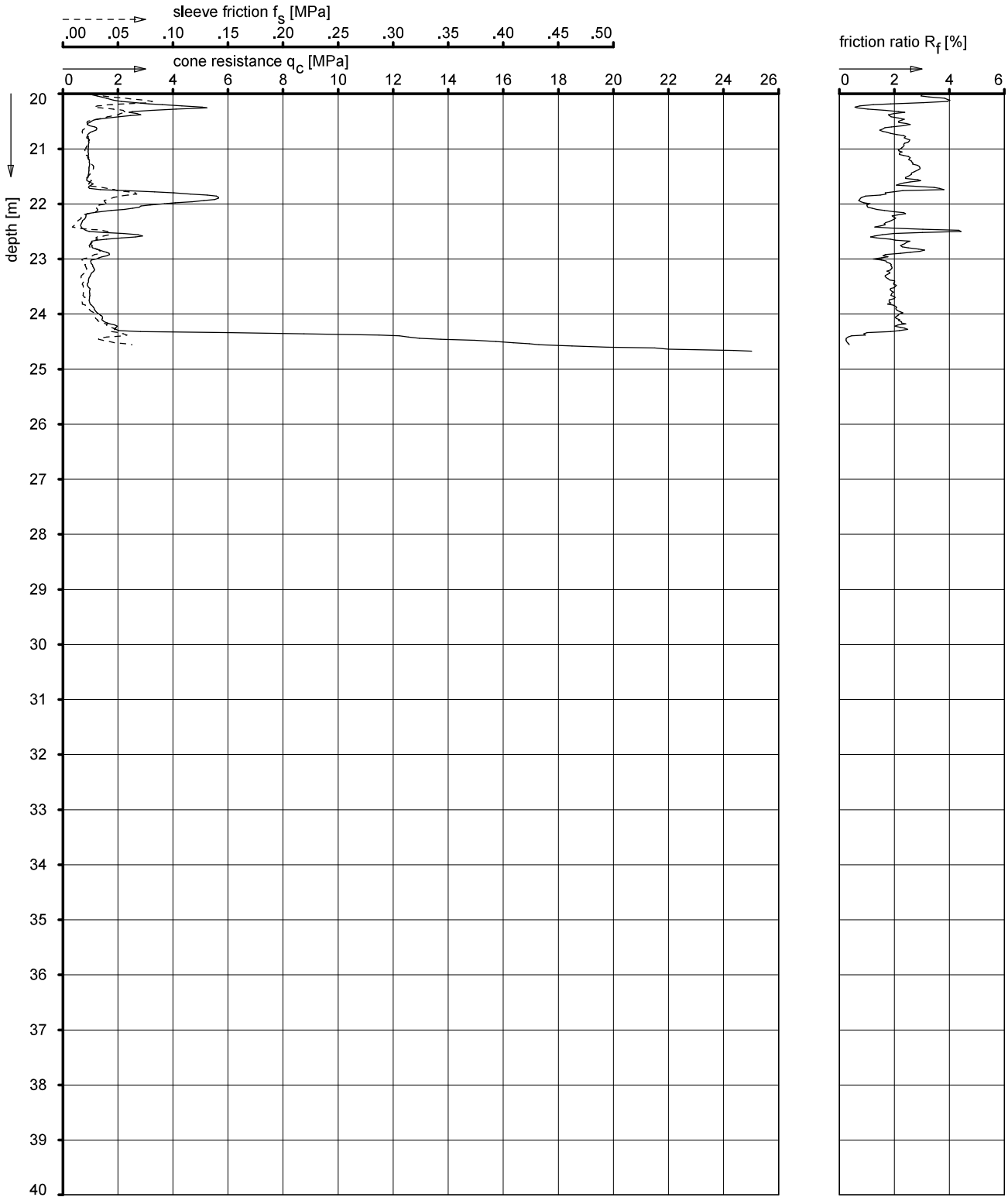
location : GE/2021/03.23A Nim Wan  
 test : CP1  
 test date : 15-Nov-2023

penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-02 / 10:11:43  
 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



location : GE/2021/03.23A Nim Wan  
 test : CP1  
 test date : 15-Nov-2023

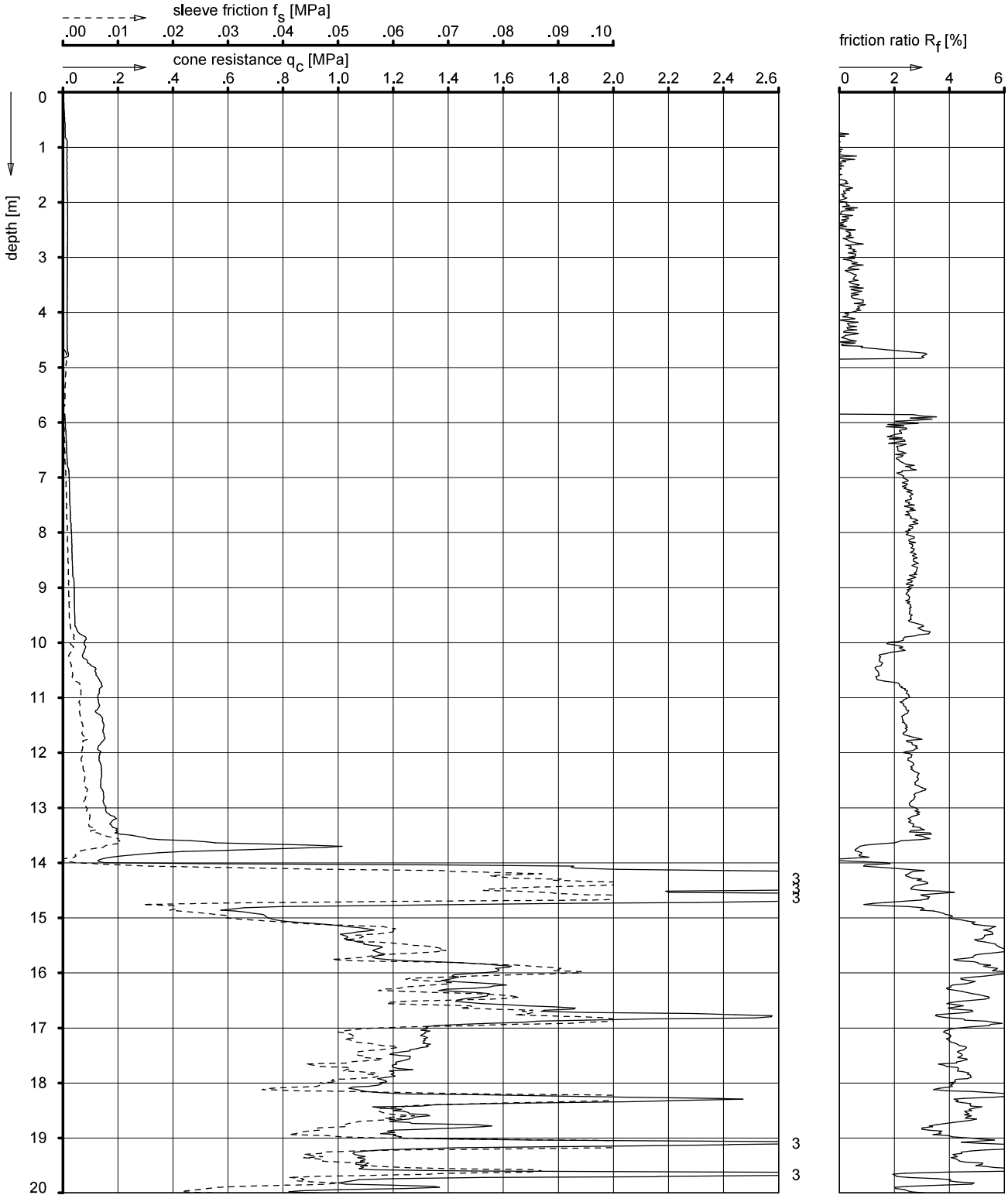
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 processed by:  
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 CPT file :  
 start level :  
 coordinates :  
 E 809775.599

F7.5CKE2HAW<sub>2</sub>/B/3285  
 KENNY.KWONG  
 2023-12-02 / 10:11:43  
 CP1.000  
 +6.18 mPD  
 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



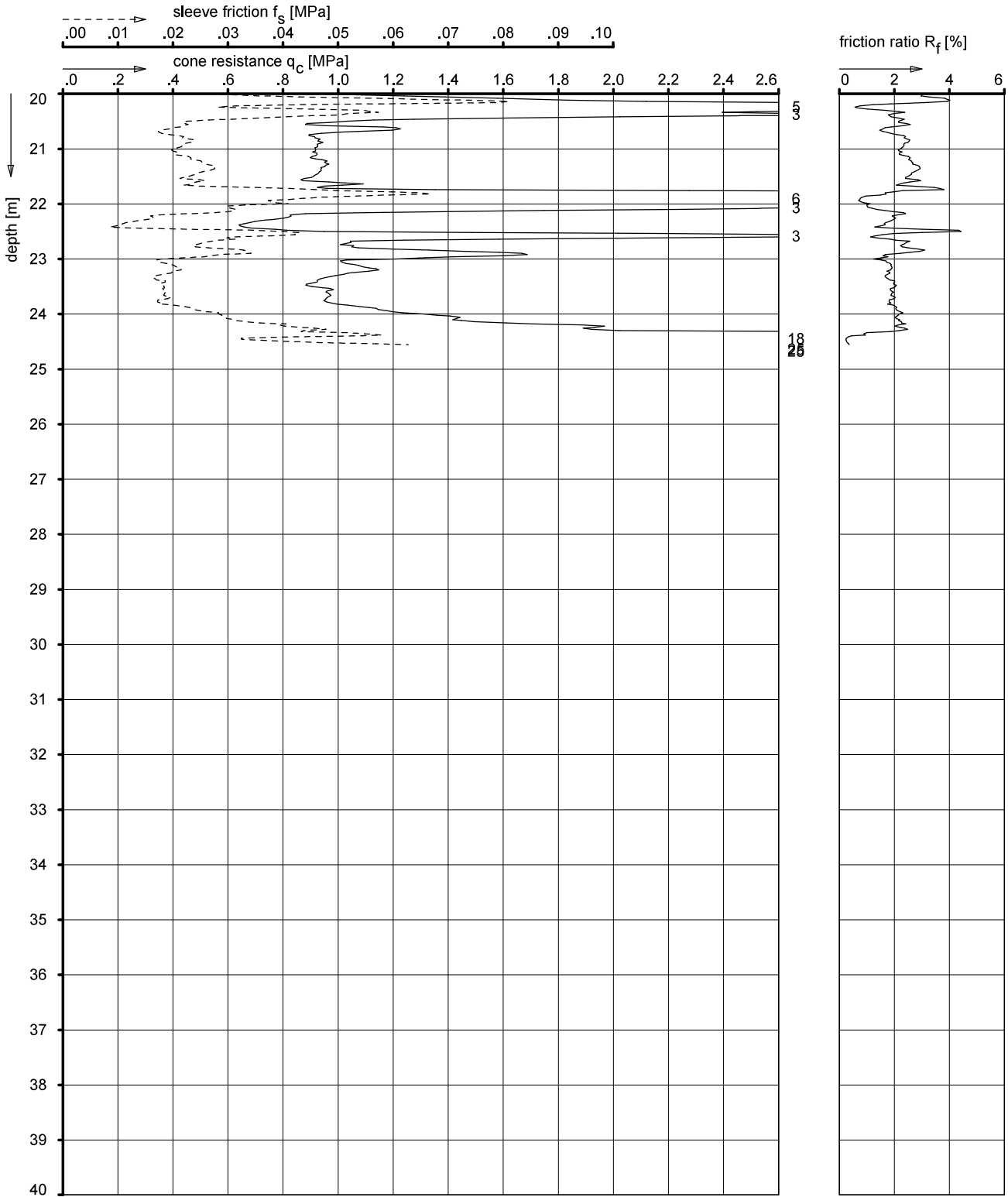
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 test : CP1  
 test date : 15-Nov-2023

penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-02 / 10:11:43  
 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



location : GE/2021/03.23A Nim Wan  
 test : CP1  
 test date : 15-Nov-2023

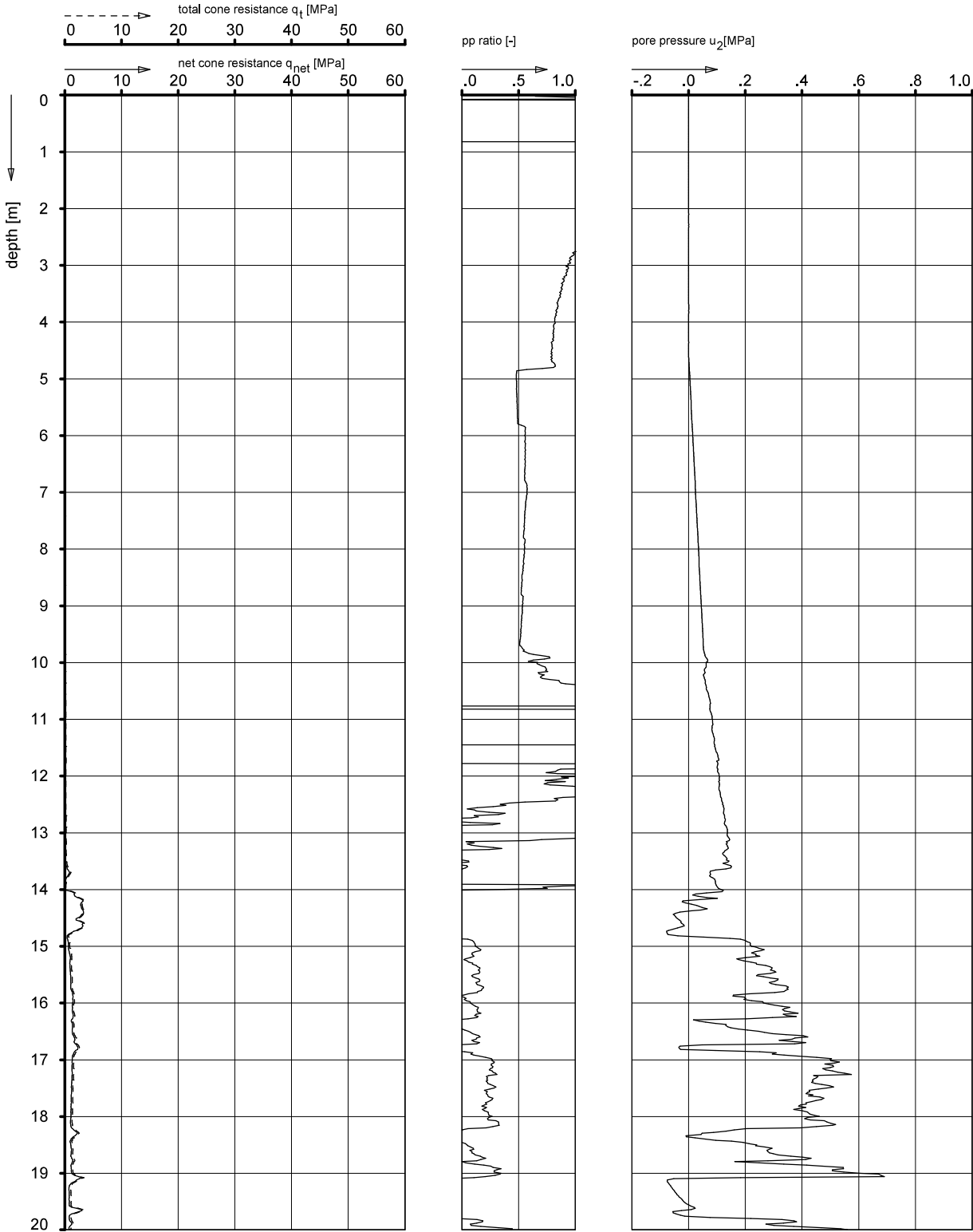
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 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur





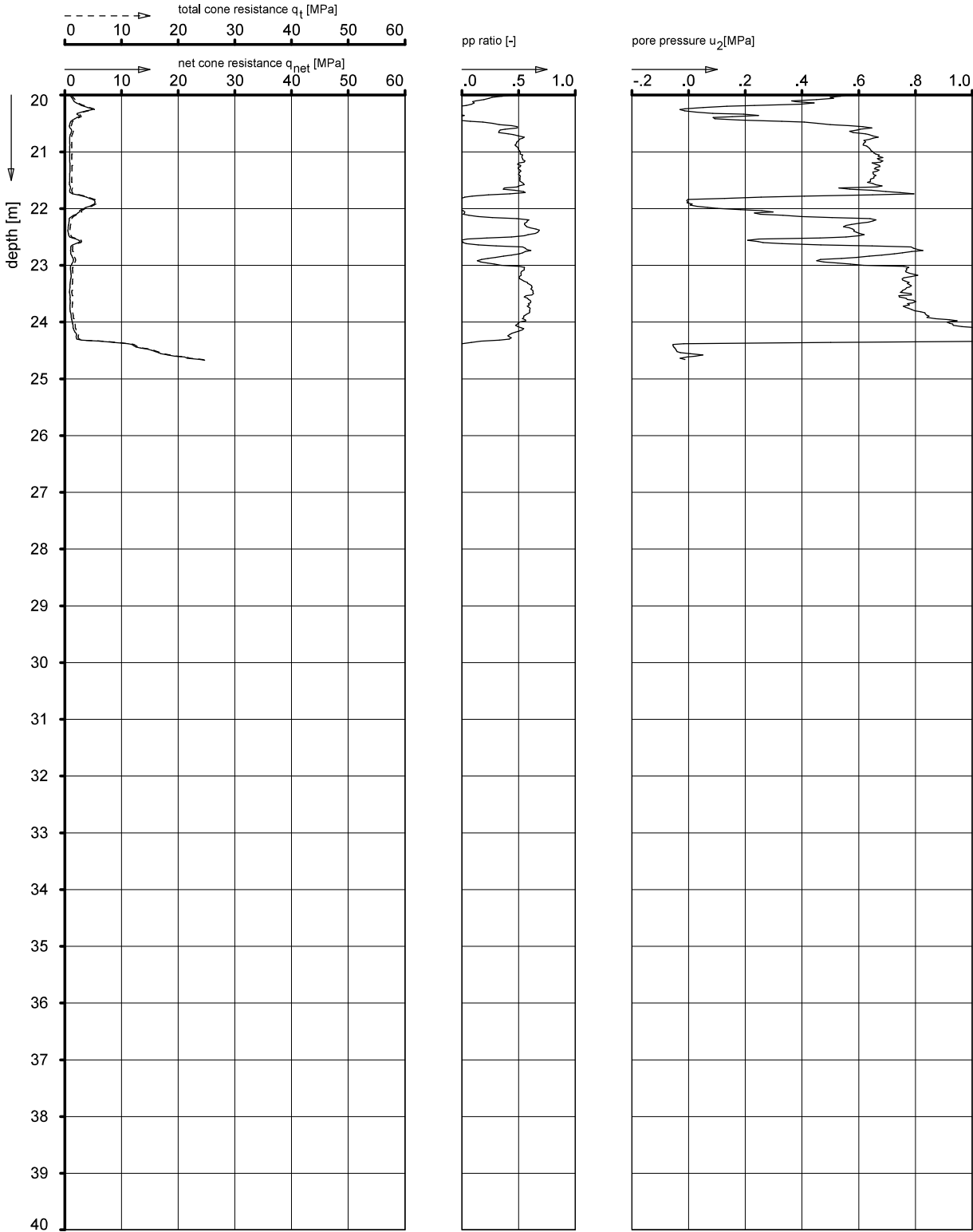
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 test date : 15-Nov-2023

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 processed by: KENNY.KWONG  
 process date: 2023-12-02 / 10:11:43  
 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



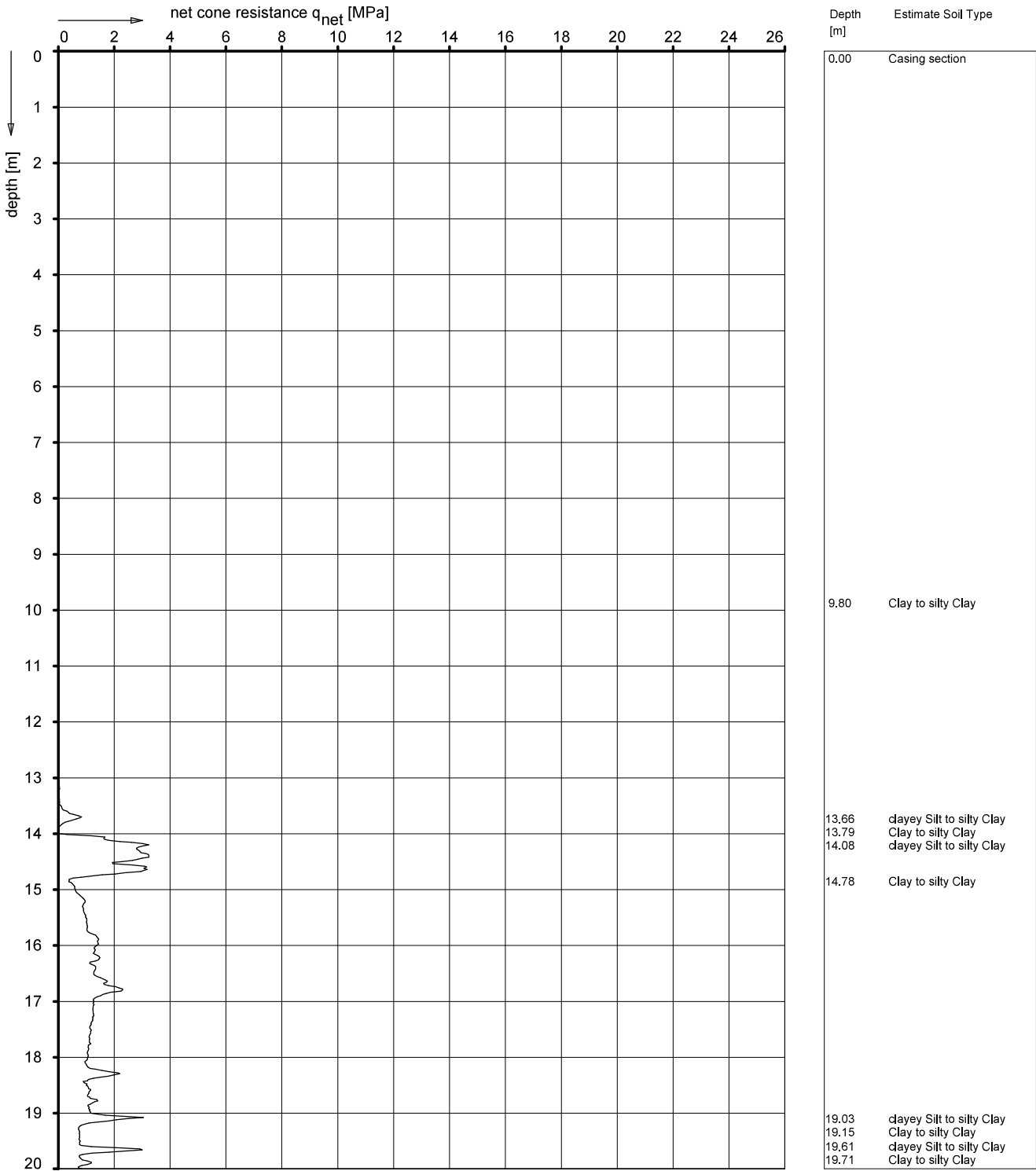
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 test : CP1  
 test date : 15-Nov-2023

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 process date: 2023-12-02 / 10:11:43  
 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur

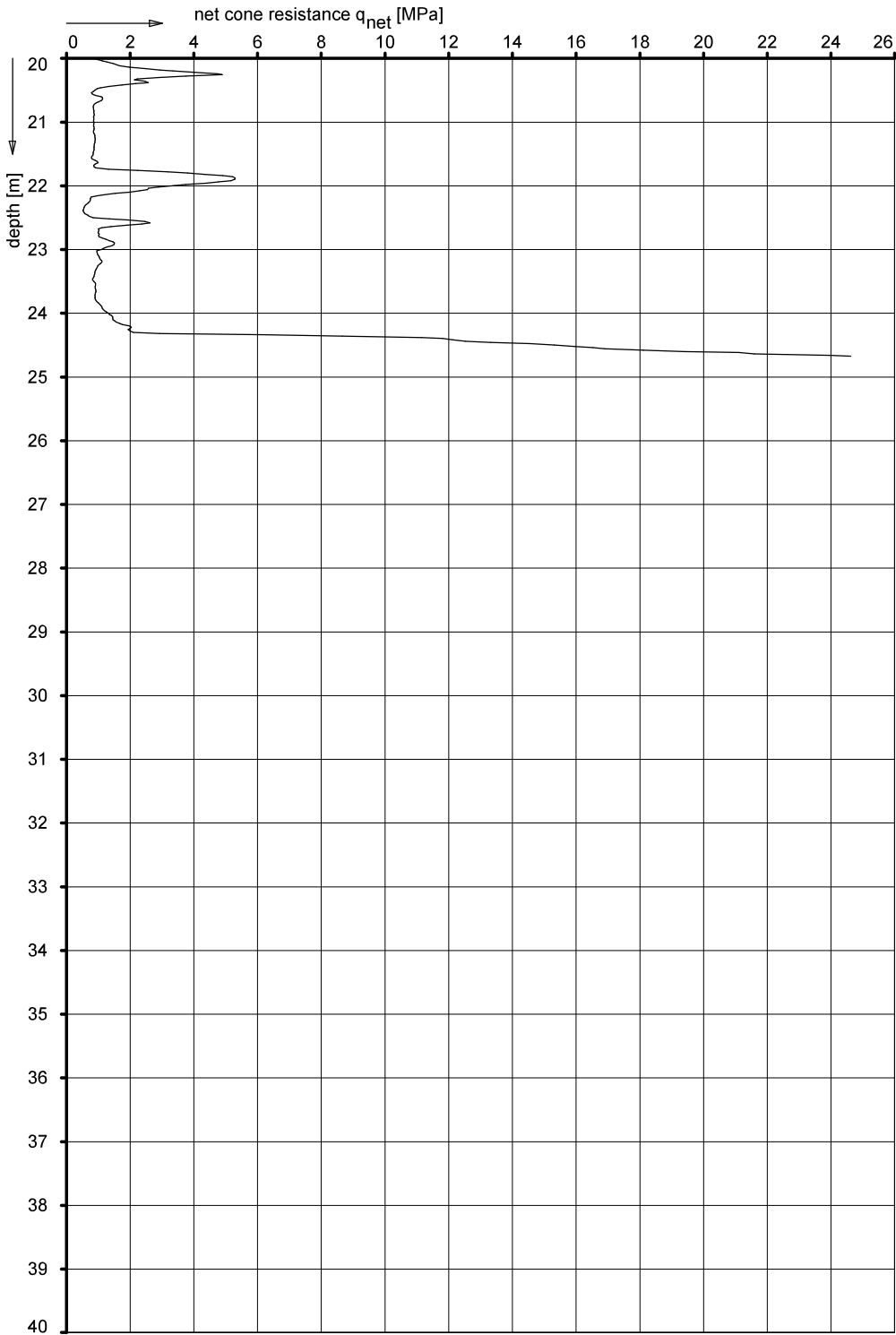


location : GE/2021/03.23A Nim Wan  
 test : CP1  
 test date : 15-Nov-2023

penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-02 / 10:11:43  
 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305  
 Checked by : Andre Mazur



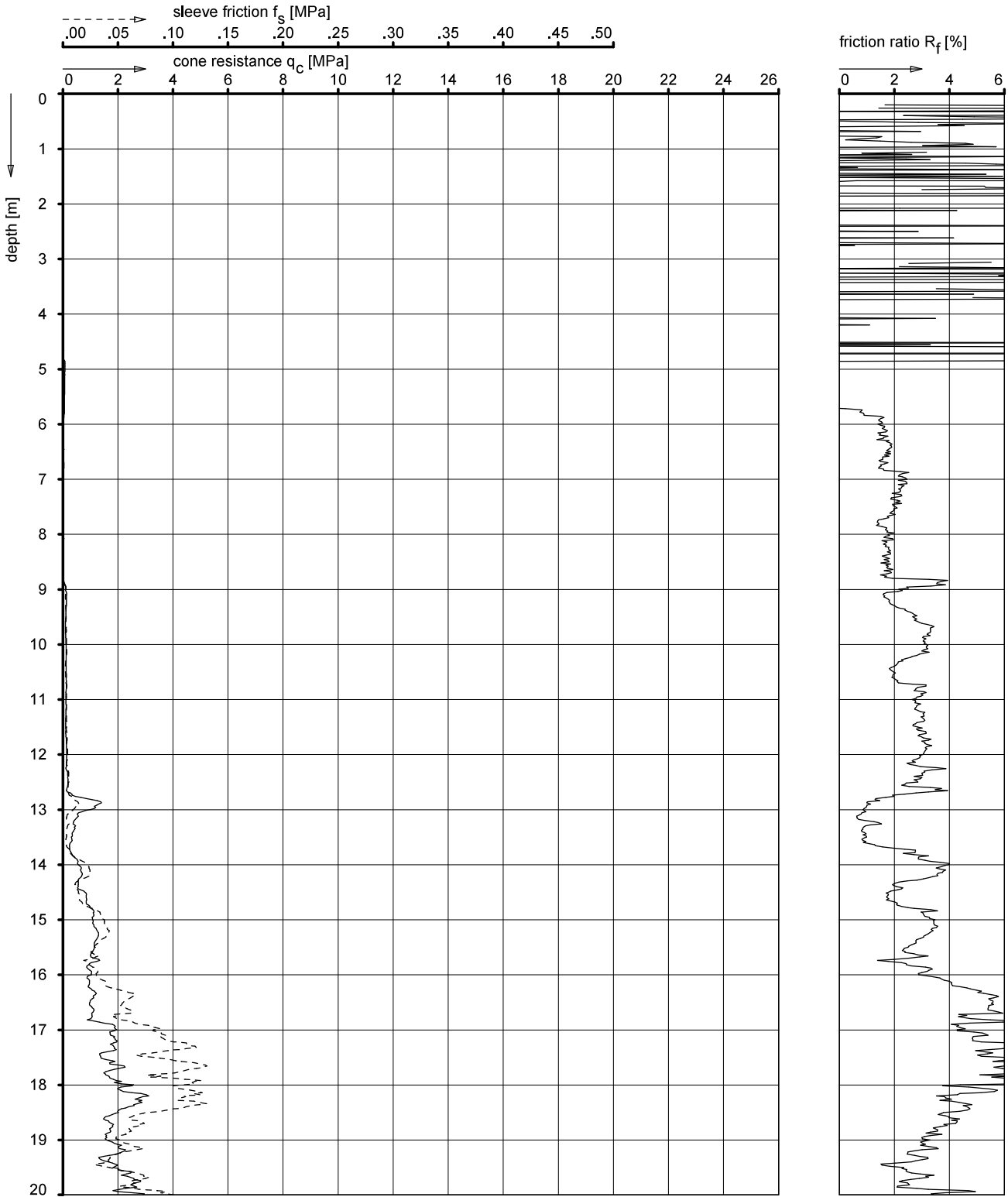
Depth [m]	Estimate Soil Type
19.71	Clay to silty Clay
20.15	silty Sand to sandy Silt
20.29	clayey Silt to silty Clay
20.44	Clay to silty Clay
21.74	silty Sand to sandy Silt
22.14	Clay to silty Clay
22.52	clayey Silt to silty Clay
22.64	Clay to silty Clay
24.04	clayey Silt to silty Clay
24.33	Sand to silty Sand
24.68	End of Test

location : GE/2021/03.23A Nim Wan  
 test : CP1  
 test date : 15-Nov-2023

penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-02 / 10:11:43  
 CPT file : CP1.000  
 start level : +6.18 mPD  
 coordinates :  
 E 809775.599 N 831675.880

PIEZOCONE PENETRATION TEST

Report : 21022305  
 Checked by : Andre Mazur



location : GE/2021/03.23A Nim Wan  
 test : CP2  
 test date : 14-Nov-2023

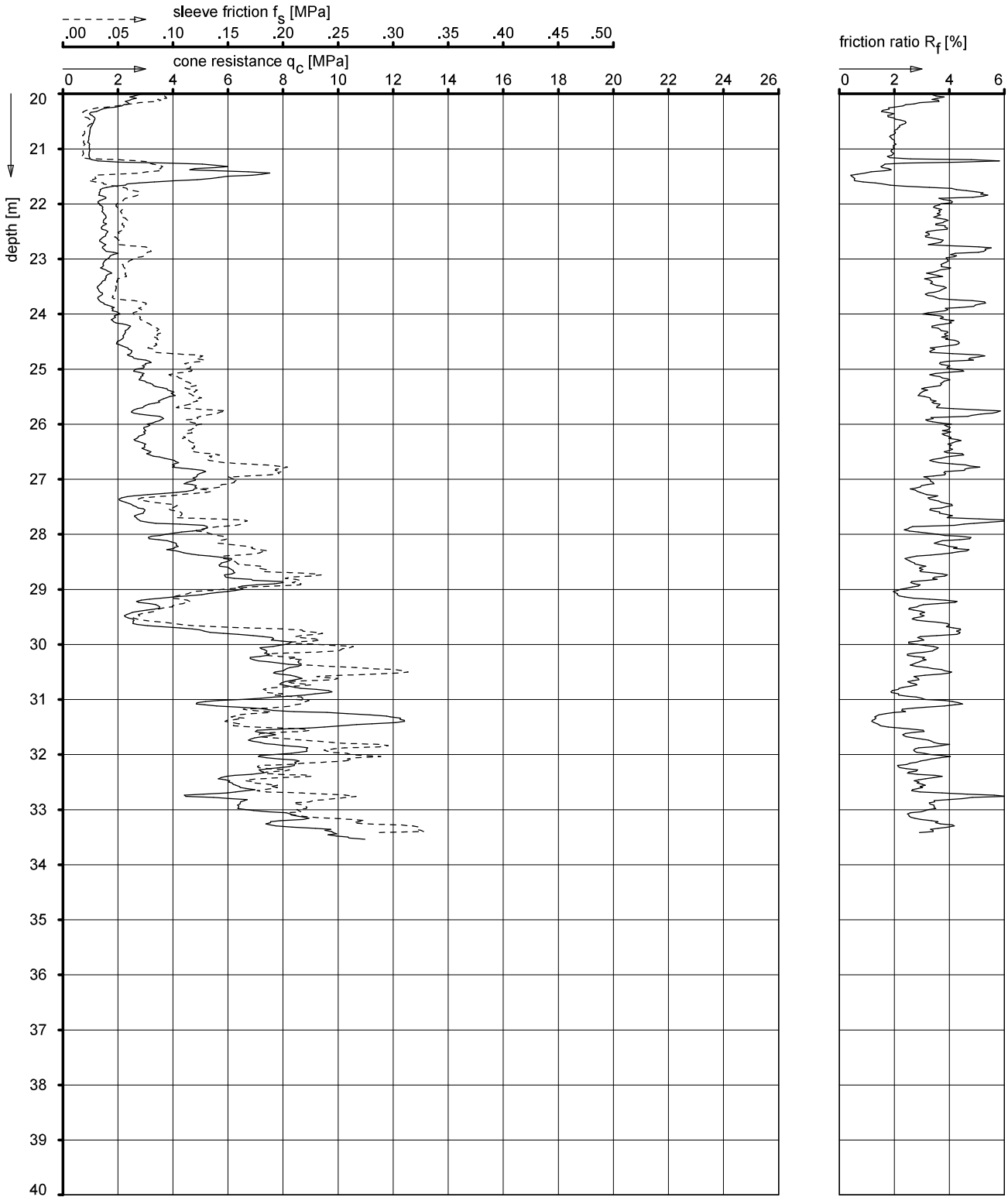
penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-06 / 17:24:50  
 CPT file : CP2.001  
 start level : +6.39 mPD  
 coordinates :  
 E 810101.938 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur





location : GE/2021/03.23A Nim Wan  
 test : CP2  
 test date : 14-Nov-2023

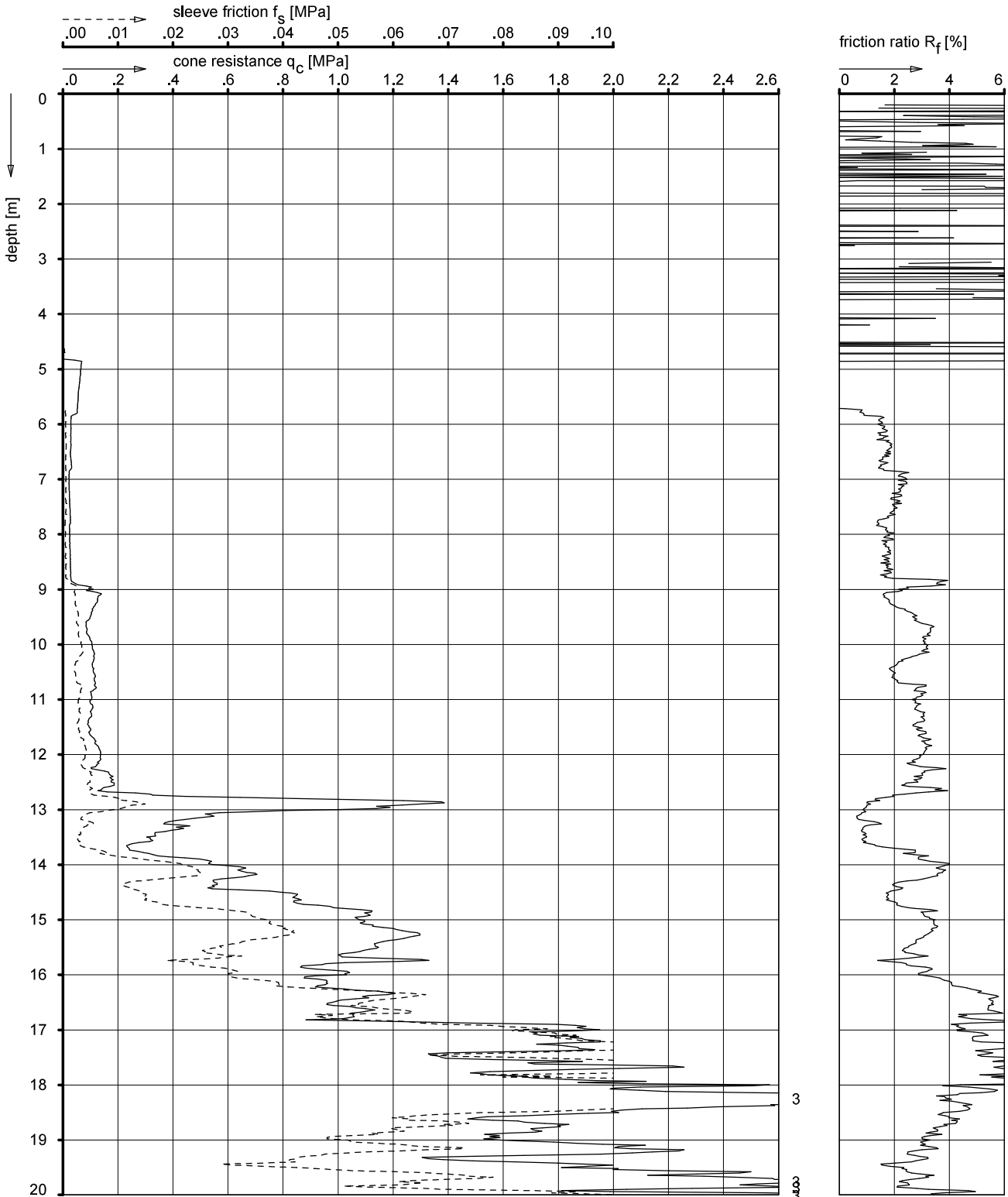
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 start level :  
 coordinates :  
 E 810101.938

F7.5CKE2HAW<sub>2</sub>/B/3285  
 KENNY.KWONG  
 2023-12-06 / 17:24:50  
 CP2.001  
 +6.39 mPD  
 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



location : GE/2021/03.23A Nim Wan  
 test : CP2  
 test date : 14-Nov-2023

penetrometer:  
 processed by:  
 process date:  
 CPT file :  
 start level :  
 coordinates :  
 E 810101.938

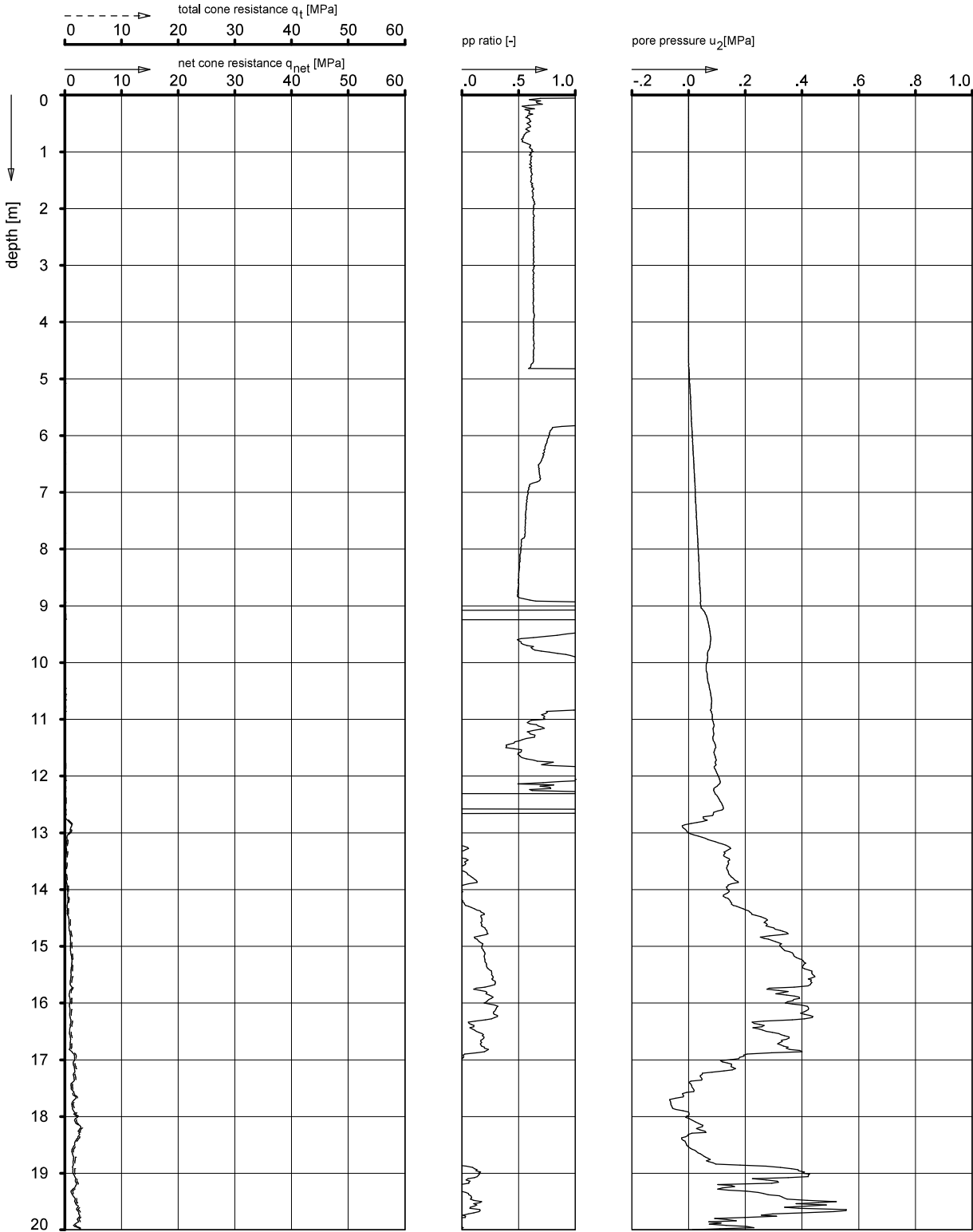
F7.5CKE2HAW<sub>2</sub>/B/3285  
 KENNY.KWONG  
 2023-12-06 / 17:24:50  
 CP2.001  
 +6.39 mPD  
 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur





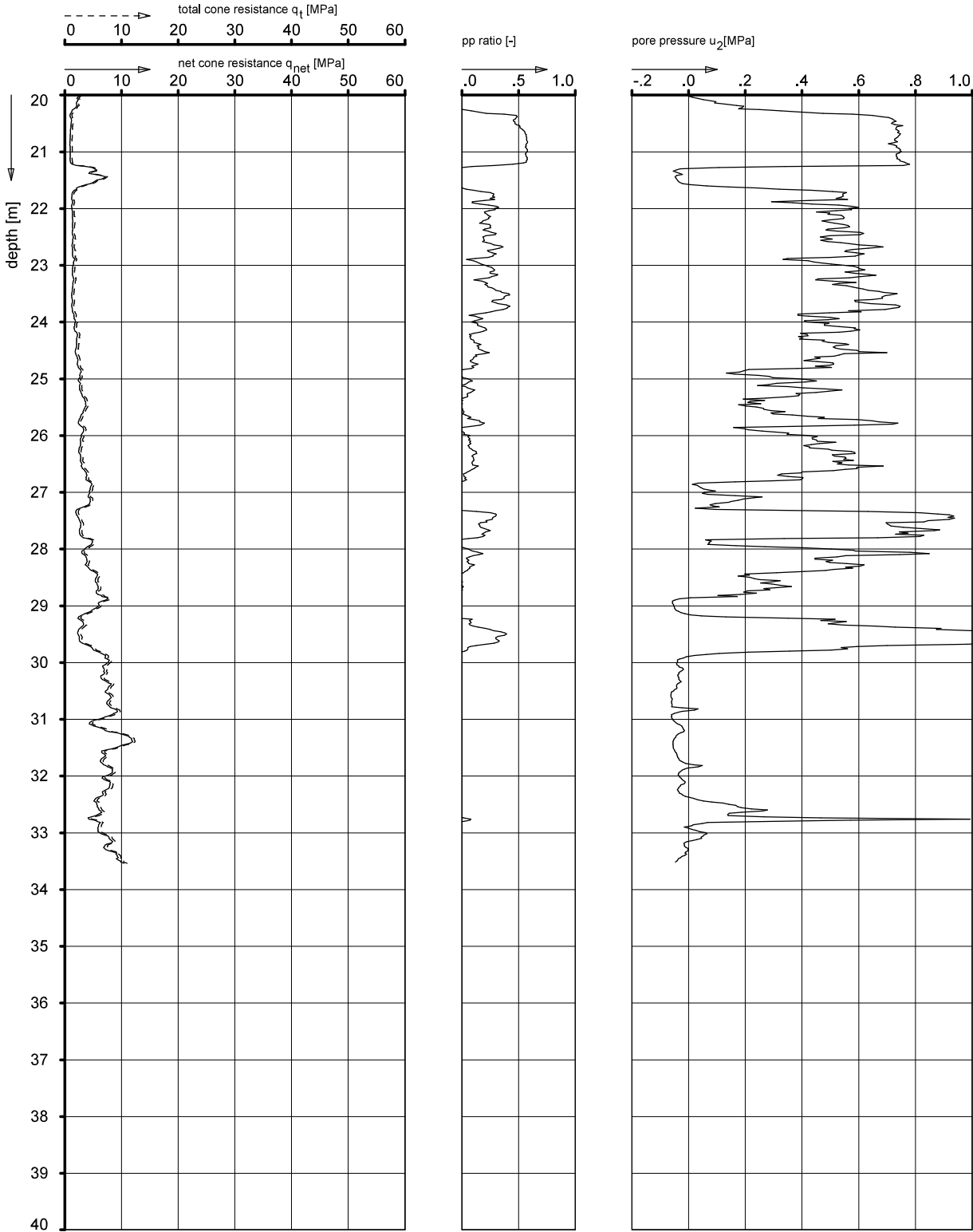
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 test date : 14-Nov-2023

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 processed by: KENNY.KWONG  
 process date: 2023-12-06 / 17:24:50  
 CPT file : CP2.001  
 start level : +6.39 mPD  
 coordinates :  
 E 810101.938 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



location : GE/2021/03.23A Nim Wan  
 test : CP2  
 test date : 14-Nov-2023

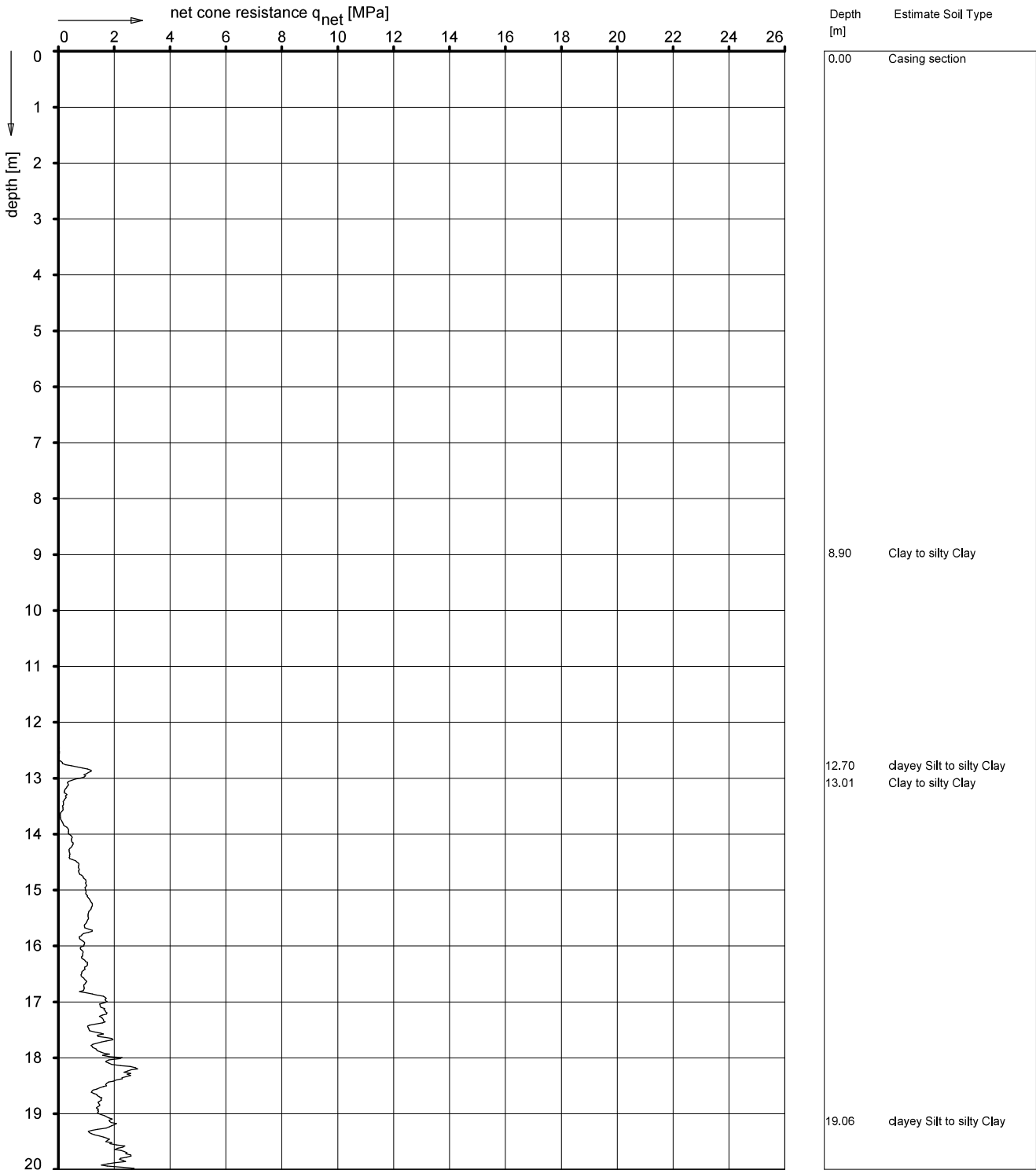
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 processed by: KENNY.KWONG  
 process date: 2023-12-06 / 17:24:50  
 CPT file : CP2.001  
 start level : +6.39 mPD  
 coordinates :  
 E 810101.938 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305

Checked by : Andre Mazur



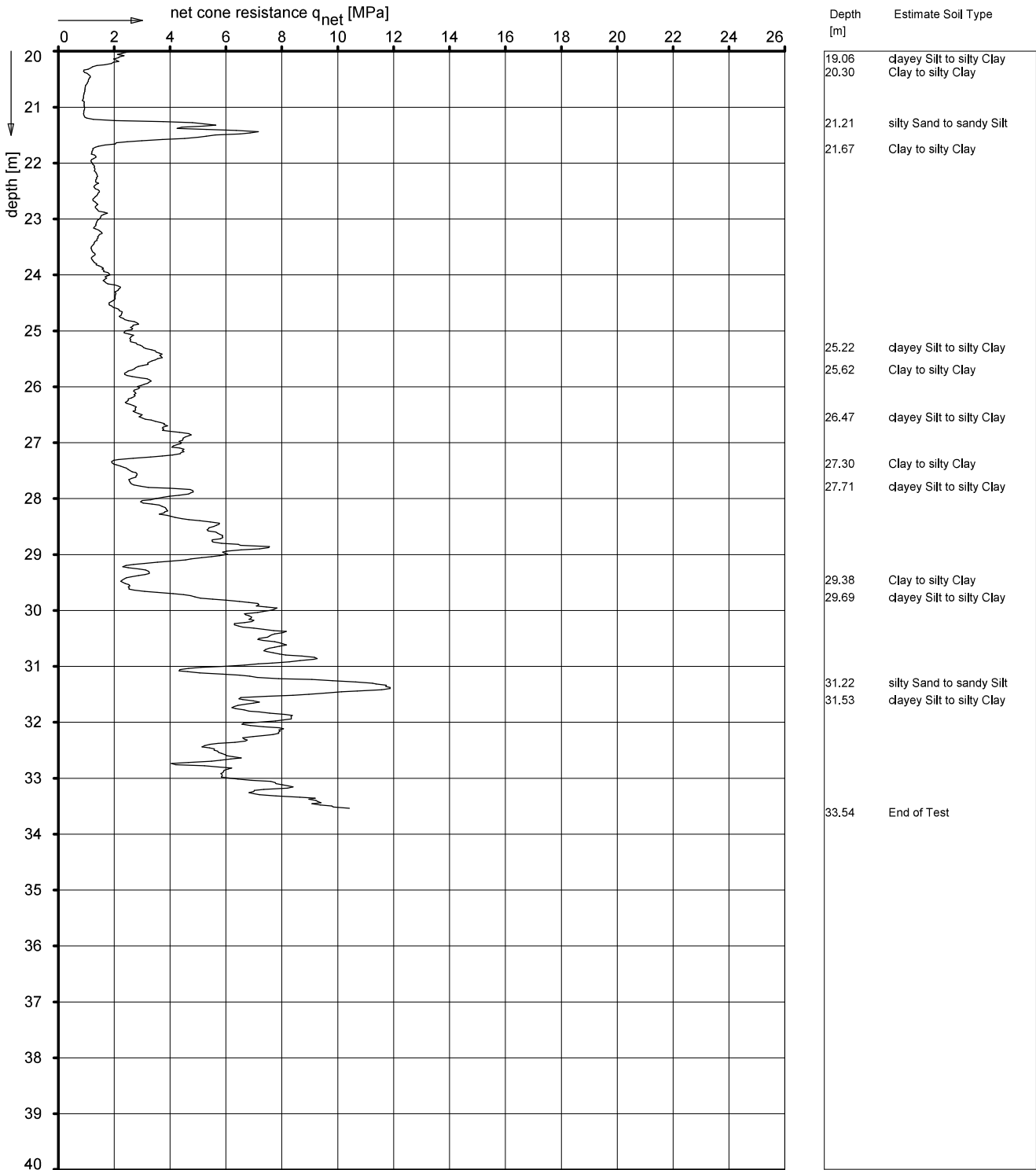


location : GE/2021/03.23A Nim Wan  
 test : CP2  
 test date : 14-Nov-2023

penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-06 / 17:24:50  
 CPT file : CP2.001  
 start level : +6.39 mPD  
 coordinates :  
 E 810101.938 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305  
 Checked by : Andre Mazur



location : GE/2021/03.23A Nim Wan  
 test : CP2  
 test date : 14-Nov-2023

penetrometer: F7.5CKE2HAW<sub>2</sub>/B/3285  
 processed by: KENNY.KWONG  
 process date: 2023-12-06 / 17:24:50  
 CPT file : CP2.001  
 start level : +6.39 mPD  
 coordinates :  
 E 810101.938 N 831743.639

PIEZOCONE PENETRATION TEST

Report : 21022305  
 Checked by : Andre Mazur

# Appendix J

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Chain of Custody Records





FUGRO TECHNICAL SERVICES LIMITED  
 Fugro Development Centre  
 5 Lok Yi Street, Tai Lam  
 Tuen Mun, NT  
 Hong Kong

**RECORD OF SEDIMENT SAMPLE & COLLECTION UNDER ETWB TC(W) NO. 34/2002/PNAP\_ADV-21**

Project Name: Agreement No. CE 26/2022 (EP), Development of Integrated Waste.  
 Name of Project Proponent: Binaries  
 Address: 42/F, AIA Tower, How Ming ST, Kwan Tung, KLN.  
 Contact Person: CHIU WAN YUEN  
 Telephone No.: 26087320 / 66982858  
 E-mail address: chinwy@binaries.com  
 Contract No: CE 26/2022 CEP  
 Fax No.:

**Sediment Sampling**

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested					Remarks	
					Metals	Metalloid	LMW PHAS	HMW PHAS	Total PCBs		TBT
G52	1-12-2023 10:15	E810101.525		Water sample							18L
G52	1-12-2023 10:20	N831744.102	Surface	Grab sample							8L x 1 bag, 1L x 1 bag, 1 jar

**Sampling Conducted by:**

Company Name: FUGRO  
 Address: 19/E, Fugro House, 1 Kwai On Rd.  
 Person-in-charge: Leong Seb on  
 Signature: [Signature]  
 Date & Time: 01-12-2023 17:30  
 Phone No.: 65727590

**Sampling Supervised by (if any):**

Company Name: Binaries  
 Address: 42/F, AIA Tower, How Ming ST, Kwan Tung  
 Responsible Person: CHIU WAN YUEN  
 Signature: [Signature]  
 Date & Time: 01-12-2023 13:30  
 Phone No.: 66982858

**Samples Received by:**

Name of Laboratory: 45 Lok Yi Street, Tai Lam Tuen Mun, NT  
 Address: FTS  
 Responsible Person: M.C. Fung  
 Signature: [Signature]  
 Date & Time: 1/12/2023 12:10  
 Phone No.: 24527965





FUGRO TECHNICAL SERVICES LIMITED  
Fugro Development Centre  
5 Lok Yi Street, Tai Lam  
Tuen Mun, NT  
Hong Kong

**RECORD OF SEDIMENT SAMPLE & COLLECTION UNDER ETWB TC(W) NO. 34/2002/PNAP ADV-21**

(sheet 1 of 1)

Project Name: Development of Integrated Waste Management Facilities Phase 2 - / D.C. (SAI) Contract No: CE 26/2022 (EP)  
 Name of Project Proponent: Binnies  
 Address: 42/F, AIA Tower, Hono Ming St., Kowloon Tong KLN.  
 Contact Person: CHIU WAN YUEN  
 Telephone No.: 6698 2838 E-mail address: chiuwy@binnies.com Fax No.: ✓

**Sediment Sampling**

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested					Remarks	
					Metals	Metalloid	LMW PHAS	HMW PHAS	Total PCBs		TBT
Ref. sample	5-12-2023 10:00	E850237.101 N720060.665	surface	grab sample							18L

**Sampling Conducted by:**  
 Company Name: FUGRO  
 Address: 19/F, Fugro House, 1 Kwai on Rd.  
 Person-in-charge: Leong Ada on  
 Telephone No.: 6532-7590  
 Signature: \_\_\_\_\_  
 Date & Time: 5-12-2023

**Sampling Supervised by (if any):**  
 Company Name: Binnies  
 Address: 42/F, AIA Tower  
 Responsible Person: CHIU WAN YUEN  
 Telephone No.: 6698 2838  
 Signature: \_\_\_\_\_  
 Date & Time: 5-12-2023

**Samples Received by:**  
 Name of Laboratory: FTL  
 Address: 5 Lok Yi Street, Tai Lam - Tuen Mun N.T.  
 Responsible Person: M. C. Yung  
 Telephone No.: 2452 7965  
 Signature: \_\_\_\_\_  
 Date & Time: 05/12/2023

13:45  
13:45

# Appendix K

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Digital and Media Index Records

# Appendix L

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Photograph Digital Images

(Master Copy Only)