

**PROPOSED EXPANSION OF CONTAINER TERMINAL CT10 - CT19
AND ITS ASSOCIATED WORKS AT WESTPORTS, PULAU INDAH,
SELANGOR.**

**FACTUAL REPORT
VOL. 3 CONE PENETRATION TEST**

Job No. : SG/1281/2018

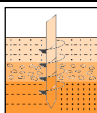
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P.O. Box 266,
Pulau Indah,
42009 Port Klang, Selangor.
Tel : 03 3169 4000

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B1 (1-4), Block B, Plaza Dwitasik,
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56000 Kuala Lumpur.
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STRATA GEOTECHNICS SDN. BHD

We specialized in Micropile, Slope Stabilization, Ground Improvement, Soil Investigation, Waterwell, Structural Repair and Laboratory Testing

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1.0 INTRODUCTION

This report presents the results of the cone penetration test carried out for the project “**PROPOSED EXPANSION OF CONTAINER TERMINAL CT10 - CT19 AND ITS ASSOCIATED WORKS AT WESTPORTS PULAU INDAH SELANGOR.**”.

Strata Geotechnics Sdn. Bhd. was appointed by the client **Westports (M) Sdn. Bhd.** to carry out the above-mentioned works.

The consulting engineer for the above-mentioned project was **HSS Integrated Sdn. Bhd.**

Field work was carried out on 14th January 2019 for cone penetration test (CPT) and was completed on 11st February 2019.

2.0 OBJECTIVES

The main objectives of this cone penetration test are to: -

- (1) Determine the geotechnical engineering properties of the sub-soil condition at the proposed site for foundation design.

3.0 GUIDELINE OF PRACTICE

The cone penetration test was carried out in compliance and accordance to the followings:

- (1) British Standard Code of Practice **BS: 5930-1981 (formerly CP2001:1957) “Site Investigations”**
- (2) British Standard Code of Practice **BS: 1377-1990 “Method of Test for Soil for Civil Engineering Purposes”**
- (3) Specifications spelt out in original quotation document as issued by the client.

4.0 SCOPE OF WORKS

To achieve the objectives mentioned above, 5 numbers of piezocones test, were carried respectively at the location by the client's representative at site.

The piezocone tests' locations are shown by the client's representative at site.

5.0 FIELD EXPLORATION

5.1 PIEZOCONE TEST

I. DESCRIPTION OF THE CONE PENETRATION TEST

II. EQUIPMENT

The equipment used for the piezocone test follows the British Standard Code Of Practice BS 1377: Part 9: 1990 and the International Reference Test Procedure for the Cone Penetration Test (CPT) and the Cone Penetration Test with pore pressure (CPTU).

The cone has transducers to measure cone resistance, local friction, water pressure, uniaxial inclination and temperature. Cones are calibrated by manufacturer. A filter element (Polypropylene) with diameter 35mm one size located in the cylindrical extension above the base of the cone allows the pore water pressure generated during the penetration to be measured by means of a pressure transducer located in the piezometer tip (u2 type cone). In order to ensure that pore pressure measurements are not affected by the presence of air in the measuring transducer, a de-airing procedure is carried out as required. The filters are saturated by de-aired silicone or glycerin. A new filter is recommended for each sounding location. Please note that following the initial de-airing procedure, it will only be repeated if the cone is removed from the water into air, or at the beginning of each working day, whichever is first.

The data acquisition equipment consists of the Extended Filed Computer System (EFCS) and a printer. Signals from the cone are transmitted to the EFCS via a cable threaded through the sounding tubes. Dept registration is provided by an event marker activated via the action of the hydraulic rams. The equipment provided:-

- a. A continuous listing (50mm interval) of measured parameters recorded both on a magnetic cartridge memory and as printed hard copy.
- b. Graphical presentation of measured parameters at any scale required.
- c. Resolution of the measured parameter is:-

Cone resistance	:	0.01 MPa
Local friction	:	0.1 kPa
Pore water pressure	:	1 kPa
Inclination	:	0.1 degrees
Temperature	:	0.1 degree Celsius

The jacking unit is a 100KN twin cylinder hydraulic ram with 120KN upward forces. The jacks, data acquisition and all accessories are mounted on a self-propelled crawler chassis. The total weight of the unit is approximately 20 ton, additional reaction can be provided by screw anchors installed using a hydraulic turning device. The equipment details and calibration charts for the piezocone test are attached in **APPENDIX A**, and the test results are shown in **APPENDIX B** of this report. Attach with a compact disc.

III. METHOD OF TEST

Cone Penetration Test

The method of carrying out the penetration test follows the British Standard Code Of Practice BS 1377: Part 9: 1990 the International Reference Test Procedure for the Cone Penetration Test (CPT) and the Cone Penetration Test with pore pressure (CPTU) with details as follows:-

- a. The crawler is set up with the jacks vertical
- b. The cone is connected to the EFCS and the whole system allowed warming up for approximately 30 minutes during which time the cone is placed in a water bath at constant temperature.
- c. Once warming up is complete and readings are steady, baseline (zero load value) is recorded and penetration started.
- d. The piezocone is advanced into the ground at a rate of 20mm/s while the measured parameters and recorded every 25mm.

Dissipation Test

1. Dissipation test will be carried out at the middle of the soil strata to get a reliable parameter of the corresponding soil strata (or) at Engineer or Client's representative specified depth.
2. Dissipation test will be carried out by stopping penetration at specified depth and record the in-situ pore pressure and time taken. (This recording will be automatically carried out by the EFCS program). During the dissipation test process the rods will be clamped.
3. When the pre pressure dissipation reach 50% or more the dissipation test will be terminated by continuing penetration (continuing CPT).
4. The test is terminated either at the limit of the equipment or at a specified depth, after which the cone is pulled out of the ground and a final baseline recorded.

The following criteria are adopted to define termination of each CPT:-

- 1 Reaching a specified depth specified by the client or its representative's at site, or
- 2 Reaching the maximum thrust capacity of the system, or
- 3 Reaching a cone resistance of 20mpa, or
- 4 The cone reaching a maximum deviation of 10 degrees and/or an increase in deviation of over 3 degrees per meter, or
- 5 If the ground no longer withstand the trust applied, or
- 6 Buckling of the sounding rods is imminent, or
- 7 At the discretion of the CPT operator if it is in his opinion, it is unsafe to continue either in terms of safety of personnel or potential loss/damage to the equipment whichever come first.

The following criteria are adopted to define terminate of each DSSP:-

- 1 Reaching a specified time by the client, or
- 2 Reaching or over the 50% normalized pore water pressure dissipation or
- 3 Reaching overnight, or
- 4 If the rods are slipping down, or
- 5 At the discretion of CPT operator if it is in his opinion, it is unsafe to continue either in terms of safety of personnel or potential loss/damage to the equipment whichever come first.

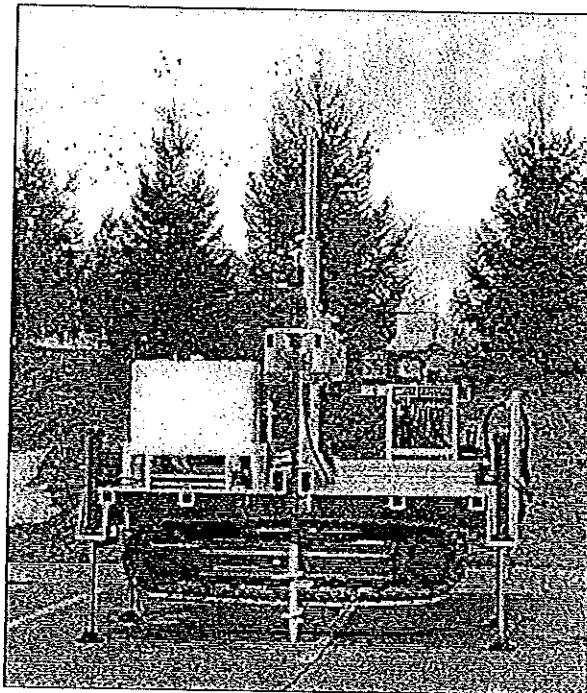
6.0 SUMMARY OF WORK

PROJECT: PROPOSED EXPANSION OF CONTAINER TERMINAL CT10 – CT19 AND ITS ASSOCIATED WORKS AT WESPORTS PULAU INDAH SELANGOR			
TEST REF. NO.	DATE STARTED	DATE COMPLETED	FINAL DEPTH (m)
CPT 1	14/01/2019	14/01/2019	26.68
CPT 2	16/01/2019	16/01/2019	33.03
CPT 3	21/01/2019	21/01/2019	30.16
CPT 4	25/01/2019	25/01/2019	28.90
CPT 5	11/02/2019	11/02/2019	32.51

Table 1: Summary of Work Done (Cone Penetration Test)

APPENDIX A
PIEZOCONE CONE EQUIPMENT DETAILS
AND CALIBRATION CHART

Crawlers: Medium Weight



The 20 ton medium weight, track mounted penetrometer system is a self propelled, hydraulic, remote controlled CPT system designed for rough terrain or areas where low ground pressure is required for access. The CPT is mounted on tracks serviceable throughout the world. It has two double acting hydraulic cylinders coupled by a platen that pushes and pulls electronic cones and other tools. It is powered by a 29 Hp diesel engine with an electric starter. An hydraulically powered anchoring system can quickly screw anchors into the ground to achieve 20 tons of reaction weight. The unit is equipped with mechanical leveling. Optional hydraulic leveling jacks are available. Cones, rods, and other accessories are furnished separately.

Specifications:

Push Capacity	20 Tons
Pull Capacity	26 Tons
Power	29 Hp diesel
Length	117"
Width	63"
Weight	12,200 Pounds (depending on tools)
Top Speed	2 Miles Per Hour
Operation	Hydraulic Remote Control (Walk behind)
Track Weight Capacity	15,000 Pounds
Ground Pressure	4.5 Pounds Per Square Inch (Based on 12,200 Pound Weight)

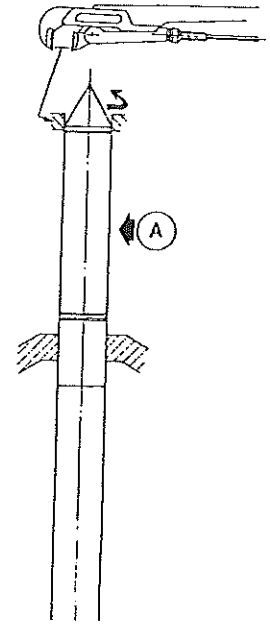
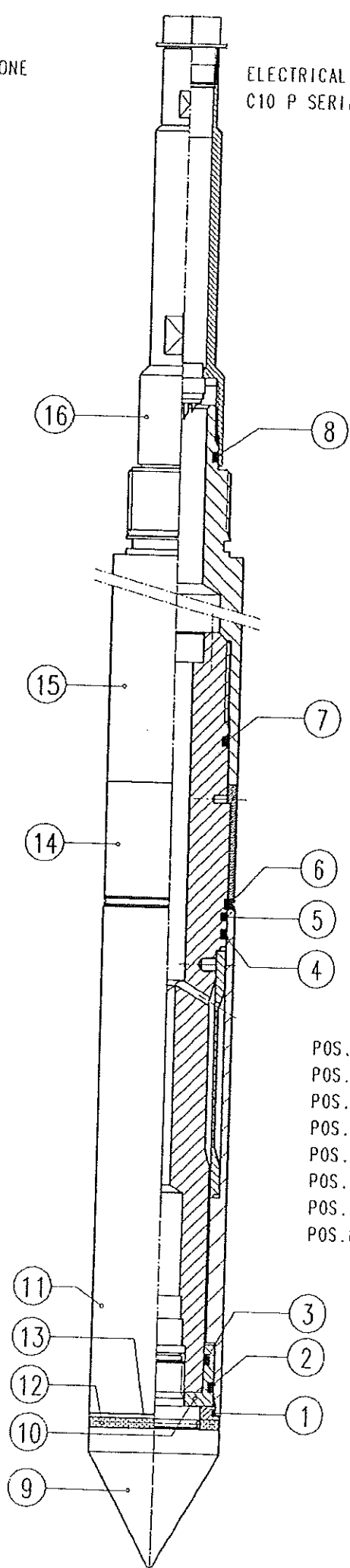
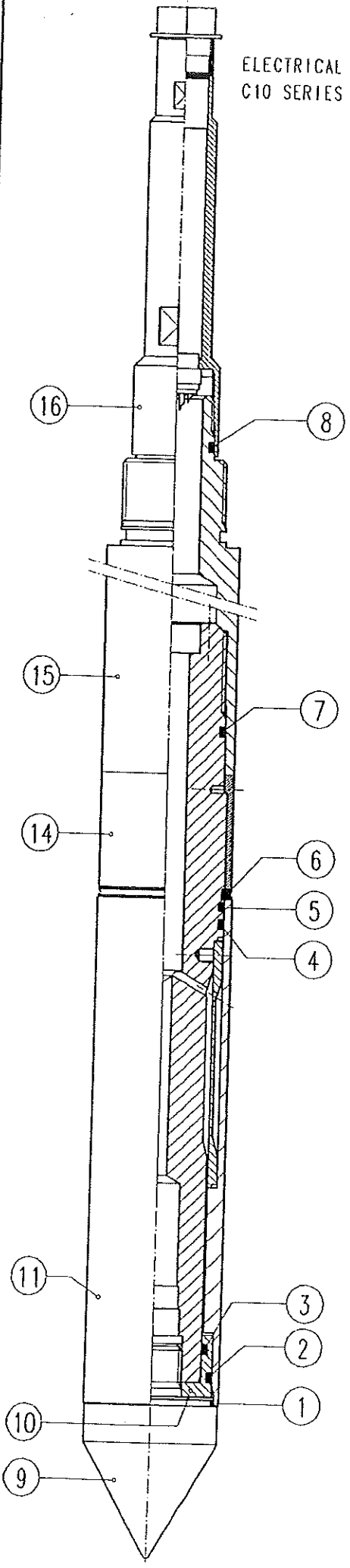
Options:

Tilt back rams
Hydraulic leveling
Cone penetrometers, samplers, ect.

FIG. 40 MZ

ELECTRICAL CONE
C10 SERIES

ELECTRICAL CONE
C10 P SERIES



- POS.1 O-RING 29.5 x 1.2
- POS.2 O-RING 28 x 2
- POS.3 O-RING 26 x 2
- POS.4 O-RING 28 x 2
- POS.5 QUADRING AS024 28.3 x 1.78
- POS.6 QUADRING AS122 28.25 x 2.62
- POS.7 O-RING 26 x 2
- POS.8 O-RING 17 x 2

De elektrische conussen zoals door GeoMil Equipment geleverd (nieuw of na service) voldoen aan de afmetingen en toleranties (in mm) van de NEN 5140 (Geotechniek. Bepaling van de conusweerstand en de plaatselijke wrijvingsweerstand van grond. Elektrische sondeer methode.) en ISSMGE normen (Report on ground property characterisation from in-situ testing. 1999.).

The electric cones delivered by GeoMil Equipment (new or after service) comply with the dimensions and tolerances (in mm) of the NEN 5140 (Geotechnics. Determination of the cone resistance and the sleeve friction of soil. Electric penetration test.) and ISSMGE standards (Report on ground property characterisation from in-situ testing. 1999.)

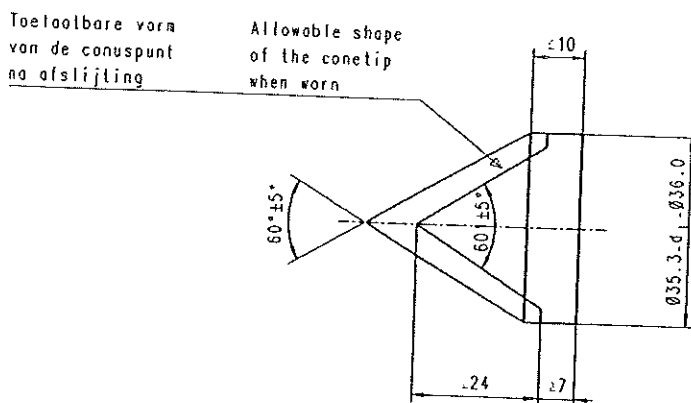


Fig. 1 - Conuspunt - Afmetingen en toleranties
Conetip - Dimensions and tolerances

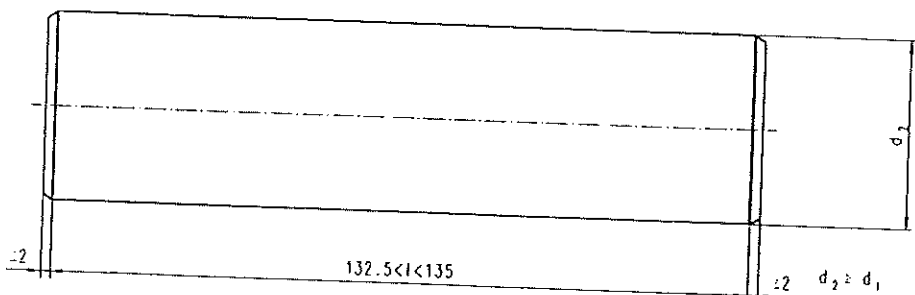


Fig. 2 - Kleefmantel - Afmetingen en toleranties
Friction sleeve - Dimensions and tolerances

Ruwheid
Surface roughness
0.4 ± 0.25 μm

$$d_2 \geq d_1$$

$$d_2 < d_1 + 0.35$$

$$d_2 < 36.1$$

Niet-symmetrisch afgesletten conuspunten zijn niet toelaatbaar.
The cone shall not be used if the cone tip is asymmetrically worn.

Opmerkingen / Notes:

- Elektrische conussen dienen met een zekere regelmaat te worden gekalibreerd. De nationale beoordelingsrichtlijn voor elektrisch sonderen (BRL 2364, 2000-07-15) hanteert een interval van maximaal 3 maanden. The ISSMGE schrijft een maximale interval van 3 maanden (of 3000 m sonderen onder standaard condities) voor bij continue gebruik van de conus. In alle gevallen geldt dat bij twijfel de conus eerder gekalibreerd dient te worden (hoge belastingen, afwijkingen in nulpunten)

Electric cones should be calibrated at regular intervals. The Dutch guideline for electric penetration testing (BRL 2364, 2000-07-15) allows a maximum interval of 3 months. The ISSMGE prescribes a maximum interval of 3 months with the cone in continuous use (or after 3000 m testing under simple testing conditions). In all cases the cone has to be calibrated whenever the proper condition of the cone can be doubted (loads close to maximum, deviation of zeroshifts).

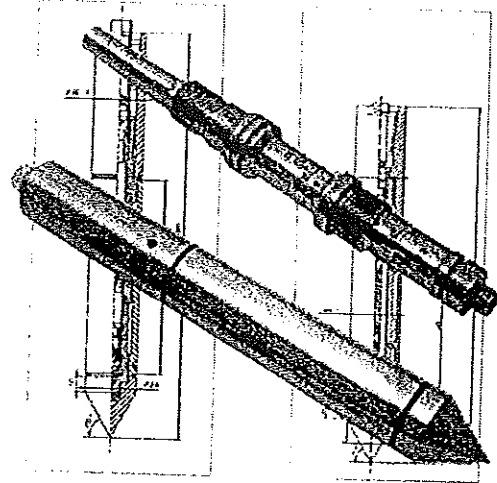
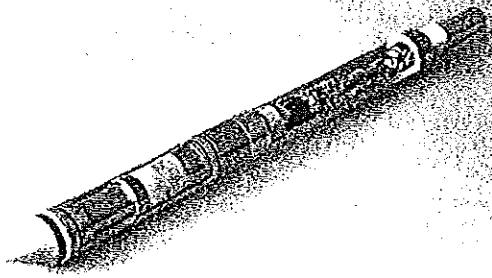
- Niet alle normen hanteren identieke afmetingen en toleranties. In verband hiermee kunnen de hierboven beschreven afmetingen en toleranties licht afwijken van andere nationale normen.

Not all standards prescribe identical dimensions and tolerances. Therefore, the dimensions and tolerances can differ slightly from other national standards.



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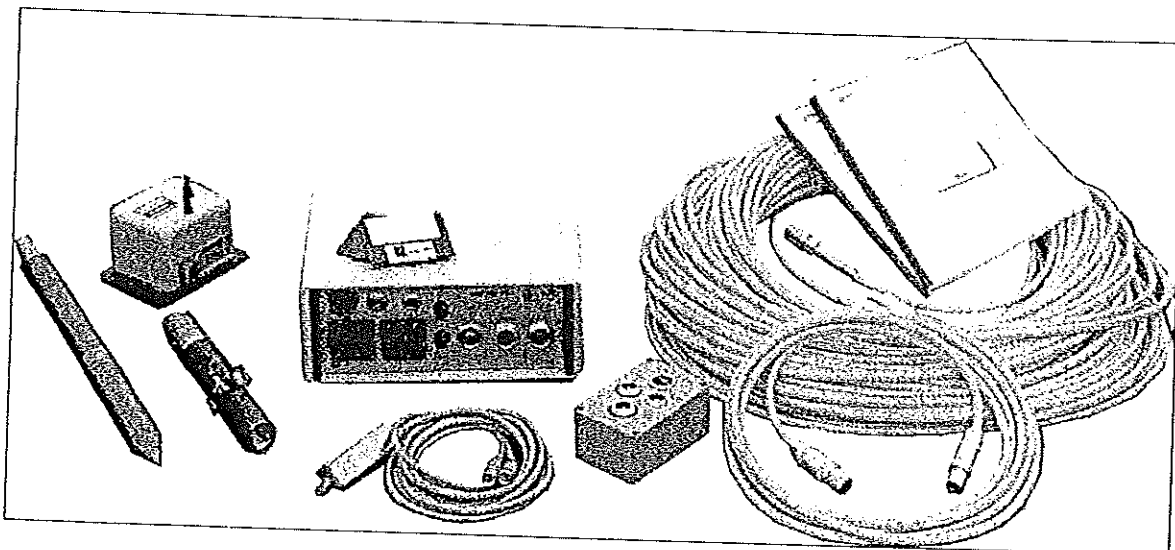
Electrical CPT



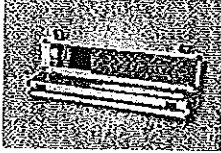
Electrical CPT probes, whether in compression or subtraction design, make up the most advanced measuring method for Cone Penetration Testing. Since very sensitive load cells are used much more accurate readings than with mechanical CPT can be achieved. The electrical solution also allows for additional parameters to be measured in-situ, among others pore pressure, temperature, electrical conductivity, inclination etc.

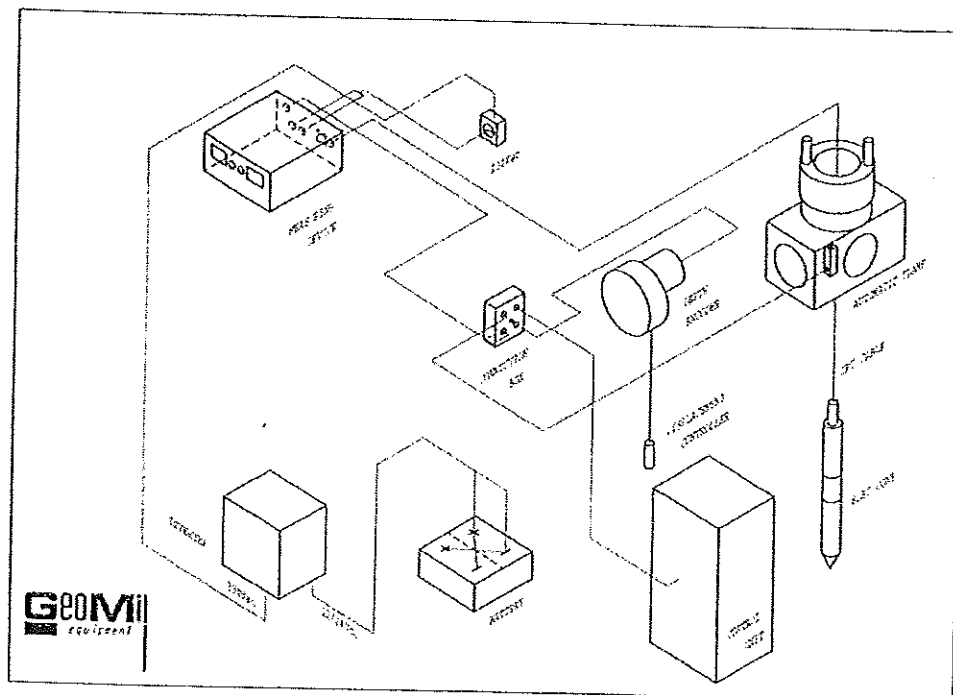
The load cell signals are transmitted to the surface as an amplified analogue voltage signal via cable and converted to a 16 bit digital signal in the GME 500 data acquisition system. The latter is available in a portable and waterproof (IP65) version suitable for outdoor use, or an industrial 19" built-in version (see separate data sheet).

GeoMil cones are equipped with tempered high quality steel parts and have state of the art load cells and electronic circuit boards, all designed by our engineers according to the latest requirements. Of course the complete product range complies with the Dutch NEN 5140 and BRL requirements, the ISSMGE and most other (inter)national standards.



A typical and complete electrical CPT system comprises:

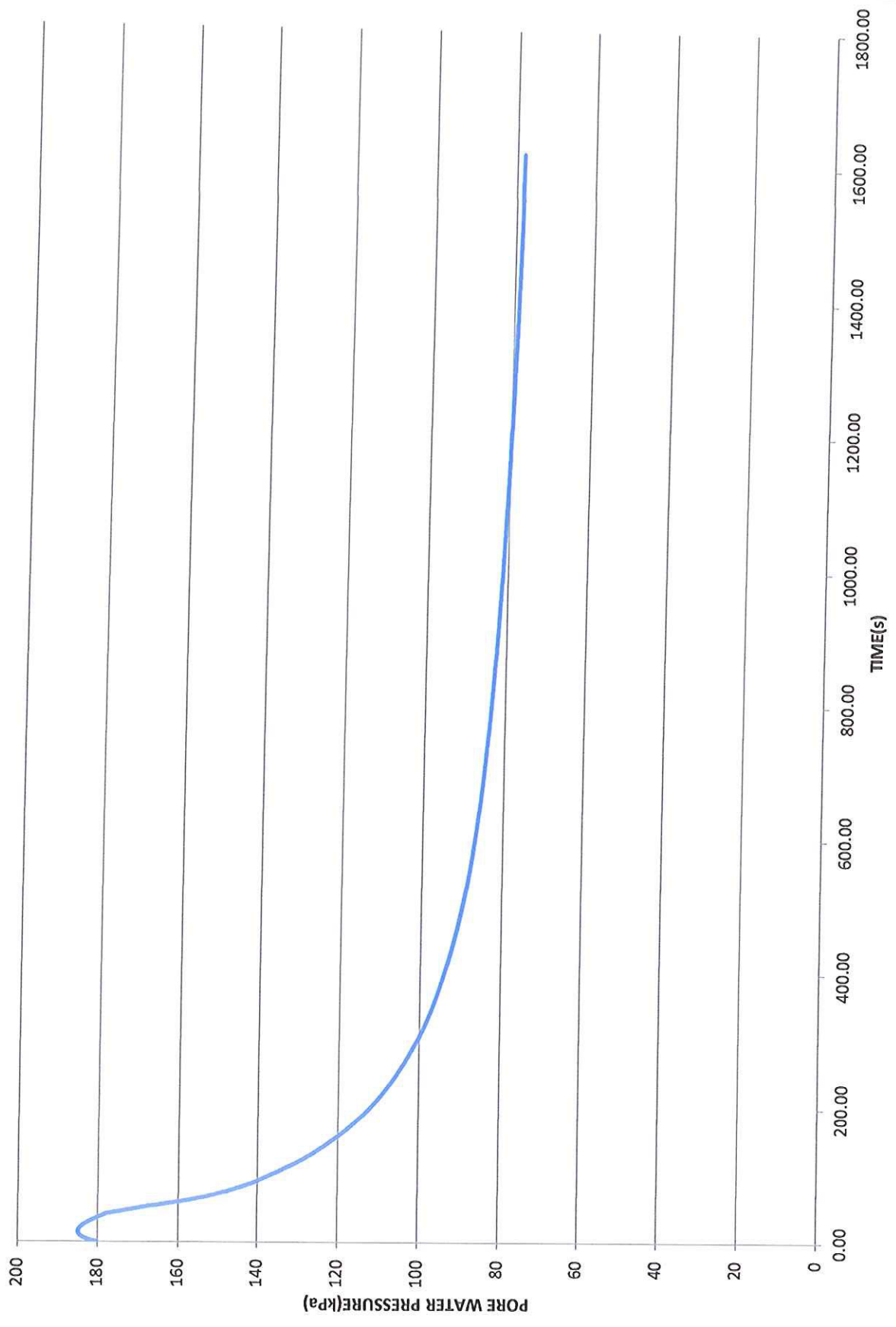
- Electric cone: GeoMil offers compression or subtraction type cones with 10cm² or 15cm² cross-sectional dimension.
The electric cones can measure the cone resistance (q_c), the local sleeve friction (f_s) and the inclination (i). Optionally the pore pressure (u), temperature (T) and one- or two-axial inclination can be measured as well. The cones can also be provided with environmental or seismic adapters (see separate data sheets).
- All GeoMil cones come in a handy portable case, protecting the cone from damage while transporting. The calibration data are provided as print as well as data file on a Floppy Disk or - optionally - on a high capacity USB Flash Hard Drive.
- 
- Electric CPT cable. The purpose built cables come in any length to suit the clients requirements and are provided with specially moulded waterproof Lemo connectors (gold-plated) and combine extreme flexibility with a long life cycle.
 - Pushing clamp or automatic push/pull clamp with built-in proximity switch. The clamp pushes the cone and tubes into the soil and pulls them out again. The proximity switch triggers the data acquisition system to start the recording.
 - Data acquisition system (8 analogue and 4 digital channels) for A/D conversion and automatic recording.
 - On PC-technology based computer (notebook, desktop, industrial or equivalent) for automatic recording of the CPT data.
 - CPTest acquisition software with an easy-to-use user interface.
 - Fully automated depth registration system with rebound compensation.
 - CPTask presentation, interpretation and analysis software.
 - Sine-wave inverter converting the 12 or 24 Vdc into 230 Vac to feed the computer (option if required).



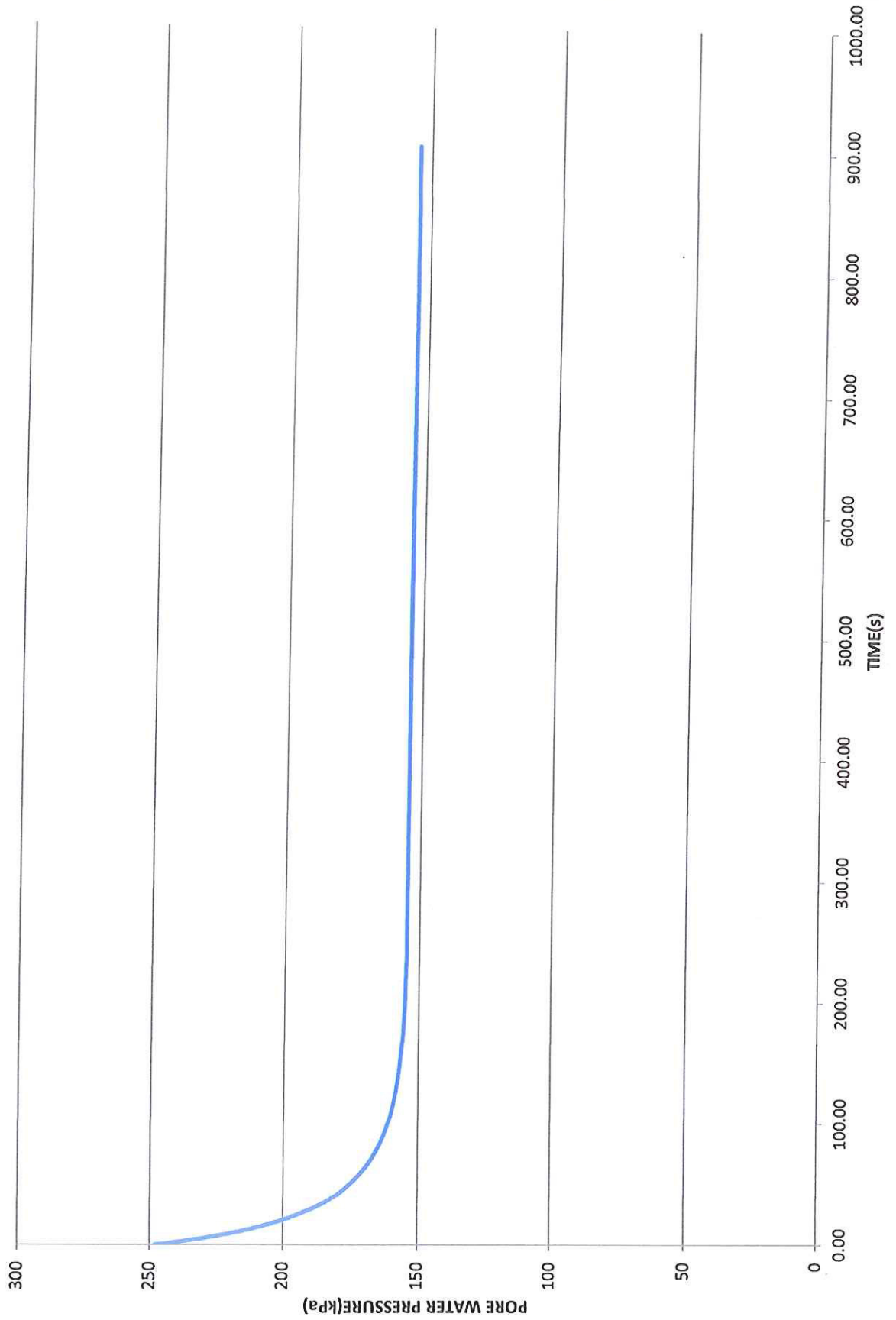
Schematic configuration of electrical CPT

APPENDIX B
PIEZOCONE TEST RESULTS

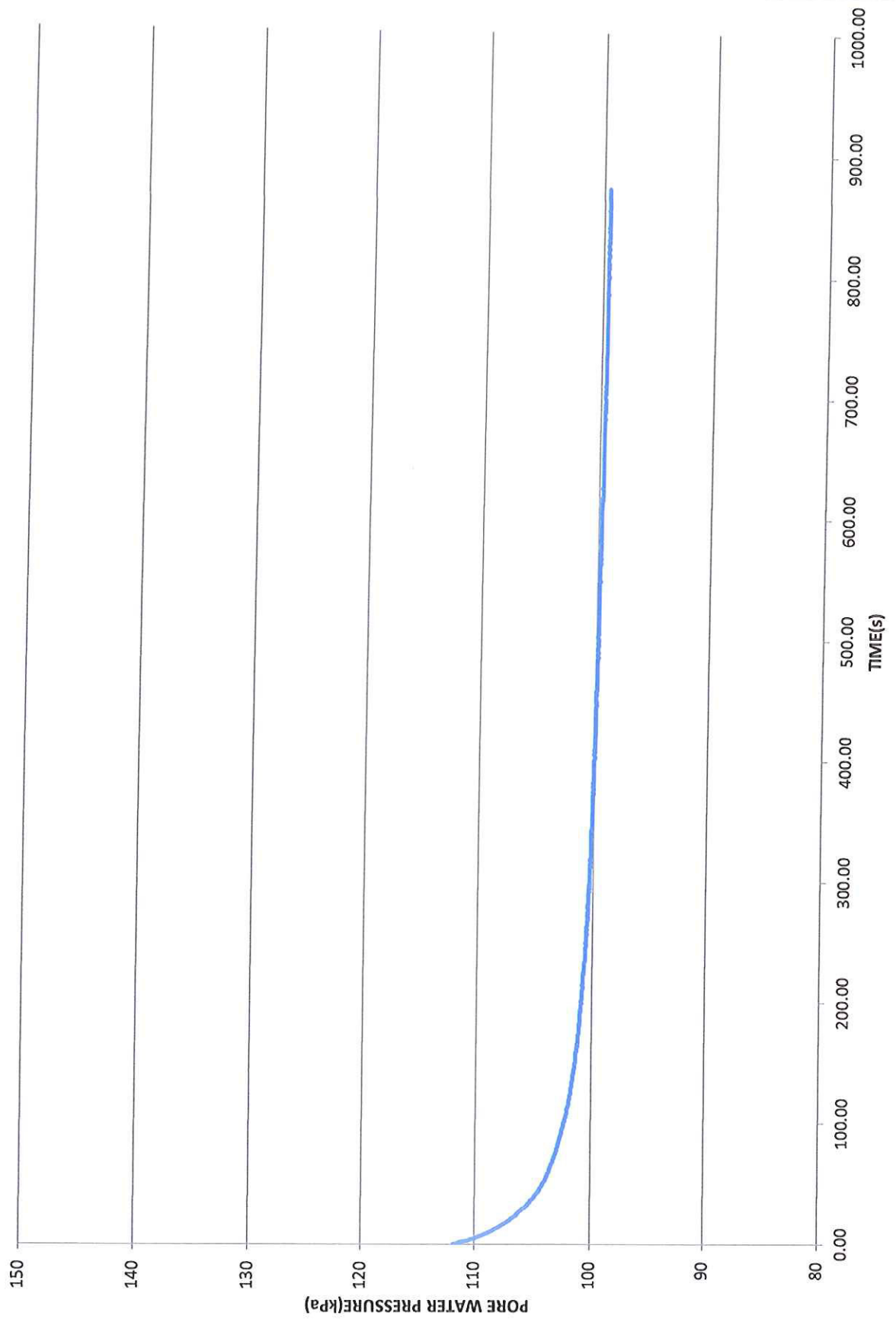
CPT 1 DISSIPATION TEST DEPTH: 7m



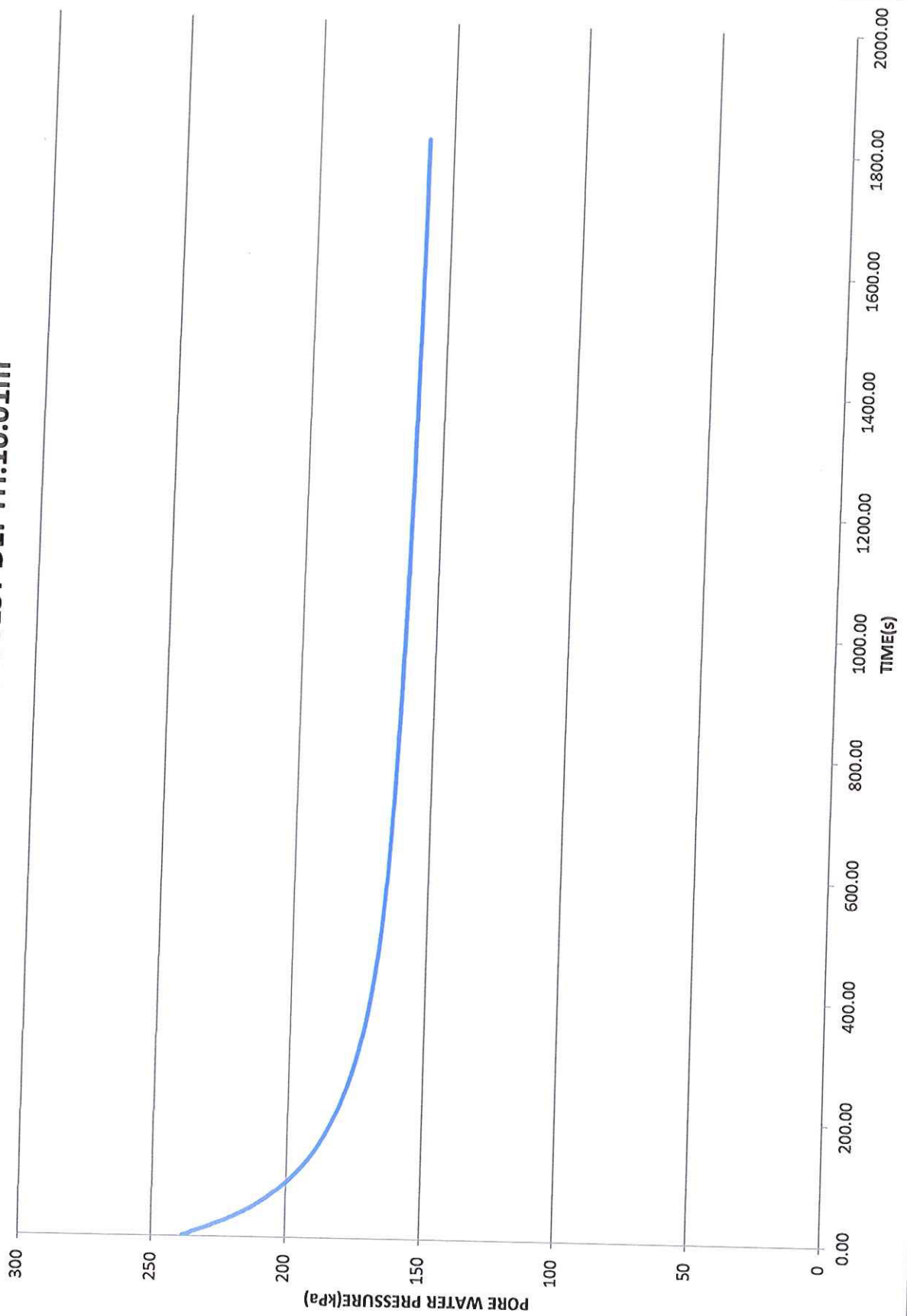
CPT 1 DISSIPATION TEST DEPTH:15.5m



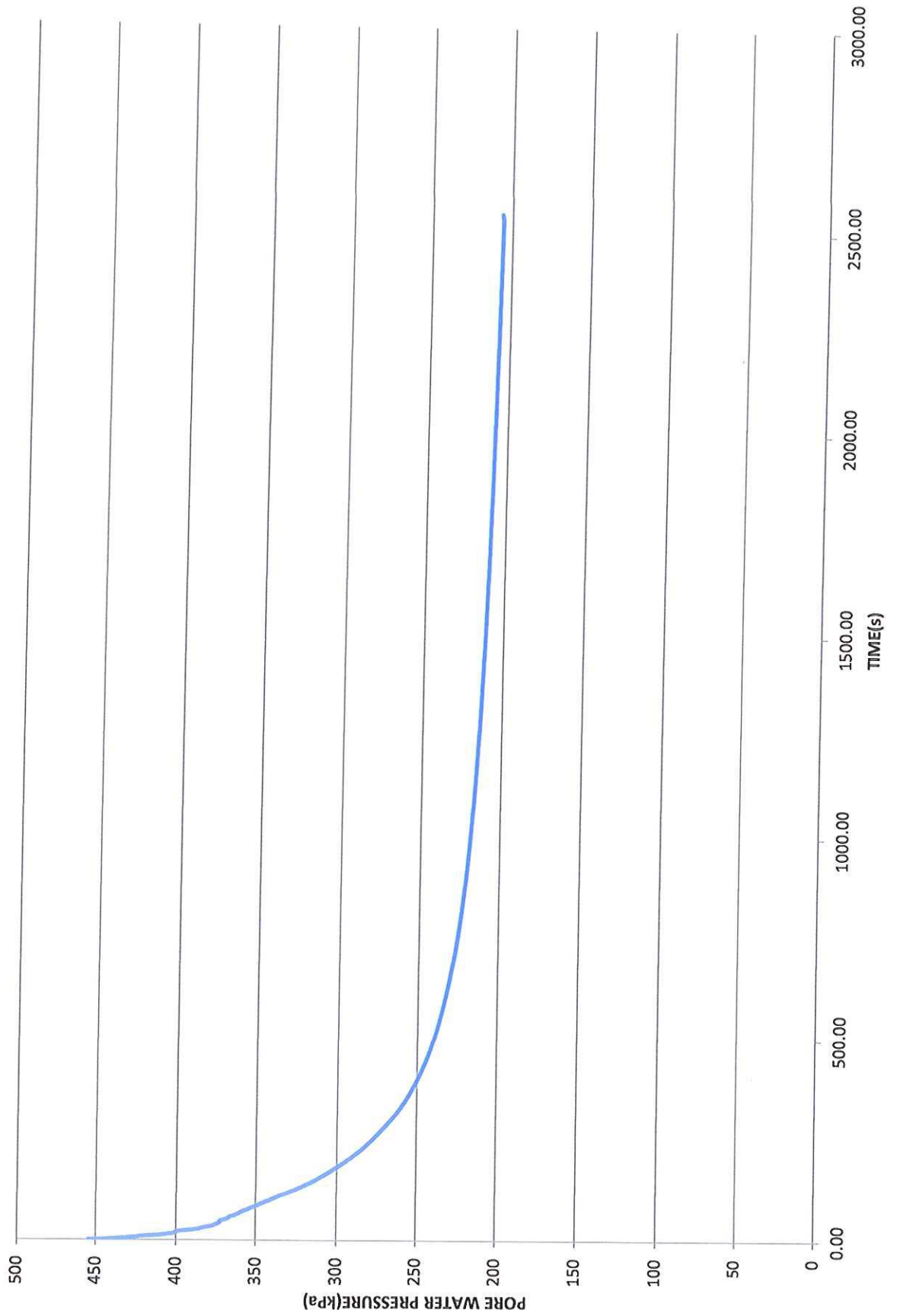
CPT 2 DISSIPATION TEST DEPTH:10m



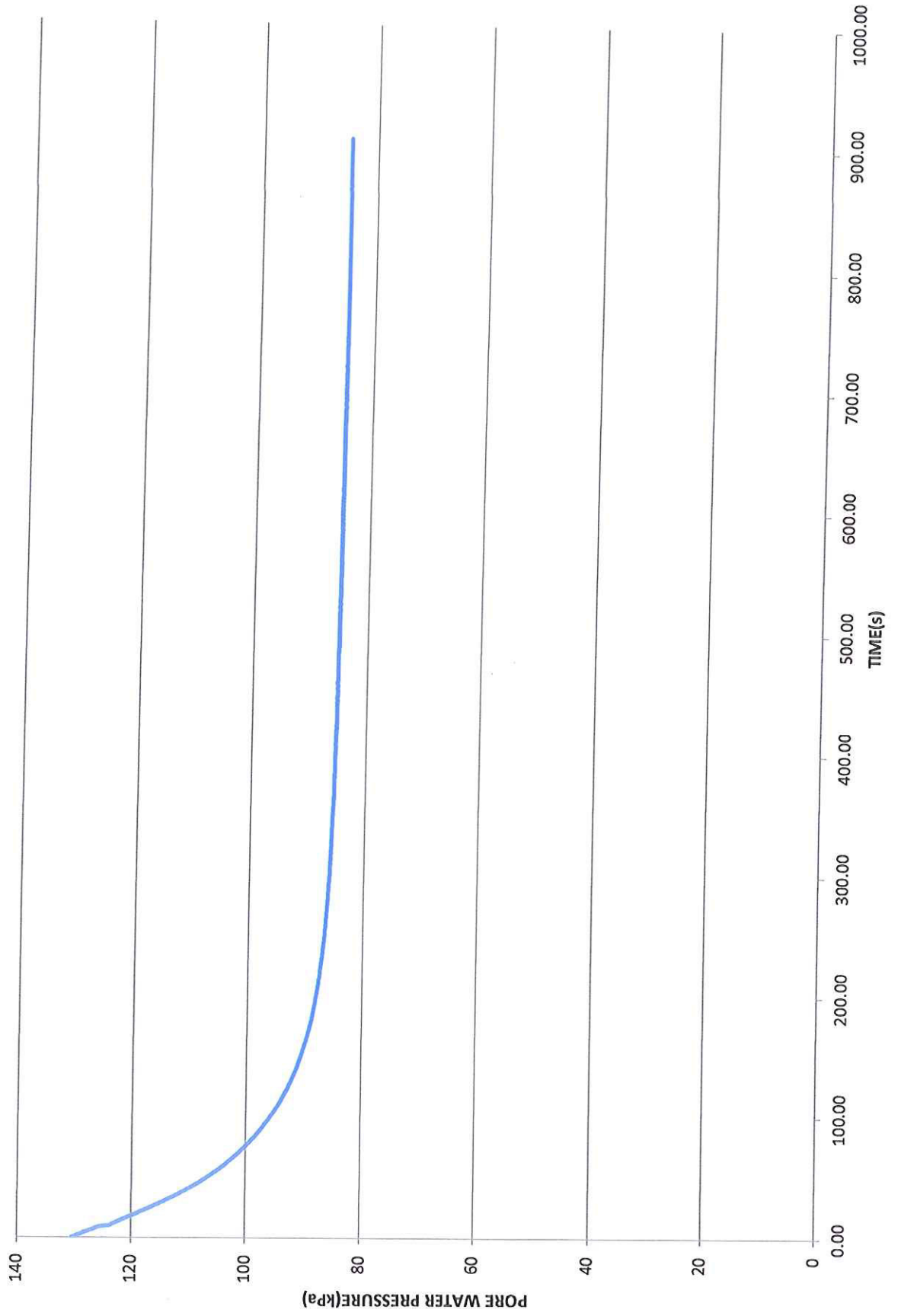
CPT 2 DISSIPATION TEST DEPTH:16.01m



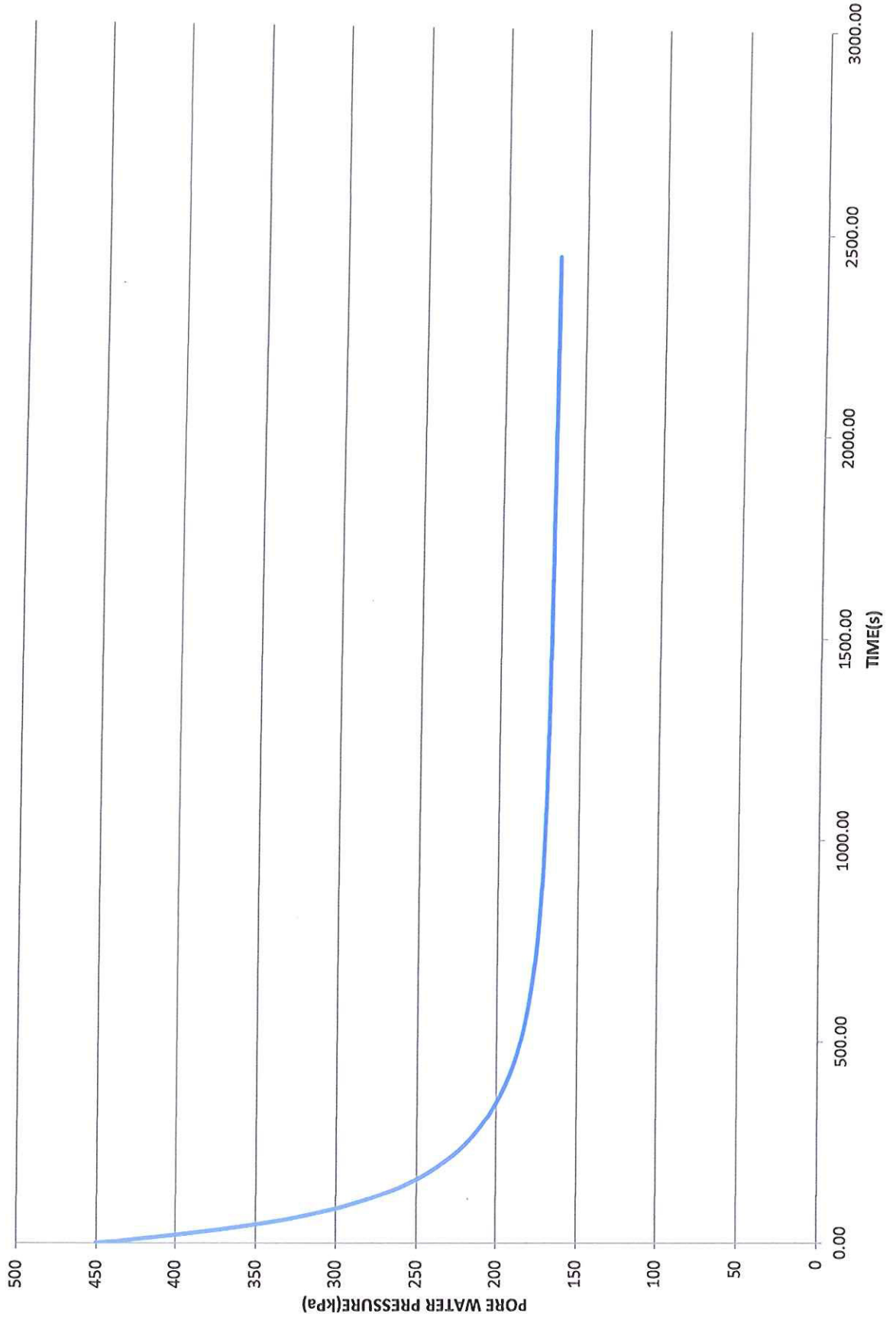
CPT 2 DISSIPATION TEST DEPTH:20m



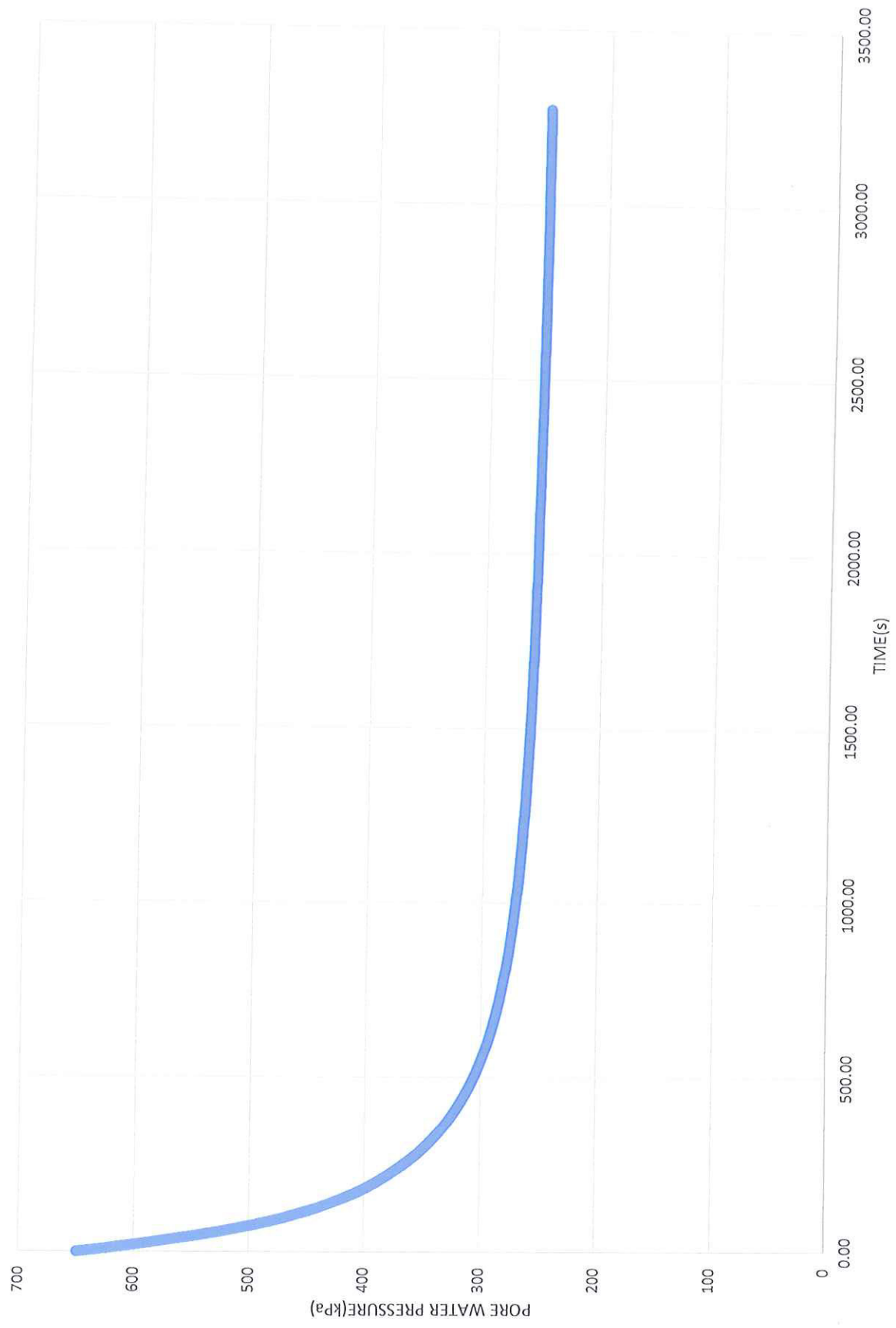
CPT 3 DISSIPATION TEST DEPTH:8m



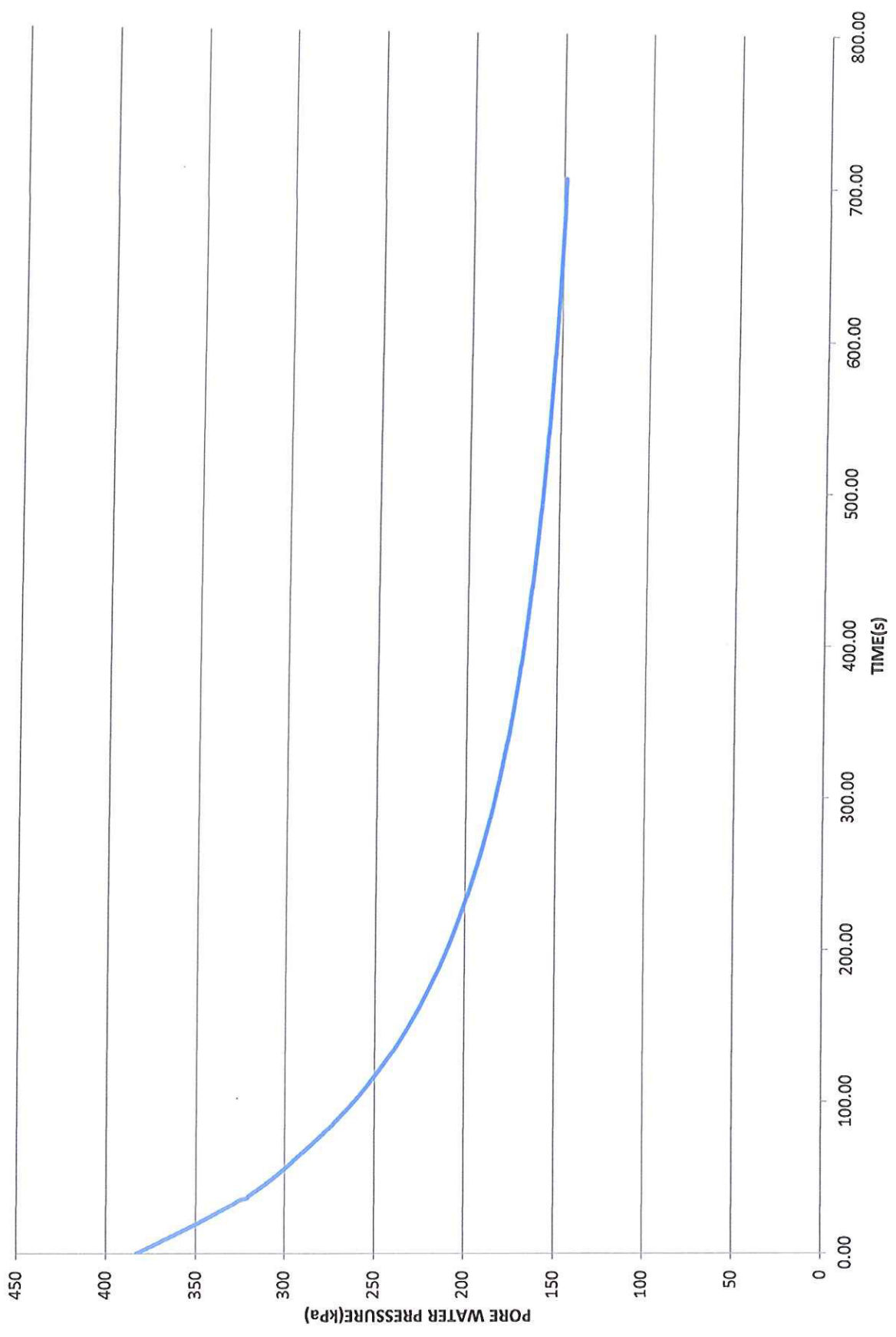
CPT 3 DISSIPATION TEST DEPTH:16m



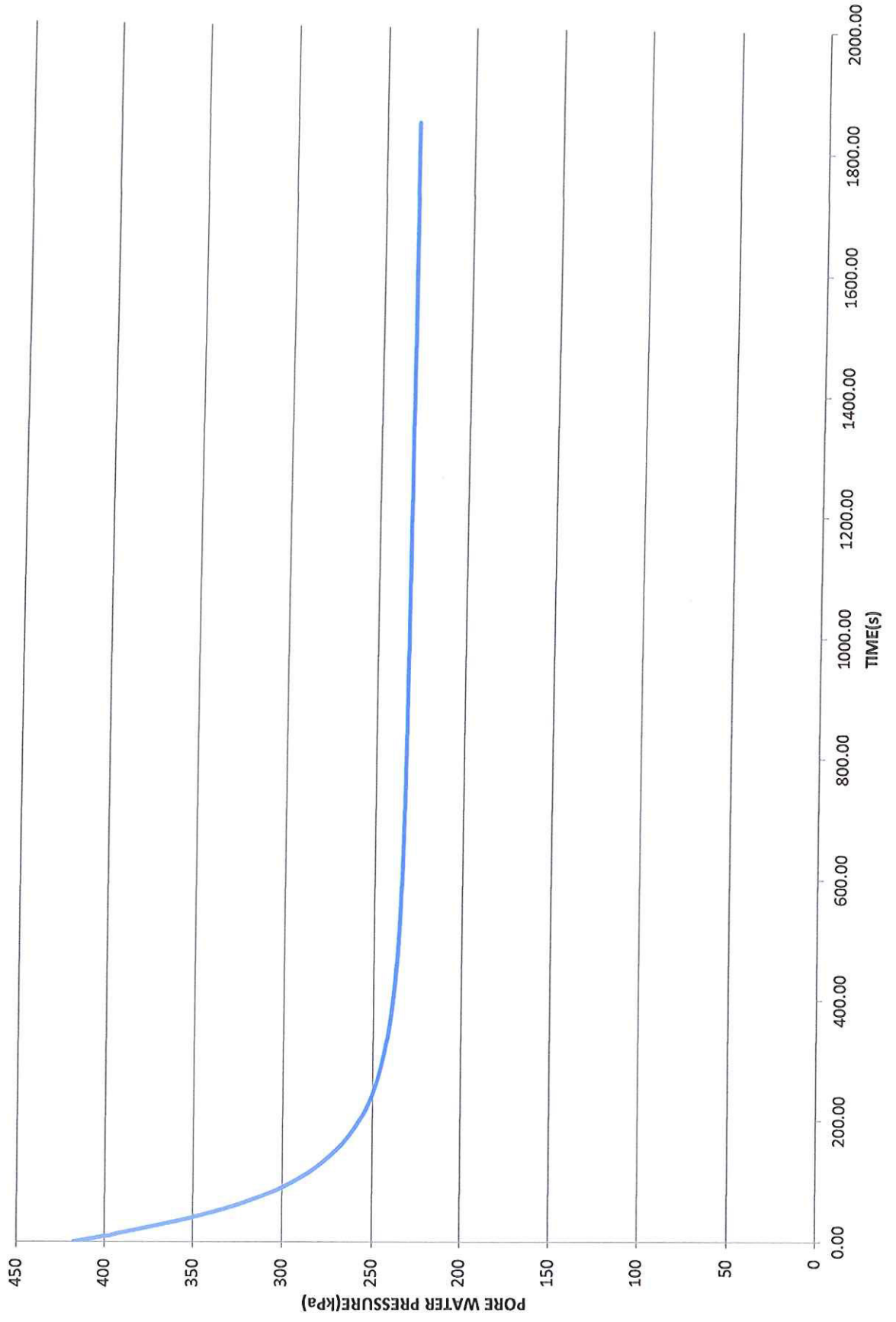
CPT 3 DISSIPATION TEST DEPTH:24m



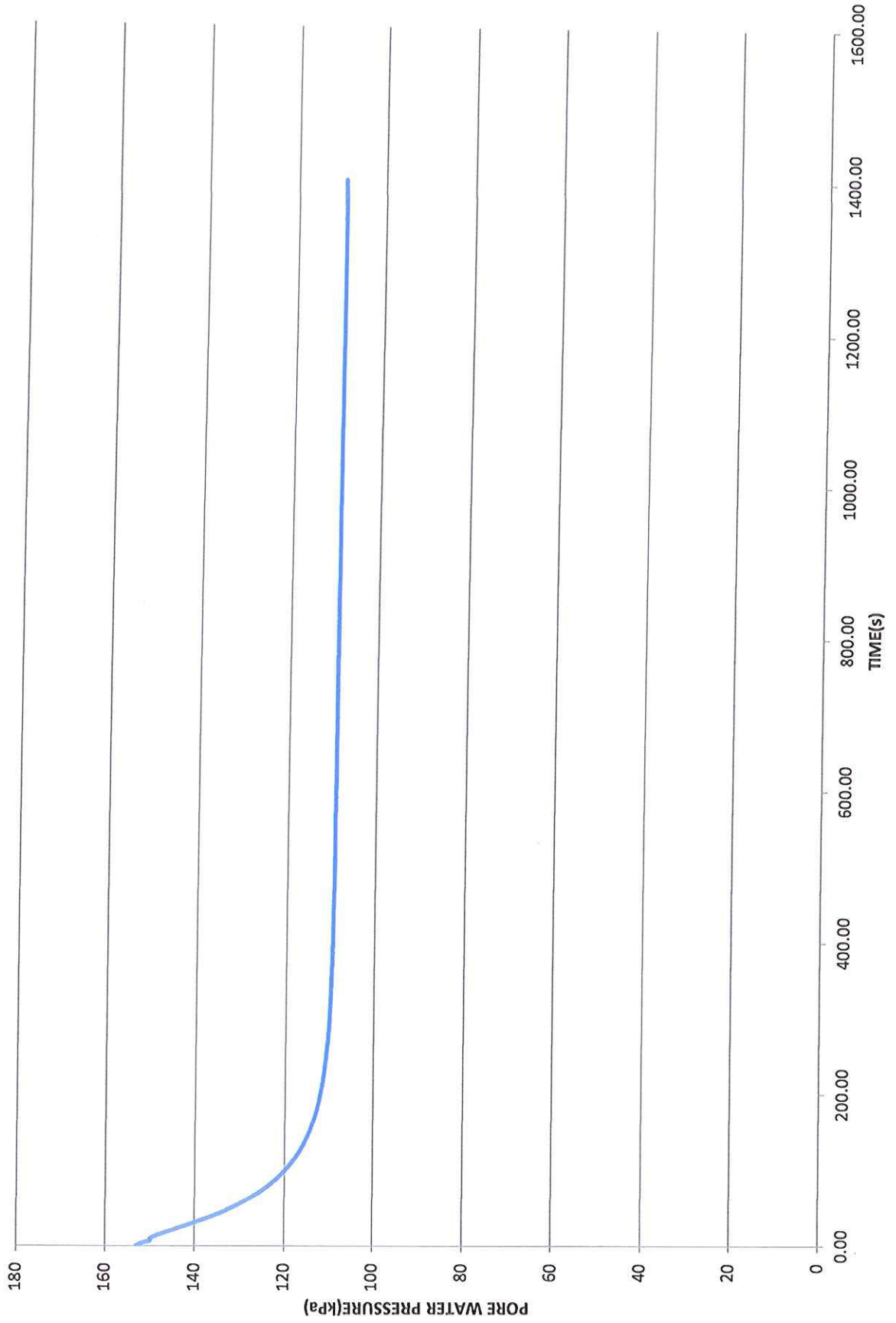
CPT 4 DISSIPATION TEST DEPTH:14m



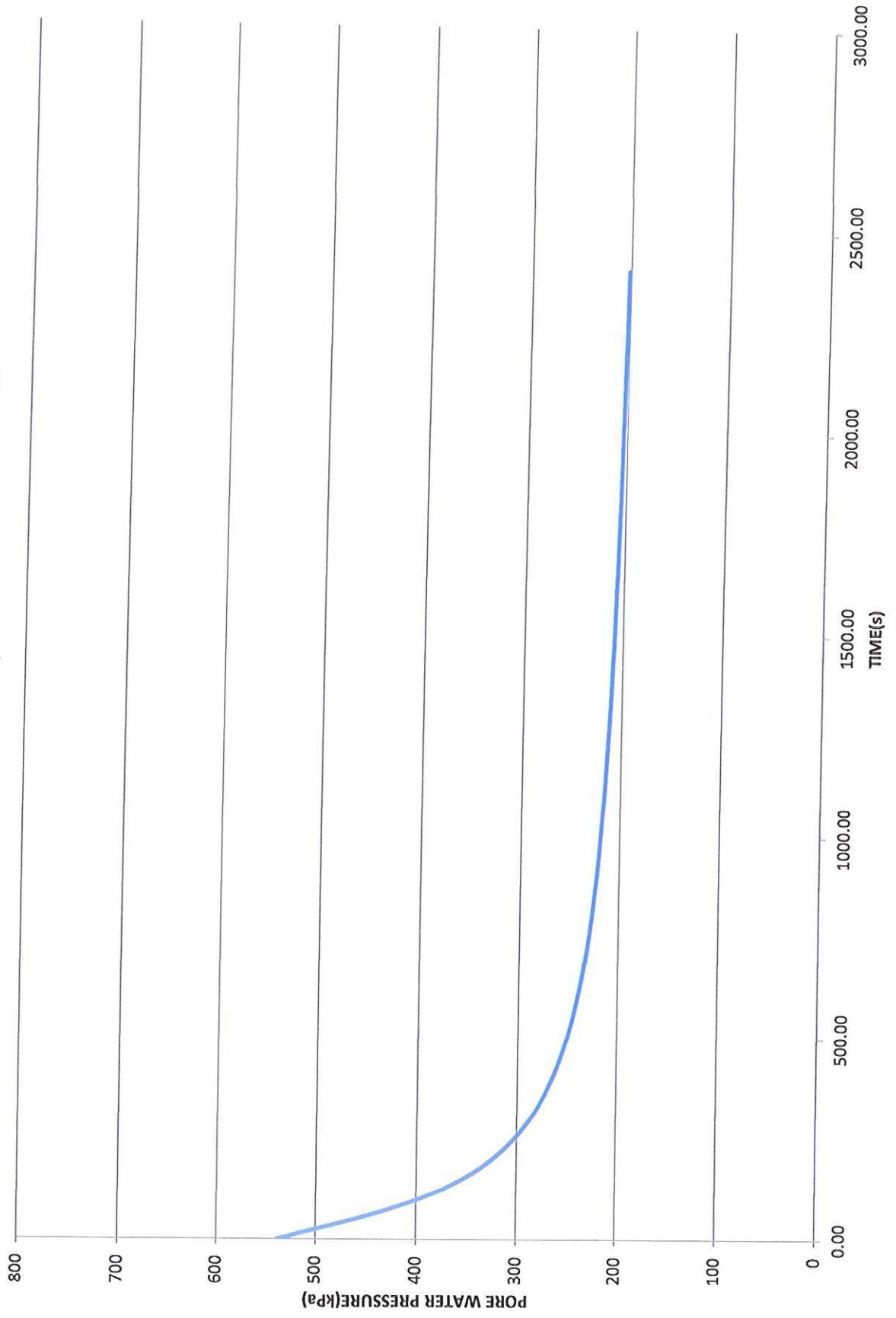
CPT 4 DISSIPATION TEST DEPTH:23.00m



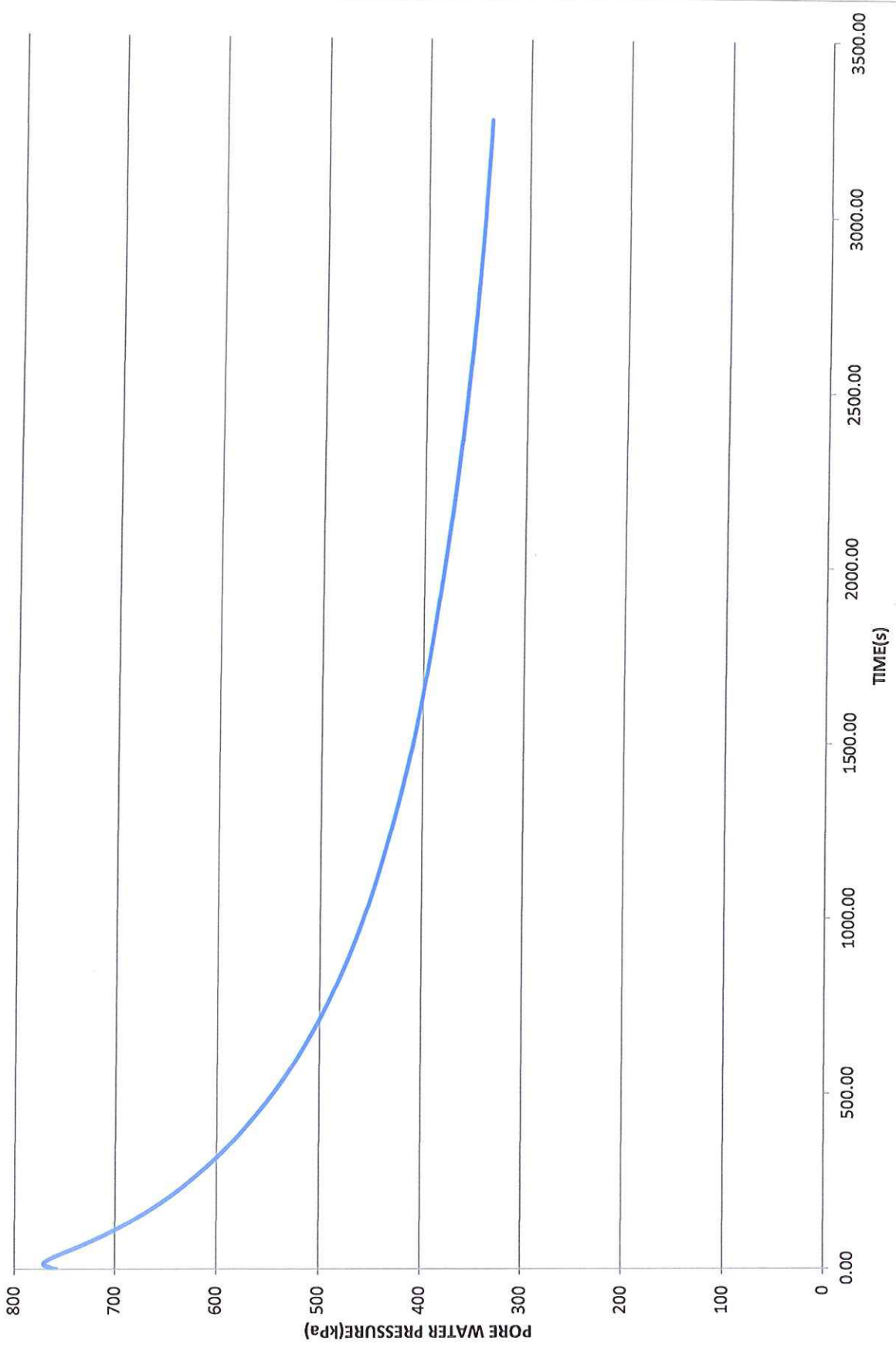
CPT 5 DISSIPATION TEST DEPTH:10.50m



CPT 5 DISSIPATION TEST DEPTH:19.10m



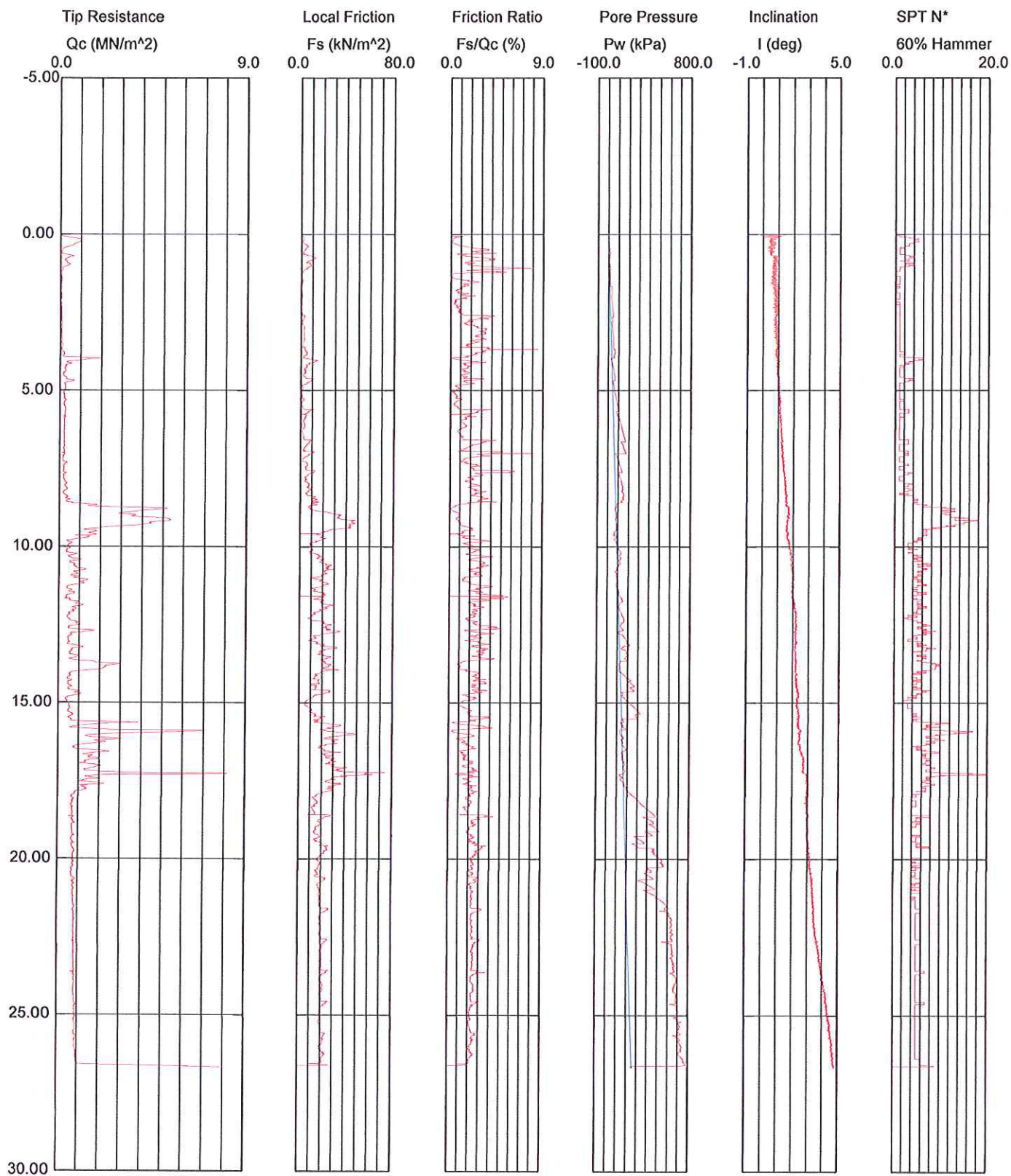
CPT 5 DISSIPATION TEST DEPTH:30.00m



STRATA GEOTECHNICS SDN.BHD

Operator: Phillip
Sounding: CPT 01
Cone Used: C10CFIIP.C14465

CPT Date/Time: 14/01/19 16:00
Location: WEST PORT
Job Number:



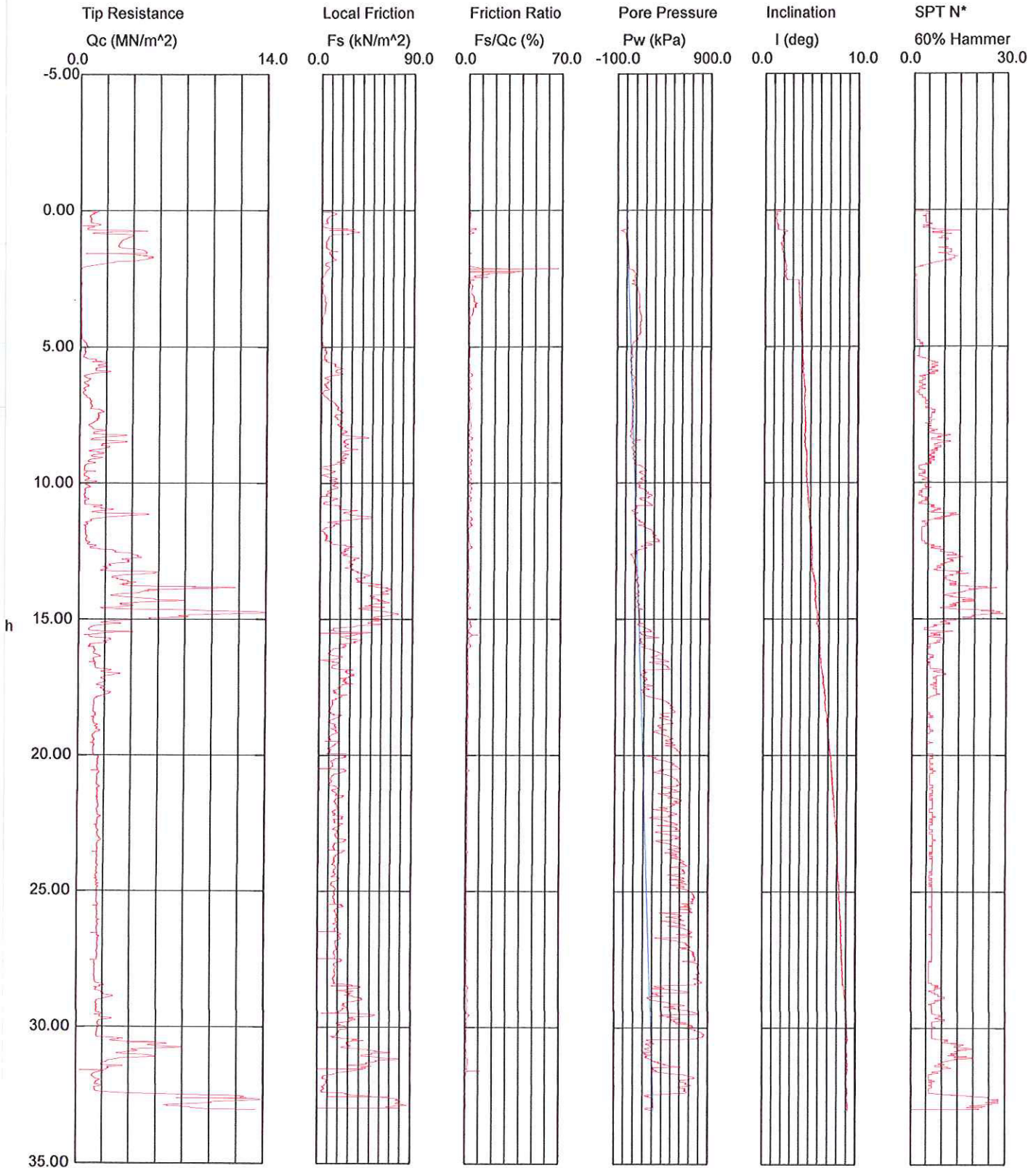
Maximum Depth = 26.68 meters

Depth Increment = 0.01 meters

STRATA GEOTECHNICS SDN.BHD

Operator: suhaimi
Sounding: CPT 02
Cone Used: C10CFIIP.C14465

CPT Date/Time: 16/01/19 12:03
Location: WEST PORT
Job Number:



Maximum Depth = 33.03 meters

Depth Increment = 0.01 meters

STRATA GEOTECHNICS SDN.BHD

Operator: SUHAIMI

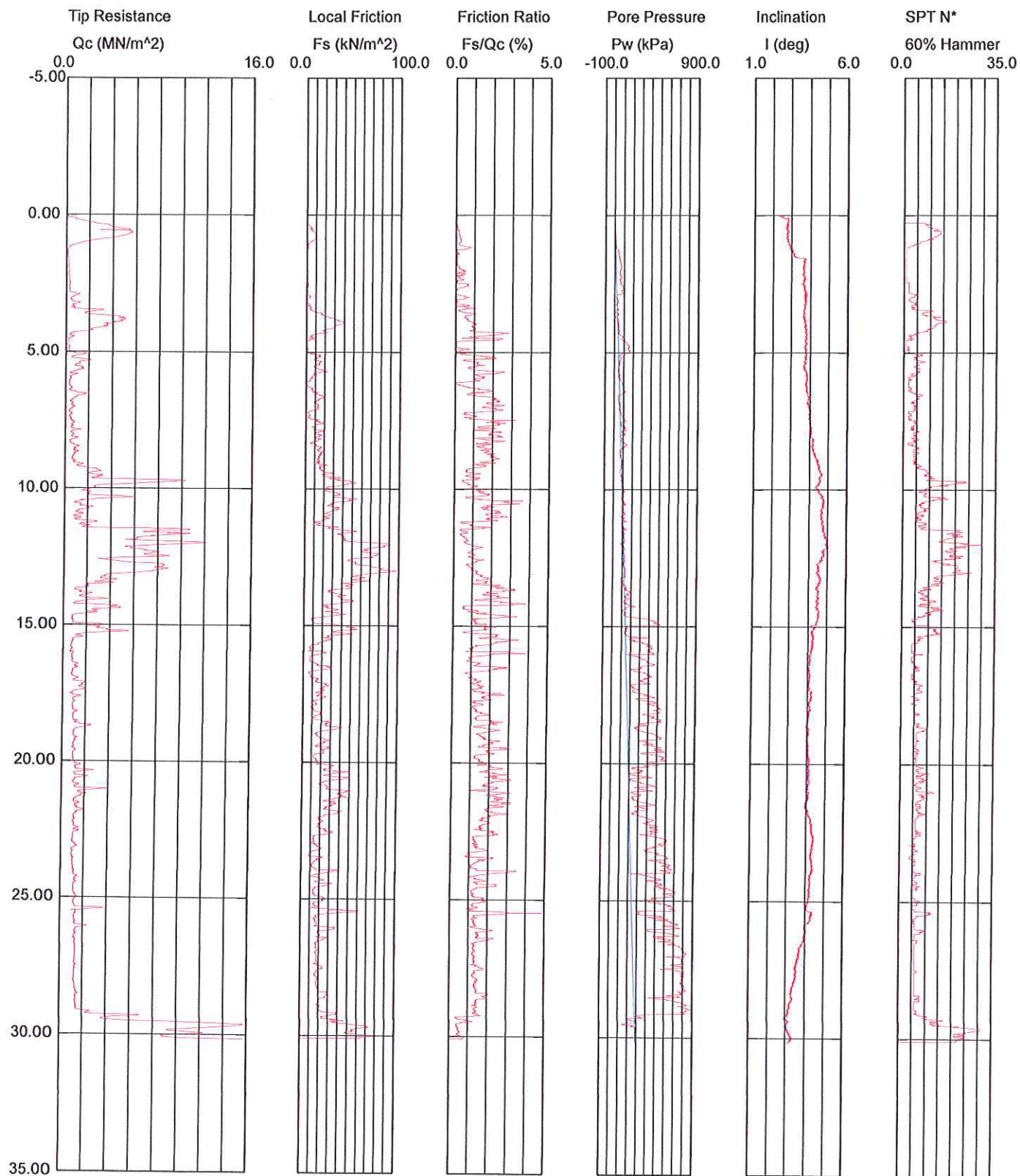
CPT Date/Time: 21/01/19 15:00

Sounding: CPT 03

Location: WEST PORT

Cone Used: C10CFIIP.C14465

Job Number:



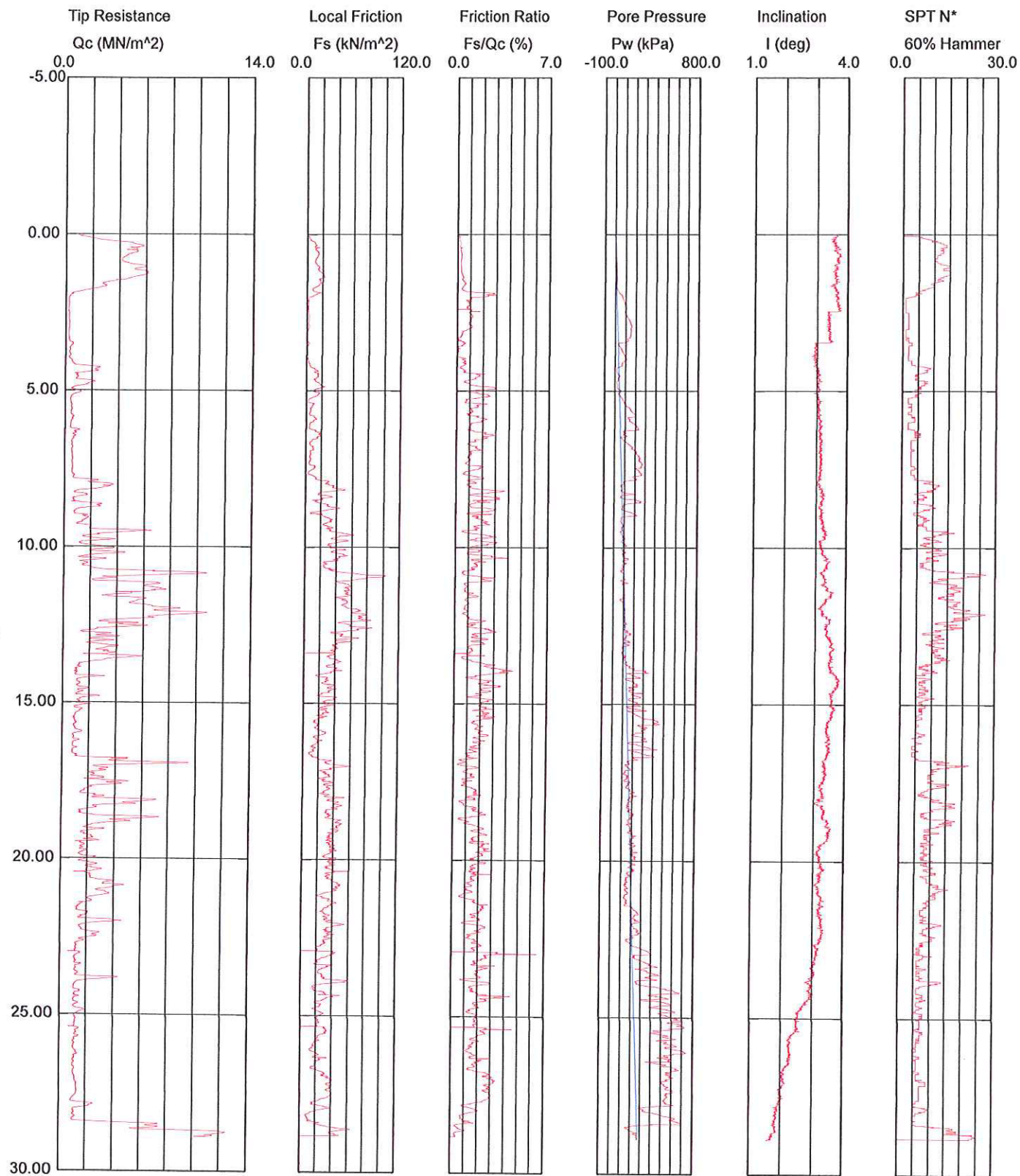
Maximum Depth = 30.16 meters

Depth Increment = 0.01 meters

STRATA GEOTECHNICS SDN.BHD

Operator: SUHAIMI
Sounding: CPT 04
Cone Used: C10CFIIP.C14465

CPT Date/Time: 25/01/19 14:30
Location: WEST PORT
Job Number:



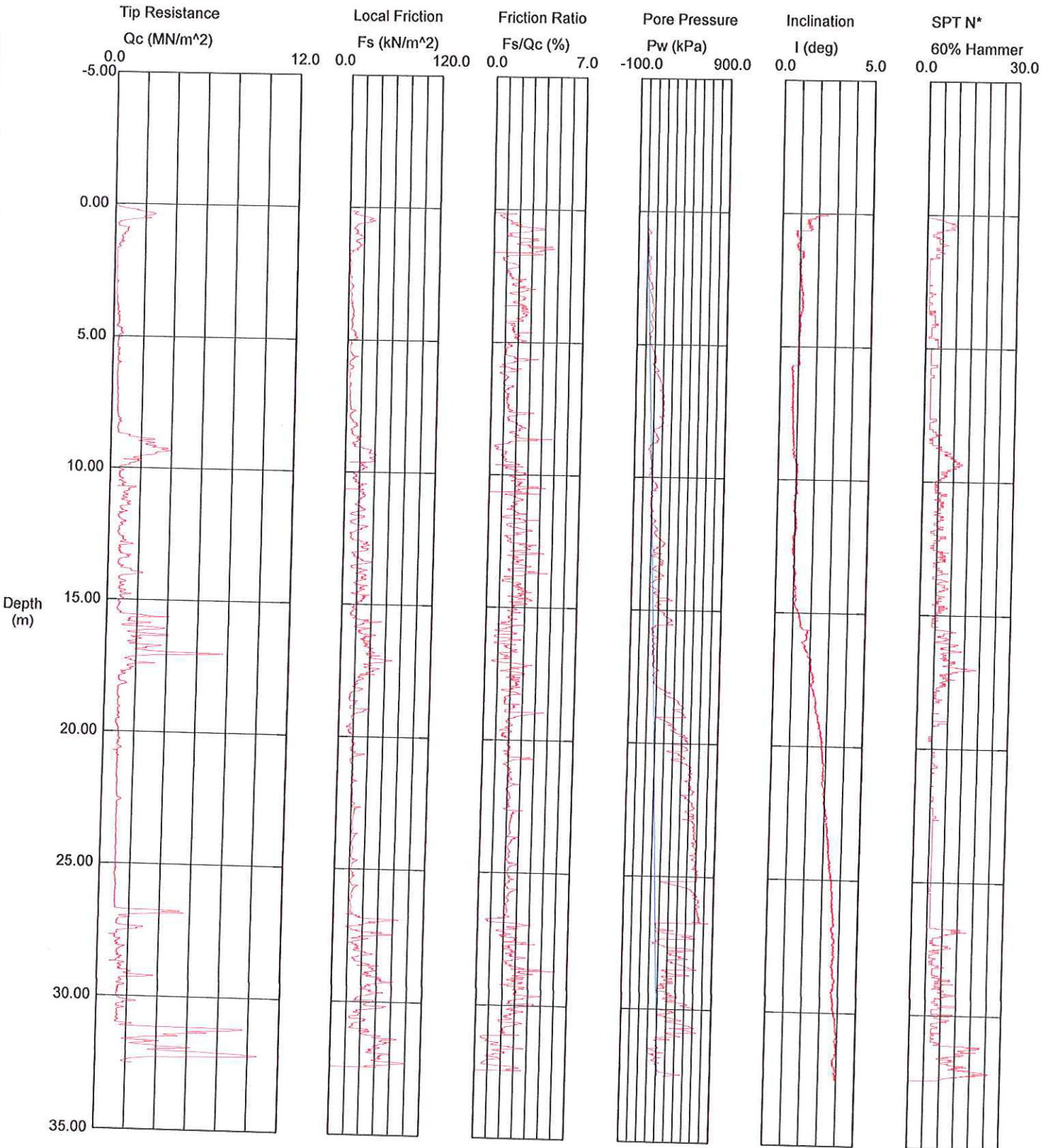
Maximum Depth = 28.90 meters

Depth Increment = 0.01 meters

STRATA GEOTECHNICS SDN.BHD

Operator: SUHAIMI
Sounding: CPT 05
Cone Used: C10CFIIP.C16033

CPT Date/Time: 11/02/19 14:30
Location: WEST PORT
Job Number:



Maximum Depth = 32.51 meters

Depth Increment = 0.01 meters

APPENDIX C
SITE PHOTOGRAPH

**CONE PENETRATION TEST AT WESTPORTS, PULAU INDAH, SELANGOR.
TEST REF. NO.: 1-5, DATE STARTED: 14/01/2019, DATE COMPLETED: 11/02/2019**



Location of CPT1



Location of CPT2



Location of CPT3



Location of CPT4



Location of CPT5