भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

TCN – 02

Ref: PSER:SCT:KLN-E1754:TCN-02 Date: 21-07-2016

Sub	Tender change notice (TCN) - 02	
Job	Design/ Engineering and construction of 33 KV sub-station along with supply, erection, testing and commissioning of equipment and system for construction power distribution system (11 KV overhead lines, package sub-station etc.),high mast lighting / temporary illumination system including obtaining clearances from various authorities, operation & maintenance (O&M), etc of construction power network for 2x660 MW Maitree Super Thermal power project at Moidara village, Rampalupazila, Bagerhat district, Bangladesh	
Ref	1.0	Tender No. **PSER:SCT:KLN-E1754:16.**
	2.0	BHEL's NIT, vide reference no PSER:SCT:KLN-E1754:5101, Dated 01-07-2016.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:KLN-E1754:TCN-01, dated 12-07-2016.
	4.0	All other pertinent issues till date.

With reference to above, following points/ documents, relevant to tender, may please be noted and complied with while submitting offer.

1.0 Pre-bid Clarification is attached vide **Annexure-A to TCN-02**.

2.0 Soil Investigation Report (Draft copy) for 2x660 MW Maitree STPP is attached herewith for tender purpose only.

3.0 Revised `No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.

4.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HEAVY ELECTRICALS LTD

ENGR (SCT)

Encl : As above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091
फैक्स/Fax : (033) 23211960 फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

ANNEXURE-A TO TCN-02

JOB: DESIGN/ ENGINEERING AND CONSTRUCTION OF 33 KV SUB-STATION ALONG WITH SUPPLY, ERECTION, TESTING AND COMMISSIONING OF EQUIPMENT AND SYSTEM FOR CONSTRUCTION POWER DISTRIBUTION SYSTEM (11 KV OVERHEAD LINES, PACKAGE SUB-STATION ETC.), HIGH MAST LIGHTING / TEMPORARY ILLUMINATION SYSTEM INCLUDING OBTAINING CLEARANCES FROM VARIOUS AUTHORITIES, OPERATION & MAINTENANCE (O&M), ETC OF CONSTRUCTION POWER NETWORK FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPALUPAZILA, BAGERHAT DISTRICT, BANGLADESH

TENDER NO: PSER:SCT:KLN-E1754:16

Sl No	SLD/ Technical Specs/ General		Specification requirement / Tender Condition	Deviation / Clarification	BIDDER'S QUERY	BHEL'S CLARIFICATION
1	Page No.3	clause No.4	Enclosure	C/D	Protection degree for Transformer compartment should be IP23 Offerd CSS : Ventilation apertures should be sufficient for natural ventilation (Class K15) i.e Rated class of Trafo compartment is K15	Protection degree for Transformer compartment of Packaged Sub-Station shall be as per IP 24
2	Page No.4	ClauseNo.5	RMU	C	Offered RMU is non-extensible, Motorized operated, 3 way, 1 no.VCB + 2 nos. LBS with bottom explosion (for internal arc fault 21KA/ 1 sec) and Bus Metering Panel, but without Auxiliary trafo and without Fault passage	This arrangement is in line to our Technical Specification of PSS/CSS
3	Page No.4	ClauseNo.5	Internal arc and Short time current	D	Offered CSS, IAC is 21KA/1sec and 21KA/3sec STC	This is in line to our Technical Specification of PSS/CSS with the indicated IAC 18.4KA/1S
4	Page No.7	Annexure-A	Numerical relay / SLD	C	We confirm to offer Self Powered Numerical Relay (Type:C&S make) in VCBs. Being it self powered relay following	Protection arrangement as per SLD of PSS/CSS shall require to be provided.
					series trip mechanism, shunt trip coil and other relays like SF6 Gas pressure Lock out, trip circuit supervision etc. not been considered.	For VCB arrangement it is not required to provide SF6 gas pr. lock out relay but other protection arrangement as per SLD of PSS/CSS shall require to be provided.
					but we have considered Tafu card instead of Auxiliary Relay (for OTI, WTI, Buchloz & PRV), for TR Protection with 12 Window annunciation.	Tafu Card is not acceptable.
					No other Relays are considered.	Protection arrangement as per SLD of PSS/CSS shall require to be provided.
5	General	NA	Type tests	C	We shall submit relevant type tests for your review and acceptance.No further type testing is considered in scope of supply	Tender condition and Tech. Spec. shall be followed
6	General	NA	CSS	C Rated class of Tr compartment is K15.	CSS shall have degree of protection IP54 for HV,LV compartments and IP23 for transformer compartment.	Protection degree for Transformer compartment of Packaged Sub-Station shall be as per IP 24
					CSS is with 30 X 3 Sqmm Earth bus bar.	Earth Bus inside CSS shall be provided by using 50x6 mm GI Flat
7	General	NA	CSS	C	2.2 Weather proof enclosure(IP as stated against reply to clause 1.1) of sub-station of sheet steel of thickness min. 2	Acceptable.
					mm. Base frame however shall be 4 mm thicnkess	This is in line to our Technical Specification of PSS/CSS
8	General	NA	CSS	C	CSS is not skid mounted	Arrangement shall be provided for fixing the CSS on concrete foundation rigidly.
9	General	NA	Capacitor bank	C	We have considered 125KVAR APFC panel in 4 steps with 1no. 630Amp MCCB with Adjustable O/L and S/C as I/C and	It is mandatorily to be provided in the CSS "415V, 300 KVAR Capacitor Banks with minimum 4 steps APFC Relay"
					MCBs as O/G	MCCBs shall be used as O/G for LV
10	General	NA	Bus Bar	C	We have considered Aluminium Bus Bar for LV and RMU	The RMU to be equipped with 2 Isolators and 1 Circuit Breaker.

ANNEXURE-A TO TCN-02

JOB: DESIGN/ ENGINEERING AND CONSTRUCTION OF 33 KV SUB-STATION ALONG WITH SUPPLY, ERECTION, TESTING AND COMMISSIONING OF EQUIPMENT AND SYSTEM FOR CONSTRUCTION POWER DISTRIBUTION SYSTEM (11 KV OVERHEAD LINES, PACKAGE SUB-STATION ETC.), HIGH MAST LIGHTING / TEMPORARY ILLUMINATION SYSTEM INCLUDING OBTAINING CLEARANCES FROM VARIOUS AUTHORITIES, OPERATION & MAINTENANCE (O&M), ETC OF CONSTRUCTION POWER NETWORK FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPALUPAZILA, BAGERHAT DISTRICT, BANGLADESH

TENDER NO: PSER:SCT:KLN-E1754:16

11	General	NA	LV Switch Gears	C	As I/C: with O/L, S/C and E/F with Ammeter, Voltmeter, Metering CT and Aux. Contacts. 1no. 800AMP,4P,MP based, ACB As O/G: With Adjustable O/L and S/C with Rotary switch, Phase Barrier and Spreadrs links but without any Measuring meters, Metering CT and Aux. contacts. (1)2nos. TM based,63Amp, 4P, MCCB (2)4nos. TM based, 100Amp, 4P, MCCB (3)2nos. MP based, 400Amp, 4P, MCCB (4)2nos. MP based, 630Amp, 4P, MCCB	Basic requirement and circuitry arrangement of CSS/PSS has been clearly specified in the Tech. Specification and SLD and it is necessarily be followed in making of CSS/PSS.
12	General	NA	Transformer	C	(1)As per IS1180, EE class-1, 500 KVA , 11/0.433 KV Oil type Air natural transformer with Off Load Tap Changer with tapping range +5% to -10% in 6 steps of 2.5% with @50% loading = 1.6KW (Subject to IS tolerance) @10% Loading = 4.75W (Subject to IS tolerance) %Z = 4.5% (Subject to IS tolerance)	Transformer of CSS shall be provided with Off Load Tap Changer with tapping range +5% to -5% in 04 steps of 2.5%
13	General	NA	Battery and Battery charger and Auxiliary Trafo	D	We have considered Battery and Battery Charger for 24V DC but Auxiliary trafo for 230V AC supply shall be in Scope	Tender condition and Tech. Spec. shall be followed
14	General	NA	Enclosure C	C	We have Considered GI Enclosure	Enclosure for the entire package substation shall be preferably of 2 mm Galvanized Iron Sheet(except base of the enclosure, base should be made of 4mm hot dip galvanized steel)
15	General	NA			As per the specification RMU type mentioned is Ringmaster, however as per in RMU detail speciifcation the requirement is for both SF6/ Vacuum type CB. Hence, we are going ahead with VCB with RMU type FBX. Kindly confirm.	VCB with RMU is acceptable
16	General	NA			We shall provide Battery and Battery charger in the RMU instead of Power Pack. Kindly clarify.	In case the RMU is provided with 24V DC back-up for min. 10 Minute duration through battery and charger arrangement then no separate power pack arrangement is required.
17	General	NA			The Outdoor Enclosure of the PSS shall be of GI material with single powder coating of 80-100 microns. Hence, the offered PSS shall be suitable for the normal atmosphere conditions instead of salty weather conditions.	Enclosure for the entire package substation shall be preferably of 2 mm Galvanized Iron Sheet(except base of the enclosure, base should be made of 4mm hot dip galvanized steel) painted with the colour epoxy high solid finish paint with minimum 80 micron(µm) total dry film thickness (DFT) of approved make and shade to achieve an even shade over steel sections with minimum 80 micron(µm) primer coats and keeping overall DFT with primer not less than 160 microns(µm) including touchup painting as per specification, manufacturer's recommendations, relevant BS or equivalent international standards and as approved by BHEL. Painting shall be of High Durability complying ISO 12944 Part 1.
18	General	NA			As per the Type tested design PSS is suitable for Temperature class of -5Deg C to + 40 Deg C. However, necessary de-rating to be considered above the same.	As per Tech. Spec. of CSS temperature range has been specified as -25˚ C to + 45˚C

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TENDER NO: PSER:SCT:KLN-E1754:16

19	General	NA			For MV - Trafo connection we can offer cable connection suitable upto 95sq,mm.	Cable connection shall be suitable for 3X 1C-150 Sq. mm cable
20	General	NA			Trafo-LV connection - The LT current rating required is Max. 666.67A. Hence, kindly confirm if 800A AL busbar is acceptable for the same or not instead 2000A.	800A AL Busbar is not acceptable, it is to be suitable for 2000A current carrying capacity.
21	General	NA			We shall provide Tafu Card with 7 LED display for the Trafo fault indication in the RMU. Kindly confirm the acceptance of the same.	Use of Tafu Card is not acceptable.
22	General	NA			Supply of Lighting Mast etc mentioned in the Technical specification shall not be in our scope. Our scope shall be limited only upto supply of PSS.	This query has been withdrawn by the concerned bidder.
23	General	NA			Soil Report of the site	Soil investigation work are in progress at site.Majority of the investigation work has been completed. Draft copy of the soil report of the completed work is attached for tender purpose only.
24	TCC, VOL-1F-TS-1, R-0, CL. NO. 2.3-26 (PAGE- 7 OF 27)		TYPICAL PEAK REQUIREMENT IS EXPECTED TO BE IN THE RANGE OF 5 TO 6 MVA	___	___	PEAK REQUIREMENT OF 5 TO 6 MVA POWER SHALL BE CATERED THROUGH 02 NOS 5 MVA 33/11 KV POWER TRANSFORMERS.
25			33 / 11 KV TRANSFORMERS…… WITH INBUILT AUTOMATIC STEP VOLTAGE REGULATOR ARRANGEMENT	___	___	BOTH THE 5 MVA (33/11 KV) TRANSFORMERS SHALL BE HAVING INBUILT AUTOMATIC STEP VOLTAGE REGULATORS WITH MIN. VOLTAGE CONTROL FACILITY IN 04 STEPS EQUALLY DISTRIBUTED FOR LOW AND HIGH VOLTAGE CONDITIONS.
26	TCC, VOL-1F-TS-1, R-0, CL. NO. 2.3-26 (PAGE- 6 OF 27)		PROVISION SHALL BE KEPT FOR INSTALLATION AND WIRING CONNECTIONS OF ENERGY METER IN 33 KV CONTROL / RELAY PANEL	___	___	SUPPLY OF ENERGY METER IS NOT IN THE SCOPE OF VENDOR.
27	GCC, VOL-1B- CL. NO. 1.3.1 (PAGE-4 OF 30)		RATES SHALL BE ENTERED IN FIGURE AS WELL AS IN WORDS.	___	___	IT IS MANDATORY TO WRITE THE "TOTAL" VALUE OF THE QUOTED PRICE IN PRICE SCHEDULE BOTH IN WORDS AND FIGURE.
28	GENERAL		WHICH SPECIFICATION SHALL BE FOLLOWED FOR DESIGN AND MANUFACTURING THE 5 MVA, 33/11 KV POWER TRANSFORMER.	___	___	DESIGN SPECIFICATION OF CBIP. INDIA (CENTRAL BOARD OF IRRIGATION AND POWER) SHALL BE FOLLOWED.
29	TCC, VOL-1F-TS-1, R-0, CL. NO. 3.1 (PAGE- 8 OF 27)		PACKAGED SUBSTATION SHALL BE EQUIPPED WITH INBUILT 125 KVAR APFC PANEL…..	___	___	AS PER STATUTORY NORMS OF BANGALADESH GOVT., FOR 500 KVA TRANFORMER IT IS REQUIRE TO USE 300 KVAR APFC PANEL. HENCE, THE RELEVANT TENDER CL. MAY BE READ AS 300 KVAR INSTEAD OF 125 KVAR.
30	GENERAL		WHETHER STEEL OR CONCRETE POLES SHALL BE USED IN 33 KV SUBSTATION.	___	___	SUITABLE SPC POLE AS PER REC/BSI/IEC SPECIFICATION MAY BE USED IN 33 KV SUBSTATION.

ANNEXURE-A TO TCN-02					
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TENDER NO: PSER:SCT:KLN-E1754:16					
31	GENERAL	BASE STRUCTURE OF PACKAGED SUBSTATION	___	___	BASE OF PACKAGED SUBSTATION SHALL SUITABLE FOR REMOVING AND REERECTING THE UNIT.
32	GENERAL	CURRENCY OF QUOTING THE TENDER RATE SCHEDULE.	___	___	Bidder shall quote their prices in INR only as per Volume-III, Price Schedule.
33	GENERAL	WHAT WILL BE EXCHANGE RATE OTHER THAN "INR"	___	___	EXCHANGE RATE SHALL BE AS PER SBI TT SELLING RATE PREVAILING ON THE LATEST DUE DATE OF OFFER SUBMISSION AS PER TENDER/TCN.
34	GENERAL	TAXES AND DUTIES	___	___	RELEVANT TENDER CLAUSE SHALL BE FOLLOWED
35	VOL-III, SCH-3: SUPPLY PRICE, ITEM SRL. NO. 17.0	AB CABLE, 3X1C, 150 SQMM WITH 180 SQMM MESSENGER WIRE WITH REQUIRED ACCESSORY	___	___	ITEM DESCRIPTION MAY BE READ AS: AB CABLE, 3X1C, 150 SQMM ALUMINIUM WITH 180 SQMM MESSENGER WIRE WITH REQUIRED ACCESSORIES
36	Cl. no. 6.2 of VOL-IF-TS-3, R-0, Technical Specification	___	___	___	The cl. No. 27.0 of Vol-1F-TCC-CML on Guarantee shall prevail & this supercedes Cl. no. 6.2 of VOL-IF-TS-3, R-0, Technical Specification.

FACTUAL REPORT ON:

GEOTECHNICAL INVESTIGATION FOR 2x660MW MAITREE SUPER THERMAL POWER PROJECT

CLIENT: BHEL

LOCATION: RAMPAL BAGERHAT

FACTUAL REPORT

JUNE, 2016

DEVELOPMENT CONSTRUCTIONS LTD.
HOUSE 11, ROAD 19A, SECTOR 4, UTTARA MODEL TOWN, DHAKA-1230, BANGLADESH
GPO BOX NO. 609, CABLE: **DRILLCO**, DHAKA. PHONE: 880-2-58957231, 58950378
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APPENDICES

1. INTRODUCTION

1.1 DESCRIPTION

This report presents the data obtained from geotechnical investigation and laboratory test for proposed 2X660 MW MAITREE STPP, Rampal, Bagerhat. The project location map is shown in Figure-1.

1.2 SCOPE OF WORK

The Scope of work for this project is illustrated as follow:

- Performing geotechnical investigation including field and laboratory testing.
- Preparing a Geotechnical Report based on engineering analysis to present the data obtained through investigation.

1.2.1 FIELD INVESTIGATION WORK

Field work included drilling and in-situ testing at various locations. Field investigation work has been performing from March, 2016.

Following is a list of field work undertaken for this geotechnical investigation:

- Setting out test locations using and establishing their elevation from nearest survey benchmark as provided by BHEL using total station.
- Drilling using rotary drilling rig only.
- Performing Standard Penetration Test (SPT) using automatic trip hammer according to ASTM D1586 standard.
- Recovering undisturbed soil samples from borehole according to ASTM D1587 standard.
- Electronic Static Cone Penetration Test as per ASTM D5778.
- Conducting in-situ Vane Shear Test as per ASTM D2573
- Conducting Electrical Resistivity Test as per ASTM G57 – 95(a)

1.2.2 LABORATORY WORK

All soil samples were subjected to visual-manual soil classification procedures in accordance with ASTM D-2488. In order to evaluate the engineering properties of the existing sub-surface material for this project, laboratory testing was performed on selected soil samples obtained from test borings.

Following laboratory tests were performed by DCL at its geotechnical testing laboratory in Uttara, Dhaka during April, 2016:

i.	Bulk Density/Unit Weight	ASTM D7263
ii.	Moisture Content Test	ASTM D2216
iii.	Particle Size Distribution	ASTM D0422
iv.	Atterberg Limits	ASTM D4318
v.	Specific Gravity Test	ASTM D0854

vi.	Consolidation Test	ASTM D2435
vii.	Direct Shear Test	ASTM D3080

1.3 STRUCTURE OF REPORT

The Report has been divided in following segments:

Appendix A contains the layout for test location.

Appendix B contains field test results

Appendix C contains the laboratory test report.

Appendix D contains the analysis of results.

2. TOPOGRAPHIC AND GEOLOGICAL SETTING

2.1 TOPOGRAPHY AND LANDSCAPE

The site is located at Rampal upazilla under Bagerhat district. The site is proposed to be used as 2x660MW Maitree Super Thermal Power Project on the north-east bank of river Pussur. The plot is fairly flat with dredge filling, of which a part is bounded by masonry boundary wall. The site is accessible through a feeder road.

Figure 1: Aerial Photo of the Proposed Site

2.2 REGIONAL GEOLOGY

Geological map of Bangladesh published by Geological Survey of Bangladesh (GSB) depicts as Marsh clay and peat-Grey or bluish-grey clay, black herbaceous peat and yellowish-grey silt. Alternating beds of peat and peaty clay common in bills and large structurally controlled depressions; peat is thickest in deeper parts. Thin beds of peat and clay are interbedded with alluvial silt in the north-central Sylhet depression. Chains of linear lakes north of the Ganges River and south of the Shillong Plateau in the Sylhet depression suggest these areas are subsiding.

2.3 SEISMICITY

The project area falls under the Seismic Zone 1 of Bangladesh Seismic Zoning map where the basic co-efficient may be considered around 0.12 (Bangladesh National Building Code, BNBC 2006).

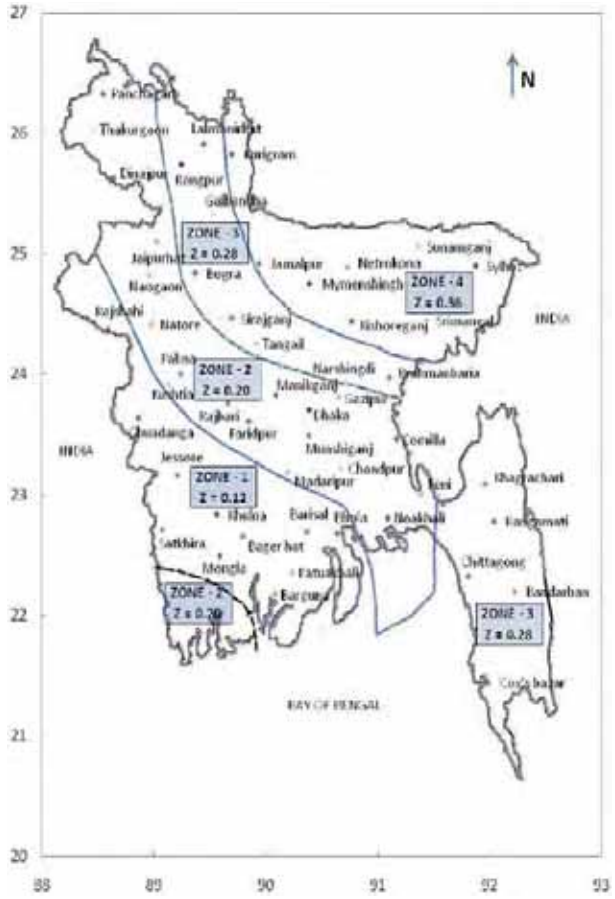


Figure 2: Seismic Map of Bangladesh (BNBC 2006)

3. INVESTIGATION METHODOLOGY

Following describes in brief each of the field works undertaken.

3.1 DRILLING OF BOREHOLES

Boreholes were drilled by rotary boring methods using a bladed bit to produce a nominal diameter for 150mm. Flushing of the hole was achieved by the addition of bentonite to form a mud of sufficient density to lift soil cutting satisfactorily. Careful attention was given to drilling rates with slow rotation speeds and a slow bit advance to ensure that soil particles cut by the bit was able to rise in bentonite mud column and thus ensure a 'clean' base to the bore hole. Casing of 150 mm diameter was used in the uppermost few meters of each boring.

3.2 SPT TEST AND DISTURBED SAMPLE COLLECTION

Standard Penetration Test (SPT) according to ASTM D 1586 was executed using automatic trip hammer at 1.0m intervals for first 5m and 1.5m interval for greater depths to determine relative density/consistency and classification of soil at different elevation inclusive collection of disturbed soil samples from each interval in accordance to the requirements of the specification of the Engineer. An exploratory boring with a diameter 150mm is bored to the depth of the first test. A SPT sampler, connected with required length of BW size rod to a 63.5 kg hammer, is inserted in to the boring. SPT sampler is split-spoon sampler with a ball valve to permit exit of air or water from the top during driving and to assist in retaining sample during withdrawal; in addition, the sampler has a tapered shoe for allowing penetration in to the ground. The number of blows required to progress the sampler 450 mm is recorded in three 150 mm intervals. The SPT N-value is calculated by summing the hammer blows required to advance the sampler during the last two intervals of the test. The blow count for the first 150 mm is recorded; however, this number is ignored during the N-value since the soil immediately below the drilling rod is disturbed.

After test is complete, the SPT sampler is withdrawn and opened. The amount of soil recovered in the sampler is recorded including its description; next, sample is transferred to an airtight container. The uncorrected SPT results are shown in the borehole records. Disturbed samples from split spoon at all SPT location labeled and preserved in airtight container before transferring them to DCL's laboratory in Dhaka.

Boring logs with SPT records are enclosed is Appendix B-1.

3.3 UNDISTURBED SAMPLE COLLECTION

Undisturbed Shelby tube sampling was under taken in drill holes as per ASTM D1587 of the contract document. An exploratory boring with a diameter ranging from 100mm to 125mm is bored to the depth of the first test. A sampler, connected with a connector rod to a 63.5 kg (140 lb) hammer, is inserted in to the boring. The Shelby sampler of 72mm diameter is open drive sampler with holes on top to permit exit of air or water from the top during driving.

After driving is complete, the sampler rotated through two complete revolutions to shear the superficial deposits horizontally at the bottom; afterwards, the sampler is withdrawn. Next, the sample tube is sealed on the both ends using three alternating layers of 20mm wax and aluminum foil and rubber capped. Sample tubes were properly labeled and a marking "TOP" was attached on the tube. All tubes were stored and transported vertically.

3.4 MEASUREMENT OF GROUND WATER

Water level inside the casing was measured for all boreholes 24 hour after completion of drilling. Measurement of water level was recorded by using a measuring tape and data was recorded. But it should be noted that this recorded data may not reflect long term ground water level due to the presence of perched water table, monsoon, and drilling operation. Therefore, recorded ground water data may not accurately reflect actual or long term ground water elevation.

3.5 ELECTRONIC STATIC CONE PENETRATION TEST WITH PORE PRESSURE (CPT-U)

Electronic Cone Penetration Testing was carried out using a 15cm2 projected area electronic cones with 60^{o} apex angle and 225cm2 friction sleeve area advance using a 20Ton hydraulic penetrometer. A total of eight (8) out of fifteen (15) soundings (designated SCPT-1 through SCPT-15) were performed at selected locations. CPT tests were terminated 60m (maximum) below existing grade and tests were conducted in accordance to ASTM D 5778. Throughout the test the cone was advanced by applying thrust on 1m long 36mm diameter rod at a rate of 2.0cm/sec. After advancement of each 1m segment subsequent rod was attached and operation was repeated.

The cone manufactured by GeoMil is a subtraction type cone equipped with instruments to measure (a) Cone Pressure, (b) Sleeve Friction, and (c) Dynamic Pore Pressure; furthermore, the cone is also equipped with two inclinometers to monitor its verticality at all times. Depth of the cone was recorded using an opto-electric encoder. All data was recorded for every centimeter automatically in a computer running proprietary software.

Prior to commencement of each test, the pressure transducer of the cone was saturated using silicon oil. The cone was calibrated prior to commencement and at the end of each test conforming to the specification using CPTest software (from GeoMil), this software also automatically recorded all data from the cone.

After completion of the test all collected data was plotted using CPTask software, which was also used to estimate engineering parameters from the in situ test data. This software was used to estimate following engineering parameters: Friction Angle, Undrained Shear Strength, Relative Density, and Classification.

CPT logs are enclosed is Appendix B-2.

3.6 FIELD VANE SHEAR TEST

Field Vane Shear Test is used for measuring undrained shear strength parameter of cohesive soil by means of rotating a vane in boreholes.

Procedure:

i. Locate the advancement equipment over the test location. The test can be performed in a pre-drilled hole, pushing from the surface, or with drilling through vane housing.

ii. Set a reaction casing to transfer forces to the torque head without twist or slippage.

iii. When drilling, stop the drill hole at a depth such that the vane tip may penetrate undisturbed soil for a depth of at least five times the outside diameter of the hole. In the case where vane housing is used, advance the housing to a depth which that is at least five vane housing diameters less than the desired depth of the vane tip.

iv. Advance the vane from the bottom of the hole or the vane housing in a single thrust to the depth at which the test is to be conducted. The vane shall be pushed down without any use of blows, vibration, or rotation. No torque should be applied to the rods during the thrust.

v. The vane is retracted in the casing, when the test zone is reached the vane is pushed out of the shoe 35 to 50 cm. Vane rod friction is this case should be negligible.

vi. The time from the end of vane penetration to beginning rotation shall be no more than 5 minutes. With the vane in position, apply the torque to the vane at a rate of 0.1 deg/s until failure.

The test results are presented in APPENDIX B-3

3.7 Electrical Resistivity Test

Thirty two (32) out of forty three (43) electrical resistivity tests was carried using a Chauvin-Arnoux (Model: CA6460) Soil Resistivity Meter at ground surface with electrode spacing of 0.5m, 1.0m, 2.0m 3.0 m, 4.0m, 6m, 8m, and 10m utilizing the Wenner - 4 Pin method. Steel electrode pegs of 2m length were hammered into the ground at the required spacing and were connected to the resistance meter as detailed in the diagram below (ASTM G57 – 95(a)).

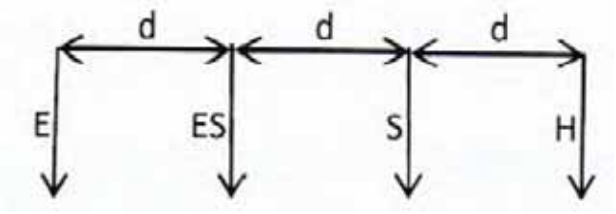


Figure 3: Electrical Resistivity Test Setup

A low voltage 97 Hz square wave current was passed between the two (outer) current electrodes E, H. The detector measures the voltage drop between the two (inner) potential electrodes ES, S, and compares this with internal standard resistors and indicates the resistance reading in ohms on a LCD display. Soil resistivity is then calculated using the following formula for the Wenner electrode configuration:

$$\rho_w = 2\pi d R_{S\text{-}ES}$$

The test results are presented in APPENDIX B-4

4. INVESTIGATION RESULTS

4.1 CLASSIFICATION OF SOIL

The Unified Soil Classification System (ASTM D2487) was used to classify the soil encountered in boring.

4.2 SUMMARY OF FIELD INVESTIGATION

Following list presents borehole number, location coordinates and chainage and ground surface elevation. Borehole location plans are included in Appendix A. Borehole logs are included in Appendix B.

BH No	UTM Coordinate		Ground Elevation*
	Easting	Northing	
BH-5	454556	499277	+4.861m
BH-6	454996	498577	+5.530m
BH-11	454711	499306	+4.732m
BH-13	454936	498888	+5.279m
BH-15	454839	499204	+5.369m
BH-19	454786	499146	+5.262m
BH-20	454799	499117	+5.193m
BH-22	454719	499146	+5.415m
BH-23	454598	499145	+5.620m
BH-24	454547	499137	+5.821m
BH-25	454467	498740	+5.532m
BH-26	454603	499118	+5.584m
BH-27	454655	499128	+5.397m
BH-29	454759	499075	+5.750m
BH-30	454799	499075	+5.450m
BH-32	454799	499033	+5.508m
BH-39	454599	499054	+5.718m
BH-40	454639	499033	+5.560m
BH-42	454374	498993	+5.532m
BH-45	454559	499012	+5.391m

BH-46	454599	499012	+5.263m
BH-47	454579	498990	+5.183m
BH-48	454559	498972	+5.623m
BH-50	454559	498932	+5.428m
BH-51	454679	499012	+5.325m
BH-52	454719	499012	++5.490m
BH-53	454759	499012	+5.908m
BH-54	454741	498989	+5.742m
BH-55	454808	498999	+5.573m
BH-57	454679	498972	+5.627m
BH-60	454604	498898	+5.563m
BH-61	454575	498882	+5.508m
BH-63	454692	498858	+5.530m
BH-69	454559	498852	+5.351m
BH-71	454579	498772	+5.544m
BH-72	454627	498772	+5.645m
BH-73	454674	498772	+5.276m
BH-74	454719	498772	+5.489m
BH-90	455215	498519	+5.651m

***Elevation reference provided by BHEL**

Table 1: Test locations for BH

ERT No.	UTM Coordinate	
	Easting	Northing
ERT-1	454183	499389
ERT-2	454660	499304
ERT-3	454759	499304
ERT-4	454946	499286
ERT-5	454799	499254
ERT-6	454405	499247
ERT-7	454739	499204

ERT-8	454639	499204
ERT-9	454757	499168
ERT-10	454171	499184
ERT-11	455250	498563
ERT-12	454521	499120
ERT-13	454631	499126
ERT-14	454686	499135
ERT-15	454732	499113
ERT-16	454773	498998
ERT-17	454651	498977
ERT-18	454541	498959
ERT-19	454424	498915
ERT-20	454173	498918
ERT-21	454635	498859
ERT-22	454780	498858
ERT-23	454325	498807
ERT-24	454111	498682
ERT-25	454221	498668
ERT-26	454422	498594
ERT-27	454462	498690
ERT-28	454547	498700
ERT-29	454728	498692
ERT-30	454657	498634
ERT-31	454850	498577
ERT-32	453977	497753

Table 2: Test locations for ERT

SCPT	UTM Coordinate	
	Easting	Northing
SCPT-1	454755	499146
SCPT-2	454599	499075
SCPT-3	454759	498972
SCPT-4	454599	498822
SCPT-5	454154	499208
SCPT-6	454154	498948
SCPT-7	454223	498651
SCPT-9	454079	497722

Table 3: Test locations for SCPT

4.3 LABORATORY TEST

Following table lists the schedule of laboratory test undertaken. All tests were under taken at DCL's own laboratory in Dhaka. A table summarizing all tests result is enclosed in Appendix-D, and all laboratory test reports are enclosed in Appendix-C.

Laboratory Test	Quantity
Bulk Density/Unit Weight	101
Moisture Content Test	120
Particle Size Distribution	187
Atterberg Limits	114
Specific Gravity Test	59
Consolidation Test	1
Direct Shear Test	13

Table 4: Quantity of Laboratory Tests.

5. GEOTECHNICAL PROPERTIES

5.1 SOIL GRADATION

Figure 4 shows the soil gradation envelope of all tests performed under the current investigation program.

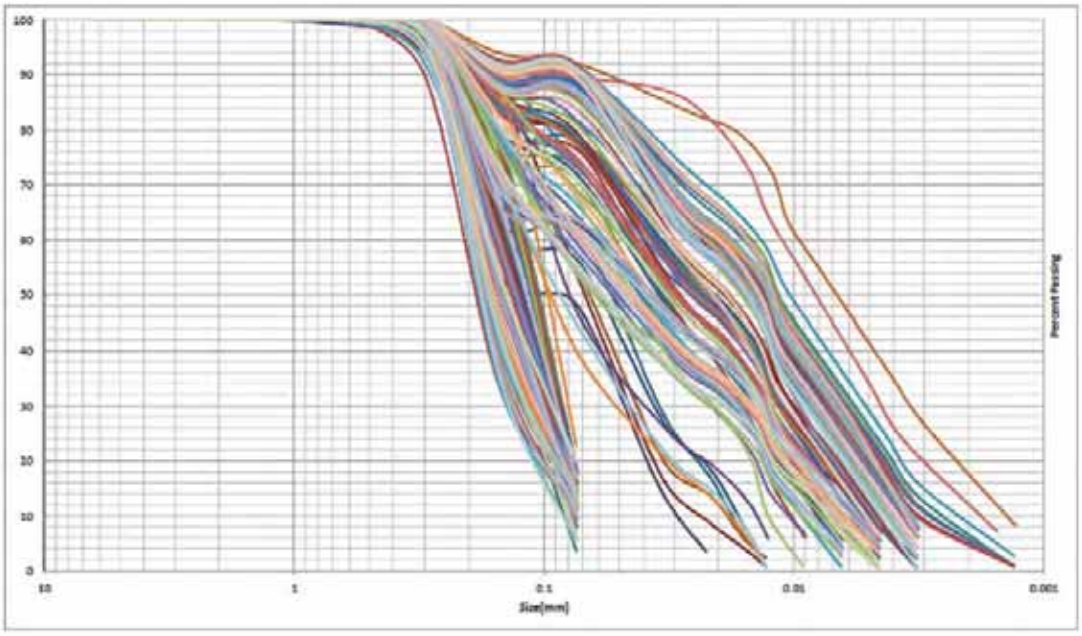


Figure 4: Soil Gradation Envelope

5.2 SOIL PLASTICITY

Figure 5 shows the plasticity chart of all soil samples tested under the current investigation program.

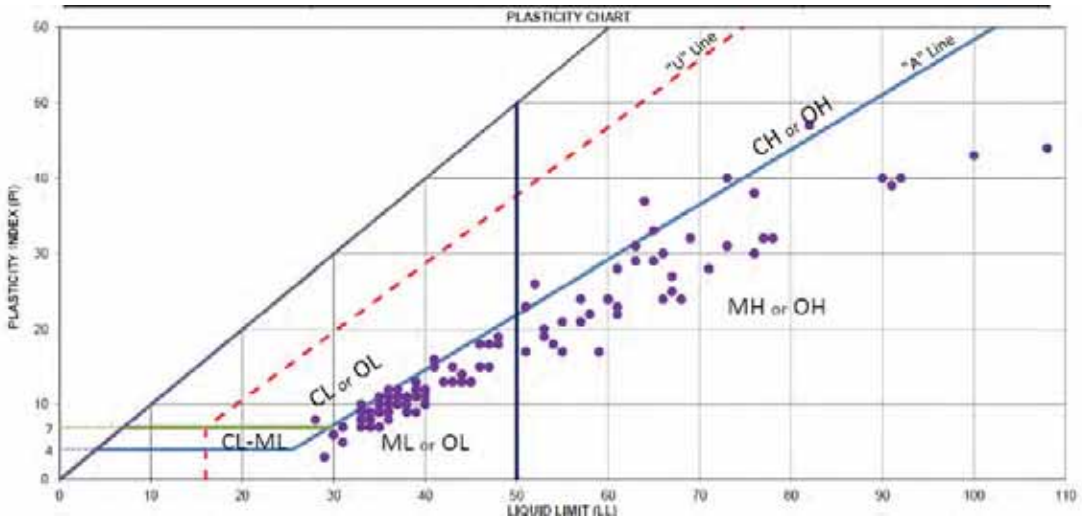


Figure 5: Soil Plasticity

5.3 GEOTECHNICAL PROPERTIES

Following tables are provided as a summary of test results done at various locations:

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SM	0-6.0	2 - 8	-	-	-
2	MH	6.0-13.0	0 - 4	46.61-52.58	LL=54 - 66 PI=18 - 30	-
3	ML	8.0 -28.0	3 - 41	39.78	LL=38 - 46 PI=9 - 18	-
4	SP-SM	13.0 -23.0	9 -24	-	-	-
5	SM	28.0-40.0	12 - 57	-	-	-
6	ML	26.0 -43.0	12 - 43	-	LL=36 - 40 PI=11	-
7	SM	29.0- 70.0	22 - 73	-	-	-

Table 5-1: Summary of test results for Chimney Area (BH-71, 72, 73, 74)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SM	0 - 6.5	3 - 5	-	-	-
2	ML	6.5 - 26.0	2 - 22	42.03	LL=48 PI=19	Φ=30.3 C=22.6
3	SP-SM	26.0- 30.0	24 - 44	-	-	-
4	SM	26.0 -40.0	20 - 38	-	-	-

Table 5-2: Summary of test results for Clarified Pump House (BH-25)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SP-SM	0- 7.5	2 - 6	-	-	-
2	ML	6.0 - 14.0	1 - 4	49.86	LL=47 PI=15-18	-
3	CH	5.0-14.0	3-5	47.82	LL=51 PI=23	-
4	CL	12.0-14.0	4 - 5	-	LL=35 PI=11	-
5	SM	14.0-26.0	20-45	-	-	-
6	ML	15.0-30.0	4-32	-	LL=34 PI=8	-

Table 5-3: Summary of test results for Switch Yard Area (BH-5, 11, 15)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SM	0-6.5	2-7	-	-	-
2	SP-SM	0-7.5	2-9	-	-	-
3	MH	7.0-15.0	1-6	51.74-63.42	LL=59-73 PI=17-31	-
4	CH	6.0-12.0	2-3	45.79-69.93	LL=73 PI=40	-
5	OH	6.0-12.0	1-4	110.8	LL=60-78 PI=24-32	-
6	ML	12.0-40.0	6-62	34.52	LL=35-38 PI=10-11	-
7	SP-SM	22.0-28.0	24-32	-	-	Φ=30.2 C=28.1
8	SM	32.0-40.0	23-58	-	-	-

Table 5-4: Summary of test results for Transformer Yard (BH-19, 20, 22, 23, 24, 26, and 27)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SP-SM	0-6.5	2-10	-	-	-
2	SM	0-6.0	4-7	-	-	-
3	OH	6.0-9.0	2-5	52.41	LL=82-91 PI=39-47	-
4	MH	5.0-19.0	0-15	37.89-59.17	LL=53-90 PI=21-40	-
5	ML	12.0-30.0	9-23	-	LL=33 PI=8	-
6	SM	19.0-27.0	22-55	-	-	-
7	ML	27.0-40.0	5-43	28.44-31.95	LL=30-34 PI=6-8	-
8	SP-SM	40.0-70.0	38-78	-	-	-
9	SP	51.0-70.0	43-75	-	-	-

Table 5-5: Summary of test results for Boiler Area (BH-45 to 48, 51 to 57)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SM	0.0-6.0	2-6	-	-	-
2	OH	5.5-9.5	2-7	114.0	LL=131 PI=62	-
3	MH	5.0-16.5	0-5	23.74-44.66	LL=53-69 PI=20-32	-
4	ML	6.0-40.0	2-55	31.62-62.86	LL=36-48 PI=10-18	-
5	SM	13.0-40.0	8-40	-	-	Φ=29.8-30.6 C=-25.8-28.1

Table 5-6: Summary of test results for ESP Area (BH-50, 60, 61, 63, 69)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SM	0.0-6.0	2-6	-	-	-
2	ML	6.0-12.0	2-6	39.79	LL=40 PI=10	-
3	SM	12.0-24.0	10-33	-	-	-
4	ML	24.0-28.5	13-15	-	LL=38 PI=10	-
5	SM	28.5-37.5	23-40	-	-	-
6	ML	37.5-40.0	26-28	-	LL=44 PI=13	-

Table 5-7: Summary of test results for Gas Cylinder Room (BH-13)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SP-SM	0-5.5	3-4	-	-	-
2	MH	5.0-11.0	2-4	40.76	LL=63 PI=29	-
3	Clayey Silt	11.0-15.5	4-5	-	-	-
4	Silty Sand	15.5-30.0	12-35	-	-	-

Table 5-8: Summary of test results for Helipad Area (BH-90)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SP-SM	0.0-7.5	3-7	-	-	-
2	MH	7.5-13.5	0-3	46.28	LL=68 PI=24	-
3	ML	13.5-30.0	8-60	-	LL=31 PI=7	Φ=30.8 C=-19.9
4	Fine Sand	30.0-40.0	30-58	-	-	-

Table 5-9: Summary of test results for IDCT (BH-42)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SP-SM	0-6.5	6-24	24.82	-	-
2	OH	6.5-10.0	2	44.74	LL=108 PI=44	-
3	Silty Clay	10.0-15.5	3-5	-	-	-
4	Clayey Silt	15.5-20.0	11-18	-	-	-
5	Silty Sand	20.0-23.0	18-19	-	-	-
6	ML	23.0-25.0	11	29.20	LL=34 PI=9	-
7	Silty Sand	25.0-27.0	30	-	-	-
8	Silty Clay	27.0-29.5	20	-	-	-
9	SM	29.5-40.0	26-72	27.58	-	-

Table 5-10: Summary of test results for Sub Station Temperature (BH-6)

Layer No	USCS/Visual Classification	Depth (m)	SPT N	Moisture Content (%)	Index Properties	Strength Properties[1] C (kPa) Φ(deg.)
1	SP-SM	0.0-6.5	3-6	-	-	-
2	SM	0.0-6.0	3-6	-	-	-
3	OH	11.0-22.0	7-11	-	-	-
4	MH	6.0-13.0	0-4	43.17	LL=51 PI=17	-
5	ML	11.0-40.0	5-80	-	LL=30-36 PI=6-10	-
6	SP-SM	14.0-28.5	12-20	-	-	Φ=30.6 C=-19.8
7	SM	32.0-70.0	18-70	-	-	-

Table 5-11: Summary of test results for TG Building (BH-29, 30, 32, 39, 40)

6.0 RECOMMENDATION

Due to insignificant number of boreholes, distance between boreholes, and varying terrain, proper soil profile could not be developed. A soil anticipated profile diagram is enclosed in Appendix B. As such, recommendation and calculations for foundation are given per-location basis.

6.1 ANALYSIS FOR SHALLOW FOUNDATION

6.1.1 BEARING CAPACITY

Due to the presence of soft to very soft material below the near surface, it is not recommended to implement shallow foundation in the proposed site for heavy or major structure as it is likely to consolidate under induced pressure of shallow foundation resulting in excessive settlement. Minor structures may be rested on isolated shallow foundation;

Following equation (Terzaghi) was used to determine bearing capacity of square foundation:

$$q_u = 1.3 \times c \times N_c + \sigma_{zD} N_q + 0.5 \gamma B N_\gamma s_\gamma$$

For un-drained condition ($\Phi=0^o$) analysis:

N_c=5.7 N_q=1; N_γ=0; s_γ=0.8;

$$q_a = \frac{q_u}{FS}$$

Location with SPT value is use to evaluate bearing capacity

Location/ Station	Footing Depth below EGL (m)	Footing Size (m x m)	Ultimate Bearing Capacity, q_u (kPa)	Allowable Bearing capacity, q_a (kPa), FS=3
Chimney Area (BH-71,72,73,74)	1.0	1.0 x 1.0	220	73
	2.0		330	110
	3.0		375	125
Clarified Pump House (BH-25)	1.0	1.0 x 1.0	210	70
	2.0		330	110
	3.0		390	130
Switch Yard (BH-5,11,15)	1.0	1.0 x 1.0	210	70
	2.0		315	105
	3.0		360	120
Transformer Yard (BH-19,20,21,22,23,24,26,27)	1.0	1.0 x 1.0	220	73
	2.0		315	105
	3.0		360	120
Boilar Area (BH-45 to 48, 51 to 57)	1.0	1.0 x 1.0	220	73
	2.0		330	110
	3.0		390	130
ESP Area (BH-50,60,61,63,69)	1.0	1.0 x 1.0	210	70
	2.0		315	105
	3.0		375	125
Gas Cylinder Room (BH-13)	1.0	1.0 x 1.0	220	73
	2.0		330	110
	3.0		390	130
Helipad Area (BH-90)	1.0	1.0 x 1.0	210	70
	2.0		255	85
	3.0		315	105
IDCT Area (BH-42)	1.0	1.0 x 1.0	220	73
	2.0		330	110
	3.0		375	125
Sub-Station Temperature (BH-6)	1.0	1.0 x 1.0	220	73
	2.0		330	110
	3.0		390	130
T.G Building (BH-29,30,32,39,40)	1.0	1.0 x 1.0	220	73
	2.0		330	110
	3.0		375	125

Table 6: Bearing capacity Estimation for shallow foundation considering 25mm settlement (Footing Size: 1m X 1m)

Location/ Station	Footing Depth below EGL (m)	Footing Size (m x m)	Ultimate Bearing Capacity, q_u (kPa)	Allowable Bearing capacity, q_a (kPa), FS=3
Chimney Area (BH-71,72,73,74)	1.0	2.0 x 2.0	120	40
	2.0		150	50
	3.0		195	65
	4.0		270	90
	5.0		420	140
Clarified Pump House (BH-25)	1.0	2.0 x 2.0	135	45
	2.0		165	55
	3.0		225	75
	4.0		300	100
	5.0		435	145
Switch Yard (BH-5,11,15)	1.0	2.0 x 2.0	105	35
	2.0		150	50
	3.0		195	65
	4.0		270	90
	5.0		420	140
Transformer Yard (BH-19,20,21,22,23,24,26,27)	1.0	2.0 x 2.0	120	40
	2.0		150	50
	3.0		195	65
	4.0		270	90
	5.0		420	140
Boilar Area (BH-45 to 48, 51 to 57)	1.0	2.0 x 2.0	135	45
	2.0		135	55
	3.0		210	70
	4.0		285	95
	5.0		405	135
ESP Area (BH-50,60,61,63,69)	1.0	2.0 x 2.0	105	35
	2.0		150	50
	3.0		195	65
	4.0		270	90
	5.0		435	145
Gas Cylinder Room (BH-13)	1.0	2.0 x 2.0	135	45
	2.0		165	55
	3.0		225	75
	4.0		285	95
	5.0		450	150
Helipad Area (BH-90)	1.0	2.0 x 2.0	105	35
	2.0		150	50

	3.0		210	70
	4.0		285	95
	5.0		435	145
IDCT Area (BH-42)	1.0	2.0 x 2.0	150	50
	2.0		180	60
	3.0		240	80
	4.0		315	105
	5.0		435	145
Sub-Station Temperature (BH-6)	1.0	2.0 x 2.0	150	50
	2.0		195	65
	3.0		255	85
	4.0		285	95
	5.0		315	105
T.G Building (BH-29,30,32,39,40)	1.0	2.0 x 2.0	105	35
	2.0		150	50
	3.0		195	65
	4.0		270	90
	5.0		420	140

Table 7: Bearing capacity Estimation for shallow foundation considering 25mm settlement (Footing Size: 2m X 2m)

Location/ Station	**Footing Depth below EGL (m)**	**Footing Size (m x m)**	**Ultimate Bearing Capacity, q_u (kPa)**	**Allowable Bearing capacity, q_a (kPa), FS=3**
Chimney Area (BH-71,72,73,74)	1.0	3.0 x 3.0	75	25
	2.0		120	40
	3.0		180	60
	4.0		240	80
	5.0		270	90
Clarified Pump House (BH-25)	1.0	3.0 x 3.0	90	30
	2.0		135	45
	3.0		195	65
	4.0		285	95
	5.0		330	110
Switch Yard (BH-5,11,15)	1.0	3.0 x 3.0	75	25
	2.0		120	40
	3.0		180	60
	4.0		255	85
	5.0		285	95
Transformer Yard (BH-	1.0	3.0 x 3.0	75	25
	2.0		120	40

19,20,21,22,23,24,26,27)	3.0		180	60
	4.0		225	75
	5.0		255	85
Boilar Area (BH-45 to 48, 51 to 57)	1.0	3.0 x 3.0	75	25
	2.0		135	45
	3.0		180	60
	4.0		240	80
	5.0		270	90
ESP Area (BH-50,60,61,63,69)	1.0	3.0 x 3.0	75	25
	2.0		120	40
	3.0		180	60
	4.0		225	75
	5.0		270	90
Gas Cylinder Room (BH-13)	1.0	3.0 x 3.0	90	30
	2.0		135	45
	3.0		165	55
	4.0		225	75
	5.0		270	90
Helipad Area (BH-90)	1.0	3.0 x 3.0	75	25
	2.0		120	40
	3.0		180	60
	4.0		225	75
	5.0		270	90
IDCT Area (BH-42)	1.0	3.0 x 3.0	90	30
	2.0		150	50
	3.0		210	70
	4.0		255	85
	5.0		285	95
Sub-Station Temperature (BH-6)	1.0	3.0 x 3.0	105	35
	2.0		135	45
	3.0		165	55
	4.0		225	75
	5.0		270	90
T.G Building (BH-29,30,32,39,40)	1.0	3.0 x 3.0	75	25
	2.0		120	40
	3.0		180	60
	4.0		255	85
	5.0		285	95

Table 8: Bearing capacity Estimation for shallow foundation considering 25mm settlement (Footing Size: 3m X 3m)

Location/ Station	Footing Depth below EGL (m)	Footing Size (m x m)	Ultimate Bearing Capacity, q_u (kPa)	Allowable Bearing capacity, q_a (kPa), FS=3
Chimney Area (BH-71,72,73,74)	1.0	4.0 x 4.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		225	75
Clarified Pump House (BH-25)	1.0	4.0 x 4.0	75	25
	2.0		120	40
	3.0		195	65
	4.0		225	75
	5.0		255	85
Switch Yard (BH-5,11,15)	1.0	4.0 x 4.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		225	75
Transformer Yard (BH-19,20,21,22,23,24,26,27)	1.0	4.0 x 4.0	60	20
	2.0		90	30
	3.0		150	50
	4.0		180	60
	5.0		225	75
Boilar Area (BH-45 to 48, 51 to 57)	1.0	4.0 x 4.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		210	70
	5.0		255	85
ESP Area (BH-50,60,61,63,69)	1.0	4.0 x 4.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		225	75
Gas Cylinder Room (BH-13)	1.0	4.0 x 4.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		240	80
Helipad Area (BH-90)	1.0	4.0 x 4.0	75	25
	2.0		120	40

	3.0		195	65
	4.0		225	75
	5.0		255	85
IDCT Area (BH-42)	1.0	4.0 x 4.0	75	25
	2.0		120	40
	3.0		165	55
	4.0		195	65
	5.0		225	75
Sub-Station Temperature (BH-6)	1.0	4.0 x 4.0	75	25
	2.0		105	35
	3.0		165	55
	4.0		210	70
	5.0		240	80
T.G Building (BH-29,30,32,39,40)	1.0	4.0 x 4.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		225	75

Table 9: Bearing capacity Estimation for shallow foundation considering 25mm settlement (Footing Size: 4m X 4m)

Location/ Station	**Footing Depth below EGL (m)**	**Footing Size (m x m)**	**Ultimate Bearing Capacity, q_u (kPa)**	**Allowable Bearing capacity, q_a (kPa), FS=3**
Chimney Area (BH-71,72,73,74)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		180	60
	5.0		225	75
Clarified Pump House (BH-25)	1.0	5.0 x 5.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		225	75
Switch Yard (BH-5,11,15)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		180	60
	5.0		210	70
Transformer Yard (BH-19,20,21,22,23,24,26,27)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		170	57

	5.0		210	70
Boilar Area (BH-45 to 48, 51 to 57)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		150	50
	4.0		195	65
	5.0		225	75
ESP Area (BH-50,60,61,63,69)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		180	60
	5.0		225	75
Gas Cylinder Room (BH-13)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		180	60
	5.0		225	75
Helipad Area (BH-90)	1.0	5.0 x 5.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		195	65
	5.0		225	75
IDCT Area (BH-42)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		180	60
	5.0		210	70
Sub-Station Temperature (BH-6)	1.0	5.0 x 5.0	60	20
	2.0		105	35
	3.0		150	50
	4.0		180	60
	5.0		210	70
T.G Building (BH-29,30,32,39,40)	1.0	5.0 x 5.0	45	15
	2.0		90	30
	3.0		135	45
	4.0		180	60
	5.0		225	75

Table 10: Bearing capacity Estimation for shallow foundation considering 25mm settlement (Footing Size: 5m X 5m)

Location with CPT value is use to evaluate bearing capacity

Bearing Capacity Base on CPT result					
25mm settlement					
Size(m) / Depth (m)	1x1	2x2	3x3	4x4	5x5
1	88	49	29	-	-
2	108	64	34	24	-
3	125	65	41	35	33
4	136	62	50	47	45
5	93	66	61	59	58
40mm settlement					
Size(m) / Depth (m)	1x1	2x2	3x3	4x4	5x5
1	132	75	45	-	-
2	155	90	46	30	25
3	175	85	49	40	36
4	186	73	56	51	48
5	114	73	66	63	61
75mm settlement					
Size(m) / Depth (m)	1x1	2x2	3x3	4x4	5x5
1	224	130	80	40	24
2	257	149	72	44	33
3	283	129	67	50	43
4	294	98	69	59	55
5	161	89	75	70	68

Table 11: Bearing capacity Estimation for shallow foundation based on CPT results

6.1.2 CONSOLIDATION

One Consolidation test data was available at the time of writing this report.

6.2 DEEP FOUNDATION

6.2.1 ANALYSIS BORED CAST-IN-SITU PILES

Ultimate Pile capacities have been calculated based on methods outlined in "Nominal Axial Compression Resistance of Single Drilled Shaft" in AASTHO LRFD 2007 Section 10. The ultimate unit is given by the relationship following relationship for drilled shaft:

$$\varphi R_n = \varphi_{qp} R_p + \varphi_{qs} R_s$$

In which:

$R_p = q_p A_p$

$R_s = q_s A_s$

Where:

R_p = Nominal Shaft Tip Resistance

R_s = Nominal Shaft Side Resistance

q_p = Unit Tip Resistance

q_s = Unit Side Resistance

φ_{qp} = Resistance factor for tip resistance

φ_{qs} = Resistance factor for side resistance

6.2.2 SIDE RESISTANCE FOR CAST-IN-SITU PILES

Nominal side resistance in cohesive soil is determined by following equation:

$q_s = \alpha S_u$

In which:

$$\alpha = 0.55 \ for \ \frac{S_u}{p_a} \leq 1.5$$

$$\alpha = 0.55 - \left(\frac{S_u}{p_a} - 1.5\right) for \ 1.5 \leq \frac{S_u}{p_a} \leq 2.5$$

Where:

S_u = Undrained Shear Strength (MPa)

α = Adhesion Factor (dimensionless)

p_a = Atmospheric pressure (=0.101MPa)

Side Resistance in cohesionless sandy soil:

Nominal side resistance in cohesionless soil is determined by following equation (β - method):

$$f_s = \beta\sigma_v' \; for \; 0.25 \leq \beta \leq 1.2$$

$$\text{For } N_{60} \geq 15 : \beta = 1.5 - (7.7 \times 10^{-3}\sqrt{z})$$

$$\text{For } N_{60} < 15 : \beta = \frac{N_{60}}{15}(1.5 - (7.7 \times 10^{-3}\sqrt{z}))$$

Where:

σ_v' = Vertical effective stress at soil layer mid-depth

β = Load Transfer coefficient (dimensionless)

z = Depth below ground, at soil layer mid-depth

N_{60} = Average SPT blow count (corrected only for hammer efficiency) = (ER/60%)N and ER=80% for automatic trip hammer (Equation 10.4.6.2.4-2 of AASHTO LRFD 2007)

6.2.3 TIP RESISTANCE FOR CAST-IN-SITU PILES

Tip Resistance in cohesionless soil may be estimated using following equation:

$$q_p - 1.2N_{60} \; for \; 0.57N_{60} \leq 50$$

$$q_p = 0.59\left[N_{60}\left(\frac{p_a}{\sigma_v'}\right)\right]^{0.8}\sigma_v' \; for \; N_{60} > 50$$

Where:

p_a = Atmospheric pressure (=0.101MPa)

σ_v' = vertical effective stress at the tip elevation of the shaft (MPa)

N_{60} = Average SPT blow count (corrected only for hammer efficiency) in the design zone under consideration (blows/300mm)

Based on the above design SPT N-values and undrained shear strength data obtained from field and laboratory tests, following units resistance has been estimated:

6.2.4 ESTIMATED PILE CAPACITY FOR CAST-IN-SITU PILES

Using above *ultimate* unit resistance following *working* load capacities of different boreholes were calculated based on SPT Value:

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Chimney Area (BH-71,72,73,74)	550	25.0	666	291	80
	600	25.0	745	317	95
	750	25.0	999	396	150
	1000	25.0	1483	528	220
	550	30.0	739	367	80
	600	30.0	819	400	95
	750	30.0	1071	500	150
	1000	30.0	1534	667	220
	550	40.0	1060	530	80
	600	40.0	1173	578	95
	750	40.0	1532	723	150
	1000	40.0	2188	964	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Clarified Pump House (BH-25)	550	25.0	578	278	80
	600	25.0	642	303	95
	750	25.0	846	379	150
	1000	25.0	1223	505	220
	550	30.0	726	355	80
	600	30.0	805	387	95
	750	30.0	1056	484	150
	1000	30.0	1518	646	220
	550	40.0	1001	521	80
	600	40.0	1106	568	95
	750	40.0	1432	710	150
	1000	40.0	2019	947	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Switch Yard Area (BH-5,11,15)	550	25.0	565	262	80
	600	25.0	629	286	95
	750	25.0	834	358	150
	1000	25.0	1217	477	220
	550	30.0	693	340	80
	600	30.0	769	370	95
	750	30.0	1009	463	150
	1000	30.0	1451	617	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Transformer Yard (BH19,20,21,22, 23,24,26,27,28)	550	25.0	627	282	80
	600	25.0	700	307	95
	750	25.0	934	384	150
	1000	25.0	1376	512	220
	550	30.0	721	360	80
	600	30.0	799	393	95
	750	30.0	1044	491	150
	1000	30.0	1492	654	220
	550	40.0	1105	525	80
	600	40.0	1228	573	95
	750	40.0	1621	716	150
	1000	40.0	2351	955	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Boilar Area (BH-45 to 48, 51 to 57)	550	25.0	692	313	80
	600	25.0	772	342	95
	750	25.0	1029	427	150
	1000	25.0	1512	570	220
	550	30.0	777	390	80
	600	30.0	861	425	95
	750	30.0	1123	532	150
	1000	30.0	1603	709	220
	550	40.0	1122	553	80
	600	40.0	1244	603	95

	750	40.0	1629	754	150
	1000	40.0	2338	1005	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
ESP Area (BH-50,60,61,63,69)	550	25.0	586	264	80
	600	25.0	654	288	95
	750	25.0	872	360	150
	1000	25.0	1283	481	220
	550	30.0	653	341	80
	600	30.0	720	372	95
	750	30.0	932	465	150
	1000	30.0	1313	619	220
	550	40.0	1028	500	80
	600	40.0	1140	546	95
	750	40.0	1498	682	150
	1000	40.0	2158	909	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Gas Cylinder Area (BH-13)	550	25.0	507	304	80
	600	25.0	553	332	95
	750	25.0	691	415	150
	1000	25.0	921	553	220
	550	30.0	774	392	80
	600	30.0	857	427	95
	750	30.0	1116	534	150
	1000	30.0	1588	712	220
	550	40.0	1026	557	80
	600	40.0	1129	608	95
	750	40.0	1447	760	150
	1000	40.0	2010	1013	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Helipad Area (BH-90)	550	25.0	585	249	80
	600	25.0	655	271	95
	750	25.0	882	339	150
	1000	25.0	1316	452	220
	550	30.0	719	329	80

	600	30.0	801	359	95
	750	30.0	1065	449	150
	1000	30.0	1560	599	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
IDCT Area (BH-42)	550	25.0	643	248	80
	600	25.0	724	271	95
	750	25.0	991	338	150
	1000	25.0	1511	451	220
	550	30.0	753	324	80
	600	30.0	842	354	95
	750	30.0	1132	442	150
	1000	30.0	1684	589	220
	550	40.0	1047	490	80
	600	40.0	1164	535	95
	750	40.0	1541	668	150
	1000	40.0	2244	891	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Sub-Station Temperature (BH-6)	550	25.0	582	240	80
	600	25.0	653	262	95
	750	25.0	884	327	150
	1000	25.0	1329	436	220
	550	30.0	624	375	80
	600	30.0	681	409	95
	750	30.0	851	511	150
	1000	30.0	1135	681	220
	550	40.0	1113	530	80
	600	40.0	1237	578	95
	750	40.0	1632	723	150
	1000	40.0	2366	964	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
TG Building (BH-	550	25.0	644	277	80
	600	25.0	720	302	95
	750	25.0	968	378	150
	1000	25.0	1441	503	220

29,30,32,39,40)	550	30.0	704	353	80
	600	30.0	780	385	95
	750	30.0	1017	482	150
	1000	30.0	1452	642	220
	550	40.0	1030	519	80
	600	40.0	1139	567	95
	750	40.0	1485	708	150
	1000	40.0	2116	944	220
	1000	50.0	2761	1331	220

Table12: Estimated Drilled Shaft Capacity for different diameter based on SPT

Note:

1. Usually 550mm diameter pile is not recommended due to construction constrain i.e. lowering of tremie using 75mm CC block.
2. Pile capacity could be enhanced around 25% by base grouting which shall be confirmed by load test.
3. Negative skin friction is not considered in calculating drilled shaft capacity.

6.2.4 ESTIMATED PILE CAPACITY FOR CAST-IN-SITU PILES

Using above *ultimate* unit resistance following *working* load capacities of different boreholes were calculated based on CPT Test:

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-1 (Transformer Yard)	550	25.0	765	291	80
	600	25.0	840	318	95
	750	25.0	1072	397	150
	1000	25.0	1456	530	220
	550	30.0	1054	347	80
	600	30.0	1161	378	95
	750	30.0	1511	473	150
	1000	30.0	2158	630	220
	550	40.0	1532	555	80
	600	40.0	1685	605	95
	750	40.0	2175	757	150
	1000	40.0	3031	1009	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-2 (TG Building)	550	25.0	1003	310	80
	600	25.0	1093	339	95
	750	25.0	1385	424	150
	1000	25.0	1869	565	220
	550	30.0	1061	370	80
	600	30.0	1171	403	95
	750	30.0	1500	504	150
	1000	30.0	2113	672	220
	550	40.0	1855	611	80
	600	40.0	2057	667	95
	750	40.0	2701	833	150
	1000	40.0	3836	1111	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-3 (Boiler Area)	550	25.0	919	225	80
	600	25.0	1038	245	95
	750	25.0	1336	307	150
	1000	25.0	1835	409	220
	550	30.0	838	319	80
	600	30.0	918	349	95
	750	30.0	1155	436	150
	1000	30.0	1555	581	220
	550	40.0	1083	418	80
	600	40.0	1186	456	95
	750	40.0	1484	570	150
	1000	40.0	1990	760	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-4 (ESP Area)	550	25.0	761	285	80
	600	25.0	838	311	95
	750	25.0	1085	389	150
	1000	25.0	1572	519	220
	550	30.0	1173	358	80
	600	30.0	1310	390	95
	750	30.0	1710	488	150
	1000	30.0	2385	651	220
	550	40.0	1745	605	80
	600	40.0	1930	660	95
	750	40.0	2502	825	150
	1000	40.0	3482	1101	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-5 (IDCT)	550	25.0	1039	294	80
	600	25.0	1165	321	95
	750	25.0	1577	402	150
	1000	25.0	2457	536	220
	550	30.0	1315	439	80
	600	30.0	1455	479	95
	750	30.0	1894	599	150
	1000	30.0	2726	799	220
	550	40.0	1737	659	80
	600	40.0	1915	719	95
	750	40.0	2465	899	150
	1000	40.0	3617	1199	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-6 (IDCT)	550	25.0	899	263	80
	600	25.0	1005	287	95
	750	25.0	1346	359	150
	1000	25.0	1818	479	220
	550	30.0	1152	352	80
	600	30.0	1284	385	95
	750	30.0	1674	481	150
	1000	30.0	2413	641	220
	550	40.0	1328	461	80
	600	40.0	1466	503	95
	750	40.0	1899	629	150
	1000	40.0	2665	839	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-7 (PT Plant Area)	550	25.0	958	260	80
	600	25.0	1076	284	95
	750	25.0	1430	355	150
	1000	25.0	2126	474	220
	550	30.0	1204	380	80
	600	30.0	1324	415	95
	750	30.0	1712	518	150
	1000	30.0	2417	691	220
	550	40.0	1819	619	80
	600	40.0	2010	675	95
	750	40.0	2618	844	150
	1000	40.0	3725	1126	220

Borehole	Pile diameter (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-9 (Intake Area)	550	25.0	825	270	80
	600	25.0	920	295	95
	750	25.0	1230	369	150
	1000	25.0	1843	492	220
	550	30.0	1129	374	80
	600	30.0	1244	408	95

	750	30.0	1603	511	150
	1000	30.0	2215	681	220

Table13: Estimated Drilled Shaft Capacity for different diameter based on CPT

6.2.5 ANALYSIS OF PRECAST DRIVEN PILES

6.2.5.1 SIDE RESISTANCE FOR DRIVEN PILES

For cohesionless soil:

Nominal side resistance in cohesionless soil for driven displacement pile is determined by following equation:

$$f = K\overline{p_o}tan\delta$$

Where:

f=unit skin friction for driven piles (kPa)

p_o=effective overburden pressure at the point

δ = friction angle between soil and pile wall

Nominal side resistance in cohesive soil is determined by following equation:

$$f_s = c_x \alpha_x$$

In which:

α_x = coefficient that is a function of *cx*, and

c_x= undrained shear strength at depth *x*.

a_x is taken equal to 1 for c less than 24 kPa. For *c* in excess of 24kPa but less than or equal to 72 kPa a_x decrease linearly from unity at *c* equal to 24kPa 0.5 at *c* equal to 72 kPa. For *c* in excess of 72 kPa a_x is taken as 0.5.

6.2.5.2 TIP RESISTANCE FOR DRIVEN PILES

Tip Resistance (Cohesionless):

Tip Resistance in cohesionless soil may be estimated using following equation:

$$q = \overline{p_o}N_q$$

Where:

q=unit tip resistance for driven piles (kPa)

po= effective overburden pressure at pile tip

Nq=bearing capacity factor

6.2.6 ESTIMATED PILE CAPACITY FOR PRECAST DRIVEN PILES

Using above *ultimate* unit resistance following *working* load capacities of different boreholes was calculated based on SPT Test Results:

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Chimney Area (BH-71,72,73,74)	350	24.0	537	244	60
	400	24.0	634	279	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Clarified Pump House (BH-25)	350	24.0	534	252	60
	400	24.0	629	288	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Switch Yard (BH-5,11,15)	350	24.0	514	231	60
	400	24.0	608	264	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Transformer Yard (BH19,20,21,22,23,24,26,27)	350	24.0	509	230	60
	400	24.0	603	262	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Boilar Area (BH-45 to 48, 51 to 57)	350	24.0	574	267	60
	400	24.0	677	305	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
ESP Area (BH-50,60,61,63,69)	350	24.0	516	230	60
	400	24.0	612	263	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Gas Cylinder Room (BH-13)	350	24.0	712	275	60
	400	24.0	855	315	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Helipad Area (BH-90)	350	24.0	348	134	60
	400	24.0	418	153	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
IDCT Area (BH-42)	350	24.0	425	206	60
	400	24.0	499	236	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
Sub-Station Temperature (BH-6)	350	24.0	344	207	60
	400	24.0	394	236	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
T.G Building (BH-29,30,32,39,40)	350	24.0	532	240	60
	400	24.0	629	274	70

Table 13: Estimated Capacity of Precast R.C.C. Driven pile for different size based on SPT

6.2.6 ESTIMATED PILE CAPACITY FOR PRECAST DRIVEN PILES

Using above *ultimate* unit resistance following *working* load capacities of different boreholes was calculated based on CPT Test Results:

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-1 (Transformer Yard)	350	24.0	589	214	60
	400	24.0	672	245	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-2 (TG Building)	350	24.0	633	217	60
	400	24.0	741	248	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-3 (Boiler Area)	350	24.0	440	157	60
	400	24.0	510	179	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-4 (ESP Area)	350	24.0	692	218	60
	400	24.0	812	249	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-5 (IDCT)	350	24.0	658	210	60
	400	24.0	768	240	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-6 (IDCT)	350	24.0	532	200	60
	400	24.0	613	228	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-7 (PT Plant Area)	350	24.0	597	176	60
	400	24.0	719	201	70

Borehole	Pile size (mm)	Length(m)	Pile capacity(kN)		
			Compression(kN)	Tension(kN)	Lateral(kN)
SCPT-9 (Intake Area)	350	24.0	579	201	60
	400	24.0	673	230	70

Table 13: Estimated Capacity of Precast R.C.C. Driven pile for different size based on SCPT

6.2.7 TESTING OF PILES

Individual piles or groups may be subjected to compression, tension, and/or lateral loads. Following are methods for confirming design capacity of piles under each type of loading condition.

Test Type	Test Method
Axial Compression	ASTM D1143
Axial Tension	ASTM D3689
Lateral	ASTM D3966

Table 11: Pile load Test Methods

7. Excavation, Compaction, and Ground Improvement Criteria:

7.1 Suitability of On Site Soil as Structural Fill

The materials covering the site near the surface consist of mostly dredged fill comprises of silty sand material, which are suitable for general backfilling purpose. However, the final decision should be taken during construction and after suitable testing program.

7.2 Backfill Material

Any back-fill material used for foundation should be well-graded, free draining backfill material with no more than five (5) percent passing a 0.075 millimeter sieve. All back fill material should be free from presence of organic or other harmful subsistence. All back fill material should be placed in layers of 150mm and should achieve 95% maximum dry density as defined by Modified Proctor Compaction Test. Field density test as defined by ASTM D1556 should be performed at regular intervals to ensure quality of compaction.

7.3 Material below Pavements:

Material selected for use in the top 500mm for cut or fill areas in the roadway shall be in addition to meeting the requirements; the materials passing the #200 (0.076mm) sieve shall not exceed 35%, the liquid limit & plasticity index for these material shall not be more than 35% & 10% respectively and soaked CBR value shall not be less than 15& and the swell not exceed 2%.

7.4 Slopes for excavation:

The materials covering the site near the surface consist of mostly silty sand. Open excavation at 1H:1V slope may be permitted for up to 1m depth. Appropriate shoring should be used for greater excavation particularly during rainy seasons or where it is required.

7.5 Ground Improvement of soft cohesive layer:

The subsurface encountered during soil exploration comprises of very soft to soft cohesive organic soil from 6m to 18m below ground level which is susceptible to consolidation settlement. This very

soft compressible soil requires be replacing or improving prior to use as a foundation layer. However, soil replacement at such depth shall not be viable and economic. Thus soil improvement is recommended. There are several methods of ground improvement. Among which “Perforated Vertical drain/ Wick drain” or “sand column” with preloading of 1.25times the design pressure could be used considering of its applicability, economy and characteristic of soil for this particular project.

8 Analysis for Liquefaction Potential

8.1 General:

The shear stress induced/developed at different depth during an earthquake depends upon the overburden pressure while the shear resistance can be calculated based on the SPT values.

The shear stress induces/developed and the shear resistances offered by the soil are evaluated in terms of Cyclic Stress Ratio (CSR) and the Cyclic Resistance Ratio (CRR) respectively. The CSR is the ratio of the shear stress developed to the effective over burden pressure at various depths while the CRR is the ratio of the shear resistance of the soil to the effective overburden pressure at various depths.

8.2 Method:

8.2.1 Calculation of Cyclic Stress Ratio:

For the determination of the CSR values at various depths, a peak horizontal ground acceleration coefficient of 0.12 as stated in Bangladesh National Building Code (BNBC 2006) has been taken in to consideration.

CSR values have been determined using the well-established and widely accepted methods given by Seed & Idriss (1971) which also included the stress reduction coefficient which varies with depth.

8.2.2 Calculation of Cyclic Resistance Ratio:

The CRR values have been determined using the method given by Robertson (2010) for an earthquake magnitude of 7.5 giving due consideration to the fact that earthquake of magnitude greater than 7 have been recorded in the Northern Bangladesh. The procedure is an update on procedure originally published in NCEER-97-0022 (Proceedings of the Workshop on Evaluation of Liquefaction Resistance of Soils).

8.2.3 Factor of Safety:

Factor of safety has been calculated based on ratio between CRR and CSR. A factor of safety of less than 1.20 indicates liquefiable soil.

8.2.4 Calculation of Liquefaction Potential Index:

Liquefaction Potential calculation based on SPT is enclosed in appendix.

8.3 Analysis of Result:

The variations of the CSR and the CRR with depth based on the results of each of the SPT have been presented in Appendix-B. Factor of safety (F.S.) are also included in the calculation sheet.

Soil is liquefiable below upto 6m from ground level as indicated by low factor of safety for all the boring location. Furthermore, the degree of susceptibility of liquefaction, as indicated is also high.

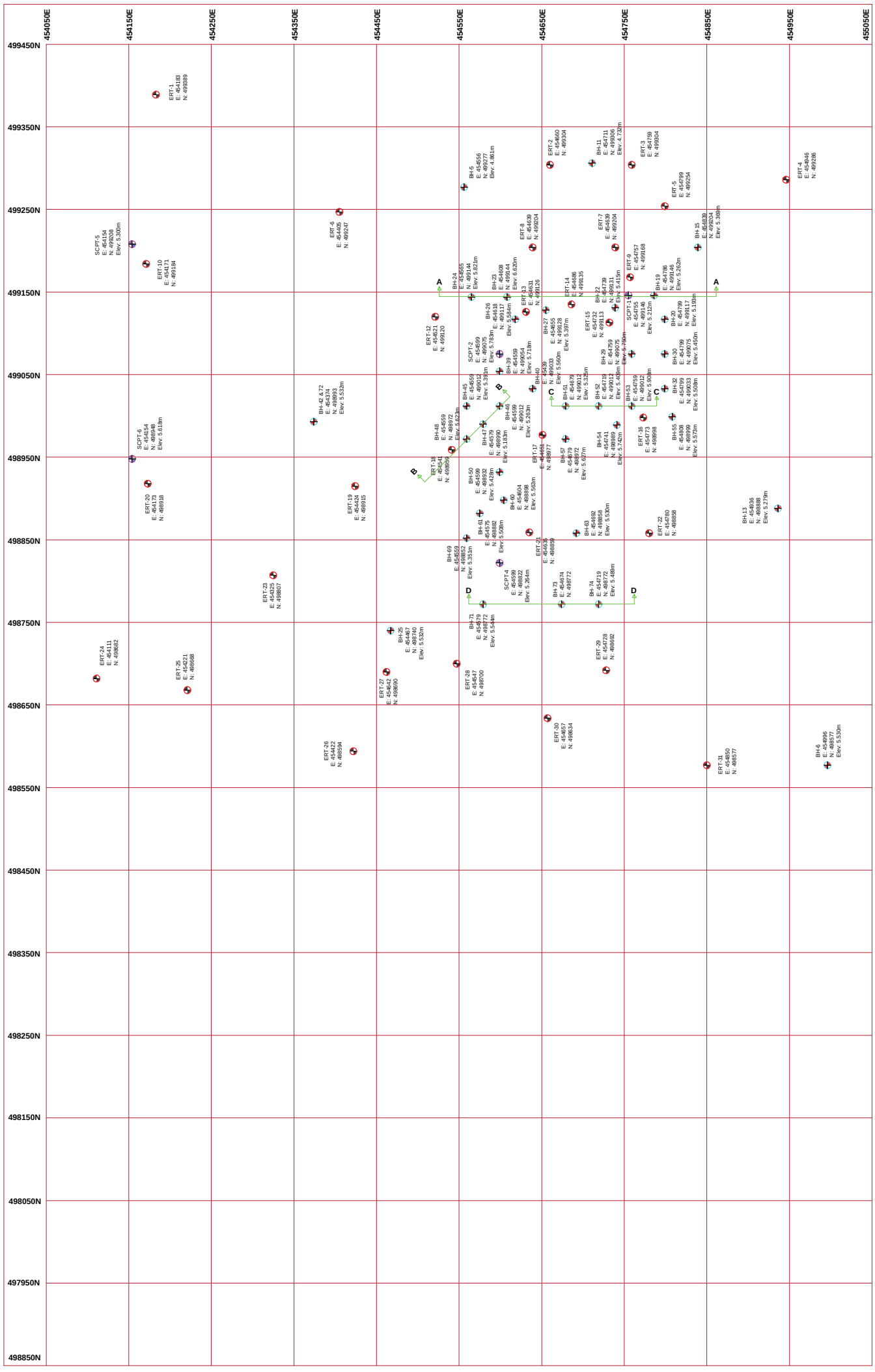
In view of the above, this depth of soil susceptible to liquefaction, ground improvement method may be used to improve the soil. Hence the proposed structures have to be supported on pile foundation exceeding the liquefiable depths.

9.0 REFERENCES

1. Geological Map of Bangladesh (1990). Md. Md. Khurshid Alam, AKM Shahidul Hasan, and Mujibur Rahman Khan, Geological Survey of Bangladesh and John W. Whitney, United States Geological Survey of Bangladesh. Published by Geological Survey of Bangladesh.
2. Bangladesh National Building Code (2006). Director, Housing and Building Research Institute, Ministry of Housing and Public Works.
3. American society for testing and materials (ASTM).
4. American Association of State Highway and Transportation Organization (AASHTO).

APPENDIX-A

[redacted] MAP



TENDER NO - PSER:SCT:KLN-E1754:16 (TCN-02) - DRAFT SI REPORT

Project	Drawing Title:	Client & Owner	Location	Engineer		Drg. No.	Sub Consultant
2x660MW Maitree STPP.	Layout Plan	**Client:** BHEL **Owner:**BIFPCL	Rampal,Bagerhat.	Drawn by:	Emran Uddin	DCL/BHEL/ Layout	Development Constructions Ltd. House 11, Road 19/A, Uttara, Dhaka 1230 Phone +880-2-58957231, Fax +880-2-58957283 Email: dcl@dcl-bd.com, Web: http://www.dcl-bd.com
				Checked by:	Engr. Rafiqul Islam		
				Approved by:	Engr. Roknuz zaman	Date:21-06-16	

Appendix-B

FIELD TEST RESULT

Appendix-B1

BOREHOLE LOGS

DEVELOPMENT CONSTRUCTIONS LIMITED.
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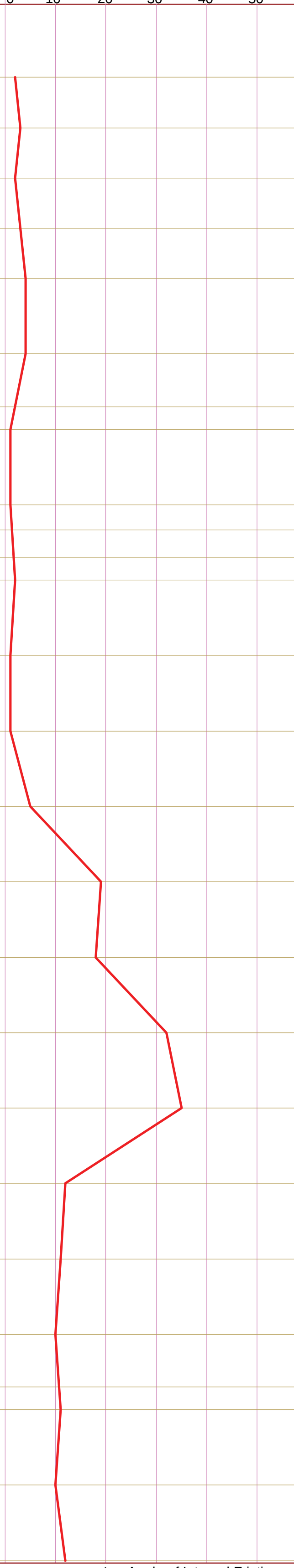
Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.
Client: BHEL; Owner:BIFPCL
Location: Rampal,Bagerhat.

Borehole: **BH- 5** | E: 454556m | N: 499277m | Elev: 4.861m
WD(m) 1.80m | Start: 27.04.16 | End: 28.04.16

Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	γ_t	γ_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	Sample No.	Sample Rec. (mm)
															01	01	01	02	D1	400
															01	01	02	03	D2	410
00	92	08	N	P											01	01	01	02	D3	390
															01	01	02	03	D4	385
															01	02	02	04	D5	400
															01	02	02	04	D6	390
																			VST-1	
															00	00	01	01	D7	480
															00	00	01	01	D8	440
																			VST-2	
00	09	91	47	15	49.52	16.17	10.82	2.68											UDS-1	
															00	01	01	02	D9	480
															00	00	01	01	D10	440
															00	00	01	01	D11	440
00	32	68	41	15											01	02	03	05	D12	450
															05	09	10	19	D13	380
00	83	17	N	P											06	08	10	18	D14	370
															10	14	18	32	D15	360
															12	15	20	35	D16	360
00	39	61	N	P											04	05	07	12	D17	390
															04	05	06	11	D18	390
															03	04	06	10	D19	480
																			UDS-2	310
00	15	85	34	08											04	05	06	11	D20	420
															04	04	06	10	D21	440
															05	06	06	12	D22	440

Standard Penetration Test



Depth (m)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
Elev (m)	4.0	3.0	2.0	1.0	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-6.0	-7.0	-8.0	-9.0	-10.0	-11.0

Depth (m)	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0
Elev (m)	-12.0	-13.0	-14.0	-15.0	-16.0	-17.0	-18.0	-19.0	-20.0	-21.0	-22.0	-23.0	-24.0	-25.0	-26.0

Layer descriptions:
- SP-SM - Poorly graded Sand with Silt. Very Loose. Grey.
- ML- Silt. Very soft to Soft. Grey.
- ML- Sandy Silt. Very soft to Medium. Grey.
- SM- Silty Sand. Medium to Dense. Grey.
- ML- Sandy Silt. Stiff. Grey.
- ML- Silt. Stiff. Grey.

Legend
L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s= Specific Gravity
γ_t = Bulk Unit Weight; γ_d= Dry Unit Weight; C_c= Compression Index; C_r= Re-compression Index
e_o= Initial Void Ratio; C_u= Undrained Cohesion; S_u= Undrained Shear Strength
Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test
WD = Depth of Water Measured 24h after Completion of Drilling
Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-06 — E: 454996m, N: 498577m, Elev: 5.530m

WD(m) 2.60m — Start: 26.03.16, End: 28.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															02	02	04	06	D1	400	1.0	4.0		
															02	03	03	06	D2	380	2.0	3.0		
00	88	12	N	P	24.82										02	03	03	06	D3	390	3.0	2.0		SP-SM - Poorly graded Sand With Silt. Loose to Medium.Grey.
															08	11	13	24	D4	360	4.0	1.0		
															01	01	01	02	D5	390	5.0	0.0		
00	13	87	108	44	44.74	19.14	13.22	2.68											UDS-1	340	6.0	-1.0		
															00	00	02	02	D6	370	7.0	-2.0		OH- Organic Silt. Soft. Grey.
															01	02	02	04	D7	380	8.0	-3.0		
															01	02	03	05	D8	370	9.0	-4.0		
																			UDS-2	360	10.0	-5.0		
															01	02	02	04	D9	400	11.0	-6.0		
															01	01	02	03	D10	390	12.0	-7.0		Silty Clay. Soft to Medium.Grey.
																					13.0	-8.0		
															05	08	10	18	D11	320	14.0	-9.0		
																					15.0	-10.0		
															02	05	08	13	D12	360	16.0	-11.0		Silty Sand. Medium.Grey.
															03	04	07	11	D13	400	17.0	-12.0		
															07	08	10	18	D14	390	18.0	-13.0		Clayey Silt. Stiff. Grey.
															04	08	11	19	D15	360	19.0	-14.0		
00	22	78	34	09	29.20										04	05	06	11	D16	450	20.0	-15.0		Slty Sand. Medium. Grey.
															11	13	17	30	D17	310	21.0	-16.0		
															10	14	19	33	D18	330	22.0	-17.0		ML- Silt with Sand. Stiff to Hard.Grey.
															07	09	11	20	D19	450	23.0	-18.0		
																			UDS-3	360	24.0	-19.0		
															09	11	15	26	D20	350	25.0	-20.0		Slty Sand. Dense. Grey.
																					26.0	-21.0		
																					27.0	-22.0		
																					28.0	-23.0		Silty Clay. Very Stiff. Grey.
																					29.0	-24.0		
																					30.0			

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

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Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-06**

E: 454996m
N: 498577m
Elev: 5.530m

WD(m) 2.60m

Start: 26.03.16
End: 28.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															08	12	14	26		D21	380	31.0	25.0		
															13	15	20	35		D22	350	32.0	26.0		
															14	16	22	38		D23	320	33.0	27.0		
00	85	15	N	P	27.58										15	17	19	36		D24	300	34.0	28.0		SM- Silty Sand. Medium to Very dense.Grey.
															19	31	41	72	(310mm/ Frist 50 blows)	D25	320	35.0	29.0		
															16	28	33	61	(320mm/ Frist 50 blows)	D26	330	36.0	30.0		
															10	13	20	33		D27	460	37.0	31.0		
																						38.0	32.0		
																						39.0	33.0		
																						40.0	34.0		
																							35.0		END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
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WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal, Bagerhat.

Borehole: BH- 11 | E: 454711m | N: 499306m | Elev: 4.732m | WD(m) 1.50m | Start: 25.06.16 | End: 02.05.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															01	01	02	03	D1	460	1.0	4.0	
															01	02	02	04	D2	480	2.0	3.0	
															02	03	03	06	D3	450	3.0	2.0	
00	93	07	N	P											02	02	04	06	D4	480	4.0	1.0	
															01	01	02	03	D5	485	5.0	0.0	
00	10	90	51	23	47.82	15.37	10.40	2.68											UDS-1	420	6.0	-1.0	
															01	02	02	04	D6	450	7.0	-2.0	
															01	01	02	03	D7	460	8.0	-3.0	
															01	02	03	05	D8	440	9.0	-4.0	
																			UDS-2	370	10.0	-5.0	
															02	02	02	04	D9	470	11.0	-6.0	
															02	03	03	06	D10	360	12.0	-7.0	
															08	09	11	20	D11	360	13.0	-8.0	
															06	10	13	23	D12	380	14.0	-9.0	
															09	11	13	24	D13	420	15.0	-10.0	
															10	12	15	27	D14	380	16.0	-11.0	
															12	12	16	28	D15	320	17.0	-12.0	
00	55	45	N	P											10	11	13	24	D16	340	18.0	-13.0	
															15	20	25	45	D17	320	19.0	-14.0	
															14	18	20	38	D18	340	20.0	-15.0	
															08	12	16	28	D19	350	21.0	-16.0	
															10	11	13	24	D20	420	22.0	-17.0	
00	39	61	N	P											10	12	12	24	D21	340	23.0	-18.0	
															11	13	16	29	D22	380	24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	
																					31.0	-26.0	

(430mm/ Frist 50 blows)

(446mm/ Frist 50 blows)

SP-SM - Poorly graded Sand With Silt. Very loose to Loose. Grey.

CH- Fat Clay. Soft to Medium. Grey.

SM- Silty Sand. Medium to Dense. Grey.

ML- Sandy Silt. Very Stiff. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
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C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
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D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
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Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner: BIFPCL

Location: Rampal, Bagerhat.

Borehole: BH-13 | E: 454936m | N: 498888m | Elev: 5.279m | WD(m) 2.43m | Start: 03.05.16 | End: 04.05.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	03	03	06		D1	490	1.0	4.0	
															02	02	03	05	(blows/305mm)	D2	440	2.0	3.0	
															01	02	02	04		D3	420	3.0	2.0	SM- Silty Sand. Loose.
00	87	13	N	P											01	02	02	04	(blows/305mm)	D4	440	4.0	1.0	
															01	01	01	02		D5	360	5.0	0.0	
															01	01	01	02	(blows/305mm)	D6	490	6.0	-1.0	
																				UDS-1	210	7.0	-2.0	
															01	02	02	04		D7	380	8.0	-3.0	
															00	01	02	03	(blows/305mm)	D8	360	9.0	-4.0	ML- Silt. Soft to Medium. Grey.
00	14	86	40	10	39.79	18.67	13.35	2.68												UDS-2	250	10.0	-5.0	
															02	03	03	06		D9	440	11.0	-6.0	
															03	04	06	10		D10	330	12.0	-7.0	
															04	05	08	13		D11	340	13.0	-8.0	
															03	05	07	12		D12	490	14.0	-9.0	
00	86	14	N	P											05	08	11	19		D13	340	15.0	-10.0	SM- Silty Sand. Medium to Dense. Grey.
															06	08	13	21		D14	320	16.0	-11.0	
															07	14	19	33		D15	360	17.0	-12.0	
															08	13	19	32		D16	390	18.0	-13.0	
															06	12	20	32		D17	440	19.0	-14.0	
00	36	64	N	P											06	07	09	15		D18	490	20.0	-15.0	ML- Sandy Silt. Stiff. Grey.
															05	05	05	15		D19	420	21.0	-16.0	
00	13	87	38	10											06	06	07	13		D20	440	22.0	-17.0	ML- Silt. Stiff. Grey.
															08	11	12	23		D21	340	23.0	-18.0	
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0	-25.0	

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

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Phone: +880-2-58957231. Fax: (880) 2-58957283. Email: fcl@dcl-fcl.com. Web: http://www.dcl-fcl.com

Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-13** | E: 454936m, N: 498888m, Elev: 5.279m | WD(m) 2.43m | Start: 03.05.16, End: 04.05.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific GravitY	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															10	15	18	33		D22	310	31.0	-26.0		
															12	14	17	31		D23	260	32.0	-27.0		
00	85	15	N	P											13	16	19	35		D24	320	33.0	-28.0		SM- Silty Sand. Medium to Dense. Grey.
															15	17	21	38	(425mm/ Frist 50 blows)	D25	360	34.0	-29.0		
															17	19	21	40	(400mm/ Frist 50 blows)	D26	340	35.0	-30.0		
															06	10	16	26		D27	490	36.0	-31.0		
00	13	87	44	13											08	12	16	28		D28	490	37.0	-32.0		ML- Silt. Very Stiff. Grey.
																						38.0	-33.0		
																						39.0	-34.0		
																						40.0	-35.0		

END OF BORING

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH- 15 | E: 454839m | N: 499204m | Elev: 5.369m | WD(m) 2.35m | Start: 02.05.16 | End: 03.05.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	02	04		D1	370	1.0	4.0	
															02	02	02	04		D2	380	2.0	3.0	
															01	01	02	03		D3	360	3.0	2.0	
00	90	10	N	P											01	02	02	04		D4	370	4.0	1.0	
															01	01	02	03		D5	385	5.0	0.0	
															01	02	02	04		D6	450	6.0	-1.0	
																				VST-1		7.0	-2.0	
00	09	91	47	18	49.86	16.06	10.72	2.68												UDS-1	420	8.0	-3.0	
															01	02	02	04		D7	370	9.0	-4.0	
															01	01	02	03		D8	480	10.0	-5.0	
																				VST-2		11.0	-6.0	
																				UDS-2	370			
															01	01	01	02		D9	440	12.0	-7.0	
00	38	62	35	11											01	02	02	04		D10	340	13.0	-8.0	
															01	02	03	05		D11	380	14.0	-9.0	
00	38	62	38	11											01	02	02	04		D12	380	15.0	-10.0	
															02	02	04	06		D13	370	16.0	-11.0	
															03	04	05	09		D14	340	17.0	-12.0	
															06	08	10	18		D15	370	18.0	-13.0	
00	38	62	N	P											07	08	12	20		D16	340	19.0	-14.0	
															08	10	12	22		D17	315	20.0	-15.0	
															07	13	17	30		D18	355	21.0	-16.0	
															08	12	18	30		D19	370	22.0	-17.0	
															06	10	15	25		D20	380	23.0	-18.0	
															10	14	18	32		D21	360	24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0	-25.0	

SP-SM - Poorly graded Sand with Silt. Very loose. Grey.

ML- Silt. Soft. Grey.

CL- Sandy Lean Clay. Soft. Grey.

ML- Sandy Silt. Medium to Hard. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-19 E: 454786m N: 499146m Elev: 5.262m

WD(m) 1.95m Start: 08.04.16 End: 09.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															01	01	01	02	D1	370	1.0	4.0	
															01	01	02	03	D2	340	2.0	3.0	
00	87	13	N	P											01	01	01	02	D3	365	3.0	2.0	
															01	01	01	02	D4	350	4.0	1.0	
															01	01	02	03	D5	340	5.0	0.0	
															00	01	01	02	D6	480	6.0	-1.0	
															01	01	01	02	D7	450	7.0	-2.0	
00	09	91	73	40	77.93	15.44	8.67	2.68											UDS-1	310	8.0	-3.0	
															00	00	01	01	D8	475	9.0	-4.0	
															01	01	01	02	D9	480	10.0	-5.0	
															01	02	04	06	D10	370	11.0	-6.0	
															02	03	05	08	D11	365	12.0	-7.0	
															03	03	04	07	D12	340	13.0	-8.0	
															03	04	04	08	D13	350	14.0	-9.0	
00	41	59	N	P											04	05	07	12	D14	355	15.0	-10.0	
															06	07	11	18	D15	365	16.0	-11.0	
															06	08	12	20	D16	370	17.0	-12.0	
															08	10	15	25	D17	365	18.0	-13.0	
															11	12	16	28	D18	350	19.0	-14.0	
															10	12	15	27	D19	350	20.0	-15.0	
															02	02	03	05	D20	420	21.0	-16.0	
00	27	73	38	11	34.52	18.20	13.53	2.66											UDS-2		22.0	-17.0	
															03	03	03	06	D21	480	23.0	-18.0	
																					24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

SM- Silty Sand. Very Loose. Grey.

CH- Fat Clay. Very Soft to Soft. Grey.

ML- Sandy Silt. Medium to Very stiff. Grey.

ML- Silt with Sand. Medium. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-19** | E: 454786m N: 499146m Elev: 5.262m | WD(m) 1.95m | Start: 08.04.16 End: 09.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															06	07	08	15		D22	340	31.0	-26.0		
															06	08	08	16		D23	350	32.0	-27.0		
															05	08	09	17		D24	325	33.0	-28.0		
00	89	11	N	P											08	10	14	24		D25	325	34.0	-29.0		SP-SM - Poorly graded Sand withSilt. Medium to Dense. Grey.
															10	12	18	30		D26	330	35.0	-30.0		
															09	13	18	31		D27	355	36.0	-31.0		
															10	14	20	34		D28	360	37.0	-32.0		
																						38.0	-33.0		
																						39.0	-34.0		
																						40.0	-35.0		

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
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Drawn BY: Md. Emran Uddin
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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-20 — E: 454799m, N: 499117m, Elev: 5.193m; WD(m) 2.15m; Start: 06.04.16, End: 07.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															03	04	06	10	D1	370	1.0	4.0		
															01	01	02	03	D2	365	2.0	3.0		
00	83	17	N	P											01	02	02	04	D3	370	3.0	2.0		SM- Silty Sand. Very loose to Loose. Grey.
															02	02	04	06	D4	380	4.0	1.0		
															02	02	04	06	D5	480	5.0	0.0		(blows/310mm)
															00	00	01	01	D6	440	6.0	-1.0		
															00	01	01	02	D7	360	7.0	-2.0		
					110.8	13.42	6.36												UDS-1	300	8.0	-3.0		
															00	01	01	02	D8	360	9.0	-4.0		OH- Sandy Organic Silt. Very soft to Soft.Dark grey.
00	37	63	76	30											01	02	02	04	D9	480	10.0	-5.0		
															01	02	02	04	D10	480	11.0	-6.0		
															03	04	05	09	D11	370	12.0	-7.0		Silty Clay. Soft. Grey.
															04	05	06	11	D12	360	13.0	-8.0		
												DST	22.0	30.7	04	05	06	11	D13	350	14.0	-9.0		
															04	05	07	12	D14	360	15.0	-10.0		
00	26	74	N	P											05	05	06	11	D15	355	16.0	-11.0		
															08	12	14	26	D16	350	17.0	-12.0		ML- Silt with Sand. Stiff to Very Stiff. Grey.
															07	10	15	25	D17	370	18.0	-13.0		
															08	09	12	21	D18	380	19.0	-14.0		
															10	11	15	26	D19	375	20.0	-15.0		
															08	11	12	23	D20	400	21.0	-16.0		
															06	10	10	20	D21	390	22.0	-17.0		
																					23.0	-18.0		
																					24.0	-19.0		
																					25.0	-20.0		
																					26.0	-21.0		
																					27.0	-22.0		
																					28.0	-23.0		
																					29.0	-24.0		
																					30.0	-25.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner: BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-20**

E: 454799m
N: 499117m
Elev: 5.193m

WD(m) 2.15m

Start: 06.04.16
End: 07.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															06	09	12	21		D22	400	31.0	26.0	
															08	10	12	22		D23	410	32.0	27.0	
															10	12	15	27		D24	375	33.0	28.0	
00	82	18	N	P											12	15	18	33		D25	385	34.0	29.0	
															10	12	18	30		D26	320	35.0	30.0	
															18	12	15	27		D27	330	36.0	31.0	
															12	15	18	33		D28	320	37.0	32.0	
																						38.0	33.0	
																						39.0	34.0	
																						40.0	35.0	

SM- Silty Sand. Dense to Very dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

Geotechnical Engineering Laboratory. Dhaka.

House 11. Road 19A. Sector 4. Uttara. Dhaka 1230. Bangladesh.

Phone: +880-2-58957231. Fax: (880) 2-58957283. Email: fcl@dcl-fcl.com. Web: http://www.dcl-fcl.com

Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-22** | E: 454739m | N: 499131m | Elev: 5.415m | WD(m) 2.50m | Start: 23.04.16 | End: 25.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															02	02	03	05	D1	420	1.0	4.0	
															01	02	02	04	D2	430	2.0	3.0	
															02	03	03	06	D3	420	3.0	2.0	
00	88	12	N	P											01	02	03	05	D4	430	4.0	1.0	
															02	02	03	05	D5	280	5.0	0.0	
															00	00	01	01	D6	440	6.0	-1.0	
00	09	91	63	31	63.42	17.49	10.70	2.67											UDS-1	340	7.0	-2.0	
															00	00	00	00	D7	280	8.0	-3.0	
															00	01	02	03	D8	450	9.0	-4.0	
															01	02	02	04	D9	460	10.0	-5.0	
																			UDS-2	260	11.0	-6.0	
															04	04	07	11	D10	350	12.0	-7.0	
															06	07	10	17	D11	380	13.0	-8.0	
															10	15	16	31	D12	420	14.0	-9.0	
															03	05	07	12	D13	420	15.0	-10.0	
															04	04	07	11	D14	420	16.0	-11.0	
															05	06	07	13	D15	390	17.0	-12.0	
00	29	71	37	10											07	08	11	19	D16	280	18.0	-13.0	
															07	08	16	24	D17	290	19.0	-14.0	
															06	07	13	20	D18	330	20.0	-15.0	
															05	08	09	17	D19	340	21.0	-16.0	
															06	07	11	18	D20	420	22.0	-17.0	
															04	05	07	12	D21	440	23.0	-18.0	
																					24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

SM- Silty Sand. Loose. Grey.

MH- Elastic Silt. Very soft to Soft. Grey.

ML- Silt with Sand. Stiff to Hard. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
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Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-22** | E: 454739m, N: 499131m, Elev: 5.415m | WD(m) 2.50m | Start: 23.04.16, End: 25.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50					
															08	12	20	32		D22	350	31.0	26.0	
															06	11	20	31		D23	390	32.0	27.0	
															11	18	20	38		D24	420	33.0	28.0	
00	39	61	N	P											09	16	18	34		D25	440	34.0	29.0	
															10	14	22	36		D26	320	35.0	30.0	
															09	13	19	32		D27	340	36.0	31.0	
															12	18	20	38	(450mm/ Frist 50 blows)	D28	480	37.0	32.0	
																						38.0	33.0	
																						39.0	34.0	
																						40.0	35.0	

ML- Sandy Silt. Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay, Silt, Sand, Gravel

Drawn BY: Md. Emran Uddin
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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-23** E: 454608m N: 499144m Elev: 5.620m

WD(m) 2.60m Start: 24.04.16 End: 26.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															00	01	01	02	D1	420	1.0	5.0		
															01	02	03	05	D2	340	2.0	4.0		
															02	02	03	05	D3	420	3.0	3.0		
00	95	05	N	P											02	03	04	07	D4	390	4.0	2.0		
															03	04	05	09	D5	350	5.0	1.0		
															02	03	04	07	D6	340	6.0	0.0		
															00	01	01	02	D7	480	7.0	-1.0		
															01	01	01	02	D8	460	8.0	-2.0		
00	09	91	78	32	45.79	16.89	11.58	2.69											UDS-1	390	9.0	-3.0		
															01	02	02	04	D9	480	10.0	-4.0		
															04	07	09	16	D10	420	11.0	-5.0		
															03	06	08	14	D11	380	12.0	-6.0		
															09	11	18	29	D12	400	13.0	-7.0		
															08	10	15	25	D13	420	14.0	-8.0		
00	45	55	N	P											07	09	11	20	D14	450	15.0	-9.0		
															09	11	14	25	D15	420	16.0	-10.0		
															05	07	09	16	D16	440	17.0	-11.0		
															06	07	11	18	D17	460	18.0	-12.0		
															13	19	22	41	D18	420	19.0	-13.0		
															09	18	20	38	D19	360	20.0	-14.0		
															08	11	12	23	D20	450	21.0	-15.0		
															07	10	15	25	D21	440	22.0	-16.0		
																					23.0	-17.0		
																					24.0	-18.0		
																					25.0	-19.0		
																					26.0	-20.0		
																					27.0	-21.0		
																					28.0	-22.0		
																					29.0	-23.0		
																					30.0	-24.0		

(445mm/ Frist 50 blows)

SP-SM - Poorly graded Sand with Silt. Very loose to Loose. Grey.

OH- Organic Silt. Soft. Grey.

ML- Sandy Silt. Stiff to Hard. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-23** | E: 454608m N: 499144m Elev: 5.620m | WD(m) 2.60m | Start: 24.04.16 End: 26.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
00	45	55	N	P											10	12	18	30		D22	420	31.0	25.0		ML- Sandy Silt. Stiff to Hard. Grey.
															09	13	20	33		D23	450	32.0	26.0		
															17	19	23	42	(430mm/ Frist 50 blows)	D24	430	33.0	27.0		
															10	16	20	36		D25	400	34.0	28.0		
															15	18	22	40	(440mm/ Frist 50 blows)	D26	340	35.0	29.0		
00	44	56	N	P											13	15	21	36		D27	420	36.0	30.0		
															20	27	35	62	(380mm/ Frist 50 blows)	D28	330	37.0	31.0		
																						38.0	32.0		
																						39.0	33.0		
																						40.0	34.0		
																							35.0		END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-24 — E: 454565m, N: 499144m, Elev: 5.821m; WD(m) 2.65m; Start: 24.04.16, End: 26.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															01	01	02	03	D1	160	1.0	5.0		
00	95	05	N	P											01	01	02	03	D2	210	2.0	4.0		
															01	02	02	04	D3	240	3.0	3.0		SM- Silty Sand. Very Loose to Loose. Grey.
															02	02	03	05	D4	250	4.0	2.0		
															03	03	04	07	D5	340	5.0	1.0		
															01	01	01	02	D6	180	6.0	0.0		
																			VST-1		7.0	-1.0		
															01	02	02	04	D7	430	8.0	-2.0		
00	09	91	59	17	51.74	15.57	11.58												UDS-1	380	9.0	-3.0		MH- Elastic Silt. Very soft to Medium. Grey.
															01	02	02	04	D8	440	10.0	-4.0		
																			VST-2		11.0	-5.0		
															00	00	01	01	D9	440	12.0	-6.0		
																			UDS-2	410	13.0	-7.0		
															01	02	02	04	D10	450	14.0	-8.0		
															02	02	04	06	D11	410	15.0	-9.0		
															03	04	05	09	D12	370	16.0	-10.0		
															03	05	55	10	D13	340	17.0	-11.0		
00	95	05	36	08											03	05	06	11	D14	360	18.0	-12.0		ML- Silt. Stiff. Grey.
															04	06	08	14	D15	340	19.0	-13.0		
															10	14	18	32	D16	240	20.0	-14.0		
															10	15	16	31	D17	230	21.0	-15.0		
00	95	05	N	P											11	13	16	29	D18	220	22.0	-16.0		SP-SM - Poorly graded Sand with Silt. Medium Dense. Grey
												DST	28.1	30.2	08	10	14	24	D19	270	23.0	-17.0		
															12	16	20	36	D20	350	24.0	-18.0		
00	95	05	38	10											04	06	08	14	D21	380	25.0	-19.0		ML- Silt with Sand. Stiff to Very stiff. Grey.
																					26.0	-20.0		
																					27.0	-21.0		
																					28.0	-22.0		
																					29.0	-23.0		
																					30.0	-24.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-24** | E: 454565m N: 499144m Elev: 5.821m | WD(m) 2.65m | Start: 24.04.16 End: 26.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															05	07	09	16	D22	370	31.0	25.0		
															10	20	22	42	D23	280	32.0	26.0		
															11	18	20	38	D24	260	33.0	27.0		
															10	12	14	26	D25	350	34.0	28.0		SM- Silty Sand. Medium to Dense. Grey.
00	95	05	N	P											10	11	12	23	D26	380	35.0	29.0		
															11	15	22	27	D27	390	36.0	30.0		
															10	15	17	32	D28	280	37.0	31.0		
																					38.0	32.0		
																					39.0	33.0		
																					40.0	34.0		END OF BORING

Standard Penetration Test: 0 10 20 30 40 50

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-25 E: 454467m N: 498740m Elev: 5.532m

WD(m) 2.60m Start: 30.04.16 End: 25.06.16

Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Grain Size: Gravel (%)	Sand (%)	Fines (%)	Atterberg Limits: L.L.	P.I.	Moisture Content w (%)	Unit Weight (kN/m³): Y_t	Y_d	Specific Gravity G_s	Consolidation: e_o	C_c	C_r	Shear Strength: Type	c_u/S_u (kN/m²)	Φ° (Deg)	Standard Penetration Test: 150mm	150mm	150mm	N-Value	Description
D1	240	1.0	4.0																	01	01	02	03	
D2	250	2.0	3.0		00	86	14	N	P											01	01	02	03	
D3	240	3.0	2.0																	01	02	02	04	SM- Silty Sand. Very Loose to Loose. Grey.
D4	230	4.0	1.0																	02	02	02	04	
D5	260	5.0	0.0																	02	02	03	05	
D6	430	6.0	-1.0																	01	01	01	02	
UDS-1	380	7.0	-2.0																					
D7	450	8.0	-3.0																	01	02	02	04	
D8	450	9.0	-4.0																	01	02	02	04	
UDS-2	420	10.0	-5.0		00	10	90	48	19	42.03	17.49	10.70	2.68											ML- Silt. Soft to Medium. Grey.
D9	450	11.0	-6.0																	02	02	03	05	
D10	420	12.0	-7.0																	02	03	03	06	
D11	380	13.0	-8.0																	03	03	04	07	
D12	320	14.0	-9.0																	04	06	10	16	
D13	370	15.0	-10.0																	05	07	11	18	
D14	340	16.0	-11.0														DST	22.6	30.3	06	08	11	19	
D15	350	17.0	-12.0		00	46	54	N	P											06	09	12	21	ML- Sandy Silt. Very Stiff. Grey.
D16	370	18.0	-13.0																	05	08	11	19	
D17	360	19.0	-14.0																	06	09	13	22	
D18	380	20.0	-15.0																	06	09	12	21	
D19	260	21.0	-16.0																	00	14	18	32	
D20	240	22.0	-17.0		00	88	12	N	P											12	18	26	44	(392mm/ Frist 50 blows)
D21	250	23.0	-18.0																	10	14	20	24	SP-SM - Poorly graded Sand with Silt. Medium to Dense. Grey.
		24.0	-19.0																					
		25.0	-20.0																					
		26.0	-21.0																					
		27.0	-22.0																					
		28.0	-23.0																					
		29.0	-24.0																					
		30.0	-25.0																					

Standard Penetration Test: 0 10 20 30 40 50

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

Geotechnical Engineering Laboratory. Dhaka.

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Phone: +880-2-58957231. Fax: (880) 2-58957283. Email: fcl@dcl-fcl.com. Web: http://www.dcl-fcl.com

Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-29** | E: 454759m | N: 499075m | Elev: m | WD(m) 1.80m | Start: 03.04.16 | End: 05.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	γ_t	γ_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															06	08	12	20		D21	425	31.0	-25.0	
															05	07	12	19		D22	380	32.0	-26.0	
															06	08	11	19		D23	375	33.0	-27.0	
																						34.0	-28.0	
												DST	34.2	30.5	10	12	18	30		D24	370	35.0	-29.0	
															11	14	20	34		D25	365	36.0	-30.0	
															08	10	12	22		D26	370	37.0	-31.0	
															08	12	14	26		D27	360	38.0	-32.0	
															05	08	12	20		D28	380	39.0	-33.0	
															06	10	12	22		D29	380	40.0	-34.0	
00	46	54	N	P	27.11										12	22	34	56	(370mm/ Frist 50 blows)	D30	340	41.0	-35.0	
															10	20	35	55	(375mm/ Frist 50 blows)	D31	330	42.0	-36.0	
															20	35	45	80	(290mm/ Frist 50 blows)	D32	340	43.0	-37.0	
															22	40	38	78	(280mm/ Frist 50 blows)	D33	345	44.0	-38.0	
																						45.0	-39.0	
																						46.0	-40.0	
																						47.0	-41.0	
																						48.0	-42.0	
																						49.0	-43.0	
																						50.0	-44.0	
																							-45.0	

ML- Sandy Silt. Very stiff to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

γ_t = Bulk Unit Weight
γ_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
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Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-26 E: 454618m N: 499117m Elev: 5.584m

WD(m) 2.20m Start: 26.04.16 End: 27.05.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	02	02	04		D1	390	1.0	4.0	
															03	03	02	05		D2	370	2.0	3.0	
															02	02	02	04	(blows/305mm)	D3	380	3.0	2.0	SM- Silty Sand. Loose.
00	87	13	N	P											01	02	02	04		D4	360	4.0	1.0	
															02	02	03	05		D5	380	5.0	0.0	
															00	00	00	00		D6	420	6.0	-1.0	
00	10	90	73	31	53.43	16.75	10.92	2.68												UDS-1	400	7.0	-2.0	
															00	00	01	01	(blows/310mm)	D7	380	8.0	-3.0	
															01	01	01	02	(blows/305mm)	D8	370	9.0	-4.0	MH- Elastic Silt. Very soft to Soft. Grey.
																				UDS-2	400	10.0	-5.0	
															00	00	02	02		D9	490	11.0	-6.0	
															00	00	02	02	(blows/305mm)	D10	440	12.0	-7.0	
															03	04	05	09		D11	340	13.0	-8.0	
															04	04	04	08	(blows/305mm)	D12	360	14.0	-9.0	
															06	07	15	22		D13	330	15.0	-10.0	
															08	08	17	25		D14	310	16.0	-11.0	
00	31	69	N	P											05	08	15	23		D15	330	17.0	-12.0	ML- Sandy Silt. Stiff to Very Stiff.
															12	13	15	28	(blows/305mm)	D16	320	18.0	-13.0	
															06	12	15	27		D17	330	19.0	-14.0	
															09	10	15	25		D18	280	20.0	-15.0	
															12	14	14	28		D19	310	21.0	-16.0	
															04	05	06	11		D20	380	22.0	-17.0	
00	18	82	35	10											05	05	07	12		D21	360	23.0	-18.0	ML- Silt with Sand. Stiff. Grey.
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0		

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

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Y_d = Dry Unit Weight
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C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-26**

E: 454618m
N: 499117m
Elev: 5.584m

WD(m) 2.20m

Start: 26.04.16
End: 27.05.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															04	08	13	21	D22	390	31.0	-25.0	
															06	07	16	23	D23	360	32.0	-26.0	
															10	14	15	29	D24	350	33.0	-27.0	
00	33	67	36	12											09	12	14	26	D25	360	34.0	-28.0	
															12	15	18	33	D26	390	35.0	-29.0	
															10	13	18	31	D27	410	36.0	-30.0	
															15	19	25	44	D28	390	37.0	-31.0	
																					38.0	-32.0	
																					39.0	-33.0	
																					40.0	-34.0	

CL- Sandy Lean Clay.
Very Stiff to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
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D = Disturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-27 E: 454655m N: 499128m Elev: 5.397m

WD(m) 2.65m Start: 21.04.16 End: 23.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															01	01	01	02	D1	220	1.0	4.0	
															01	01	01	02	D2	240	2.0	3.0	
00	85	15	N	P											01	02	02	04	D3	250	3.0	2.0	
															01	02	03	05	D4	240	4.0	1.0	
															01	02	03	05	D5	230	5.0	0.0	
															01	01	01	02	D6	450	6.0	-1.0	
00	11	89	60	24	69.93	16.29	9.58	2.69											UDS-1	380	7.0	-2.0	
															00	01	01	02	D7	420	8.0	-3.0	
															00	01	01	02	D8	410	9.0	-4.0	
															01	01	02	03	D9	450	10.0	-5.0	
																			UDS-2	380	11.0	-6.0	
															03	04	06	10	D10	360	12.0	-7.0	
															04	06	08	14	D11	350	13.0	-8.0	
															05	06	07	13	D12	380	14.0	-9.0	
00	29	71	N	P											05	07	08	15	D13	370	15.0	-10.0	
															06	08	10	18	D14	350	16.0	-11.0	
															07	09	11	20	D15	340	17.0	-12.0	
															13	16	22	38	D16	240	18.0	-13.0	
00	83	17	N	P											15	18	22	40	D17	230	19.0	-14.0	
															06	08	12	20	D18	320	20.0	-15.0	
															04	07	11	18	D19	360	21.0	-16.0	
00	10	90	43	13											06	06	08	14	D20	450	22.0	-17.0	
															09	12	13	25	D21	450	23.0	-18.0	
																					24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

SM- Silty Sand. Very loose to Loose. Grey.

OH- Organic Silt. Soft. Grey.

ML- Silt with Sand. Stiff to Very stiff. Grey.

SM- Silty Sand. Dense. Grey.

ML- Silt. Stiff to Very stiff. Grey.

(396mm/ Frist 50 blows)

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
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Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-27**

E: 454655m
N: 499128m
Elev: 5.397m

WD(m) 2.65m

Start: 21.04.16
End: 23.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															10	12	16	28		D22	340	31.0	26.0	
															10	14	19	33		D23	310	32.0	27.0	
															11	15	20	35		D24	320	33.0	28.0	
															11	16	21	37		D25	310	34.0	29.0	
00	82	18	N	P											13	15	20	35		D26	320	35.0	30.0	
															19	24	34	58	(340mm/ Frist 50 blows)	D27	280	36.0	31.0	
															16	19	26	45	(380mm/ Frist 50 blows)	D28	320	37.0	32.0	
																						38.0	33.0	
																						39.0	34.0	
																						40.0	35.0	

SM- Silty Sand. Dense to Very dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

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Y_d = Dry Unit Weight
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Clay
Silt
Sand
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Drawn BY: Md. Emran Uddin
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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-29** E: 454759m N: 499075m Elev: 5.750m

WD(m) 1.80m Start: 03.04.16 End: 05.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	02	04		D1	400	1.0	5.0	Filling Sand. Very Loose. Brownish Grey.
															01	02	02	04		D2	395	2.0	4.0	
															01	01	02	03		D3	390	3.0	3.0	
															01	01	02	03		D4	390	4.0	2.0	
					43.60	16.61	11.57	2.68	1.12	0.45	0.02									UDS-1	300	5.0	1.0	
00	38	62	77	32	53.99										01	01	02	03		D5	380	6.0	0.0	
															01	02	02	04		D6	370	7.0	-1.0	OH- Sandy Organic Silt. Soft. Dark grey.
															01	01	02	03		D7	450	8.0	-2.0	
															01	02	02	04		D8	460	9.0	-3.0	
					44.33	17.93	12.42													UDS-2	440	10.0	-4.0	
															01	02	03	05		D9	420	11.0	-5.0	Silty Clay. Soft. Dark grey.
															04	06	08	14		D10	415	12.0	-6.0	
00	45	55	N	P	30.77										03	04	05	09		D11	380	13.0	-7.0	
															08	09	10	19		D12	370	14.0	-8.0	
															07	08	10	18		D13	360	15.0	-9.0	ML- Sandy Silt. Medium to Hard.Grey.
															06	07	08	15		D14	365	16.0	-10.0	
															10	15	22	37		D15	370	17.0	-11.0	
															09	14	20	34		D16	360	18.0	-12.0	
															06	08	10	18		D17	370	19.0	-13.0	
															05	08	11	19		D18	420	20.0	-14.0	Slty Sand. Medium. Grey.
															02	03	03	06		D19	480	21.0	-15.0	
00	28	72	36	10	33.91										03	08	10	18		D20	440	22.0	-16.0	ML- Silt With Sand. Medium to Very stiff. Grey.
																						23.0	-17.0	
																						24.0	-18.0	
																						25.0	-19.0	
																						26.0	-20.0	
																						27.0	-21.0	
																						28.0	-22.0	
																						29.0	-23.0	
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Legend

L.L. = Liquid Limit
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Borehole: **BH-29** | E: 454759m | N: 499075m | Elev: m | WD(m) 1.80m | Start: 03.04.16 | End: 05.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															06	08	12	20		D21	425	31.0	-25.0	
															05	07	12	19		D22	380	32.0	-26.0	
															06	08	11	19		D23	375	33.0	-27.0	
																						34.0	-28.0	
												DST	34.2	30.5	10	12	18	30		D24	370	35.0	-29.0	
															11	14	20	34		D25	365	36.0	-30.0	
															08	10	12	22		D26	370	37.0	-31.0	
															08	12	14	26		D27	360	38.0	-32.0	
															05	08	12	20		D28	380	39.0	-33.0	
															06	10	12	22		D29	380	40.0	-34.0	
00	46	54	N	P	27.11										12	22	34	56	(First 50 blows/370mm)	D30	340	41.0	-35.0	
															10	20	35	55	(First 50 blows/375mm)	D31	330	42.0	-36.0	
															20	35	45	80	(First 50 blows/290mm)	D32	340	43.0	-37.0	
															22	40	38	78	(First 50 blows/280mm)	D33	345	44.0	-38.0	
																						45.0	-39.0	
																						46.0	-40.0	
																						47.0	-41.0	
																						48.0	-42.0	
																						49.0	-43.0	
																						50.0	-44.0	
																							-45.0	

ML- Sandy Silt. Very stiff to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 15.05.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 30** | E: 454799m | N: 499075m | Elev: 5.450m | WD(m) 2.65m | Start: 05.04.16 | End: 07.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															01	01	01	02	D1	120	1.0	4.0		SM- Silty Sand. Very loose to Loose. Grey.
															01	02	02	04	D2	220	2.0	3.0		
															01	02	03	05	D3	230	3.0	2.0		
															02	03	03	06	D4	330	4.0	1.0		
00	84	16	N	P											01	02	02	04	D5	310	5.0	0.0		
															00	01	01	02	D6	450	6.0	-1.0		Organic Clay. Very soft to Medium. Grey.
					143.2	14.25	5.86	2.68											UDS-1	380	7.0	-2.0		
															00	00	01	01	D7	450	8.0	-3.0		
															01	02	03	05	D8	450	9.0	-4.0		
					75.63	16.19	9.22												UDS-2	380	10.0	-5.0		
															02	03	05	08	D9	420	11.0	-6.0		Silty Clay. Stiff. Grey.
															03	04	05	09	D10	380	12.0	-7.0		
															05	07	08	15	D11	280	13.0	-8.0		ML- Silt with Sand. Stiff to Hard. Grey
															03	04	06	10	D12	360	14.0	-9.0		
00	23	77	N	P											04	05	06	11	D13	350	15.0	-10.0		
															04	06	09	15	D14	340	16.0	-11.0		
															04	05	08	13	D15	340	17.0	-12.0		
															07	15	20	35	D16	320	18.0	-13.0		
															12	19	27	46	D17	280	19.0	-14.0		(370mm/ Frist 50 blows)
															10	18	23	41	D18	330	20.0	-15.0		
															06	11	14	25	D19	420	21.0	-16.0		
															05	09	12	21	D20	430	22.0	-17.0		
00	35	65	36	09											07	09	10	19	D21	420	23.0	-18.0		ML- Sandy Silt. Very stiff to Hard. Grey.
																					24.0	-19.0		
																					25.0	-20.0		
																					26.0	-21.0		
																					27.0	-22.0		
																					28.0	-23.0		
																					29.0	-24.0		
																					30.0	-25.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s= Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c= Compression Index; C_r= Re-compression Index

e_o= Initial Void Ratio; C_u= Undrained Cohesion; S_u= Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 30**

E: 454799m
N: 499075m
Elev: 5.450m

WD(m) 2.65m

Start: 05.04.16
End: 07.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															06	08	10	18		D22	430	31.0	26.0	
															10	13	17	30		D23	320	32.0	27.0	
															12	16	18	34		D24	310	33.0	28.0	
															20	30	35	65	(300mm/ Frist 50 blows)	D25	260	34.0	29.0	
															06	10	09	19		D26	380	35.0	30.0	
															07	11	12	23		D27	370	36.0	31.0	
															09	13	15	28		D28	380	37.0	32.0	
																						38.0	33.0	
																						39.0	34.0	
																						40.0	35.0	

ML- Sandy Silt. Very stiff to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-32** E: 454799m N: 499033m Elev: 5.508m

WD(m) 2.65m Start: 03.04.16 End: 25.06.16

Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	Moisture Content w (%)	Unit Weight Y_t	Unit Weight Y_d	Specific Gravity G_s	Consolidation e_o	Consolidation C_c	Consolidation C_r	Shear Strength Type	Shear Strength c_u/S_u (kN/m²)	Shear Strength Φ° (Deg)	SPT 150mm	SPT 150mm	SPT 150mm	SPT N-Value	Layer Symbol	Description
D1	410	1.0	4.0																01	01	02	03		SP-SM - Poorly graded Sand With Silt. Very Loose to Loose. Grey.
D2	300	3.0	2.0	00	90	10	N	P											01	02	03	05		
D3	400	4.0	1.0																02	03	03	06		
D4	430	5.0	0.0																01	01	02	03		
UDS-1	360	6.0	-1.0						63.57	16.17	9.89	2.70												
D5	450	7.0	-2.0	00	52	48	100	43											01	01	02	03		OH- Sandy Organic Silt. Very Loose to Loose.Grey.
D6	450	8.0	-3.0																01	01	02	03		
UDS-2	370	9.0	-4.0						56.45	15.94	10.19													
D7	410	10.0	-5.0																01	02	03	05		
D8	440	11.0	-6.0																01	02	03	05		
D9	320	12.0	-7.0																02	04	06	10		
D10	330	13.0	-8.0																03	05	06	11		
D11	320	14.0	-9.0	00	31	69	30	06											04	04	06	10		ML- Sandy Silt. Medium to Very stiff. Grey.
D12	340	15.0	-10.0																04	05	06	11		
D13	450	16.0	-11.0																07	09	11	20		
D14	450	17.0	-12.0																06	07	06	13		
D15	310	18.0	-13.0																17	24	20	44		(385mm/ Frist 50 blows)
D16	340	19.0	-14.0																13	16	22	38		Silty Sand. Medium to Dense. Grey.
D17	350	20.0	-15.0																08	10	12	22		
D18	340	21.0	-16.0																06	08	08	16		
UDS-3	340	22.0	-17.0						23.56	19.42	15.72													
D19	370	23.0	-18.0																03	04	06	10		Clayey Silt. Stiff to Very stiff. Grey.
D20	360	24.0	-19.0																06	08	10	18		
		25.0	-20.0																					
		26.0	-21.0																					
		27.0	-22.0																					
		28.0	-23.0																					
		29.0	-24.0																					
		30.0	-25.0																					

Standard Penetration Test: 0 10 20 30 40 50

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-32 E: 454599m N: 499075m Elev: 5.508m

WD(m) 2.65m Start: 03.04.16 End: 25.06.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															10	15	18	33	D21	320	31.0	-26.0		
															11	16	19	35	D22	310	32.0	-27.0		
															11	09	09	18	D23	340	33.0	-28.0		Silty Sand. Medium to Dense. Grey.
															08	10	16	26	D24	330	34.0	-29.0		
															09	11	15	26	D25	350	35.0	-30.0		
															04	06	07	13	D26	370	36.0	-31.0		
00	21	79	40	12											04	06	06	12	D27	380	37.0	-32.0		ML- Silt with Sand. Stiff. Grey.
																					38.0	-33.0		
																					39.0	-34.0		
																					40.0	-35.0		END OF BORING

Standard Penetration Test scale: 0 10 20 30 40 50

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
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WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
Silt
Sand
Gravel

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Khulna.

Borehole: BH-39 — E: 454599m, N: 499054m, Elev: 5.718m

WD(m) 2.10m — Start: 06.04.16, End: 12.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	02	02	04	(blows/320mm)	D1	350	1.0	5.0	
															01	01	02	03	(blows/315mm)	D2	360	2.0	4.0	
															02	01	03	04	(blows/310mm)	D3	370	3.0	3.0	SM- Silty Sand. Very loose to Loose. Grey.
00	81	19	N	P											02	02	03	05	(blows/305mm)	D4	380	4.0	2.0	
															03	02	03	05		D5	340	5.0	1.0	
															02	02	03	05	(blows/310mm)	D6	360	6.0	0.0	
00	08	92	92	40	61.95	14.13	8.72	2.68												UDS-1	400	7.0	-1.0	
															00	00	01	01		D7	370	8.0	-2.0	
															01	01	02	03	(blows/305mm)	D8	380	9.0	-3.0	MH- Elastic Silt. Very soft to Medium. Grey.
															02	01	02	03	(blows/310mm)	D9	340	10.0	-4.0	
															02	02	02	04	(blows/310mm)	D10	350	11.0	-5.0	
															03	04	08	12	(blows/305mm)	D11	300	12.0	-6.0	
															03	05	08	13		D12	310	13.0	-7.0	
															04	05	07	12		D13	320	14.0	-8.0	
															03	04	08	12	(blows/310mm)	D14	330	15.0	-9.0	
												DST	19.8	30.6	03	03	09	12	(blows/305mm)	D15	340	16.0	-10.0	SP-SM - Poorly graded Sand with Silt. Medium. Grey.
00	89	11	N	P											10	11	11	22	(blows/320mm)	D16	340	17.0	-11.0	
															07	06	09	15	(blows/305mm)	D17	350	18.0	-12.0	
															08	08	10	18	(blows/310mm)	D18	360	19.0	-13.0	
															06	08	12	20		D19	370	20.0	-14.0	
															07	07	12	19	(blows/310mm)	D20	380	21.0	-15.0	
															06	04	08	12		D21	340	22.0	-16.0	ML- Silt. Stiff. Grey.
																						23.0	-17.0	
																						24.0	-18.0	
																						25.0	-19.0	
																						26.0	-20.0	
																						27.0	-21.0	
																						28.0	-22.0	
																						29.0	-23.0	
																						30.0	-24.0	

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Khulna.

Borehole: **BH-39** | E: 454599m N: 499054m Elev: 2.718m | WD(m) 2.10m | Start: 06.04.16 End: 12.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
00	10	90	35	09											07	04	07	11	(blows/305mm)	D22	350	31.0	-25.0	
															08	07	12	19	(blows/315mm)	D23	360	32.0	-26.0	
															09	07	11	18	(blows/310mm)	D24	370	33.0	-27.0	
															07	13	18	31		D25	380	34.0	-28.0	
															08	11	12	23		D26	340	35.0	-29.0	
															09	08	16	24	(blows/310mm)	D27	350	36.0	-30.0	
															10	08	13	21		D28	380	37.0	-31.0	
															16	20	25	45	(370mm/ Frist 50 blows)	D29	370	38.0	-32.0	
00	81	19	N	P											15	19	27	46	(360mm/ Frist 50 blows)	D30	360	39.0	-33.0	SM-Silty Sand. Medium to Very dense. Grey.
															11	12	15	27	(blows/310mm)	D31	330	40.0	-34.0	
															12	12	17	29	(blows/305mm)	D32	340	41.0	-35.0	
															18	21	25	46	(320mm/ Frist 50 blows)	D33	350	42.0	-36.0	
															19	20	23	43	(340mm/ Frist 50 blows)	D34	360	43.0	-37.0	
															05	06	09	15	(blows/310mm)	D35	370	44.0	-38.0	
															36	50	-	(50	blows/190mm)	D36	360	45.0	-39.0	
															34	50	-	(50	blows/180mm)	D37	310	46.0	-40.0	
															15	25	32	57	(340mm/ Frist 50 blows)	D38	320	47.0	-41.0	
															30	35	35	70	(210mm/ Frist 50 blows)	D39	310	48.0	-42.0	
															31	34	35	69	(240mm/ Frist 50 blows)	D40	320	49.0	-43.0	
															19	22	32	54	(330mm/ Frist 50 blows)	D41	330	50.0	-44.0	
00	86	14	N	P											20	20	35	55	(320mm/ Frist 50 blows)	D42	320	51.0	-45.0	SM- Silty Sand. Dense To Very Dense.
																						52.0	-47.0	
																						53.0	-48.0	
																						54.0	-49.0	
																						55.0	-50.0	
																						56.0	-51.0	
																						57.0	-52.0	
																						58.0	-53.0	
																						59.0	-54.0	
																						60.0	-55.0	
																						61.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s= Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c= Compression Index; C_r= Re-compression Index

e_o= Initial Void Ratio; C_u= Undrained Cohesion; S_u= Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
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Phone: +880-2-58957231. Fax: (880) 2-58957283. Email: fcl@dcl-fcl.com. Web: http://www.dcl-fcl.com

Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Khulna.

Borehole: **BH-39** | E: 454599m N: 499054m Elev: 2.718m | WD(m) 2.10m | Start: 06.04.16 End: 12.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50					
															35	50	-		(210mm/ Frist 50 blows)	D43	330	62.0	-56.0	
															34	34	36	70	(200mm/ Frist 50 blows)	D44	340	63.0	-57.0	
															18	22	45	67	(320mm/ Frist 50 blows)	D45	350	64.0	-58.0	
															22	20	47	67	(320mm/ Frist 50 blows)	D46	370	65.0	-59.0	SM-Silty Sand. Medium to Very dense. Grey.
															21	26	42	68	(310mm/ Frist 50 blows)	D47	330	66.0	-60.0	
															23	24	41	65	(330mm/ Frist 50 blows)	D48	340	67.0	-61.0	
																						68.0	-62.0	
																						69.0	-63.0	
																						70.0	-64.0	

END OF BORING

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 40** | E: 454639m | N: 499033m | Elev: 5.560m | WD(m) 2.65m | Start: 19.04.16 | End: 20.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
00	88	12	N	P											01	01	02	03	D1	330	1.0	4.0	SP-SM - Poorly graded Sand with Silt. Very Loose to Loose. Grey.
															01	02	02	04	D2	340	2.0	3.0	
															01	02	02	04	D3	350	3.0	2.0	
															01	02	03	05	D4	340	4.0	1.0	
															02	02	04	06	D5	360	5.0	0.0	
															00	00	00	00	D6	445	6.0	-1.0	
																			VST-1		7.0	-2.0	
			76	38	54.26										00	00	00	00	D7	450	8.0	-3.0	MH- Elastic Silt. Very soft to Soft. Grey.
															00	01	02	03	D8	450	9.0	-4.0	
																			VST-2		10.0	-5.0	
															01	02	02	04	D9	450	11.0	-6.0	
00	09	91	51	17	43.17	18.88	13.19	2.68											UDS-1	420	12.0	-7.0	
															01	02	02	04	D10	450	13.0	-8.0	
															02	06	06	12	D11	360	14.0	-9.0	
															03	08	07	15	D12	320	15.0	-10.0	
															05	06	07	13	D13	360	16.0	-11.0	
															08	08	11	19	D14	340	17.0	-12.0	
00	25	75	37	11											06	07	09	16	D15	300	18.0	-13.0	ML- Silt with Sand. Stiff to Hard. Grey.
															07	09	12	21	D16	300	19.0	-14.0	
															09	10	14	24	D17	340	20.0	-15.0	
															13	14	20	34	D18	380	21.0	-16.0	
00	19	81	37	12											07	09	09	18	D19	280	22.0	-17.0	
															08	09	10	19	D20	290	23.0	-18.0	
															06	11	20	31	D21	330	24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

Standard Penetration Test scale: 0 10 20 30 40 50

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 40**

E: 454639m
N: 499033m
Elev: 5.560m

WD(m) 2.65m

Start: 19.04.16
End: 20.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															06	09	12	21		D22	340	31.0		
															11	16	18	34		D23	280	32.0	-26.0	
00	81	19	N	P											12	18	20	38		D24	240	33.0	-27.0	
															10	14	17	31		D25	330	34.0	-28.0	
															11	15	20	35		D26	340	35.0	-29.0	
															16	24	26	50		D27	310	36.0	-30.0	
															08	10	12	22	(385mm/ Frist 50 blows)	D28	410	37.0	-31.0	
																						38.0	-32.0	
																						39.0	-33.0	
																						40.0	-34.0	
																							-35.0	

SM - Silty Sand. Medium to Dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
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WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 42** | E: 454374m | N: 498993m | Elev: 5.532m | WD(m) 2.60m | Start: 19.04.16 | End: 20.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	01	02	03		D1	420	1.0	4.0	
															01	02	03	05		D2	450	2.0	3.0	
															02	02	03	05		D3	420	3.0	2.0	
															01	02	04	06		D4	420	4.0	1.0	
00	90	10	N	P											02	02	03	05		D5	440	5.0	0.0	
															02	03	04	07		D6	400	6.0	-1.0	
															00	00	00	00		D7	460	7.0	-2.0	
00	09	91	68	24	46.28	17.89	12.57	2.68												UDS-1	380	8.0	-3.0	
															00	01	01	02		D8	480	9.0	-4.0	
															01	01	02	03		D9	460	10.0	-5.0	
															00	01	01	02		D10	485	11.0	-6.0	
																				UDS-2		12.0	-7.0	
															04	05	08	13		D11	420	13.0	-8.0	
															05	07	09	16		D12	380	14.0	-9.0	
															06	10	11	21		D13	480	15.0	-10.0	
												DST	19.9	30.8	05	11	14	25		D14	450	16.0	-11.0	
															04	08	10	18		D15	420	17.0	-12.0	
															06	08	12	20		D16	420	18.0	-13.0	
															02	04	04	08		D17	470	19.0	-14.0	
															10	22	38	60	(410mm/ Frist 50 blows)	D18	320	20.0	-15.0	
															11	20	28	48	(440mm/ Frist 50 blows)	D19	350	21.0	-16.0	
00	24	76	31	07											07	15	24	39		D20	420	22.0	-17.0	
															06	12	20	32		D21	430	23.0	-18.0	
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0	-25.0	

SP-SM - Poorly graded Sand with Silt. Very loose to Loose. Grey.

MH- Elistic Silt. Very soft to Soft. Grey.

ML- Silt with Sand. Stiff to Hard. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
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WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 42**

E: 454374m
N: 498993m
Elev: 5.532m

WD(m) 2.60m

Start: 19.04.16
End: 20.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															20	25	27	52	(340mm/ Frist 50 blows)	D22	330	31.0	-26.0		
															18	24	25	49	(430mm/ Frist 50 blows)	D23	350	32.0	-27.0		
															10	13	17	30		D24	350	33.0	-28.0		
															12	14	22	36		D25	400	34.0	-29.0		Fine Sand. Dense to Very dense. Grey.
															24	27	31	58	(360mm/ Frist 50 blows)	D26	460	35.0	-30.0		
															18	24	27	51	(390mm/ Frist 50 blows)	D27	320	36.0	-31.0		
															20	25	28	53	(410mm/ Frist 50 blows)	D28	300	37.0	-32.0		
																						38.0	-33.0		
																						39.0	-34.0		
																						40.0	-35.0		END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
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Clay
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH- 45 | E: 454559m | N: 499012m | Elev: 5.391m | WD(m) 2.78m | Start: 27.03.16 | End: 28.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	02	03	05	(blows/305mm)	D1	250	1.0	4.0		Filling Sand. Loose. Light Brownish Grey.
															02	02	03	05	(blows/305mm)	D2	400	2.0	3.0		
															02	03	03	06	(blows/310mm)	D3	360	3.0	2.0		
															02	02	03	05	(blows/310mm)	D4	220	4.0	1.0		
					52.41	15.91	10.44	2.69												UDS-1	350	5.0	0.0		
00	43	57	91	39	48.38										02	02	02	04	(blows/305mm)	D5	310	6.0	-1.0		OH- Sandy Organic Silt. Medium. Grey.
															01	02	02	04	(blows/315mm)	D6	350	7.0	-2.0		
																				UDS-2	340	8.0	-3.0		
															03	03	03	06	(blows/305mm)	D7	490	9.0	-4.0		
															03	04	04	08		D8	440	10.0	-5.0		
					37.20	18.27	13.32	2.68												UDS-3	280	11.0	-6.0		
															02	03	03	06		D9	420	12.0	-7.0		
00	14	86	35	07											02	03	03	06	(blows/310mm)	D10	400	13.0	-8.0		ML- Silt. Soft to Medium . Grey.
															01	01	01	02	(blows/315mm)	D11	490	14.0	-9.0		
															05	07	09	16		D12	310	15.0	-10.0		
															06	08	14	22		D13	300	16.0	-11.0		
												DST	28.1	30.5	07	10	14	24		D14	280	17.0	-12.0		
															06	11	17	28		D15	340	18.0	-13.0		Slty Sand. Medium to Dense. Dark grey.
															07	12	18	30		D16	330	19.0	-14.0		
															10	17	19	36		D17	380	20.0	-15.0		
															09	15	17	32		D18	320	21.0	-16.0		
															04	04	05	09	(blows/305mm)	D19	490	22.0	-17.0		
00	22	78	35	09											04	05	06	11	(blows/305mm)	D20	490	23.0	-18.0		ML-Silt with Sand. Stiff. Grey.
																						24.0	-19.0		
																						25.0	-20.0		
																						26.0	-21.0		
																						27.0	-22.0		
																						28.0	-23.0		
																						29.0	-24.0		
																						30.0	-25.0		

Legend

L.L. = Liquid Limit
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Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 45**

E: 454559m
N: 499012m
Elev: 5.391m

WD(m) 2.78m

Start: 27.03.16
End: 28.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															05	06	07	13	(blows/305mm)	D21	490	31.0	26.0		ML-Silt with Sand. Stiff. Grey.
															09	13	19	32		D22	440	32.0	27.0		
															10	14	22	36		D23	490	33.0	28.0		
															09	15	17	32		D24	490	34.0	29.0		
															17	21	26	47		D25	250	35.0	30.0		Slty Sand. Dense. Grey.
															10	14	17	31		D26	360	36.0	31.0		
															13	17	19	36		D27	340	37.0	32.0		
																						38.0	33.0		
																						39.0	34.0		
																						40.0	35.0		

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
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Y_t = Bulk Unit Weight
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Clay
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-46** | E: 454599m | N: 499012m | Elev: 5.263m | WD(m) 2.45m | Start: 29.03.16 | End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50							
															01	02	03	05	(blows/310mm)	D1	390	1.0	4.0		Filling Sand. Loose. Brownish Grey.
															02	02	03	05	(blows/310mm)	D2	360	2.0	3.0		
															02	02	03	05	(blows/305mm)	D3	340	3.0	2.0		
															01	01	02	03	(blows/320mm)	D4	490	4.0	1.0		
00	13	87	66	24	56.11	15.20	9.74													UDS-1	320	5.0	0.0		
															00	00	01	01	(blows/315mm)	D5	490	6.0	-1.0		
															01	01	02	03	(blows/320mm)	D6	490	7.0	-2.0		
																				UDS-2		8.0	-3.0		MH- Elastic Silt. Very soft to Medium.Grey.
															02	02	02	04	(blows/310mm)	D7	440	9.0	-4.0		
															02	03	03	06	(blows/310mm)	D8	420	10.0	-5.0		
00	12	88	60	24	52.46	17.58	11.53													UDS-3	200	11.0	-6.0		
															02	02	03	05	(blows/310mm)	D9	360	12.0	-7.0		
															04	04	07	11		D10	340	13.0	-8.0		
															07	08	11	19		D11	320	14.0	-9.0		
															04	05	06	11		D12	440	15.0	-10.0		Slty Sand. Very Stiff.
															07	08	09	17		D13	320	16.0	-11.0		
															06	10	11	21		D14	340	17.0	-12.0		
															13	16	20	36		D15	300	18.0	-13.0		
															06	07	09	16		D16	420	19.0	-14.0		
															07	12	20	32		D17	340	20.0	-15.0		
00	26	74	37	11	34.32										05	07	10	17		D18	330	21.0	-16.0		
															03	05	07	12		D19	440	22.0	-17.0		
															12	15	18	33		D20	360	23.0	-18.0		
																						24.0	-19.0		
																						25.0	-20.0		
																						26.0	-21.0		ML- Silt With Sand. Stiff to Very Stiff.
																						27.0	-22.0		
																						28.0	-23.0		
																						29.0	-24.0		
																						30.0	-25.0		

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-46** | E: 454599m, N: 499012m, Elev: 5.263m | WD(m) 2.45m | Start: 29.03.16, End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															15	20	25	45	(390mm/ Frist 50 blows)	D21	340	31.0	-26.0	
															15	18	27	45	(400mm/ Frist 50 blows)	D22	320	32.0	-27.0	
00	86	14	N	P	25.50										14	17	24	41	(410mm/ Frist 50 blows)	D23	370	33.0	-28.0	
															11	14	18	32		D24	290	34.0	-29.0	
															07	11	16	27		D25	320	35.0	-30.0	
															09	14	18	32		D26	320	36.0	-31.0	
															10	17	20	37		D27	340	37.0	-32.0	
															10	17	22	39		D28	400	38.0	-33.0	
															11	19	22	41	(445mm/ Frist 50 blows)	D29	290	39.0	-34.0	
															14	18	14	32		D30	320	40.0	-35.0	
															13	16	21	37	(450mm/ Frist 50 blows)	D31	200	41.0	-36.0	
															14	18	22	40	(435mm/ Frist 50 blows)	D32	250	42.0	-37.0	
															20	25	37	62	(350mm/ Frist 50 blows)	D33	280	43.0	-38.0	
																						44.0	-39.0	
																						45.0	-40.0	
																						46.0	-41.0	
																						47.0	-42.0	
																						48.0	-43.0	
																						49.0	-44.0	
																						50.0	-45.0	
																						51.0		

SM- Silty Sand. Medium to Very dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay, Silt, Sand, Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-47** | E: 454579m | N: 498990m | Elev: 5.183m | WD(m) 2.59m | Start: 02.04.16 | End: 06.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	02	04	(blows/310mm)	D1	340	1.0	4.0		Filling Sand. Very Loose. Brownish Grey.
															01	02	02	04	(blows/305mm)	D2	320	2.0	3.0		
															01	01	01	02	(blows/305mm)	D3	300	3.0	2.0		
															00	00	00	00	(blows/315mm)	D4	490	4.0	1.0		
																				UDS-1		5.0	0.0		
															00	00	00	00	(blows/320mm)	D5	490	6.0	-1.0		
															02	02	03	05	(blows/310mm)	D6	460	7.0	-2.0		
00	11	89	53	19	49.41	17.51	11.72													UDS-2	310	8.0	-3.0		MH- Elastic Silt. Very Soft to Medium. Grey.
															02	02	03	05		D7	450	9.0	-4.0		
															02	03	03	06		D8	420	10.0	-5.0		
					37.56	18.24	13.26													UDS-3	300	11.0	-6.0		
															02	02	02	04	(blows/310mm)	D9	420	12.0	-7.0		
															00	01	02	03	(blows/320mm)	D10	460	13.0	-8.0		
															03	03	05	08	(blows/305mm)	D11	400	14.0	-9.0		
															04	05	08	13		D12	340	15.0	-10.0		
															05	07	11	18		D13	390	16.0	-11.0		
															05	06	07	13		D14	340	17.0	-12.0		
															06	06	09	15		D15	300	18.0	-13.0		Slty Sand. Loose to Medium. Grey.
															06	08	12	20		D16	320	19.0	-14.0		
															06	07	10	17		D17	340	20.0	-15.0		
															06	08	12	20		D18	300	21.0	-16.0		
00	27	73	39	11	32.90										05	06	10	16		D19	490	22.0	-17.0		ML- Silt With Sand. Very Stiff.Grey.
															10	10	11	21		D20	360	23.0	-18.0		
																						24.0	-19.0		
																						25.0	-20.0		
																						26.0	-21.0		
																						27.0	-22.0		
																						28.0	-23.0		
																						29.0	-24.0		
																						30.0	-25.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s= Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c= Compression Index; C_r= Re-compression Index

e_o= Initial Void Ratio; C_u= Undrained Cohesion; S_u= Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-47** | E: 454579m | N: 498990m | Elev: 5.183m | WD(m) 2.59m | Start: 02.04.16 | End: 06.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															10	15	17	32		D21	340	31.0	26.0	
															07	10	16	26		D22	330	32.0	27.0	
															08	10	19	29		D23	320	33.0	28.0	
															09	13	15	28		D24	390	34.0	29.0	
															11	14	19	33		D25	300	35.0	30.0	
															10	13	18	31		D26	340	36.0	31.0	
												DST	26.9	30.2	12	16	18	34		D27	360	37.0	32.0	
															13	15	18	33		D28	250	38.0	33.0	
															14	24	29	53	(360mm/ Frist 50 blows)	D29	260	39.0	34.0	
															17	28	34	62	(330mm/ Frist 50 blows)	D30	220	40.0	35.0	
															13	16	23	39	(435mm/ Frist 50 blows)	D31	260	41.0	36.0	
															11	16	22	38		D32	240	42.0	37.0	
00	88	12	N	P											12	22	30	52	(410mm/ Frist 50 blows)	D33	280	43.0	38.0	
															16	19	32	51	(370mm/ Frist 50 blows)	D34	300	44.0	39.0	
															14	20	29	49	(380mm/ Frist 50 blows)	D35	320	45.0	40.0	
															22	28	32	60	(300mm/ Frist 50 blows)	D36	210	46.0	41.0	
															21	22	24	46	(390mm/ Frist 50 blows)	D37	240	47.0	42.0	
															20	26	29	55	(330mm/ Frist 50 blows)	D38	220	48.0	43.0	
															15	21	22	43	(395mm/ Frist 50 blows)	D39	260	49.0	44.0	
															16	23	31	54	(400mm/ Frist 50 blows)	D40	270	50.0	45.0	
																						51.0	45.0	
																						52.0	47.0	
																						53.0	48.0	
																						54.0	49.0	
																						55.0	50.0	
																						56.0	51.0	
																						57.0	52.0	
																						58.0	53.0	
																						59.0	54.0	
																						60.0	55.0	
																						61.0		

SM- Silty Sand. Medium to Very dense. Grey.

SP - Poorly graded Sand. Dense to Very dense. Grey.

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-47**

E: 454579m
N: 498990m
Elev: 5.183m

WD(m) 2.59m

Start: 02.04.16
End: 06.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific GravitY	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															24	35	39	74	(260mm/ Frist 50 blows)	D41	240	62.0	-57.0		
															30	46	24	70	(230mm/ Frist 50 blows)	D42	220	63.0	-58.0		
															25	33	42	75	(255mm/ Frist 50 blows)	D43	220	64.0	-59.0		
															27	35	38	73	(250mm/ Frist 50 blows)	D44	240	65.0	-60.0		SP - Poorly graded Sand. Dense to Very dense. Grey.
															24	31	36	67	(275mm/ Frist 50 blows)	D45	240	66.0	-61.0		
00	96	04	N	P											20	30	34	64	(300mm/ Frist 50 blows)	D46	250	67.0	-62.0		
															28	41	31	72	(230mm/ Frist 50 blows)	D47	220	68.0	-63.0		
																						69.0	-64.0		
																						70.0	-65.0		

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-48 E: 454559m N: 498972m Elev: 5.623m

WD(m) 2.60m Start: 03.04.16 End: 06.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	03	05		D1	320	1.0	5.0	
															02	02	03	05		D2	300	2.0	4.0	
															02	03	03	06		D3	350	3.0	3.0	
															01	02	03	05		D4	370	4.0	2.0	
															00	01	02	03		D5	450	5.0	1.0	
00	12	88	61	22																UDS-1	370	6.0	0.0	
															01	01	02	03		D6	450	7.0	-1.0	
															01	02	03	05		D7	470	8.0	-2.0	
															04	05	06	11		D8	420	9.0	-3.0	
					43.64	17.54	12.21													UDS-2	380	10.0	-4.0	
															03	04	06	10		D9	460	11.0	-5.0	
															03	06	06	12		D10	400	12.0	-6.0	
															04	06	08	14		D11	420	13.0	-7.0	
															04	05	10	15		D12	430	14.0	-8.0	
															10	14	16	30		D13	320	15.0	-9.0	
00	84	16	N	P											10	14	18	32		D14	350	16.0	-10.0	
															13	20	30	50	(410mm/ Frist 50 blows)	D15	345	17.0	-11.0	
															12	18	26	44	(440mm/ Frist 50 blows)	D16	320	18.0	-12.0	
															07	10	14	24		D17	300	19.0	-13.0	
															09	11	11	22		D18	380	20.0	-14.0	
															08	10	14	24		D19	400	21.0	-15.0	
00	23	77	30	06	28.44	18.11	14.10													UDS-3		22.0	-16.0	
															10	12	15	27		D20	320	23.0	-17.0	
																						24.0	-18.0	
																						25.0	-19.0	
																						26.0	-20.0	
																						27.0	-21.0	
																						28.0	-22.0	
																						29.0	-23.0	
																						30.0	-24.0	

Fine Sand. Loose. Grey.

MH- Elastic Silt. Soft to Stiff. Grey.

SM- Silty Sand. Dense. Grey.

ML-Silt with Sand. Very Stiff. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
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WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-48** E: 454559m N: 498972m Elev: 5.623m

WD(m) 2.60m Start: 03.04.16 End: 06.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Remarks
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															10	11	13	24		D21	350	31.0	26.0		
															07	14	28	42		D22	380	32.0	27.0		
															07	16	24	40		D23	350	33.0	28.0		
															07	15	29	44	(445mm/ Frist 50 blows)	D24	340	34.0	29.0		
00	53	47	N	P											10	17	22	49	(430mm/ Frist 50 blows)	D25	270	35.0	30.0		SM- Silty Sand. Dense to Very dense. Grey..
															17	33	47	80	(300mm/ Frist 50 blows)	D26	260	36.0	31.0		
															19	31	43	74	(300mm/ Frist 50 blows)	D27	280	37.0	32.0		
																						38.0	33.0		
																						39.0	34.0		
																						40.0	35.0		END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

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Phone: +880-2-58957231. Fax: (880) 2-58957283. Email: fcl@dcl-fcl.com. Web: http://www.dcl-fcl.com

Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-50 E: 454599m N: 498932m Elev: 5.428m

WD(m) 2.35m Start: 25.06.16 End: 05.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	γ_t	γ_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	02	04	(blows/310mm)	D1	370	1.0	4.0		
															01	02	02	04	(blows/315mm)	D2	380	2.0	3.0		
															02	01	02	03	(blows/320mm)	D3	360	3.0	2.0		Filling Sand. Very Loose. Grey.
															00	01	01	02		D4	370	4.0	1.0		
															02	01	02	03	(blows/310mm)	D5	380	5.0	0.0		
00	08	92	131	62	114.0	14.52	6.79													UDS-1	400	6.0	-1.0		
															03	04	03	07	(blows/305mm)	D6	390	7.0	-2.0		OH- Organic Silt. Soft to Medium. Grey.
															00	00	02	02	(blows/315mm)	D7	400	8.0	-3.0		
															01	02	02	04	(blows/310mm)	D8	370	9.0	-4.0		
															03	03	04	07		D9	380	10.0	-5.0		
								2.51												UDS-2	400	11.0	-6.0		Silty Clay. Soft to Medium. Grey.
															01	01	02	03		D10	360	12.0	-7.0		
															05	03	06	09	(blows/310mm)	D11	350	13.0	-8.0		
															04	02	06	08	(blows/305mm)	D12	360	14.0	-9.0		
															02	03	05	08	(blows/320mm)	D13	370	15.0	-10.0		
00	82	18	N	P	27.55			2.67							07	06	08	14	(blows/315mm)	D14	380	16.0	-11.0		SM- Silty Sand. Loose to Medium. Grey.
															09	08	09	17		D15	370	17.0	-12.0		
															07	10	12	22	(blows/310mm)	D16	380	18.0	-13.0		
															08	11	15	26	(blows/315mm)	D17	370	19.0	-14.0		
															07	10	11	21	(blows/305mm)	D18	360	20.0	-15.0		
00	16	84	36	10	31.62	19.29	14.66													UDS-3	400	21.0	-16.0		
															04	04	06	10	(blows/320mm)	D19	370	22.0	-17.0		ML- Silt With Sand. Stiff to Very Stiff. Grey.
															05	04	07	11	(blows/310mm)	D20	380	23.0	-18.0		
																						24.0	-19.0		
																						25.0	-20.0		
																						26.0	-21.0		
																						27.0	-22.0		
																						28.0	-23.0		
																						29.0	-24.0		
																						30.0	-25.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s= Specific Gravity

γ_t = Bulk Unit Weight; γ_d = Dry Unit Weight; C_c= Compression Index; C_r= Re-compression Index

e_o= Initial Void Ratio; C_u= Undrained Cohesion; S_u= Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-50** | E: 454599m | N: 498932m | Elev: 5.428m | WD(m) 2.35m | Start: 25.06.16 | End: 05.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value							
															03	05	11	16	(blows/305mm)	D21	380	31.0	26.0	
															04	05	10	15	(blows/310mm)	D22	370	32.0	27.0	
															10	16	13	29		D23	380	33.0	28.0	
															11	15	16	31		D24	340	34.0	29.0	
															12	13	17	30	(blows/320mm)	D25	350	35.0	30.0	
															13	15	16	31	(blows/305mm)	D26	360	36.0	31.0	
															17	11	21	32	(blows/305mm)	D27	370	37.0	32.0	
																						38.0	33.0	
																						39.0	34.0	
																						40.0	35.0	

Standard Penetration Test scale: 0 10 20 30 40 50

Slty Sand. Medium to Dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity
Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index
e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling
Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-51** | E: 454679m | N: 499012m | Elev: 5.325m | WD(m) 2.50m | Start: 28.03.16 | End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50					
															01	02	02	04	(blows/310mm)	D1	480	1.0	4.0	
00	92	08	N	P	25.63										01	02	03	05	(blows/310mm)	D2	420	2.0	3.0	
															01	02	02	04		D3	400	3.0	2.0	SP-SM - Poorly graded Sand With Silt. Loose. Grey.
															02	03	03	06	(blows/320mm)	D4	320	4.0	1.0	
															01	01	02	03	(blows/310mm)	D5	460	5.0	0.0	
00	14	86	82	47																UDS-1		6.0	-1.0	
															00	02	02	04		D6	320	7.0	-2.0	
															01	01	02	03	(blows/305mm)	D7	400	8.0	-3.0	OH- Organic Clay. Soft . Grey
															00	01	02	03	(blows/310mm)	D8	480	9.0	-4.0	
					48.82	18.44	12.39	2.68												UDS-2	390	10.0	-5.0	
															01	02	02	04		D9	450	11.0	-6.0	
															03	07	09	16	(blows/310mm)	D10	380	12.0	-7.0	Silty Clay. Soft to Very Stiff. Grey
															03	07	06	13	(blows/305mm)	D11	400	13.0	-8.0	
															02	08	07	15		D12	420	14.0	-9.0	
															03	07	11	18	(blows/305mm)	D13	450	15.0	-10.0	
00	81	19	N	P	27.92										07	10	12	22		D14	350	16.0	-11.0	Sandy Silt. Stiff to Very Stiff. Grey.
															06	12	13	25		D15	330	17.0	-12.0	
															18	26	29	55	(340mm/ Frist 50 blows)	D16	380	18.0	-13.0	
															16	20	31	51	(350mm/ Frist 50 blows)	D17	400	19.0	-14.0	
															11	11	13	24		D18	420	20.0	-15.0	
															09	10	12	22		D19	320	21.0	-16.0	SM- Silty Sand. Medium to Very dense. Grey.
															06	10	11	21		D20	350	22.0	-17.0	
																						23.0	-18.0	
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	Silty Clay.Very Stiff. Grey.
																						29.0	-24.0	
																						30.0	-25.0	

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-51** | E: 454679m | N: 499012m | Elev: 5.325m | WD(m) 2.50m | Start: 28.03.16 | End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value							
					29.15	19.15	14.83													UDS-3	370	31.0	26.0	
															06	11	13	24		D21	350			
															08	16	14	30		D22	320	32.0	27.0	
															08	10	12	22		D23	360	33.0	28.0	
															08	12	14	26		D24	420	34.0	29.0	
00	83	17	N	P											09	22	22	44		D25	380	35.0	30.0	
															10	14	17	31		D26	400	36.0	31.0	
															11	16	18	34	(blows/305mm)	D27	360	37.0	32.0	
																						38.0	33.0	
																						39.0	34.0	
																						40.0	35.0	

SM- Silty Sand. Medium to Very dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
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Clay
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Sand
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Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-52** E: 454719m N: 499012m Elev: 5.490m

WD(m) 2.70m Start: 01.04.16 End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	02	03	05		D1	230	1.0	4.0	
															02	02	02	04		D2	260	2.0	3.0	
00	91	09	N	P	28.47										02	03	03	06		D3	280	3.0	2.0	SP-SM - Poorly graded Sand With Silt. Loose. Grey.
															02	02	02	04		D4	250	4.0	1.0	
															01	01	02	03		D5	450	5.0	0.0	
00	14	86	46	15	38.58	18.14	13.09													UDS-1	395	6.0	-1.0	
															01	01	02	03		D6	370	7.0	-2.0	ML- Silt .Soft. Dark grey.
															01	02	02	04		D7	360	8.0	-3.0	
					36.81	18.88	13.80													UDS-2	380	9.0	-4.0	
															03	05	05	10		D8	390	10.0	-5.0	
															03	04	05	09		D9	280	11.0	-6.0	
															04	06	08	14		D10	450	12.0	-7.0	
															05	07	09	16		D11	450	13.0	-8.0	
00	84	16	N	P	26.69										06	12	12	24		D12	380	14.0	-9.0	SM- Silty Sand. Loose to Very dense. Grey.
															07	10	12	22		D13	370	15.0	-10.0	
															08	04	03	07		D14	450	16.0	-11.0	
															16	26	35	61	(340mm/ Frist 50 blows)	D15	320	17.0	-12.0	
															15	24	30	54	(395mm/ Frist 50 blows)	D16	320	18.0	-13.0	
															10	15	20	35		D17	340	19.0	-14.0	
00	22	78	42	13	35.31										03	05	06	11		D18	450	20.0	-15.0	
															04	06	07	13		D19	450	21.0	-16.0	ML- Silt With Sand. Stiff. Grey.
															06	10	12	22		D20	340	22.0	-17.0	
																						23.0	-18.0	
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0	-25.0	

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-52** E: 454719m N: 499012m Elev: 5.490m

WD(m) 2.70m Start: 01.04.16 End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Remarks
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															08	14	24	38		D21	320	31.0	26.0		
															11	14	15	29		D22	330	32.0	27.0		
															12	16	20	36		D23	340	33.0	28.0		
															15	25	26	51	(375mm/ Frist 50 blows)	D24	320	34.0	29.0		SM- Silty Sand. Medium to Very dense.
															14	22	24	46	(400mm/ Frist 50 blows)	D25	320	35.0	30.0		
00	82	18	N	P	27.40										15	17	20	37		D26	330	36.0	31.0		
															12	13	16	29		D27	340	37.0	32.0		
																						38.0	33.0		
																						39.0	34.0		
																						40.0	35.0		

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
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Φ = Angle of Internal Friction
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Clay
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-53 E: 454759m N: 499012m Elev: 5.908m

WD(m) 2.80m Start: 28.03.16 End: 29.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	03	05		D1	240	1.0	5.0	
															02	03	04	07		D2	230	2.0	4.0	
00	89	11	N	P	25.69										02	04	06	10		D3	250	3.0	3.0	SP-SM - Poorly graded sand with silt. Loose. Brownish Grey.
															02	03	05	08		D4	320	4.0	2.0	
															00	01	02	03		D5	450	5.0	1.0	
					109.9	14.44	6.88													UDS-1	320	6.0	0.0	
															00	00	00	00		D6	450	7.0	-1.0	
															00	01	01	02		D7	450	8.0	-2.0	
					37.60	17.85	12.97													UDS-2	340	9.0	-3.0	Organic Silty Clay. Very Soft to Soft. Grey.
															00	01	01	02		D8	450	10.0	-4.0	
															07	09	11	20		D9	260	11.0	-5.0	
															06	08	10	18		D10	240	12.0	-6.0	
															04	06	11	17		D11	320	13.0	-7.0	
00	22	78	34	09	31.31										05	07	08	15		D12	310	14.0	-8.0	
															04	06	08	14		D13	450	15.0	-9.0	ML- Silt With Sand. Stiff to Very Stiff. Grey.
															05	06	07	13		D14	450	16.0	-10.0	
															20	46	34	80	(200mm/ Frist 50 blows)	D15	220	17.0	-11.0	
								2.68							18	25	38	63	(385mm/ Frist 50 blows)	D16	240	18.0	-12.0	
															16	20	26	46		D17	250	19.0	-13.0	Silty Sand. Dense to Very dense. Grey.
															12	20	23	43		D18	260	20.0	-14.0	
															10	18	24	42		D19	250	21.0	-15.0	
															16	14	18	32		D20	450	22.0	-16.0	ML- Silt With Sand. Very Stiff to Hard. Grey.
																						23.0	-17.0	
																						24.0	-18.0	
																						25.0	-19.0	
																						26.0	-20.0	
																						27.0	-21.0	
																						28.0	-22.0	
																						29.0	-23.0	
																						30.0	-24.0	

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-53** | E: 454759m | N: 499012m | Elev: 5.908m | WD(m) 2.80m | Start: 28.03.16 | End: 29.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
00	21	79	33	08	36.39										12	14	16	30	D21	450	31.0	25.0	
															12	15	16	31	D22	360	32.0	26.0	
															13	16	18	34	D23	350	33.0	27.0	
															09	11	14	25	D24	450	34.0	28.0	
															08	10	12	22	D25	450	35.0	29.0	
															08	09	10	19	D26	450	36.0	30.0	
															10	12	14	26	D27	450	37.0	31.0	
																					38.0	32.0	
																					39.0	33.0	
																					40.0	34.0	

Standard Penetration Test scale: 0 10 20 30 40 50

ML- Silt With Sand. Very Stiff to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity
Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index
e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling
Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-54** E: 454741m N: 498989m Elev: 5.742m

WD(m) 2.15m Start: 27.03.16 End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															01	02	02	04	D1	260	1.0	5.0	
															00	01	02	03	D2	320	2.0	4.0	
															01	02	02	04	D3	300	3.0	3.0	
															01	02	02	04	D4	350	4.0	2.0	
																			UDS-1	450	5.0	1.0	
															01	01	02	03	D5	490	6.0	0.0	
															01	02	03	05	D6	490	7.0	-1.0	
00	12	88	67	27															UDS-2	350	8.0	-2.0	
															02	02	04	06	D7	410	9.0	-3.0	
															02	03	05	08	D8	380	10.0	-4.0	
															02	03	05	08	D9	380	11.0	-5.0	
															02	04	06	10	D10	400	12.0	-6.0	
															03	04	06	10	D11	380	13.0	-7.0	
															03	04	07	11	D12	380	14.0	-8.0	
															02	03	04	07	D13	390	15.0	-9.0	
															03	04	05	09	D14	400	16.0	-10.0	
															15	27	31	58	D15	370	17.0	-11.0	
00	84	16	28	08	27.90										09	09	10	19	D16	350	18.0	-12.0	
															06	08	12	20	D17	350	19.0	-13.0	
															03	03	04	07	D18	480	20.0	-14.0	
					31.59	18.70	14.21	2.67											UDS-3	330	21.0	-15.0	
															03	04	04	08	D19	440	22.0	-16.0	
															03	03	04	07	D20	460	23.0	-17.0	
																					24.0	-18.0	
																					25.0	-19.0	
																					26.0	-20.0	
																					27.0	-21.0	
																					28.0	-22.0	
																					29.0	-23.0	
																					30.0	-24.0	

Filling Sand.Very Loose. Brownish Grey.

MH- Elastic Silt.Soft to Medium. Grey.

Silt with Sand. Medium to Stiff. Grey.

SC- Clayey Sand. Medium to Very dense. Grey.

Silty Clay. Very Stiff. Grey

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-54** | E: 454741m | N: 498989m | Elev: 5.742m | WD(m) 2.15m | Start: 27.03.16 | End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															02	03	03	06		D21	470	31.0	-25.0	
															02	02	03	05		D22	480	32.0	-26.0	
															06	10	10	20		D23	370	33.0	-27.0	
															07	10	12	22		D24	365	34.0	-28.0	
															06	08	11	19		D25	265	35.0	-29.0	
00	20	80	31	07	29.86										06	08	12	20		D26	340	36.0	-30.0	
															11	19	28	47		D27	350	37.0	-31.0	
															10	20	26	46		D28	355	38.0	-32.0	
															09	18	22	40		D29	290	39.0	-33.0	
															08	16	22	38		D30	300	40.0	-34.0	
															20	30	45	75	(300mm/ Frist 50 blows)	D31	330	41.0	-35.0	
															22	32	40	72	(295mm/ Frist 50 blows)	D32	290	42.0	-36.0	
															15	27	29	56	(350mm/ Frist 50 blows)	D33	285	43.0	-37.0	
															18	30	38	68	(310mm/ Frist 50 blows)	D34	340	44.0	-38.0	
															16	28	35	63	(315mm/ Frist 50 blows)	D35	345	45.0	-39.0	
															23	30	45	75	(285mm/ Frist 50 blows)	D36	280	46.0	-40.0	
															20	30	46	76	(3400mm/ Frist 50 blows)	D37	300	47.0	-41.0	
															22	36	42	78	(290mm/ Frist 50 blows)	D38	310	48.0	-42.0	
															35	50	15	65	(180mm/ Frist 50 blows)	D39	260	49.0	-43.0	
															37	48	15	63	(190mm/ Frist 50 blows)	D40	265	50.0	-44.0	
																						51.0	-45.0	
																						52.0	-46.0	
																						53.0	-47.0	
																						54.0	-48.0	
																						55.0	-49.0	
																						56.0	-50.0	
																						57.0	-51.0	
																						58.0	-52.0	
																						59.0	-53.0	
																						60.0	-54.0	
																						61.0	-55.0	

ML- Silt With Sand. Very Stiff. Grey.

SP-SM - Poorly graded Sand With Silt. Dense to Very dense. Brownish Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-54** | E: 454741m N: 498989m Elev: 5.742m | WD(m) 2.15m | Start: 27.03.16 End: 02.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50					
00	94	06	N	P	19.25											36	50	-	(300mm/ Frist 50 blows)	D41	260	62.0	-56.0	
																36	50	-	(300mm/ Frist 50 blows)	D42	255	63.0	-57.0	
															35	47	18	65	(150mm/ Frist 50 blows)	D43	260	64.0	-58.0	
															32	45	23	68	(180mm/ Frist 50 blows)	D44	265	65.0	-59.0	
																						66.0	-60.0	
																						67.0	-61.0	
																						68.0	-62.0	
																						69.0	-63.0	
																						70.0	-64.0	

SP-SM - Poorly graded Sand With Silt. Dense to Very dense. Brownish Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
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DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 55** | E: 454808m | N: 498999m | Elev: 5.573m | WD(m) 2.70m | Start: 09.04.16 | End: 11.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															01	01	01	02	D1	140	1.0	5.0	
															01	01	02	03	D2	150	2.0	4.0	
															01	01	02	03	D3	240	3.0	3.0	
00	89	11	N	P											02	02	02	04	D4	310	4.0	2.0	
															01	02	03	05	D5	220	5.0	1.0	
															00	00	00	00	D6	450	6.0	0.0	
															01	01	01	02	D7	450	7.0	-1.0	
																			UDS-1	250	8.0	-2.0	
															01	01	02	03	D8	450	9.0	-3.0	
															01	02	03	05	D9	450	10.0	-4.0	
00	08	92	55	21	37.86	18.38	13.33												UDS-2	420	11.0	-5.0	
															00	01	01	02	D10	450	12.0	-6.0	
															04	06	09	15	D11	360	13.0	-7.0	
															03	05	07	12	D12	380	14.0	-8.0	
00	18	82	N	P											04	06	08	14	D13	370	15.0	-9.0	
															02	04	06	10	D14	380	16.0	-10.0	
															04	06	07	13	D15	370	17.0	-11.0	
															08	14	19	33	D16	250	18.0	-12.0	
00	87	13	N	P											09	10	12	22	D17	240	19.0	-13.0	
															08	10	12	22	D18	360	20.0	-14.0	
00	11	89	33	10											06	08	10	18	D19	350	21.0	-15.0	
															07	09	11	20	D20	340	22.0	-16.0	
															06	07	10	17	D21	350	23.0	-17.0	
																					24.0	-18.0	
																					25.0	-19.0	
																					26.0	-20.0	
																					27.0	-21.0	
																					28.0	-22.0	
																					29.0	-23.0	
																					30.0	-24.0	

SP-SM - Poorly graded sand with silt. Very loose to Loose. Grey.

MH- Elastic Silt. Very soft to Medium. Grey.

ML- Silt With Sand. Stiff. Grey.

SM- Silty Sand. Medium to Dense. Grey.

CL- Lean Clay. Very Stiff. Grey.

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s= Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c= Compression Index; C_r= Re-compression Index

e_o= Initial Void Ratio; C_u= Undrained Cohesion; S_u= Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 55** E: 454808m N: 498999m Elev: 5.573m

WD(m) 2.70m Start: 09.04.16 End: 11.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	02	03	05		D22	450	31.0	-25.0	
00	09	91	34	08	31.95	19.46	14.75													UDS-3	280	32.0	-26.0	
															04	06	07	13		D23	450	33.0	-27.0	
															13	15	18	33		D24	330	34.0	-28.0	
00	13	87	33	09											10	13	18	31		D25	310	35.0	-29.0	
															10	12	17	29		D26	320	36.0	-30.0	
															08	10	12	22		D27	450	37.0	-31.0	
00	09	91	45	13											06	07	09	16		D28	450	38.0	-32.0	
																						39.0	-33.0	
																						40.0	-34.0	
																							-35.0	

ML- Silt. Medium to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
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WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Phone: +880-2-58957231. Fax: (880) 2-58957283. Email: fcl@dcl-fcl.com. Web: http://www.dcl-fcl.com

Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH- 57** E: 454679m N: 498972m Elev: 5.627m

WD(m) 2.25m Start: 18.04.16 End: 19.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															02	02	02	04	(blows/310mm)	D1	340	1.0	4.0	
00	83	17	N	P											02	03	05	08	(blows/305mm)	D2	330	2.0	3.0	SM- Silty Sand. Loose. Grey.
															02	03	04	07	(blows/310mm)	D3	340	3.0	2.0	
															02	03	03	06		D4	350	4.0	1.0	
															03	03	04	07		D5	340	5.0	0.0	
															00	01	02	03	(blows/305mm)	D6	350	6.0	-1.0	
																				VST-1		7.0	-2.0	MH- Elastic Silt. Very soft to Soft. Grey.
00	10	90	90	40	59.17	15.20	9.54	2.21												UDS-1	400	8.0	-3.0	
															00	00	00	00	(blows/305mm)	D7	360	9.0	-4.0	
															00	00	01	01	(blows/305mm)	D8	370	10.0	-5.0	
																				VST-2		11.0	-6.0	
															01	01	02	03	(blows/310mm)	D9	340	12.0	-7.0	
															04	04	07	11	(blows/305mm)	D10	320	13.0	-8.0	
															03	03	06	09	(blows/305mm)	D11	330	14.0	-9.0	
															03	04	07	11		D12	320	15.0	-10.0	
															04	04	08	12	(blows/305mm)	D13	340	16.0	-11.0	
00	32	68	N	P											06	09	12	21		D14	350	17.0	-12.0	ML- Sandy Silt. Stiff to Very Stiff. Grey.
															05	10	13	23		D15	360	18.0	-13.0	
															02	03	09	12		D16	340	19.0	-14.0	
															03	04	07	11	(blows/305mm)	D17	350	20.0	-15.0	
															04	04	07	11	(blows/310mm)	D18	340	21.0	-16.0	
															05	04	08	12	(blows/305mm)	D19	330	22.0	-17.0	
															04	05	05	10		D20	330	23.0	-18.0	
00	09	91	33	08											04	04	05	09	(blows/305mm)	D21	340	24.0	-19.0	ML- Silt. Stiff. Grey.
															03	04	06	10		D22	360	25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0		

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

DEVELOPMENT CONSTRUCTIONS LIMITED.

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-60** | E: 454604m | N: 498898m | Elev: 5.563m | WD(m) 2.59m | Start: 10.04.16 | End: 12.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	02	04	(blows/310mm)	D1	340	1.0	4.0	
															02	02	02	04	(blows/305mm)	D2	320	2.0	3.0	
															01	02	03	05	(blows/305mm)	D3	340	3.0	2.0	SM- Silty Sand. Loose. Grey.
00	86	14	N	P											02	02	03	05	(blows/305mm)	D4	380	4.0	1.0	
															01	02	03	05	(blows/310mm)	D5	260	5.0	0.0	
															00	00	00	00	(blows/310mm)	D6	490	6.0	-1.0	
															01	01	01	02	(blows/305mm)	D7	440	7.0	-2.0	
00	09	91	69	32	44.66	16.11	11.14	2.69												UDS-1	260	8.0	-3.0	
															01	02	02	04		D8	420	9.0	-4.0	MH- Elastic Silt. Very soft to Soft. Grey.
															01	01	01	02	(blows/305mm)	D9	440	10.0	-5.0	
															01	02	02	04	(blows/305mm)	D10	360	11.0	-6.0	
															03	03	05	08		D11	340	12.0	-7.0	
															03	04	06	10		D12	360	13.0	-8.0	
															06	10	12	22		D13	340	14.0	-9.0	
															08	12	13	25		D14	320	15.0	-10.0	
00	85	15	N	P											07	11	18	29		D15	320	16.0	-11.0	SM- Silty Sand. Loose to Dense. Grey.
												DST	28.1	29.8	11	12	14	26		D16	280	17.0	-12.0	
															15	20	21	41		D17	340	18.0	-13.0	
															14	18	22	40		D18	320	19.0	-14.0	
															05	05	08	13		D19	440	20.0	-15.0	
															06	08	10	18		D20	370	21.0	-16.0	
															06	08	10	18		D21	375	22.0	-17.0	
																						23.0	-18.0	
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0		

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-60**

E: 454604m
N: 498898m
Elev: 5.563m

WD(m) 2.59m

Start: 10.04.16
End: 12.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															03	03	04	07		D22	440	31.0	-26.0	
00	84	16	N	P											08	09	14	23		D23	380	32.0	-27.0	
															10	12	16	28		D24	370	33.0	-28.0	
															12	14	16	30		D25	350	34.0	-29.0	
															10	12	13	25		D26	360	35.0	-30.0	
															06	12	17	29		D27	350	36.0	-31.0	
															11	17	18	35		D28	280	37.0	-32.0	
																						38.0	-33.0	
																						39.0	-34.0	
																						40.0	-35.0	

SM- Silty Sand. Loose to Dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
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DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-61** | E: 454575m | N: 498882m | Elev: 5.508m | WD(m) 2.25m | Start: 12.04.16 | End: 13.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															02	01	01	02	D1	370	1.0	4.0	
00	84	16	N	P											01	01	02	03	D2	395	2.0	3.0	
															01	01	02	03	D3	380	3.0	2.0	
															01	02	02	04	D4	340	4.0	1.0	
															01	01	01	02	D5	480	5.0	0.0	
															00	01	01	02	D6	480	6.0	-1.0	
00	13	87	53	20	23.74	17.51	14.15	2.68											UDS-1	340	7.0	-2.0	
															00	01	01	02	D7	485	8.0	-3.0	
															01	01	02	03	D8	440	9.0	-4.0	
															00	00	00	00	D9	445	10.0	-5.0	
															00	00	01	01	D10	450	11.0	-6.0	
															01	02	02	04	D11	480	12.0	-7.0	
															02	02	03	05	D12	480	13.0	-8.0	
															06	08	10	18	D13	340	14.0	-9.0	
															06	07	12	19	D14	360	15.0	-10.0	
00	86	14	N	P											07	09	10	19	D15	270	16.0	-11.0	
												DST	25.8	30.6	08	10	12	22	D16	340	17.0	-12.0	
															08	10	15	25	D17	375	18.0	-13.0	
															06	10	12	22	D18	370	19.0	-14.0	
															04	05	05	10	D19	480	20.0	-15.0	
															04	05	06	11	D20	440	21.0	-16.0	
00	09	91	33	08	37.88	18.51	13.42												UDS-2		22.0	-17.0	
															05	06	06	12	D21	420	23.0	-18.0	
																					24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

SM - Silty Sand. Very Loose.

MH- Elastic Silt. Very soft to Medium. Grey.

SM - Silty Sand. Medium. Grey.

ML- Silt .Dark grey. Stiff. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-61** | E: 454575m N: 498882m Elev: 5.508m | WD(m) 2.25m | Start: 12.04.16 End: 13.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	Description
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value						
															04	05	06	11	D22	450	31.0	-26.0		
															08	10	15	25	D23	370	32.0	-27.0		
															08	12	16	28	D24	365	33.0	-28.0		
															09	11	16	27	D25	370	34.0	-29.0		
00	60	40	N	P											10	14	16	30	D26	355	35.0	-30.0		SM - Silty Sand. Medium to Dense. Grey.
															13	16	20	36	D27	380	36.0	-31.0		
															12	16	18	34	D28	375	37.0	-32.0		
																					38.0	-33.0		
																					39.0	-34.0		
																					40.0	-35.0		END OF BORING

Standard Penetration Test scale: 0 10 20 30 40 50

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-63** E: 454692m N: 498858m Elev: 5.530m

WD(m) 2.60m Start: 15.04.16 End: 16.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															01	01	01	02	D1	230	1.0	5.0	
															01	01	02	03	D2	240	2.0	4.0	
00	88	12	N	P											01	01	01	02	D3	290	3.0	3.0	
															00	01	01	02	D4	300	4.0	2.0	
															01	01	01	02	D5	280	5.0	1.0	
															01	01	01	02	D6	340	6.0	0.0	
															01	01	01	02	D7	420	7.0	-1.0	
00	10	90	48	18	39.94	15.65	11.18												UDS-1	420	8.0	-2.0	
															01	01	02	03	D8	440	9.0	-3.0	
															01	02	02	04	D9	430	10.0	-4.0	
					55.72	18.49	11.87	2.68											UDS-2	430	11.0	-5.0	
															01	03	05	08	D10	420	12.0	-6.0	
															03	04	05	09	D11	410	13.0	-7.0	
															04	06	08	14	D12	360	14.0	-8.0	
00	42	58	N	P											04	07	08	15	D13	340	15.0	-9.0	
															03	04	05	09	D14	330	16.0	-10.0	
00	26	74	N	P											04	06	08	14	D15	360	17.0	-11.0	
															08	14	19	31	D16	310	18.0	-12.0	
00	46	54	N	P											10	16	20	36	D17	280	19.0	-13.0	
															05	08	10	18	D18	450	20.0	-14.0	
															06	09	12	21	D19	450	21.0	-15.0	
00	13	87	38	11											04	05	06	11	D20	450	22.0	-16.0	
															04	06	07	13	D21	450	23.0	-17.0	
																					24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

SM - Silty Sand. Very Loose. Grey.

ML- Silt. Soft. Grey.

ML- Sandy Silt. Stiff. Grey.

ML- Silt with Sand. Stiff. Grey.

ML- Sandy Silt. Hard. Grey.

ML- Silt. Stiff to Very stiff. Grey.

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
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e_o = Initial Void Ratio
C_u = Undrained Cohesion
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-63** | E: 454692m, N: 498858m, Elev: 5.530m | WD(m) 2.60m | Start: 15.04.16, End: 16.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															05	07	08	15		D22	450	31.0	-26.0	
															05	09	11	20		D23	430	32.0	-27.0	
															18	25	30	55	(367mm/ Frist 50 blows)	D24	420	33.0	-28.0	
00	38	62	N	P											10	20	24	44		D25	440	34.0	-29.0	
															12	22	28	50	(390mm/ Frist 50 blows)	D26	320	35.0	-30.0	
															12	23	17	40		D27	420	36.0	-31.0	
															08	10	12	22		D28	440	37.0	-32.0	
																						38.0	-33.0	
																						39.0	-34.0	
																						40.0	-35.0	

ML- Sandy Silt .Very stiff to Hard. Grey.

END OF BORING

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay, Silt, Sand, Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-69** | E: 454559m | N: 498852m | Elev: 5.351m | WD(m) 2.35m | Start: 15.04.16 | End: 16.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															01	01	02	03	D1	350	1.0	4.0	
															01	01	02	03	D2	340	2.0	3.0	
															02	02	03	05	D3	390	3.0	2.0	SM - Silty Sand. Very loose to Loose. Grey.
															01	02	04	06	D4	380	4.0	1.0	
00	84	16	N	P											01	02	04	06	D5	360	5.0	0.0	
															00	00	00	00	D6	480	6.0	-1.0	
															00	00	01	01	D7	440	7.0	-2.0	
															01	02	02	04	D8	485	8.0	-3.0	MH- Elastic Silt. Very soft to Medium. Grey.
00	12	88	58	22	37.25	17.53	12.77	2.68											UDS-1	380	9.0	-4.0	
															02	02	03	05	D9	440	10.0	-5.0	
															01	02	02	04	D10	480	11.0	-6.0	
															03	03	04	07	D11	370	12.0	-7.0	
															03	04	04	08	D12	400	13.0	-8.0	
															02	04	06	10	D13	385	14.0	-9.0	
															05	06	10	16	D14	380	15.0	-10.0	ML- Sandy Silt. Medium to Very stiff. Grey.
00	42	58	N	P											05	07	08	15	D15	385	16.0	-11.0	
															05	08	10	18	D16	371	17.0	-12.0	
															06	07	12	19	D17	365	18.0	-13.0	
															06	08	12	20	D18	370	19.0	-14.0	
					62.86	19.90	12.91												UDS-2		20.0	-15.0	
00	09	91	33	07											04	05	06	11	D19	420	21.0	-16.0	
															05	05	07	12	D20	370	22.0	-17.0	ML- Silt. Stiff. Grey.
															04	07	12	19	D21	350	23.0	-18.0	
																					24.0	-19.0	
																					25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
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DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-69** | E: 454559m | N: 498852m | Elev: 5.351m | WD(m) 2.35m | Start: 15.04.16 | End: 16.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															08	10	14	24		D22	440	31.0	26.0	
															08	10	12	22		D23	400	32.0	27.0	
00	77	23	N	P											08	10	14	24		D24	370	33.0	28.0	
															12	14	15	29		D25	365	34.0	29.0	
															10	16	18	34		D26	370	35.0	30.0	
															10	15	18	33		D27	340	36.0	31.0	
															12	14	20	34		D28	350	37.0	32.0	
																						38.0	33.0	SM - Silty Sand. Medium to Dense. Grey.
																						39.0	34.0	
																						40.0	35.0	END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
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Clay
Silt
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-71** | E: 454579m | N: 498772m | Elev: 5.544m | WD(m) 2.60m | Start: 27.04.16 | End: 29.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test				Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value					
															01	01	02	03	D1	160	1.0	4.0	
															01	01	02	03	D2	220	2.0	3.0	
00	88	12	N	P											02	02	03	05	D3	240	3.0	2.0	SM - Silty Sand. Very loose to Loose. Grey.
															02	02	04	06	D4	250	4.0	1.0	
															02	02	03	05	D5	230	5.0	0.0	
															01	01	01	02	D6	380	6.0	-1.0	
																			VST-1		7.0	-2.0	
															01	01	01	02	D7	450	8.0	-3.0	
00	10	90	54	18	46.61	17.41	11.88	2.68											UDS-1	410	9.0	-4.0	MH- Elastic Silt. Very soft to Soft. Grey.
															01	01	01	02	D8	450	10.0	-5.0	
																			VST-2		11.0	-6.0	
															00	00	00	00	D9	450	12.0	-7.0	
																			UDS-2	420	13.0	-8.0	
00	10	90	38	09											02	03	03	06	D10	450	14.0	-9.0	ML- Silt. Medium. Grey.
															03	03	04	07	D11	450	15.0	-10.0	
															04	06	08	14	D12	340	16.0	-11.0	
															08	10	12	22	D13	330	17.0	-12.0	
00	89	11	36	09											10	11	13	24	D14	310	18.0	-13.0	SP-SM - Poorly graded sand with silt. Medium. Grey.
															08	11	12	23	D15	360	19.0	-14.0	
00	37	63	N	P											10	14	20	34	D16	320	20.0	-15.0	ML- Sandy Silt. Hard. Grey.
															04	06	08	14	D17	350	21.0	-16.0	
00	86	14	N	P											10	14	22	40	D18	280	22.0	-17.0	SM- Silty Sand. Medium to Dense. Grey.
															05	08	12	20	D19	320	23.0	-18.0	
															06	09	13	22	D20	330	24.0	-19.0	
00	32	68	37	11											05	07	10	17	D21	350	25.0	-20.0	
																					26.0	-21.0	
																					27.0	-22.0	
																					28.0	-23.0	
																					29.0	-24.0	
																					30.0	-25.0	

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-71** | E: 454579m N: 498772m Elev: 5.544m | WD(m) 2.60m | Start: 27.04.16 End: 29.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific GravitY	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol	
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															08	10	13	23		D22	340	31.0	-26.0		
															11	19	24	43	(394mm/ Frist 50 blows)	D23	270	32.0	-27.0		ML- Sandy Silt . Very stiff to Hard. Grey.
															12	18	20	38		D24	260	33.0	-28.0		
00	47	53	N	P											15	16	17	33		D25	250	34.0	-29.0		
															06	09	10	19		D26	380	35.0	-30.0		
00	15	85	40	11											07	09	11	20		D27	370	36.0	-31.0		ML- Silt .Very Stiff. Grey.
															08	10	12	22		D28	360	37.0	-32.0		
																						38.0	-33.0		
																						39.0	-34.0		
																						40.0	-35.0		END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-72** | E: 454374m | N: 498993m | Elev: 5.645m | WD(m) 2.60m | Start: 15.04.16 | End: 18.04.16

Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	Moisture Content w (%)	Unit Weight Y_t (kN/m³)	Unit Weight Y_d (kN/m³)	Specific Gravity G_s	Consolidation e_o	Consolidation C_c	Consolidation C_r	Shear Strength Type	Shear Strength c_u/S_u (kN/m²)	Shear Strength Φ° (Deg)	SPT 150mm	SPT 150mm	SPT 150mm	SPT N-Value	Layer Symbol
D1	450	1.0	5.0																00	01	01	02	
D2	420	2.0	4.0																01	02	02	04	
D3	420	3.0	3.0																01	02	02	04	
D4	380	4.0	2.0																01	02	03	05	
D5	450	5.0	1.0	00	88	12	N	P											01	03	03	06	
D6	380	6.0	0.0																01	02	03	05	
D7	460	7.0	-1.0																00	01	02	03	
D8	420	8.0	-2.0																01	01	02	03	
UDS-1	220	9.0	-3.0	00	09	91	46	18	39.78	18.26	13.06	2.66											
D9	450	10.0	-4.0																02	02	03	05	
D10	480	11.0	-5.0																02	03	04	07	
D11	460	12.0	-6.0																05	07	09	16	
D12	450	13.0	-7.0	00	14	86	35	09											06	07	11	18	
D13	420	14.0	-8.0																09	11	14	25	
D14	460	15.0	-9.0																06	15	25	40	
D15	460	16.0	-10.0																08	15	18	33	
D16	480	17.0	-11.0																07	17	24	41	
D17	420	18.0	-12.0	00	25	75	39	13											08	10	11	21	
D18	400	19.0	-13.0																09	10	14	24	
D19	420	20.0	-14.0																10	11	15	26	
D20	450	21.0	-15.0																08	10	13	23	
D21	400	22.0	-16.0																09	15	20	35	
		23.0	-17.0																				
		24.0	-18.0																				
		25.0	-19.0																				
		26.0	-20.0																				
		27.0	-21.0																				
		28.0	-22.0																				
		29.0	-23.0																				
		30.0	-24.0																				

Standard Penetration Test: 0 10 20 30 40 50

SM - Silty Sand. Very loose to Loose. Grey.

ML- Silt. Soft to Hard. Grey.

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-72**

E: 454374m
N: 498993m
Elev: 5.645m

WD(m) 2.60m

Start: 15.04.16
End: 18.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															10	12	16	28		D22	450	31.0	25.0		
															18	21	23	44	(440mm/ Frist 50 blows)	D23	320	32.0	26.0		
															16	18	22	40	(445mm/ Frist 50 blows)	D24	300	33.0	27.0		
00	56	44	N	P											09	11	16	27		D25	400	34.0	28.0		SM - Silty Sand. Medium to Very Dense. Grey.
															11	13	18	31		D26	350	35.0	29.0		
															10	14	20	34		D27	320	36.0	30.0		
															13	21	36	57	(380mm/ Frist 50 blows)	D28	300	37.0	31.0		
																						38.0	32.0		
																						39.0	33.0		
																						40.0	34.0		
																							35.0		END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
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Y_t = Bulk Unit Weight
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Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Khulna.

Borehole: BH-73 | E: 454674m | N: 498772m | Elev: 5.276m | WD(m) 2.69m | Start: 16.04.16 | End: 19.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															00	01	01	02	(blows/305mm)	D1	320	1.0	4.0	
															01	02	02	04	(blows/310mm)	D2	340	2.0	3.0	
00	85	15	N	P											02	02	02	04	(blows/305mm)	D3	340	3.0	2.0	SM- Silty Sand. Very loose to Loose. Grey.
															02	03	04	07		D4	480	4.0	1.0	
															03	04	04	08		D5	480	5.0	0.0	
															02	02	02	04	(blows/305mm)	D6	490	6.0	-1.0	
																				VST-1				
															00	00	00	00	(blows/320mm)	D7	490	7.0	-2.0	
			66	30	52.58	16.15	10.58													UDS-1	330	8.0	-3.0	
															01	01	01	02	(blows/310mm)	D8	490	9.0	-4.0	MH- Elastic Silt. Very soft to Soft. Grey.
																				VST-2				
															00	01	02	03	(blows/310mm)	D9	490	10.0	-5.0	
00	08	92	55	17	37.42	16.99	12.36	2.68												UDS-2	270	11.0	-6.0	
															01	01	02	03	(blows/305mm)	D10	490	12.0	-7.0	
															03	04	05	09		D11	360	13.0	-8.0	
															04	06	07	13		D12	340	14.0	-9.0	
															05	10	14	24		D13	320	15.0	-10.0	SP-SM - Poorly graded Sand With Silt. Loose to Medium. Grey.
00	90	10	N	P											05	07	09	16		D14	310	16.0	-11.0	
															06	08	10	18		D15	340	17.0	-12.0	
															09	11	13	24		D16	300	18.0	-13.0	
															10	11	12	23		D17	340	19.0	-14.0	
															05	07	08	15		D18	360	20.0	-15.0	
00	10	90	40	12											03	04	05	09		D19	440	21.0	-16.0	ML- Silt. Stiff to Very stiff. Grey.
															10	12	14	26		D20	360	22.0	-17.0	
															06	06	06	12		D21	340	23.0	-18.0	
																						24.0	-19.0	
																						25.0	-20.0	
																						26.0	-21.0	
																						27.0	-22.0	
																						28.0	-23.0	
																						29.0	-24.0	
																						30.0	-25.0	

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin

Checked BY: Md. Rafiqul Islam

Approved BY: Engr. Mehedy Amin

Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Khulna.

Borehole: **BH-73** | E: 454674m | N: 498772m | Elev: 5.276m | WD(m) 2.69m | Start: 16.04.16 | End: 19.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50					
															11	16	16	32		D22	340	31.0	-26.0	SM- Silty Sand. Medium to Dense. Grey.
00	86	14	N	P											10	16	18	34		D23	320	32.0	-27.0	
															10	14	15	29		D24	360	33.0	-28.0	
															09	10	12	22		D25	300	34.0	-29.0	
															07	07	07	14		D26	440	35.0	-30.0	
00	11	89	36	11											08	08	09	17		D27	440	36.0	-31.0	ML- Silt. Stiff to Hard.Grey.
															09	10	10	20		D28	390	37.0	-32.0	
															06	06	06	12		D29	490	38.0	-33.0	
															11	18	22	40	(445mm/ Frist 50 blows)	D30	390	39.0	-34.0	
															30	37	33	70	(230mm/ Frist 50 blows)	D31	220	40.0	-35.0	
															13	14	23	37	(450mm/ Frist 50 blows)	D32	340	41.0	-36.0	
															17	20	22	42	(380mm/ Frist 50 blows)	D33	290	42.0	-37.0	
															17	20	23	43	(380mm/ Frist 50 blows)	D34	300	43.0	-38.0	
															15	28	40	68	(320mm/ Frist 50 blows)	D35	240	44.0	-39.0	
															13	24	27	51	(360mm/ Frist 50 blows)	D36	300	45.0	-40.0	SM- Silty Sand. Dense to Very dense. Grey.
															15	22	32	54	(360mm/ Frist 50 blows)	D37	250	46.0	-41.0	
00	84	16	N	P											24	33	40	73	(260mm/ Frist 50 blows)	D38	220	47.0	-42.0	
															20	27	31	58	(390mm/ Frist 50 blows)	D39	240	48.0	-43.0	
															25	50	-		(220mm/ Frist 50 blows)	D40	200	49.0	-44.0	
															23	35	25	60	(260mm/ Frist 50 blows)	D41	240	50.0	-45.0	
															20	29	34	63	(305mm/ Frist 50 blows)	D42	250	51.0	-46.0	
																						52.0	-47.0	
																						53.0	-48.0	
																						54.0	-49.0	
																						55.0	-50.0	
																						56.0	-51.0	
																						57.0	-52.0	
																						58.0	-53.0	
																						59.0	-54.0	
																						60.0	-55.0	
																						61.0		

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Khulna.

Borehole: **BH-73** | E: 454674m, N: 498772m, Elev: 5.276m | WD(m) 2.69m | Start: 16.04.16, End: 19.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50					
															21	32	36	68	(280mm/ Frist 50 blows)	D43	220	62.0	-56.0 -57.0	SM- Silty Sand. Dense to Very dense. Grey.
															19	30	33	63	(305mm/ Frist 50 blows)	D44	230	63.0 64.0	-58.0 -59.0	
															26	41	23	64	(230mm/ Frist 50 blows)	D45	240	65.0	-60.0	
															21	31	34	65	(295mm/ Frist 50 blows)	D46	240	66.0 67.0	-61.0 -62.0	
															33	50	-		(250mm/ Frist 50 blows)	D47	220	68.0	-63.0	
															28	40	32	72	(230mm/ Frist 50 blows)	D48	250	69.0 70.0	-64.0	

END OF BORING

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-74** | E: 454719m | N: 498772m | Elev: 5.489m | WD(m) 2.30m | Start: 29.04.16 | End: 30.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															00	01	01	02	(blows/310mm)	D1	380	1.0	4.0		
00	87	13	N	P											01	01	01	02	(blows/305mm)	D2	360	2.0	3.0		
															01	01	02	03	(blows/310mm)	D3	370	3.0	2.0		SM- Silty Sand. Very Loose. Grey.
															02	02	02	04		D4	350	4.0	1.0		
															01	02	02	04		D5	360	5.0	0.0		
															00	00	01	01	(blows/305mm)	D6	390	6.0	-1.0		
																				VST-1		7.0	-2.0		
															01	01	01	02	(blows/310mm)	D7	370	8.0	-3.0		
00	10	90	61	23	52.16	17.67	11.61													UDS-1	400	9.0	-4.0		MH- Elastic Silt. Very soft to Soft. Grey.
															01	01	02	03		D8	360	10.0	-5.0		
																				VST-2		11.0	-6.0		
															01	02	02	04		D9	380	12.0	-7.0		
																				UDS-2		13.0	-8.0		
															05	05	08	13	(blows/310mm)	D10	370	14.0	-9.0		
															05	07	07	14	(blows/310mm)	D11	350	15.0	-10.0		
															05	05	08	13	(blows/305mm)	D12	360	16.0	-11.0		
00	86	14	N	P											07	10	15	25		D13	350	17.0	-12.0		SM- Silty Sand. Medium to Dense. Grey..
															08	09	14	23		D14	330	18.0	-13.0		
															09	11	20	31		D15	340	19.0	-14.0		
															15	17	18	35		D16	330	20.0	-15.0		
															14	19	21	40	(360mm/ Frist 50 blows)	D17	310	21.0	-16.0		
															15	20	21	41	(380mm/ Frist 50 blows)	D18	350	22.0	-17.0		
															14	22	23	45	(390mm/ Frist 50 blows)	D19	340	23.0	-18.0		
00	22	78	39	09											05	05	07	12		D20	330	24.0	-19.0		ML- Silt with Sand. Stiff. Grey.
															09	10	12	22		D21	340	25.0	-20.0		
																						26.0	-21.0		
																						27.0	-22.0		
																						28.0	-23.0		
																						29.0	-24.0		
																						30.0	-25.0		

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s= Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c= Compression Index
C_r= Re-compression Index

e_o= Initial Void Ratio
C_u= Undrained Cohesion
S_u= Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 15.05.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: **BH-74** | E: 454719m | N: 498772m | Elev: 5.489m | WD(m) 2.30m | Start: 29.04.16 | End: 30.04.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															11	12	13	25		D22	350	31.0	-26.0	
															09	11	22	33		D23	360	32.0	-27.0	
															08	13	25	38		D24	370	33.0	-28.0	
															15	16	18	34		D25	350	34.0	-29.0	
00	87	13	N	P											17	19	21	40	(360mm/ Frist 50 blows)	D26	360	35.0	-30.0	
															16	18	25	43	(380mm/ Frist 50 blows)	D27	370	36.0	-31.0	
															21	23	25	48	(330mm/ Frist 50 blows)	D28	380	37.0	-32.0	
																						38.0	-33.0	
																						39.0	-34.0	
																						40.0	-35.0	

SM- Silty Sand. Medium to Dense. Grey.

END OF BORING

Legend

L.L. = Liquid Limit
P.I. = Plasticity Index
w = Moisture Content
G_s = Specific Gravity

Y_t = Bulk Unit Weight
Y_d = Dry Unit Weight
C_c = Compression Index
C_r = Re-compression Index

e_o = Initial Void Ratio
C_u = Undrained Cohesion
S_u = Undrained Shear Strength
WD = Depth of Water Measured 24h after Completion of Drilling

Φ = Angle of Internal Friction
D = Disturbed Sample
UD = Undisturbed Sample
DST = Direct Shear Test

Clay
Silt
Sand
Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 15.05.16

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Project: 2x660MW BIFPCL STPP Maitree Thermal Power Plant.

Client: BHEL; Owner:BIFPCL

Location: Rampal,Bagerhat.

Borehole: BH-90 — E: 455215m, N: 498519m, Elev: 5.651m; WD(m) 2.70m; Start: 24.03.16, End: 25.03.16

Grain Size			Atterberg Limits		Moisture Content	Unit Weight (kN/m³)		Specific Gravity	Consolidation			Shear Strength			Standard Penetration Test					Sample No.	Sample Rec. (mm)	Depth (m)	Elev (m)	Layer Symbol
Gravel (%)	Sand (%)	Fines (%)	L.L.	P.I.	w (%)	Y_t	Y_d	G_s	e_o	C_c	C_r	Type	c_u/S_u (kN/m²)	Φ° (Deg)	150mm	150mm	150mm	N-Value	0 10 20 30 40 50						
															01	02	02	04	(blows/320mm)	D1	360	1.0	5.0	
00	92	08	N	P	22.83										02	02	02	04	(blows/310mm)	D2	365	2.0	4.0	
															01	02	01	03	(blows/305mm)	D3	350	3.0	3.0	
															01	01	01	02	(blows/310mm)	D4	465	4.0	2.0	
00	10	90	63	29	40.76	17.03	12.10	2.28												UDS-1	400	5.0	1.0	
															01	01	02	03	(blows/305mm)	D5	460	6.0	0.0	
															01	01	02	03	(blows/310mm)	D6	470	7.0	-1.0	
																				UDS-2	385	8.0	-2.0	
															02	02	02	04		D7	465	9.0	-3.0	
															01	02	02	04	(blows/310mm)	D8	460	10.0	-4.0	
															01	02	02	04		D9	470	11.0	-5.0	
															02	02	03	05		D10	470	12.0	-6.0	
															04	06	06	12		D11	380	13.0	-7.0	
															04	06	06	12		D12	375	14.0	-8.0	
															09	12	17	29		D13	300	15.0	-9.0	
															10	12	18	30		D14	305	16.0	-10.0	
															12	16	18	34		D15	300	17.0	-11.0	
															11	15	20	35		D16	310	18.0	-12.0	
															09	12	15	27		D17	305	19.0	-13.0	
															10	13	17	30		D18	300	20.0	-14.0	
															08	08	12	20		D19	415	21.0	-15.0	
															08	08	12	20		D20	405	22.0	-16.0	
																						23.0	-17.0	
																						24.0	-18.0	
																						25.0	-19.0	
																						26.0	-20.0	
																						27.0	-21.0	
																						28.0	-22.0	
																						29.0	-23.0	
																						30.0	-24.0	

SP-SM - Poorly graded Sand With Silt. Very Loose. Brownish Grey.

MH- Elastic Silt.Soft to Medium. Grey.

Clayey Silty. Soft. Grey.

Silty Fine Sand. Medium to Dense. Grey.

Legend

L.L. = Liquid Limit; P.I. = Plasticity Index; w = Moisture Content; G_s = Specific Gravity

Y_t = Bulk Unit Weight; Y_d = Dry Unit Weight; C_c = Compression Index; C_r = Re-compression Index

e_o = Initial Void Ratio; C_u = Undrained Cohesion; S_u = Undrained Shear Strength; WD = Depth of Water Measured 24h after Completion of Drilling

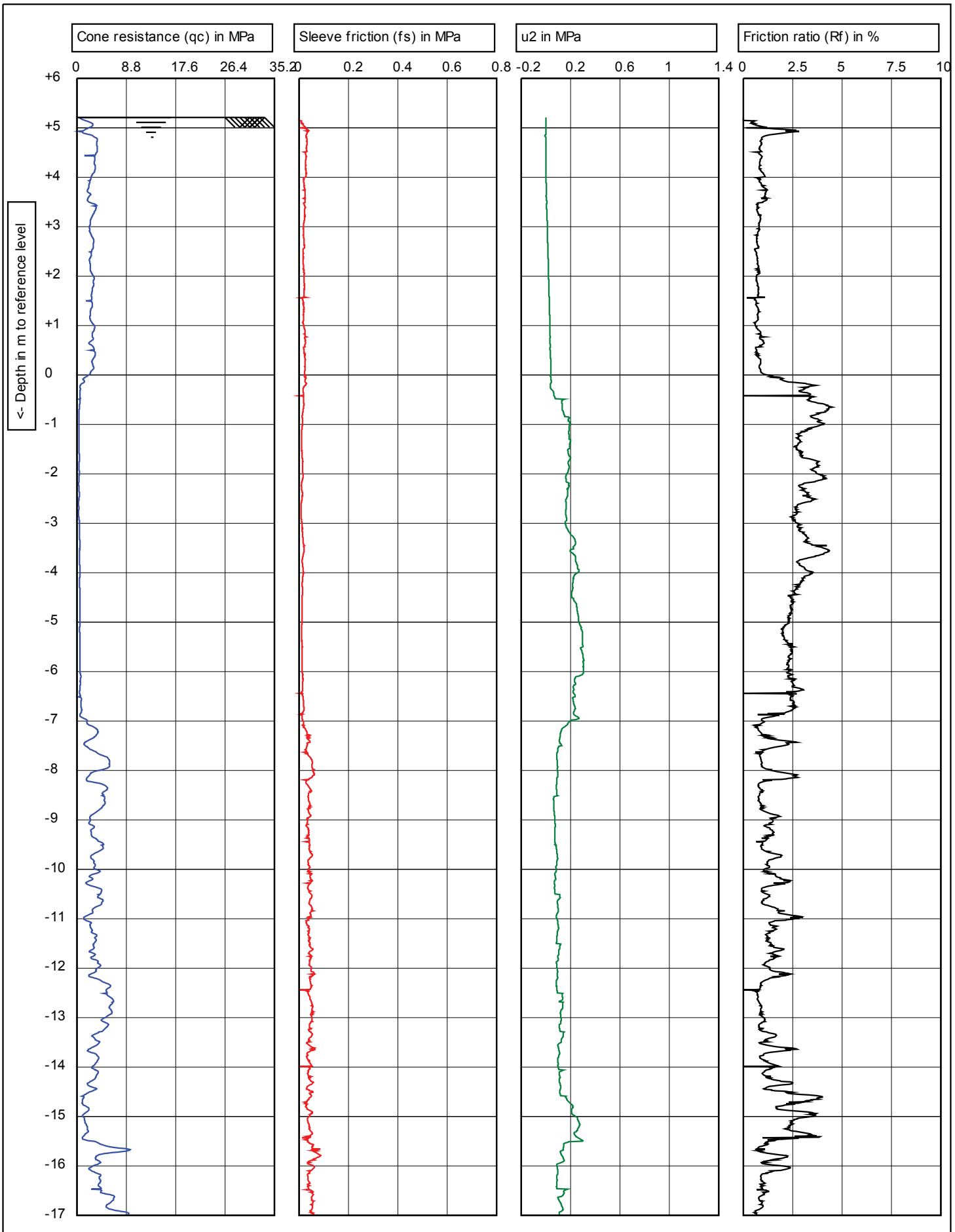
Φ = Angle of Internal Friction; D = Disturbed Sample; UD = Undisturbed Sample; DST = Direct Shear Test

Clay; Silt; Sand; Gravel

Drawn BY: Md. Emran Uddin
Checked BY: Md. Rafiqul Islam
Approved BY: Engr. Mehedy Amin
Date : 25.06.16

Appendix-B2

CONE PENETRATION TEST LOGS



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1.40

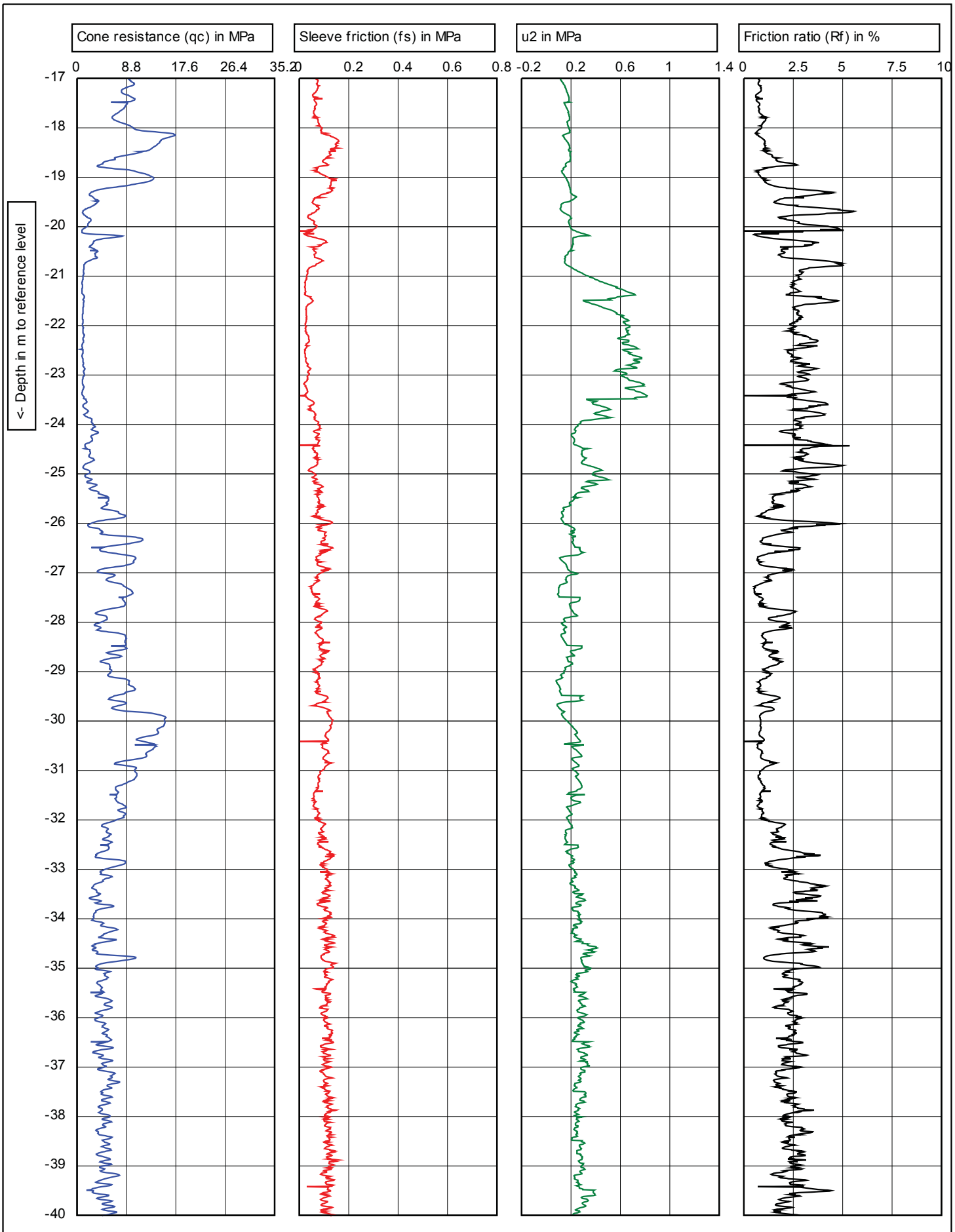
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.212 NAP | W.L.: **0**

Project: **Maitree Thermal Power Project**
Location: **Rampal**
Position: **454755, 499146 RD**

Predrill :	**0 m Predrilled**
Date:	**4/11/2016**
Cone no.:	**S15CFIIP.S09131**
Project no.:	**Maitree Thermal**
CPT no.:	**01** **1/12**



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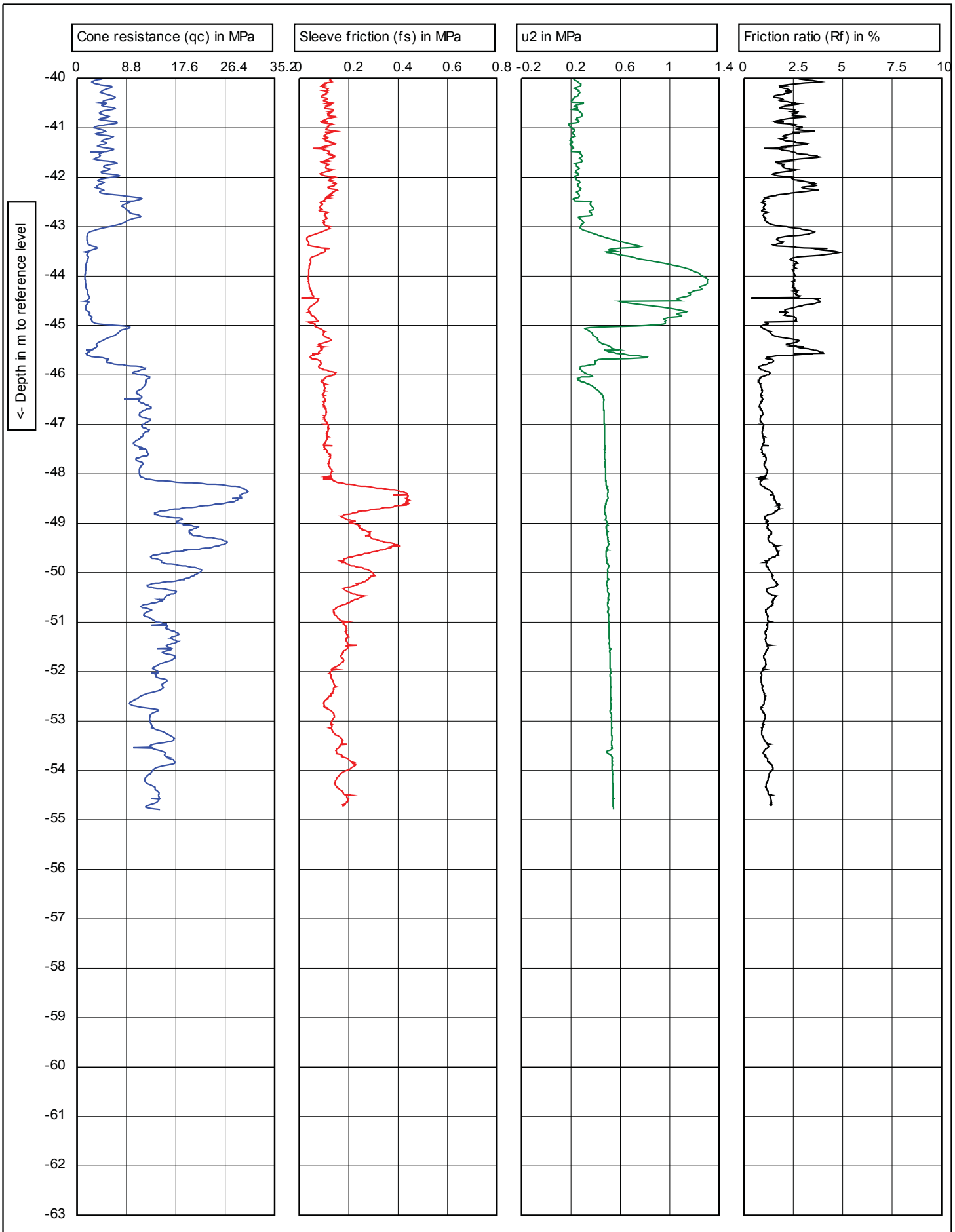
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.212 NAP	W.L.: **0**	Date:	**4/11/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454755, 499146 RD**		CPT no.:	**01** **2/12**



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1.40

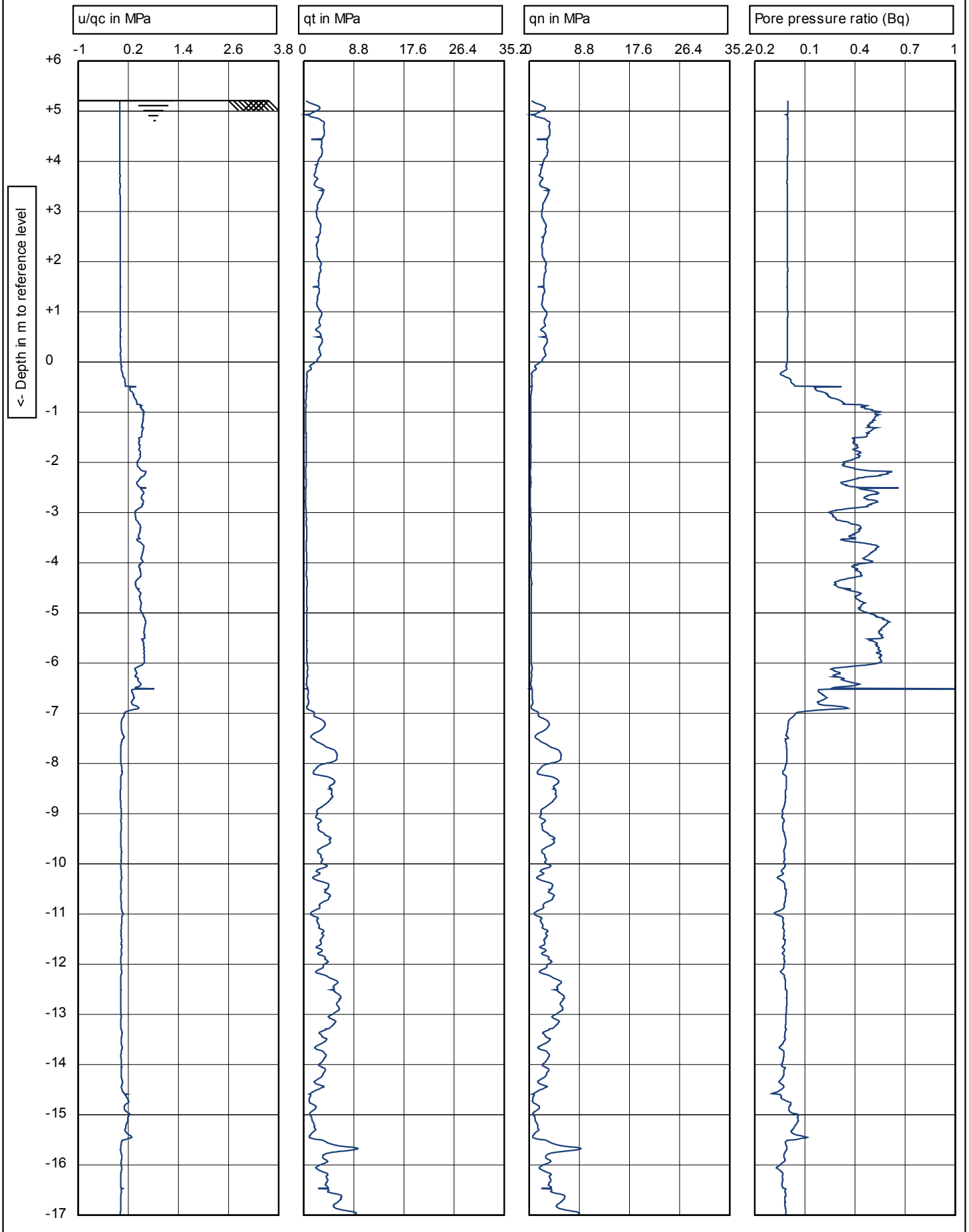
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.212 NAP | W.L.: **0**

Project: **Maitree Thermal Power Project**
Location: **Rampal**
Position: **454755, 499146 RD**

Predrill :	**0 m Predrilled**
Date:	**4/11/2016**
Cone no.:	**S15CFIIP.S09131**
Project no.:	**Maitree Thermal**
CPT no.:	**01** **3/12**



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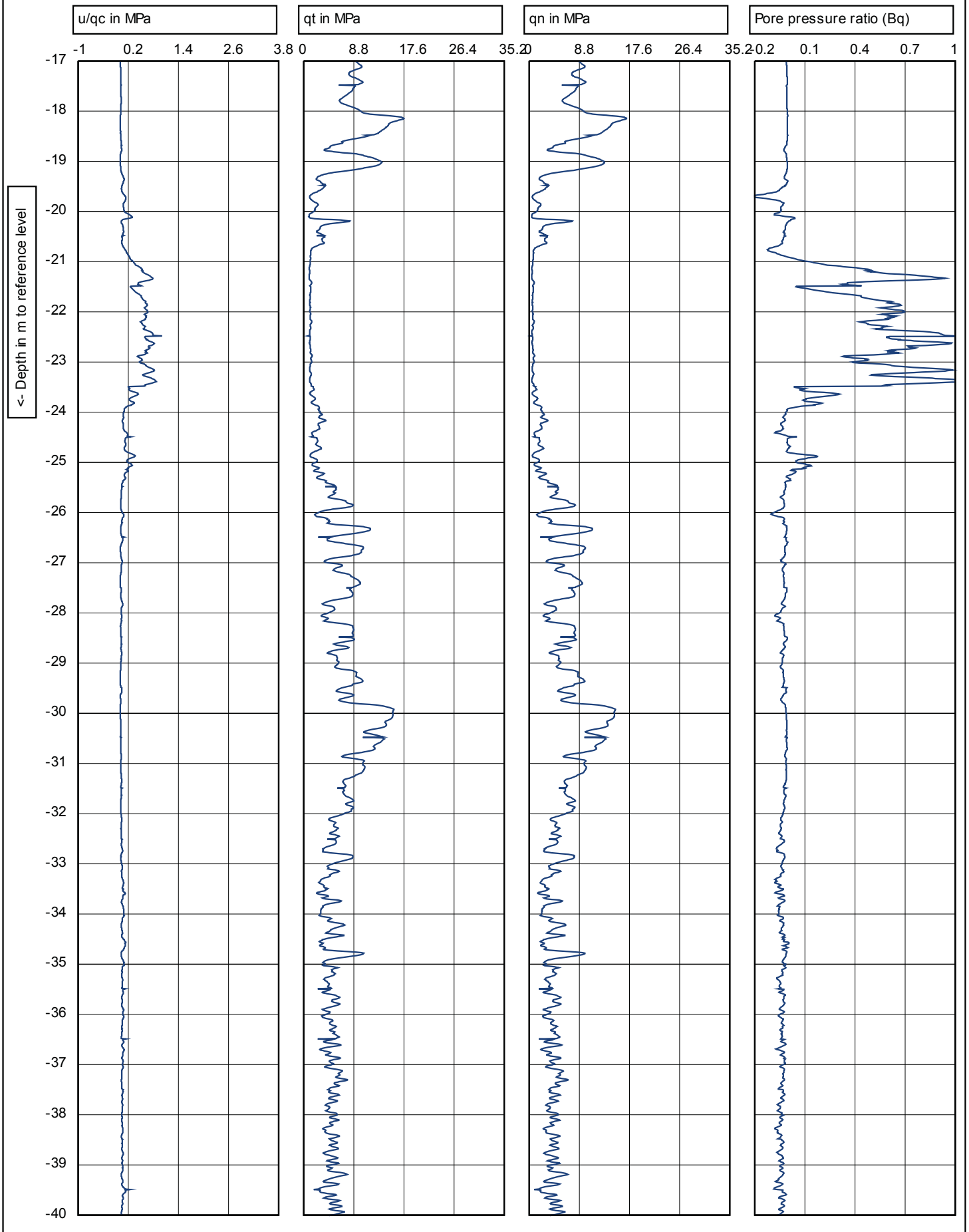
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

r u2
L 225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.212 NAP	W.L.: **0**	Date:	**4/11/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454755, 499146 RD**		CPT no.:	**01** 4/12



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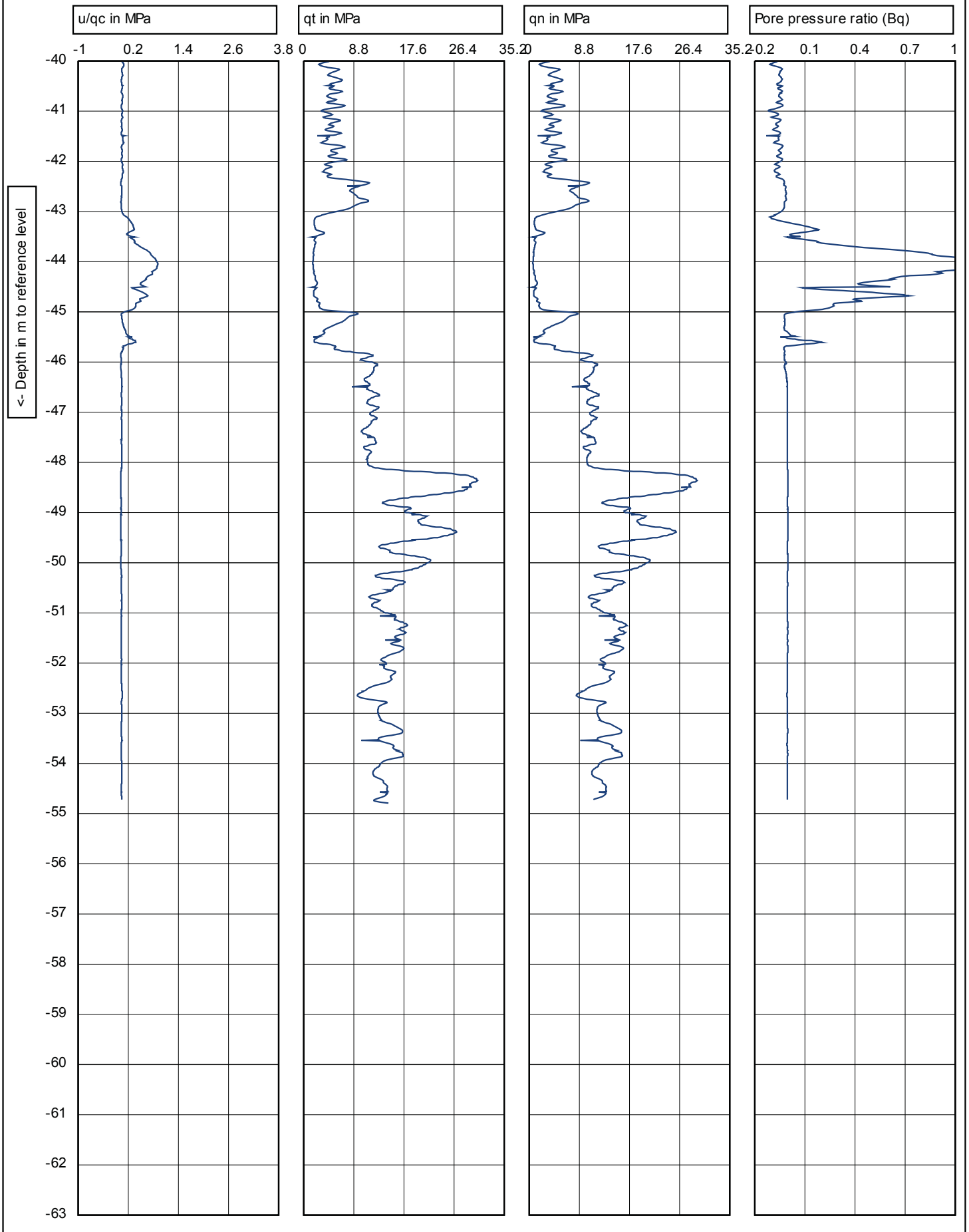
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.212 NAP	W.L.: **0**	Date:	**4/11/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454755, 499146 RD**		CPT no.:	**01** **5/12**



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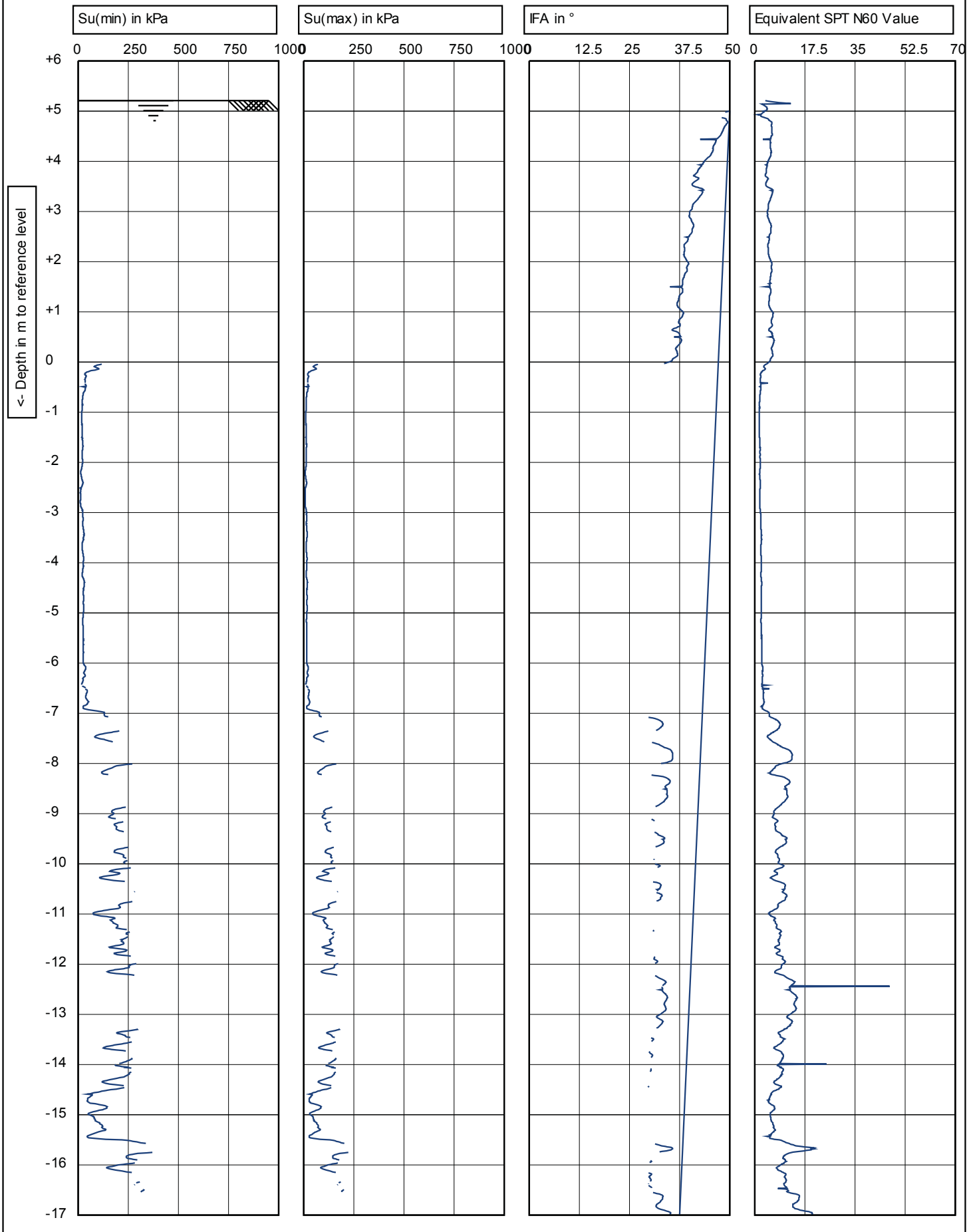
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.212 NAP	W.L.: **0**	Date:	**4/11/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454755, 499146 RD**		CPT no.:	**01** 6/12



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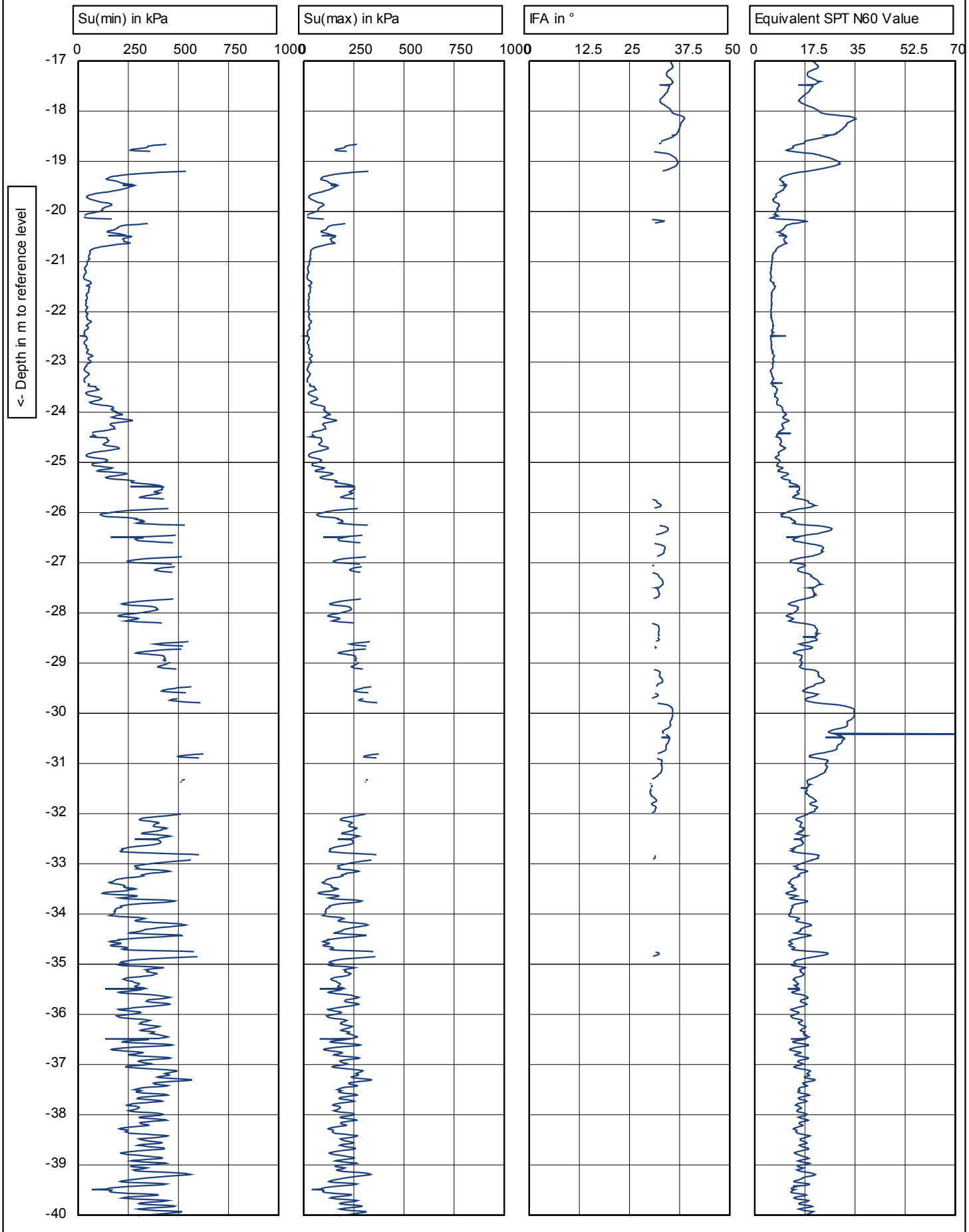
1.40

qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.212 NAP — W.L.: **0**	Date:	**4/11/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454755, 499146 RD**	CPT no.:	**01** — **7/12**



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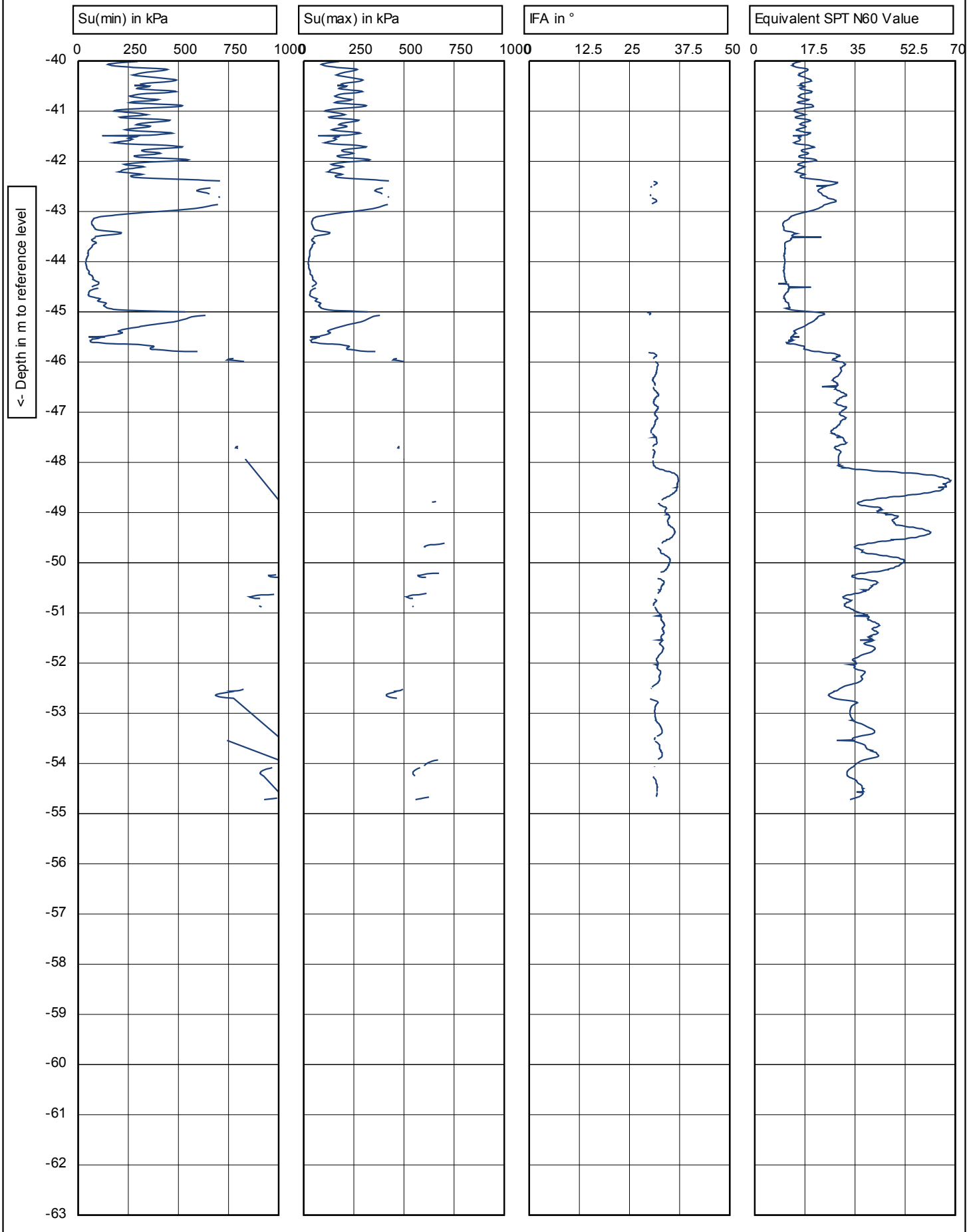
1.40

qu2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.212 NAP	W.L.: **0**	Date:	**4/11/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454755, 499146 RD**		CPT no.:	**01** **8/12**



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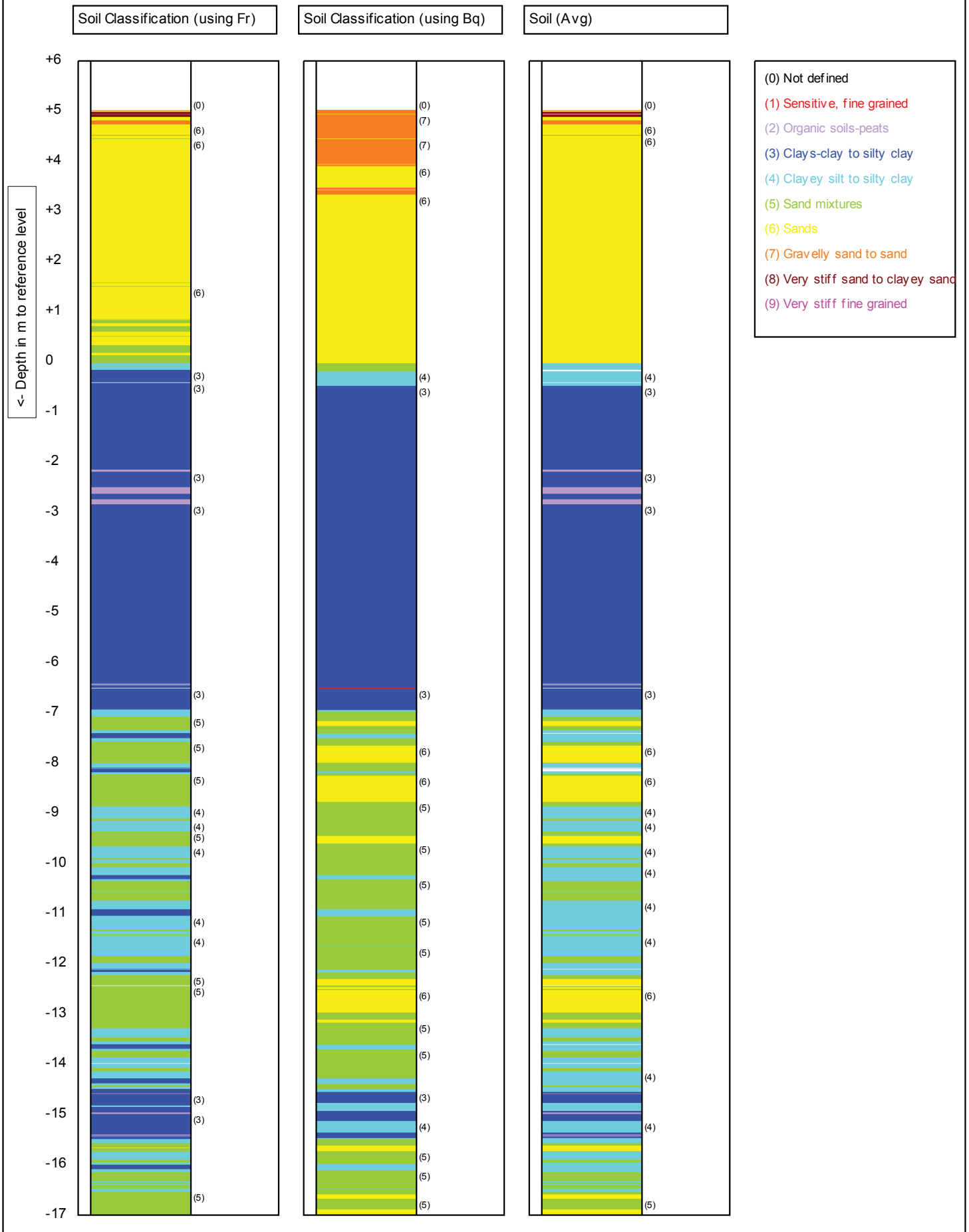
1.40

r u2
L 225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.212 NAP	W.L.: **0**	Date:	**4/11/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454755, 499146 RD**		CPT no.:	**01** **9/12**



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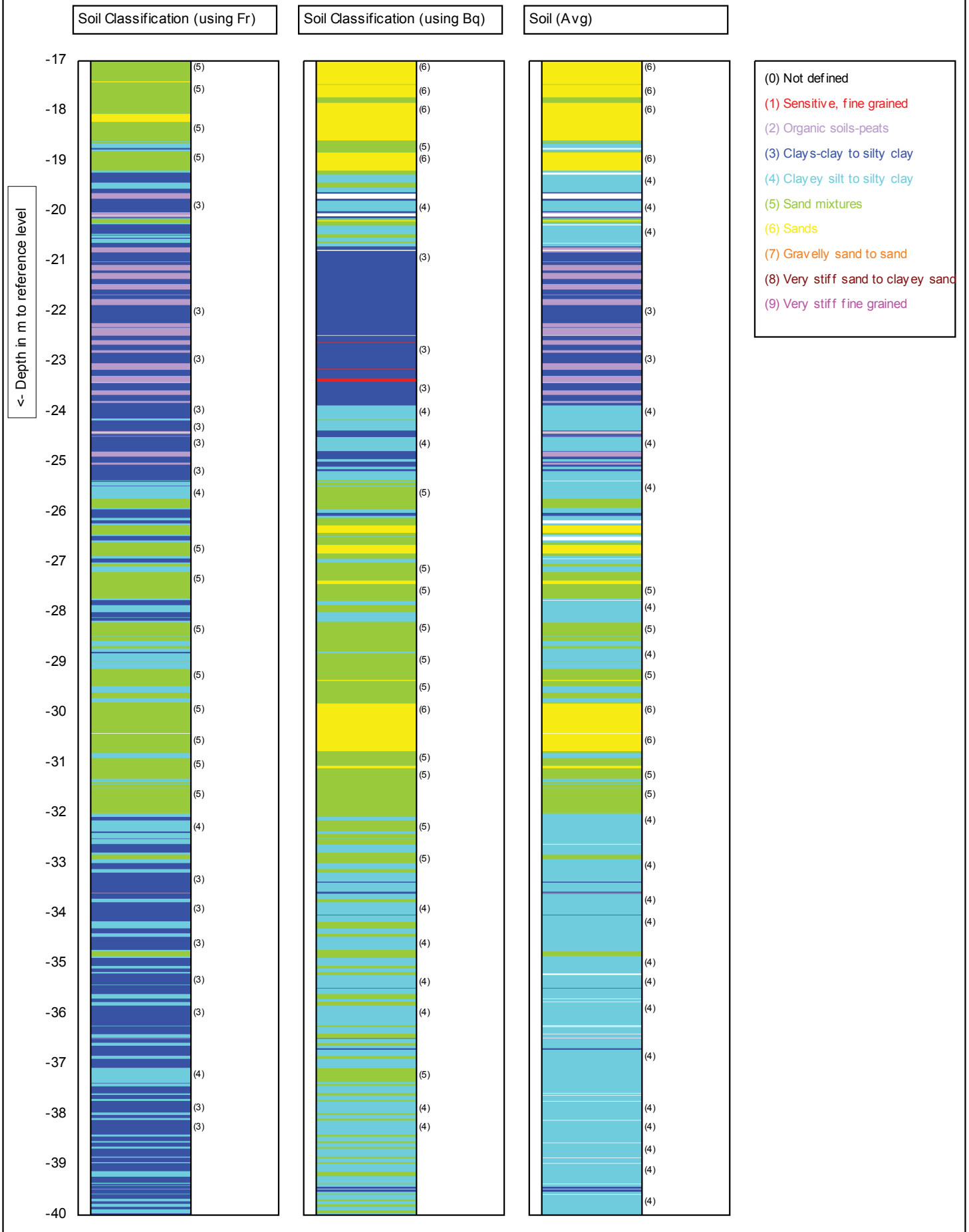
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.212 NAP / W.L.: 0	Date:	4/11/2016
Project:	Maitree Thermal Power Project	Cone no.:	S15CFIIP.S09131
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454755, 499146 RD	CPT no.:	01 / 10/12



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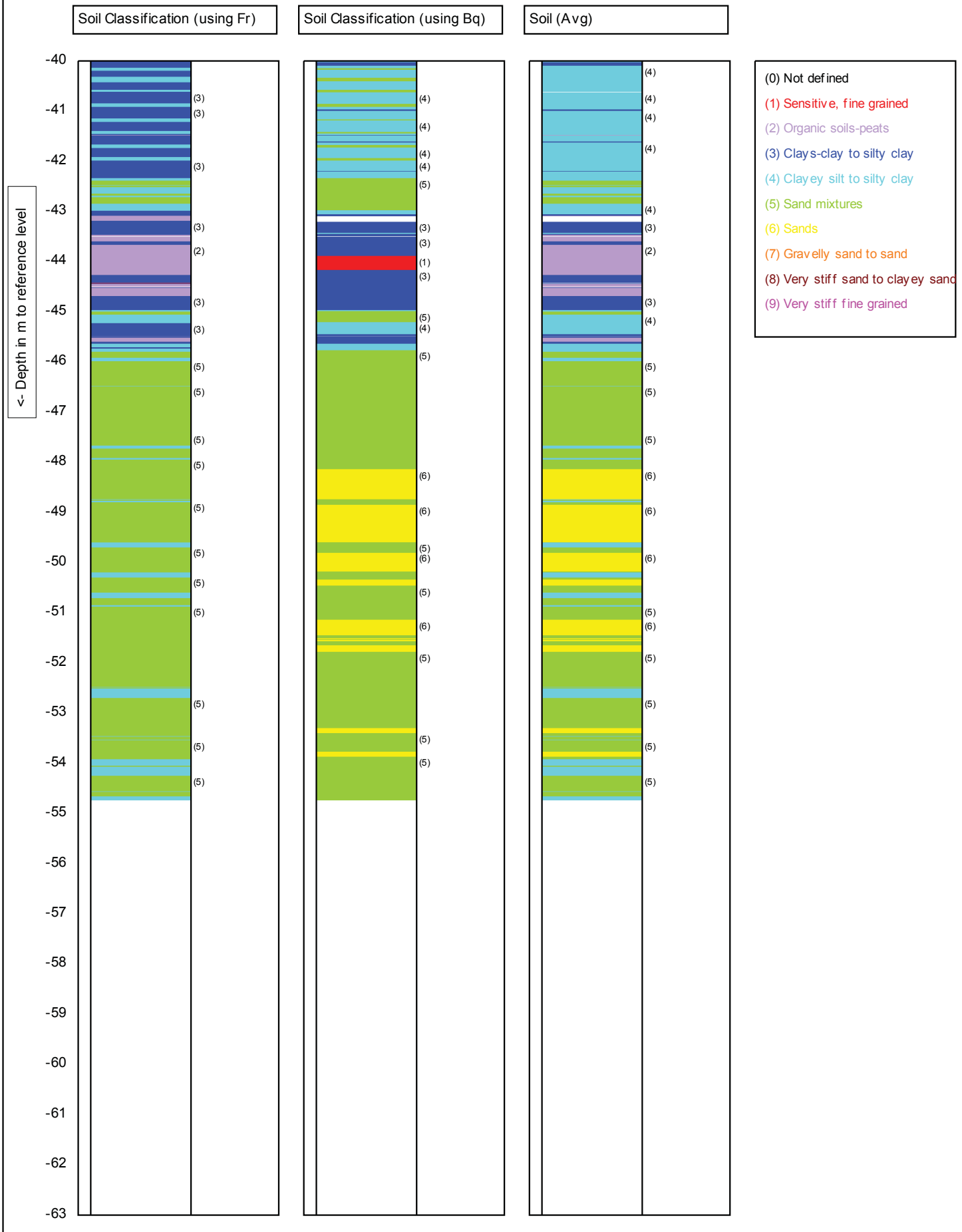
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.212 NAP — W.L.: 0	Date:	4/11/2016
Project:	Maitree Thermal Power Project	Cone no.:	S15CFIP.S09131
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454755, 499146 RD	CPT no.:	01 — 11/12



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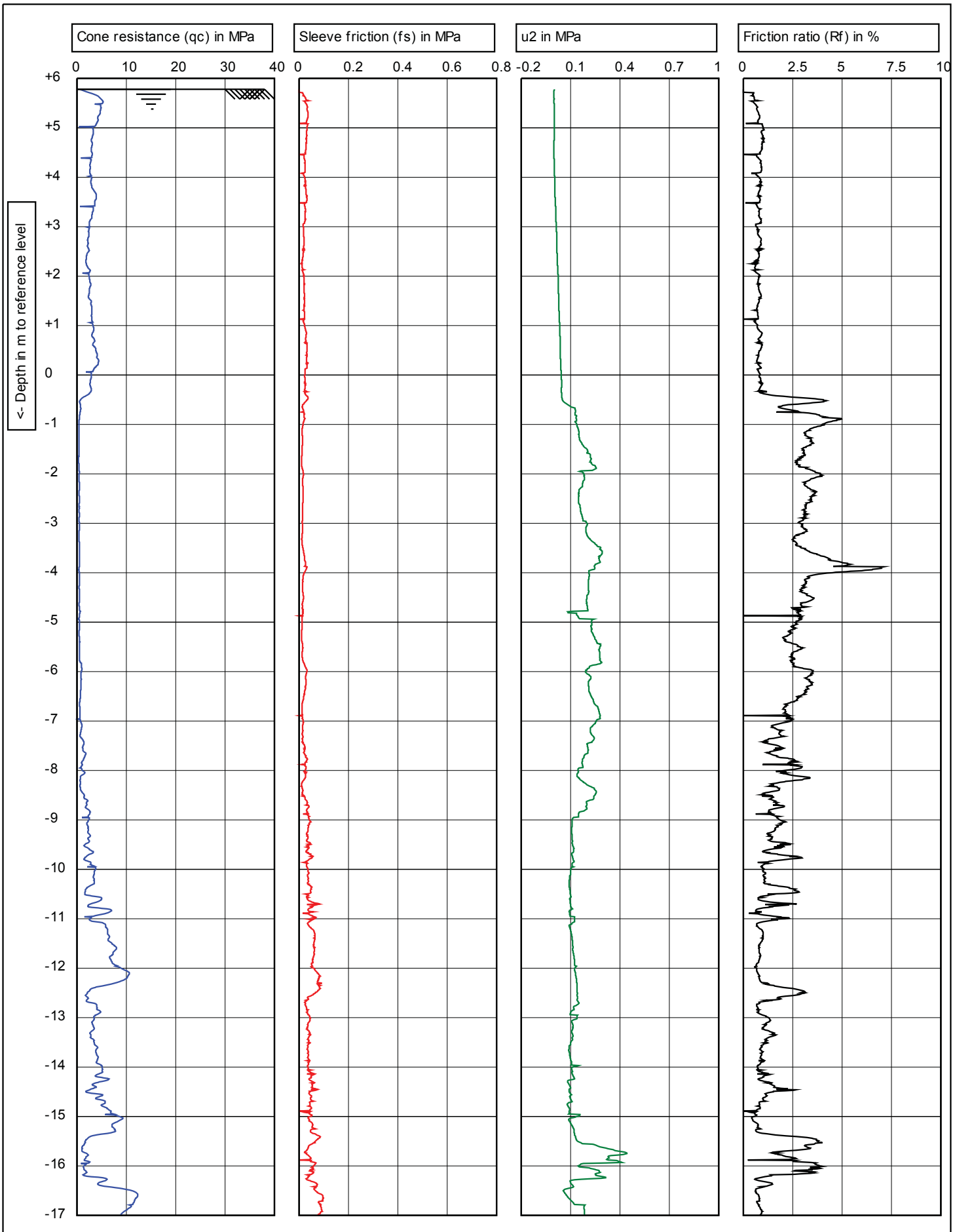
1.40

r u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.212 NAP — W.L.: **0**	Date:	**4/11/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454755, 499146 RD**	CPT no.:	**01** — **12/12**



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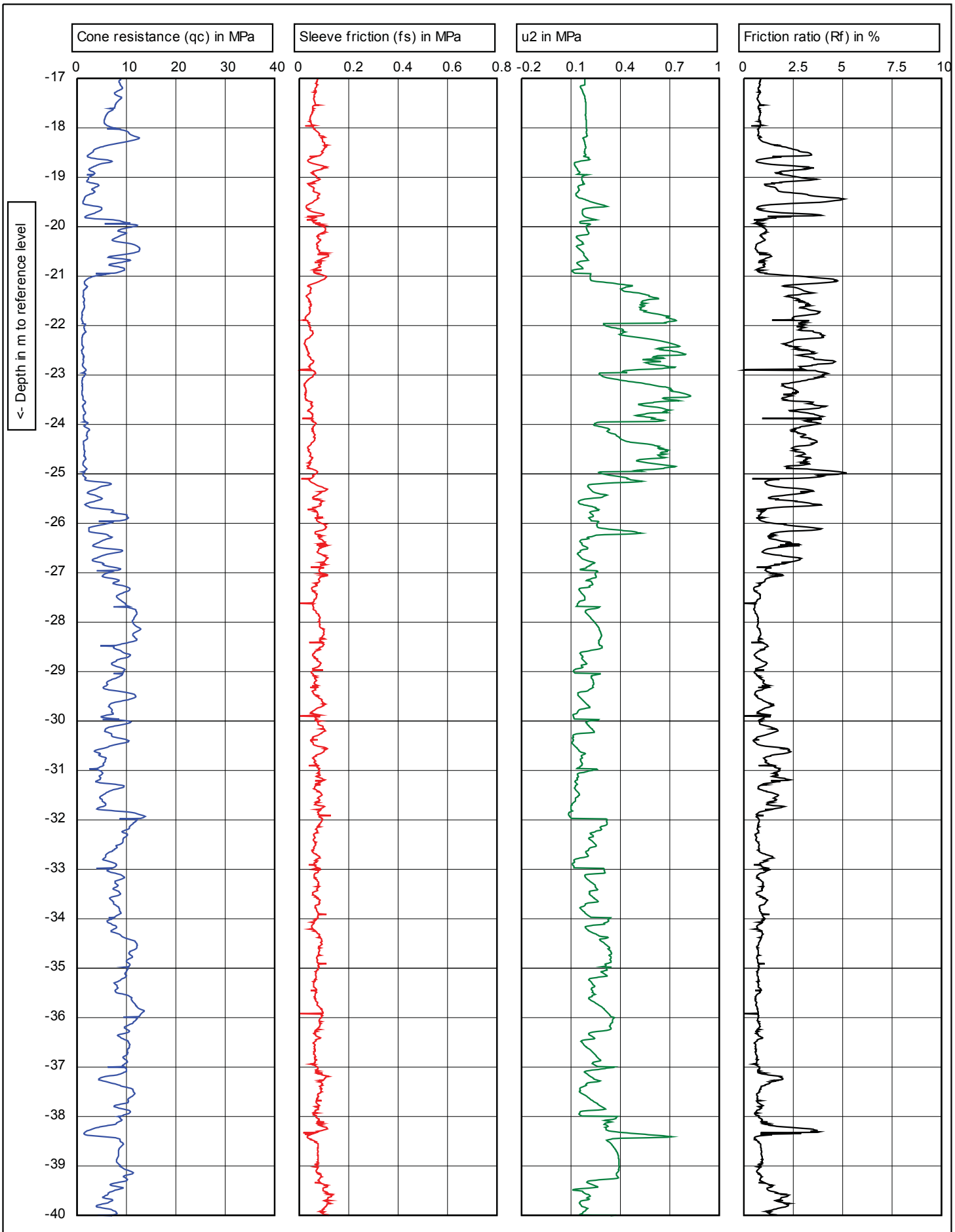
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.78 NAP	W.L.: **0**	Date:	**4/13/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIP.S09131**
Location: **RampalT**		Project no.:	**Maitree Thareemal**
Position: **454599, 499075 RD**		CPT no.:	**02** **1/12**



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1.40

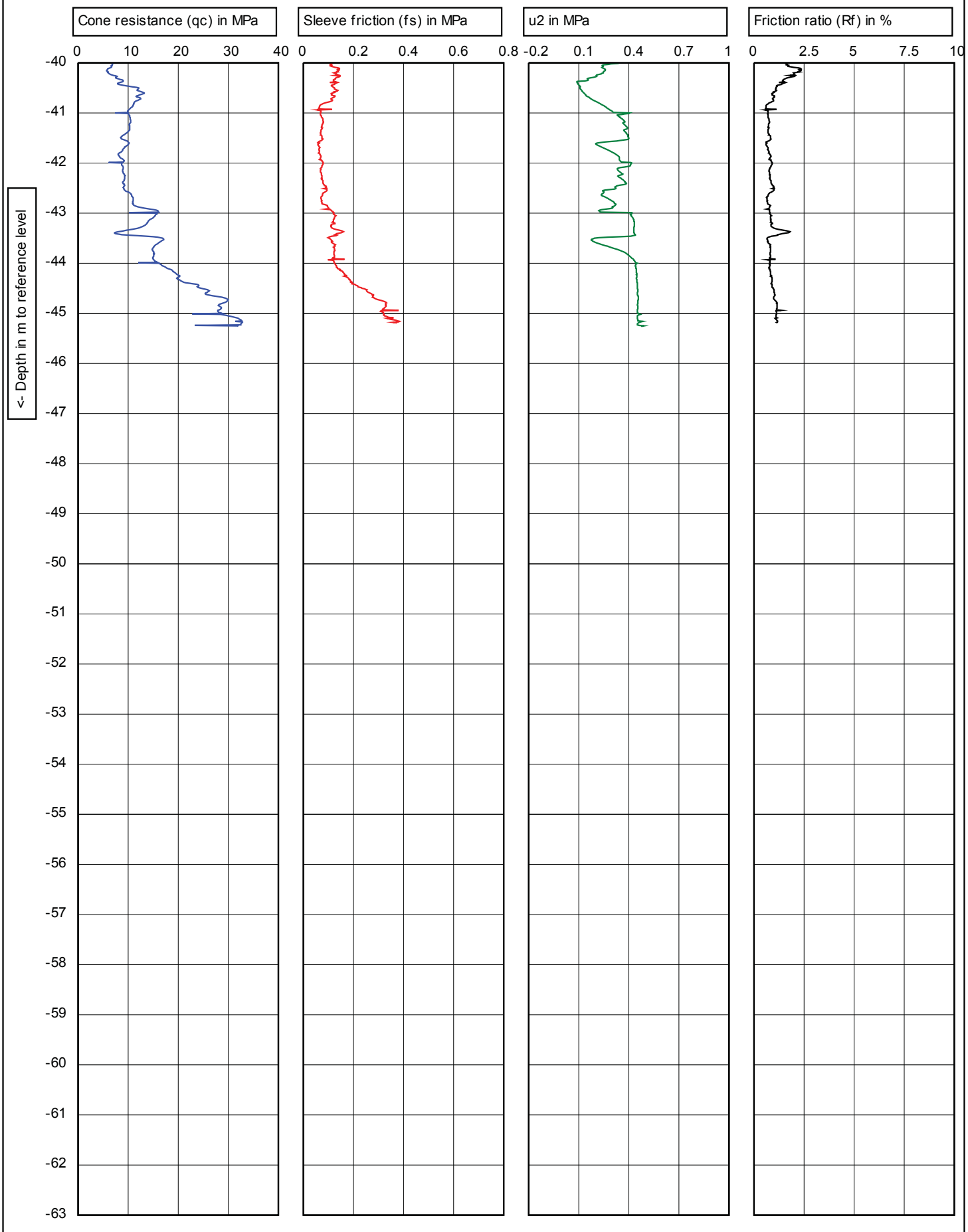
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.78 NAP | W.L.: **0**

Project: **Maitree Thermal Power Project**
Location: **RampalT**
Position: **454599, 499075 RD**

Predrill :	**0 m Predrilled**
Date:	**4/13/2016**
Cone no.:	**S15CFIIP.S09131**
Project no.:	**Maitree Thareemal**
CPT no.:	**02** **2/12**



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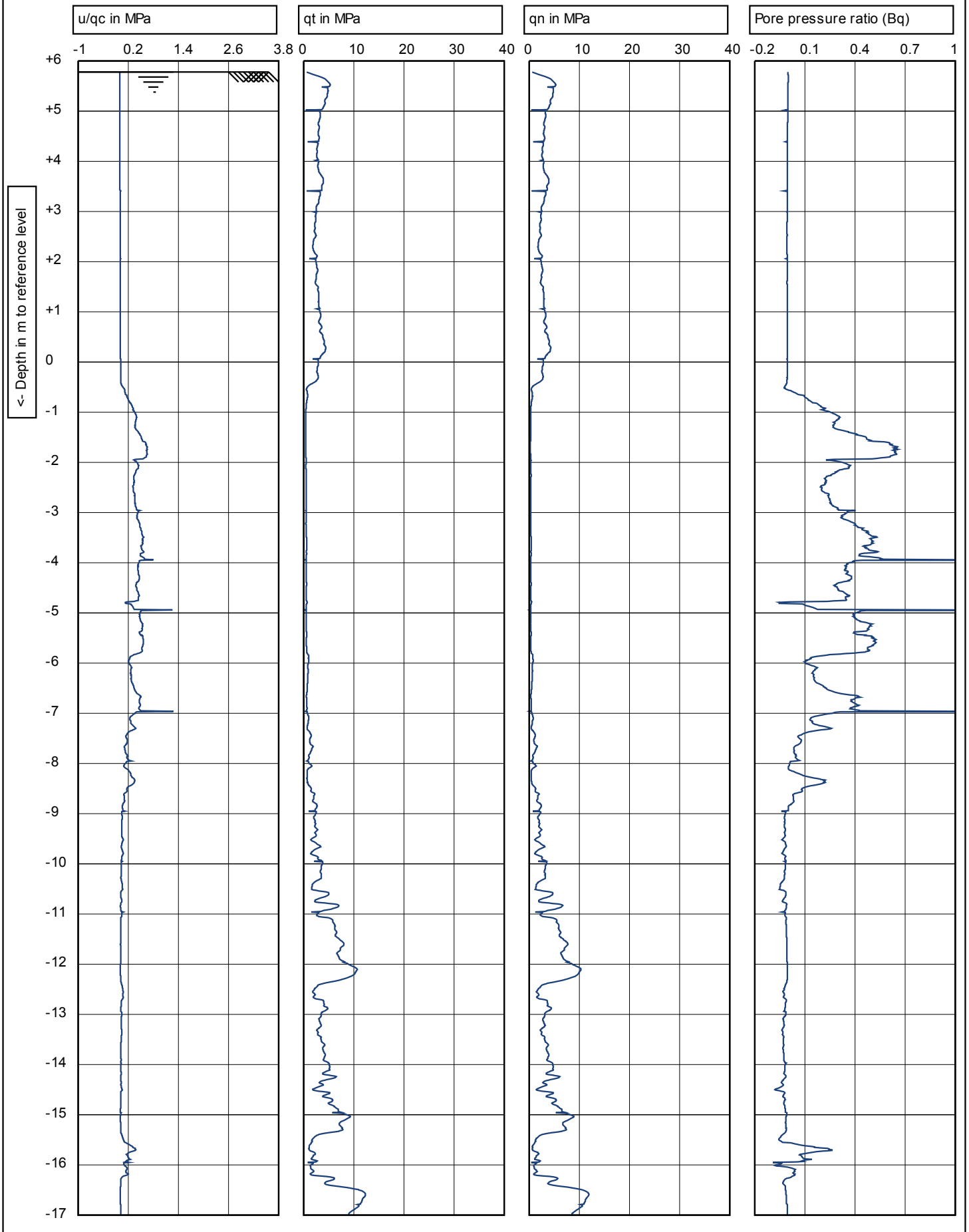
r u2
L 225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.78 NAP	W.L.: **0**	Date:	**4/13/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **RampalT**		Project no.:	**Maitree Thareemal**
Position: **454599, 499075 RD**		CPT no.:	**02** **3/12**



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1.40

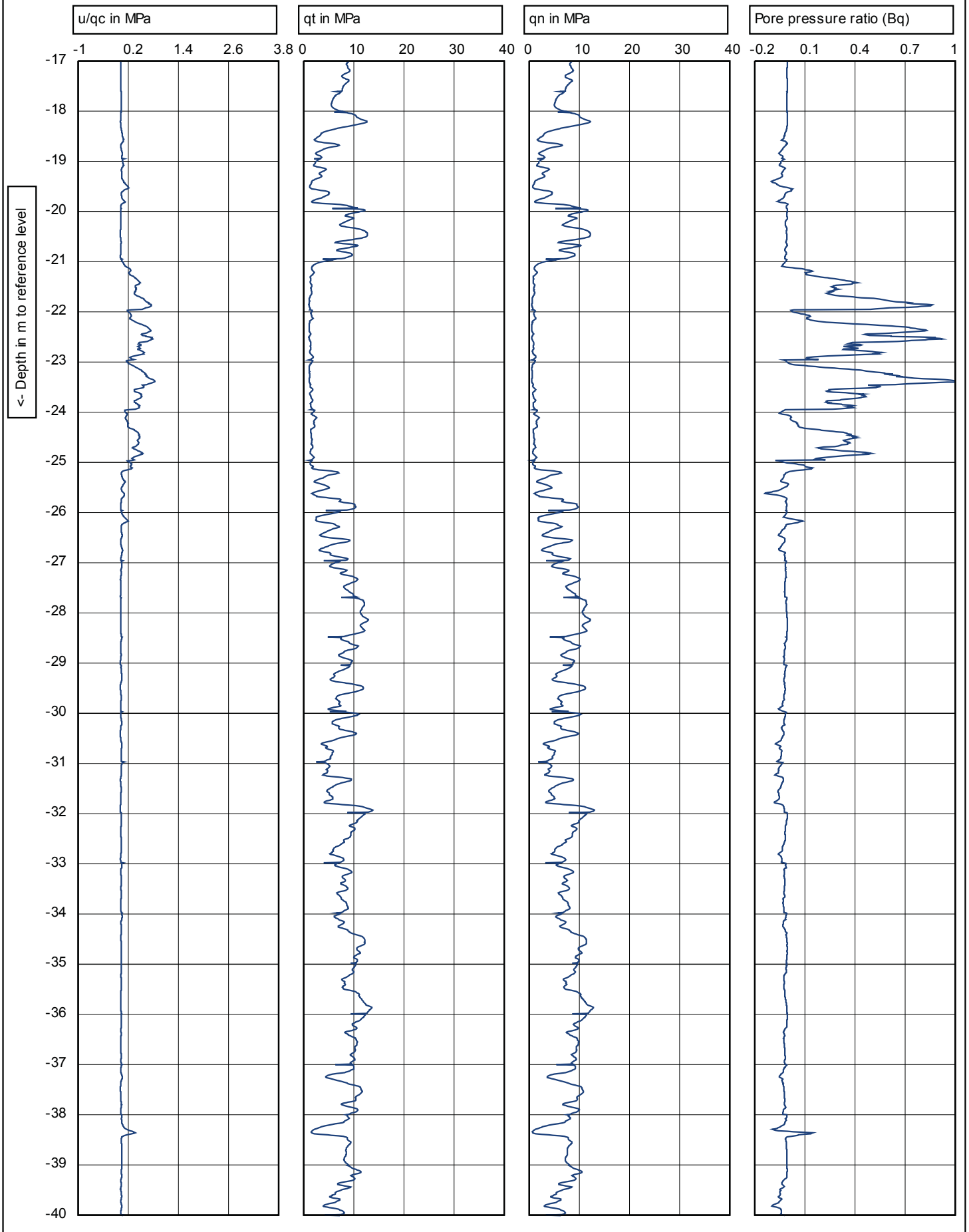
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.78 NAP | W.L.: **0**

Project: **Maitree Thermal Power Project**
Location: **RampalT**
Position: **454599, 499075 RD**

Predrill :	**0 m Predrilled**
Date:	**4/13/2016**
Cone no.:	**S15CFIP.S09131**
Project no.:	**Maitree Thareemal**
CPT no.:	**02** 4/12



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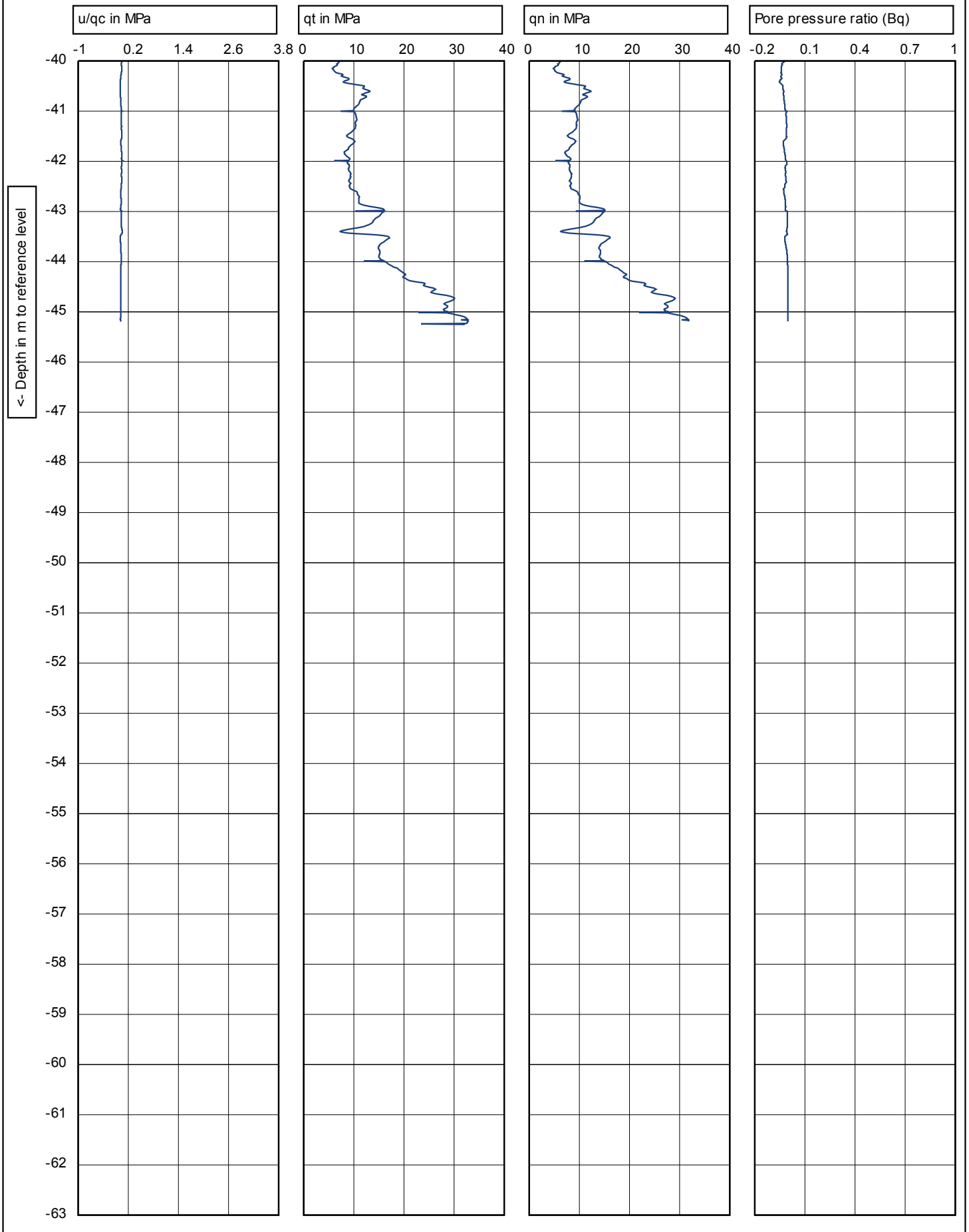
1.40

u2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.78 NAP / W.L.: **0**	Date:	**4/13/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thareemal**
Position:	**454599, 499075 RD**	CPT no.:	**02** **5/12**



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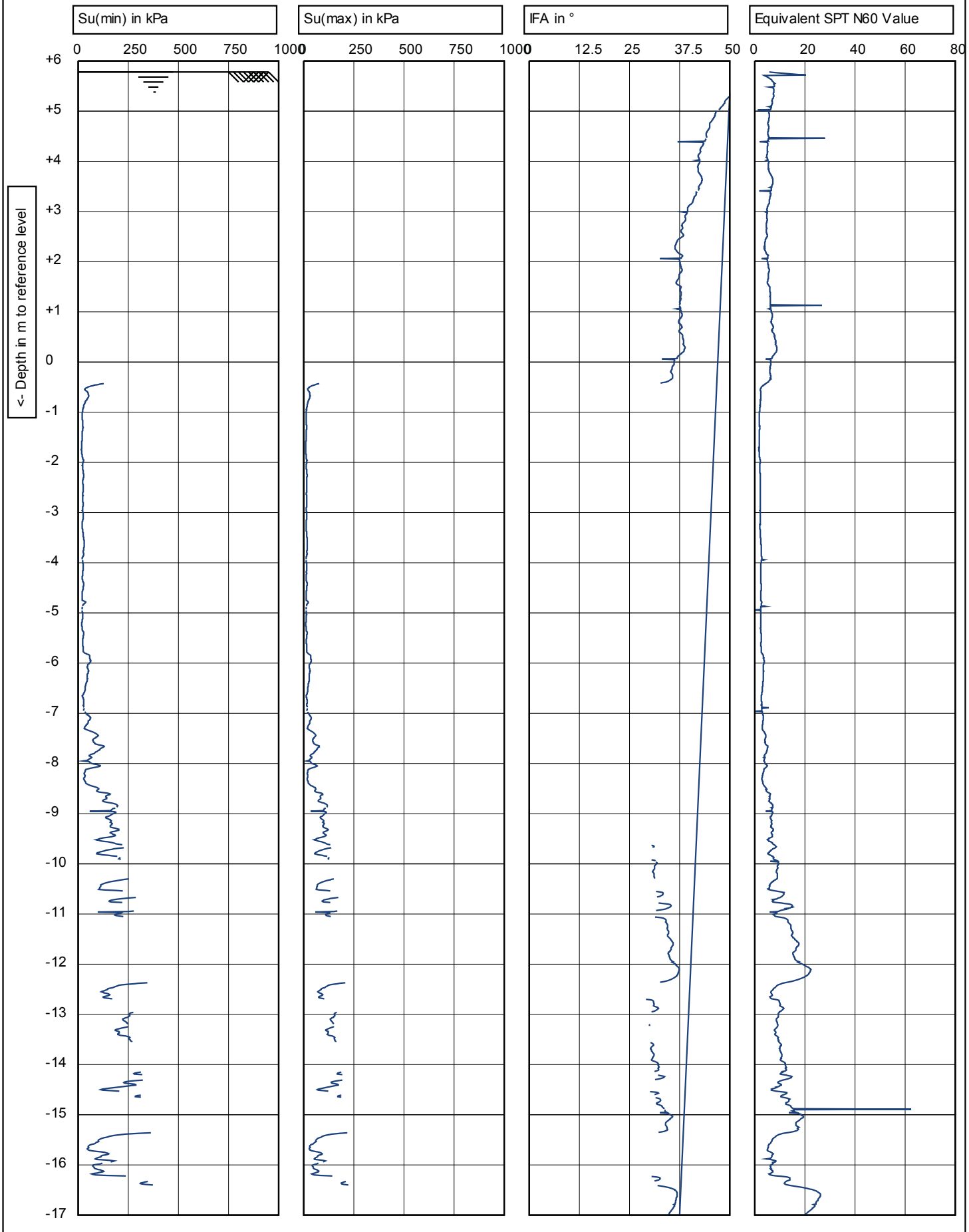
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.78 NAP	W.L.: **0**	Date:	**4/13/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **RampalT**		Project no.:	**Maitree Thareemal**
Position: **454599, 499075 RD**		CPT no.:	**02** **6/12**



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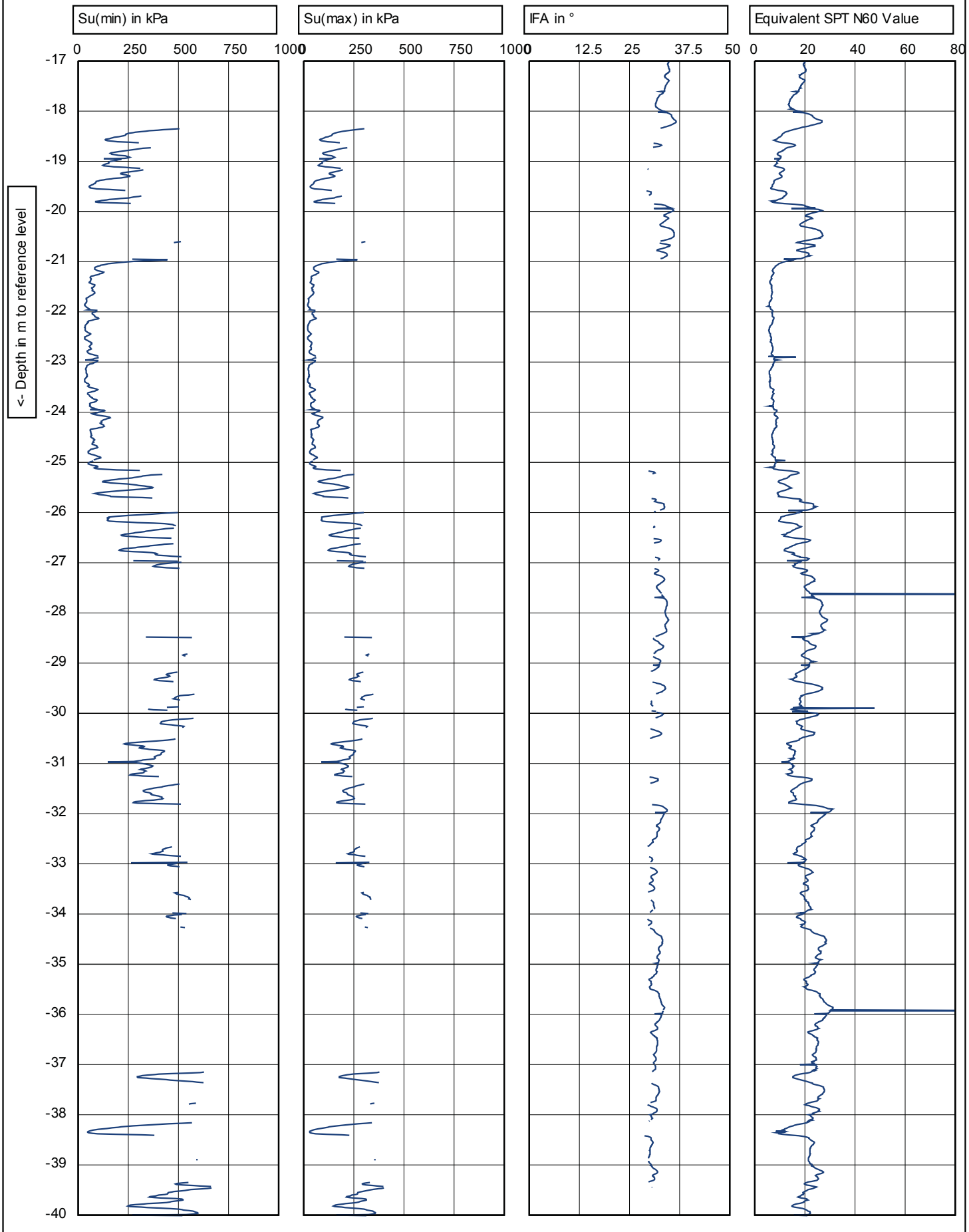
1.40

qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.78 NAP — W.L.: **0**	Date:	**4/13/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thareemal**
Position:	**454599, 499075 RD**	CPT no.:	**02** — **7/12**



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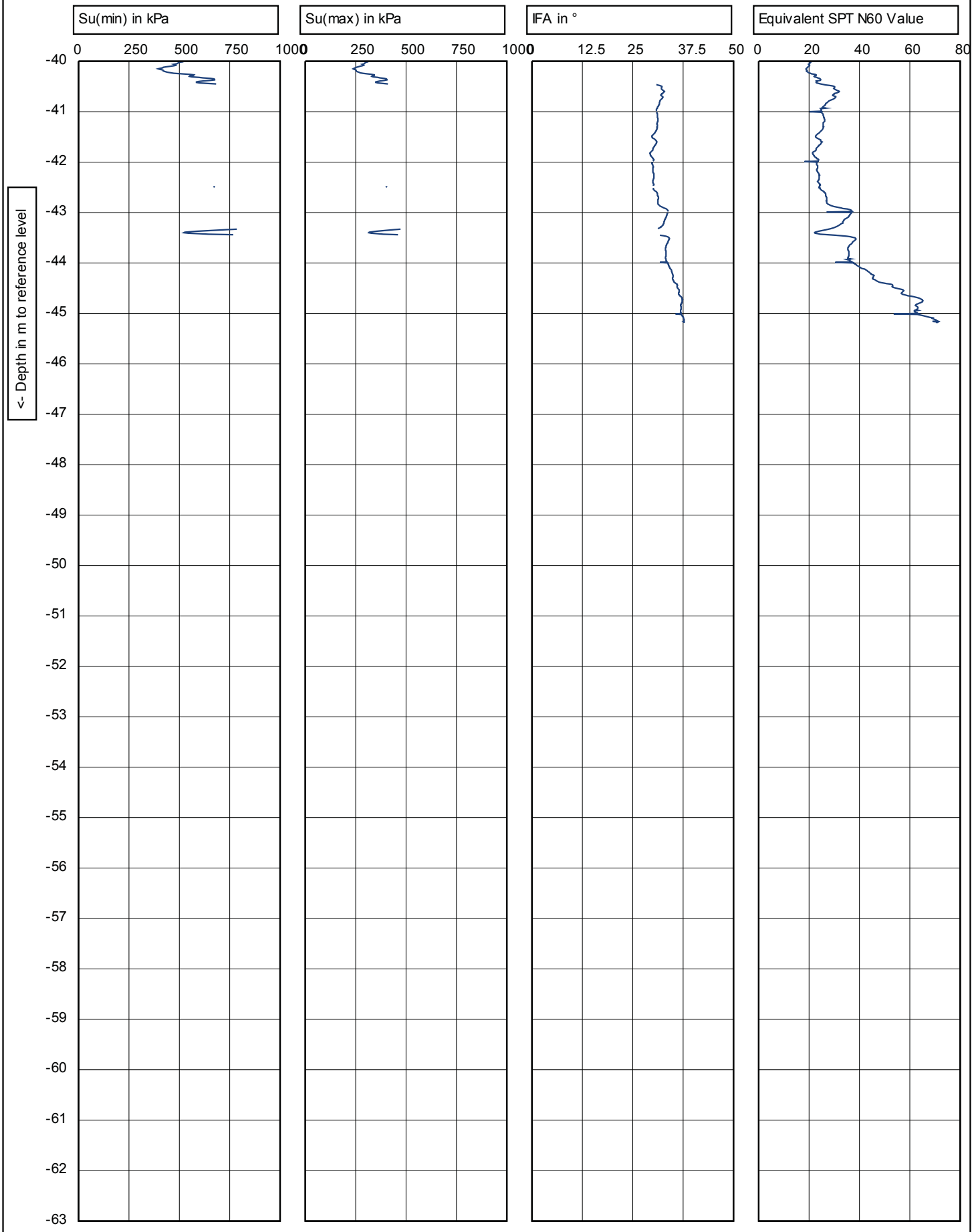
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.78 NAP / W.L.: **0**	Date:	**4/13/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thareemal**
Position:	**454599, 499075 RD**	CPT no.:	**02** **8/12**



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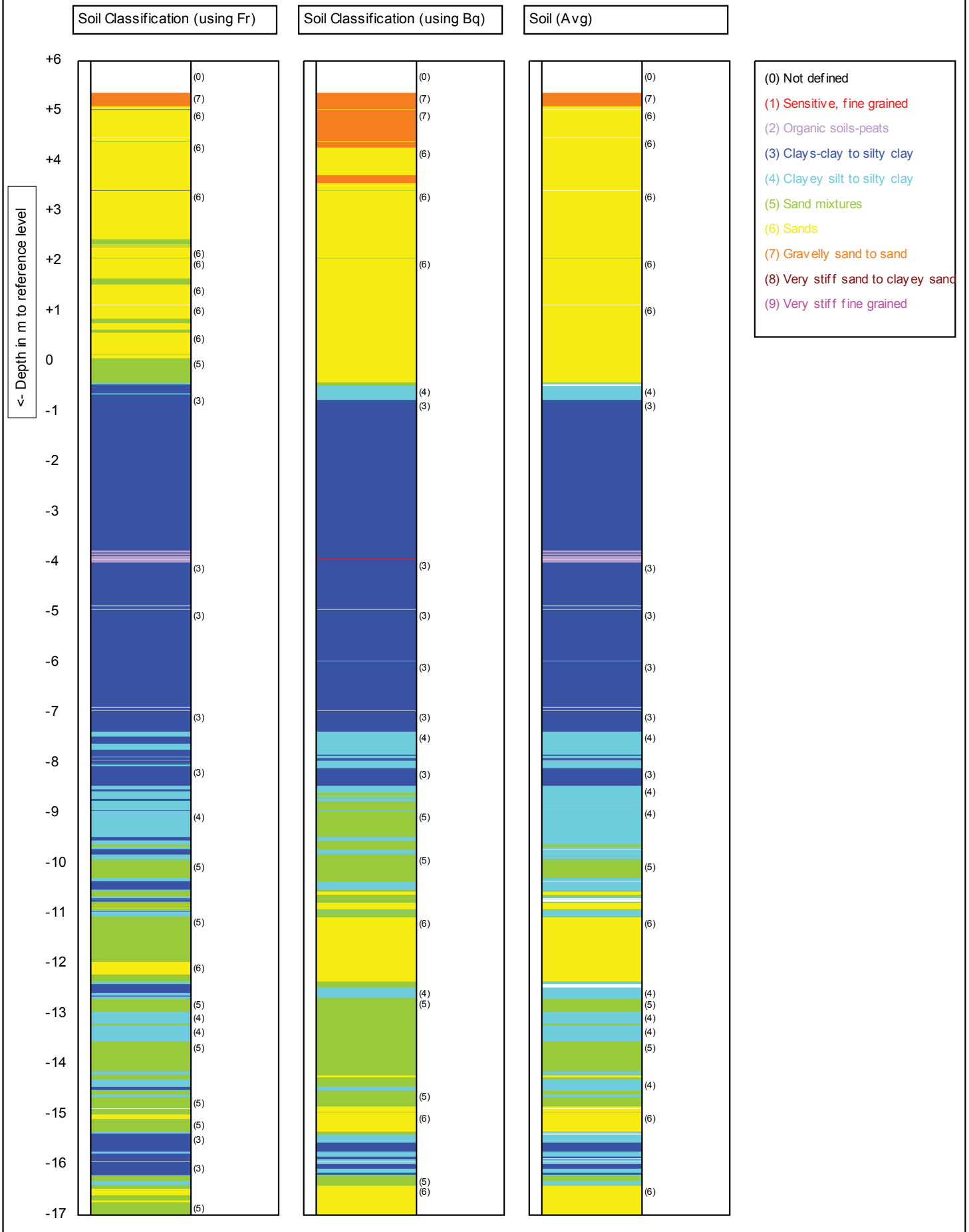
1.40

qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.78 NAP — W.L.: **0**	Date:	**4/13/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thareemal**
Position:	**454599, 499075 RD**	CPT no.:	**02** — **9/12**



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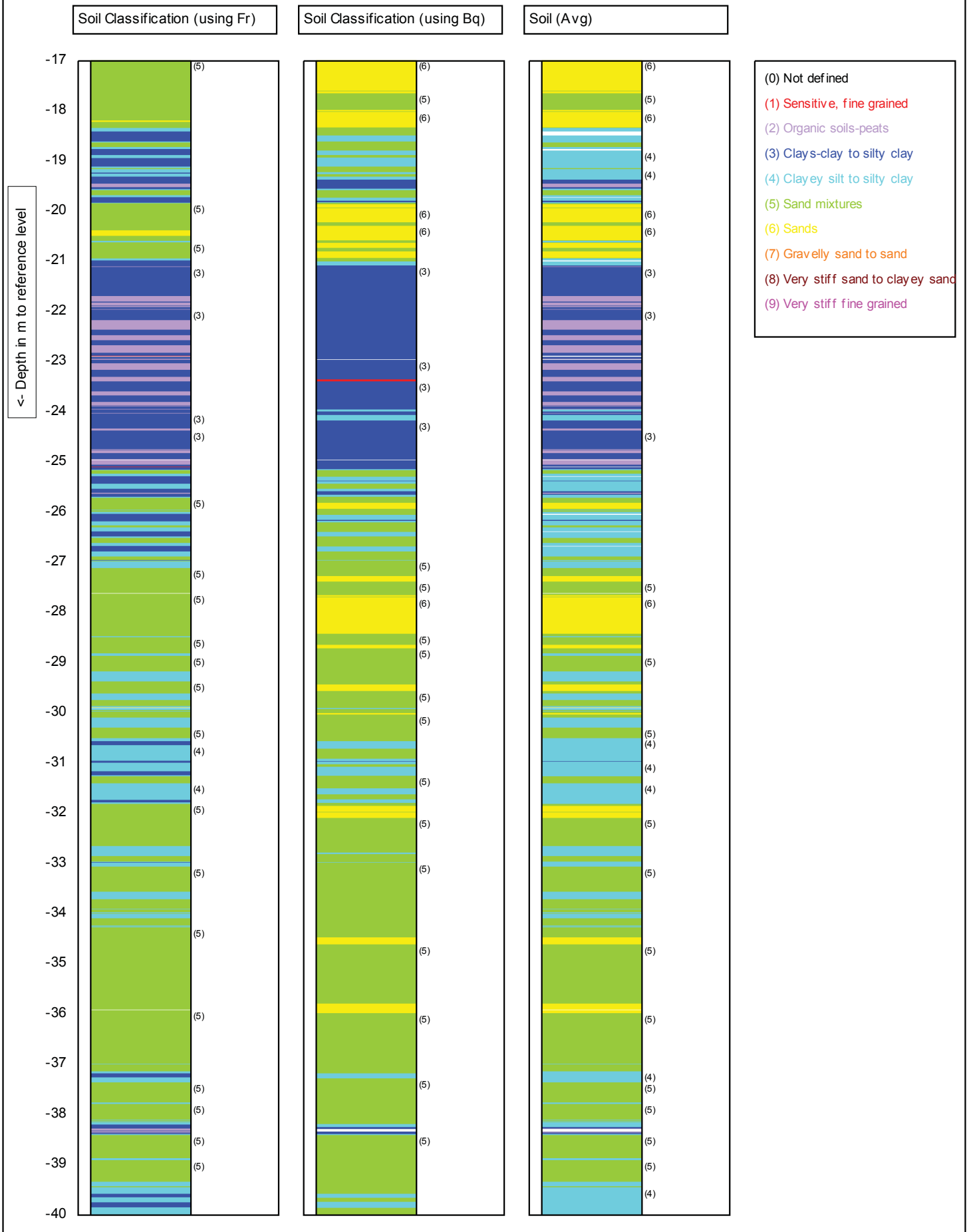
1.40

qc u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.78 NAP	W.L.: **0**	Date:	**4/13/2016**
Project: **Maitree Thermal Power Project**		Cone no.:	**S15CFIIP.S09131**
Location: **RampalT**		Project no.:	**Maitree Thareemal**
Position: **454599, 499075 RD**		CPT no.:	**02** 10/12



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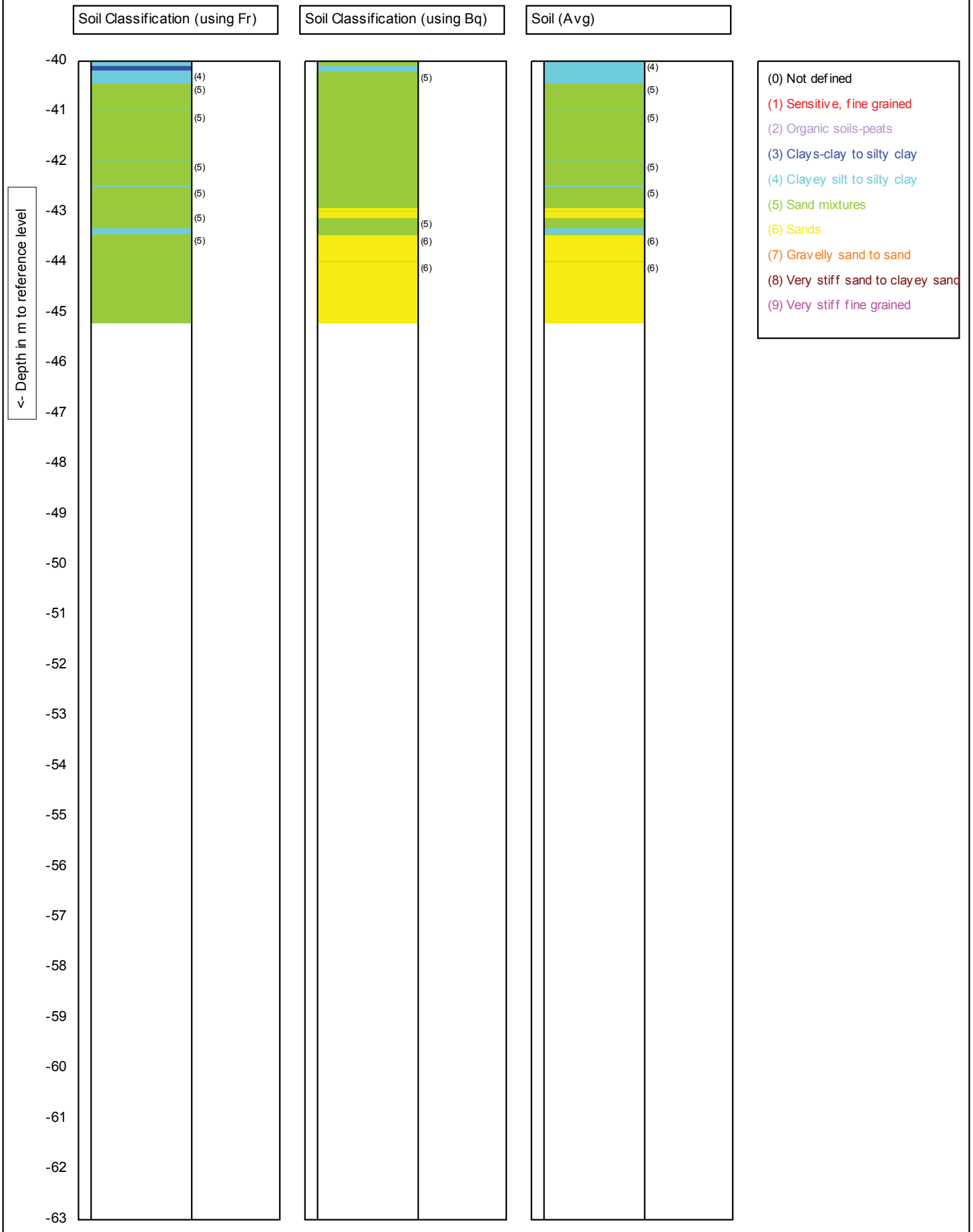
1.40

r u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.78 NAP / W.L.: **0**	Date:	**4/13/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thareemal**
Position:	**454599, 499075 RD**	CPT no.:	**02** / **11/12**



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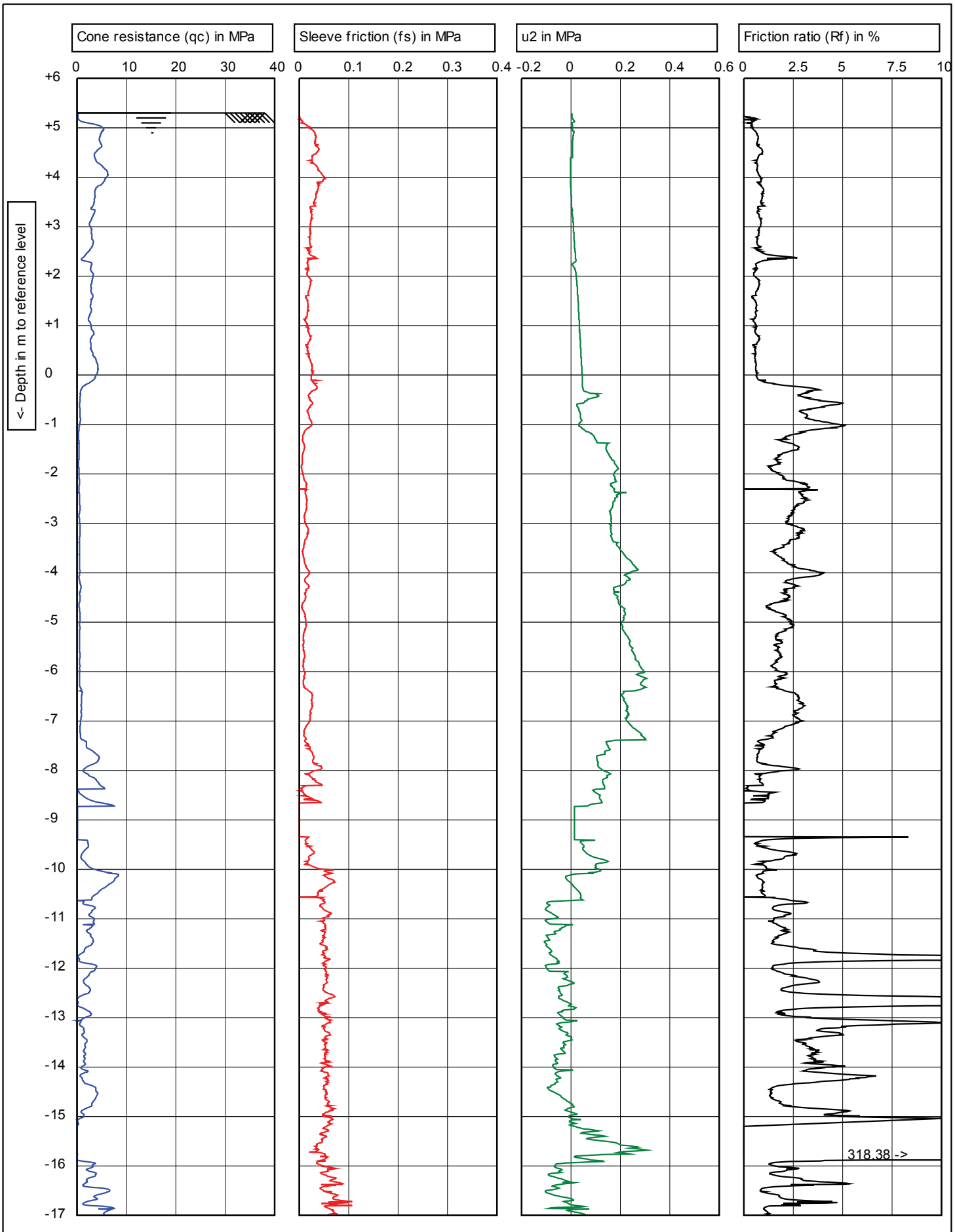
1.40

r u2 / L 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.78 NAP / W.L.: **0**	Date:	**4/13/2016**
Project:	**Maitree Thermal Power Project**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thareemal**
Position:	**454599, 499075 RD**	CPT no.:	**02** / **12/12**



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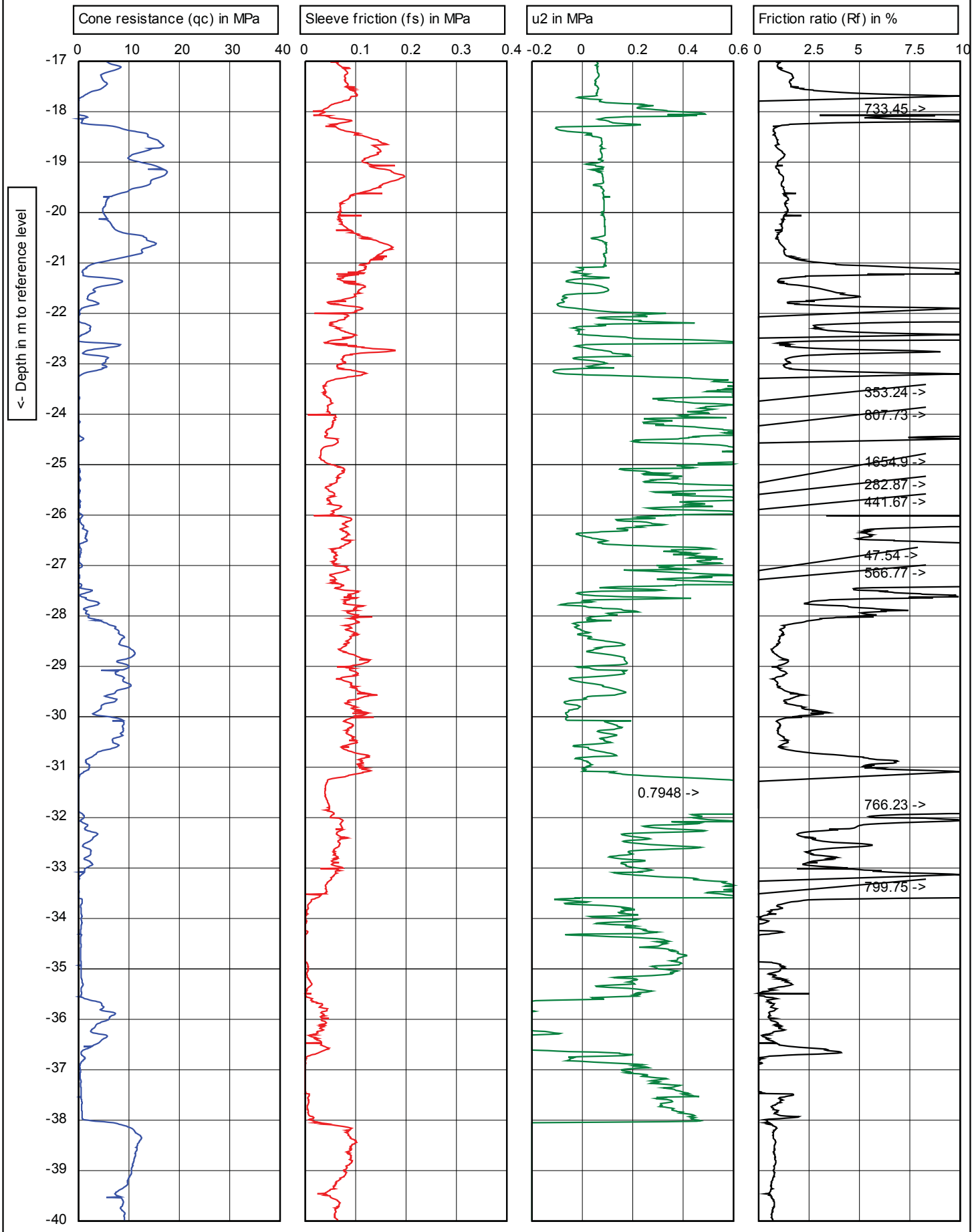
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

Test according NEN 5140 class 1		Predrill :	0 m Predrilled
G.L. 5.3 NAP	W.L.: 0	Date:	4/9/2016
Project: 2X660MW Maitree STPP		Cone no.:	S15CFIP.S09132
Location: Rampal		Project no.:	Maitree Thermal
Position: 454759, 498972 RD		CPT no.:	03 1/12



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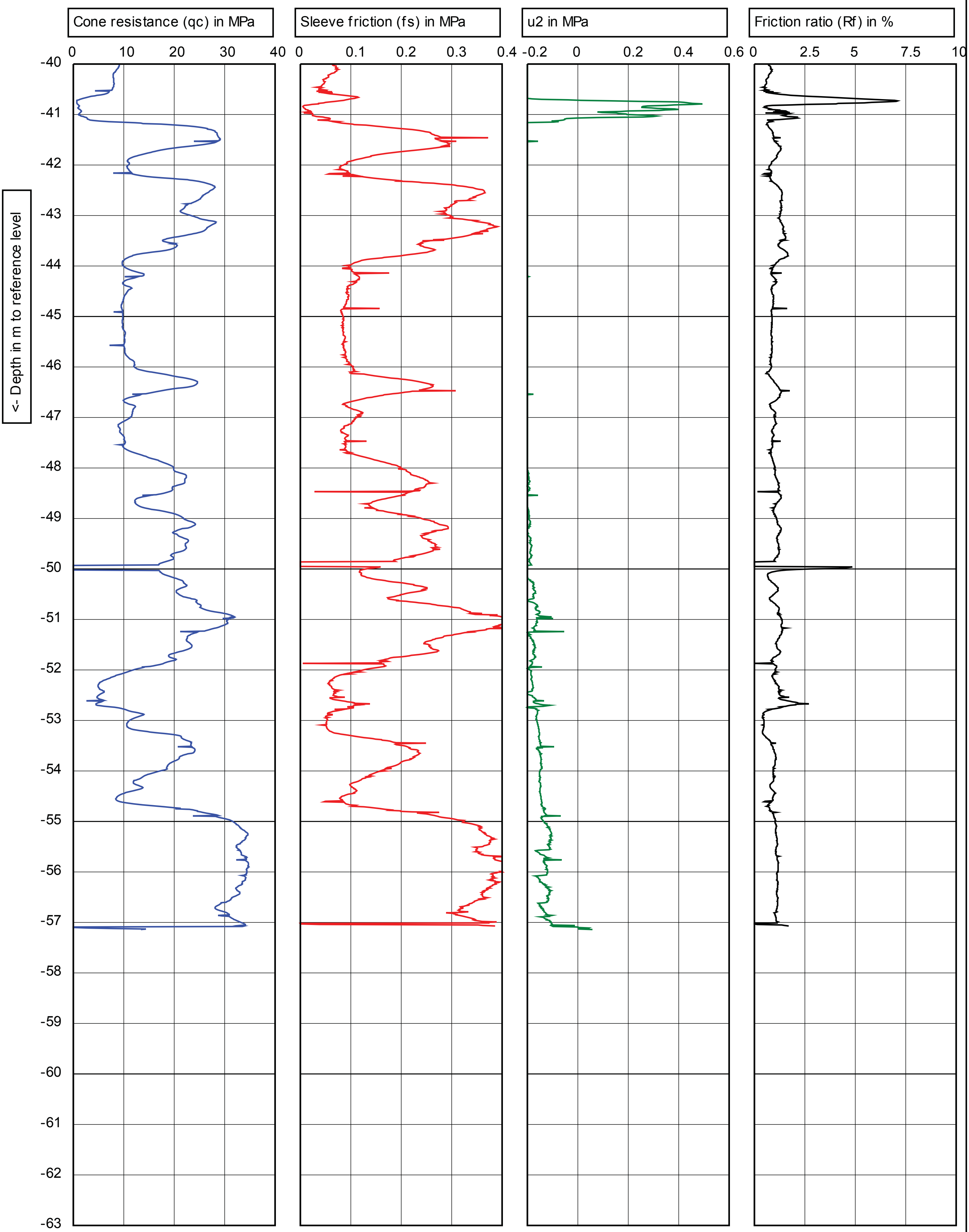
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

Test according NEN 5140 class 1

G.L. 5.3 NAP | W.L.: **0**

Project: **2X660MW Maitree STPP**
Location: **Rampal**
Position: **454759, 498972 RD**

Predrill :	**0 m Predrilled**
Date:	**4/9/2016**
Cone no.:	**S15CFIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**03** 2/12



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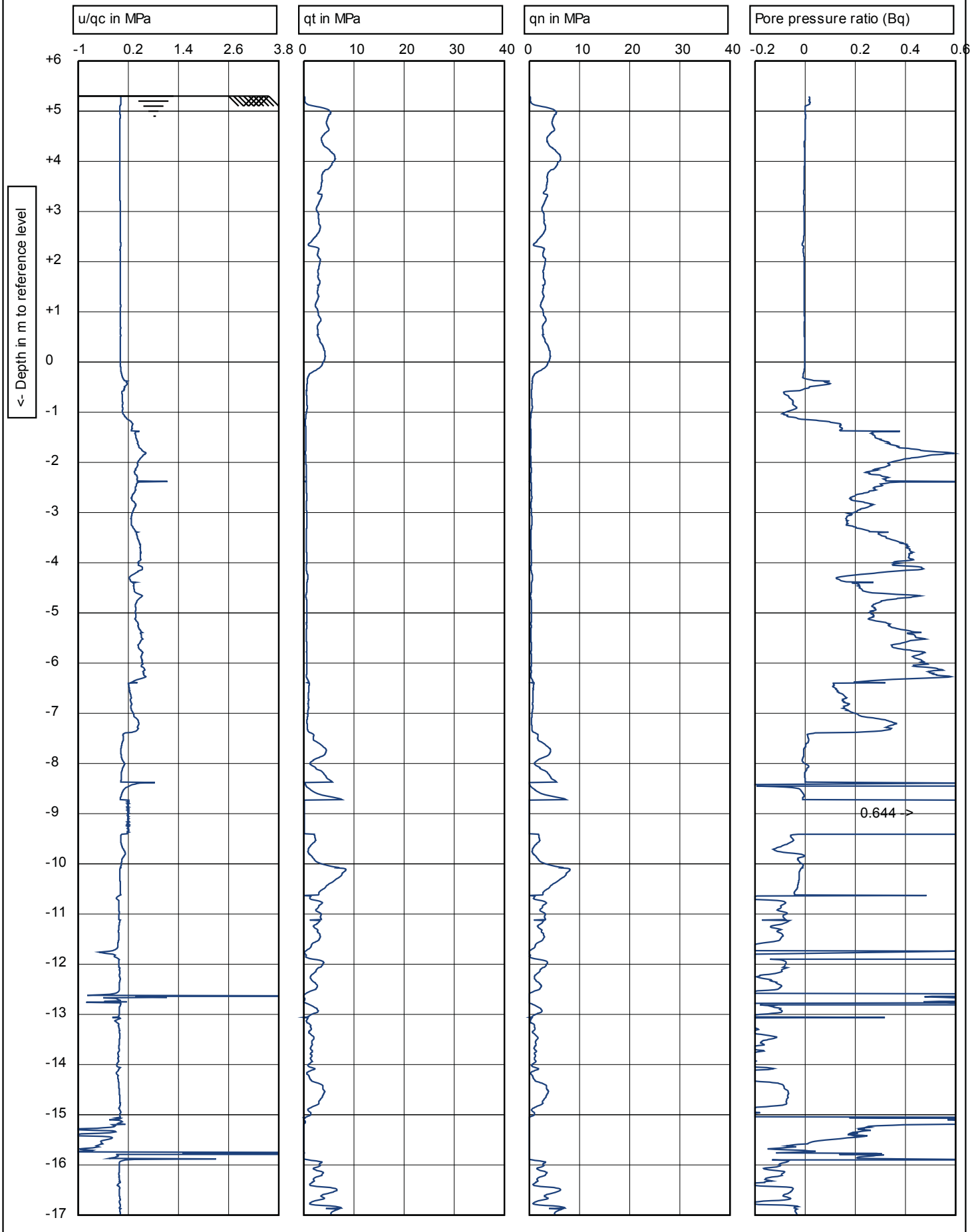
Web: http://www.dcl-fcl.com Email: dcl@dcl-fcl.com

1.40

u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1		Predrill :	0 m Predrilled
	G.L. 5.3 NAP	W.L.: **0**	Date:	**4/9/2016**
Project:	**2X660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location:	**Rampal**		Project no.:	**Maitree Thermal**
Position:	**454759, 498972 RD**		CPT no.:	**03** 3/12



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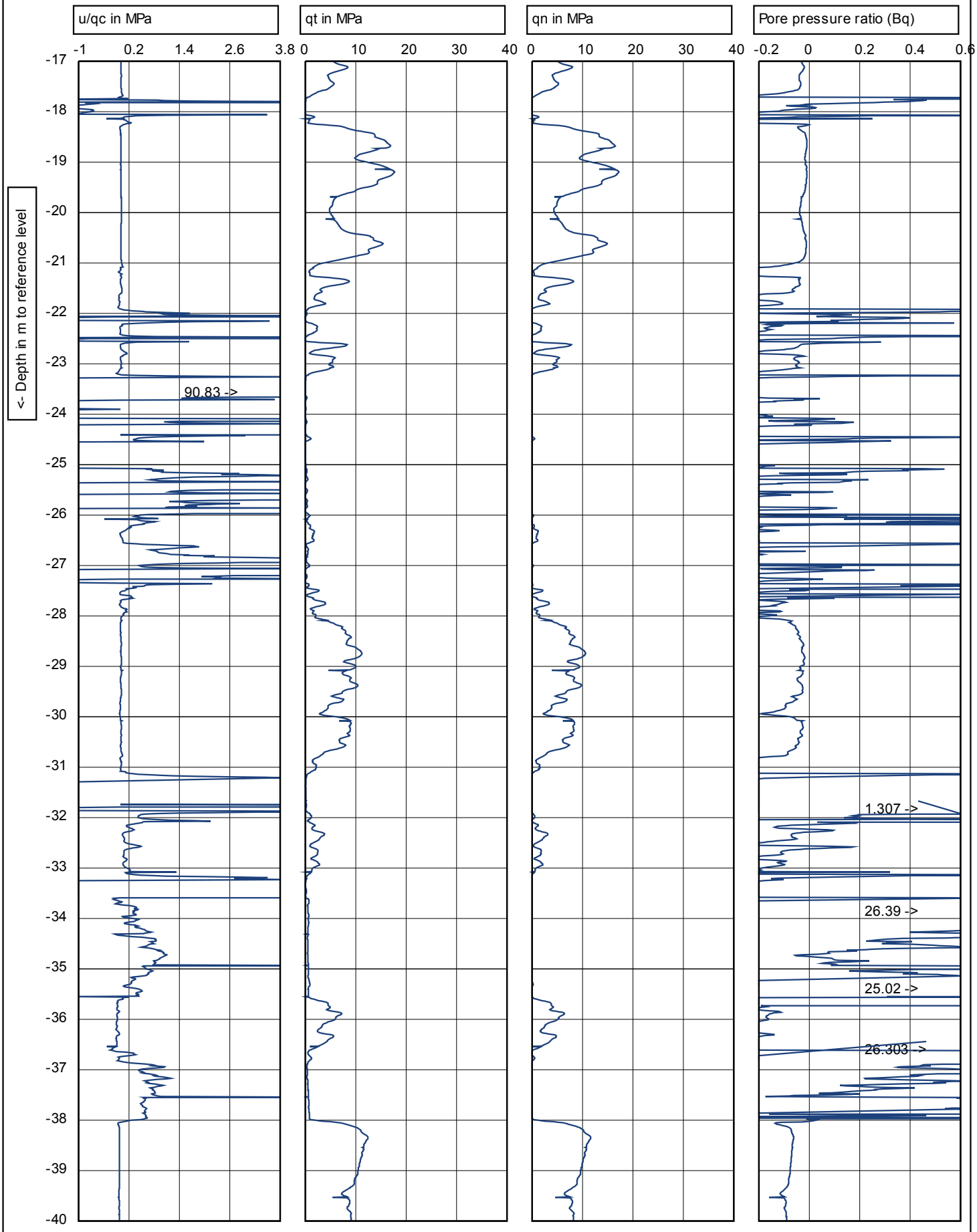
1.40

r u2 / L 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP — W.L.: **0**	Date:	**4/9/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454759, 498972 RD**	CPT no.:	**03** — **4/12**



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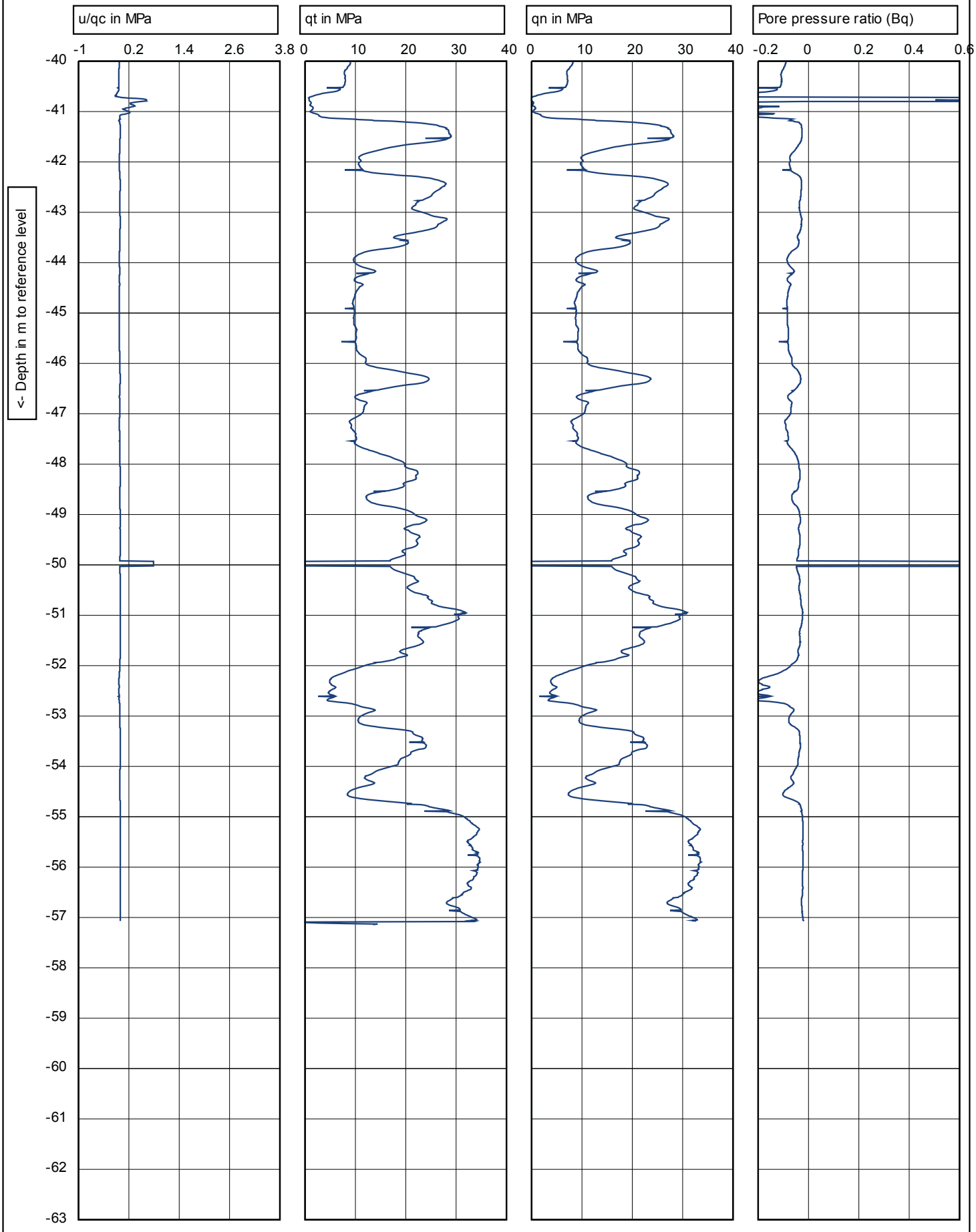
1.40

r u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.3 NAP	W.L.: **0**	Date:	**4/9/2016**
Project: **2X660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454759, 498972 RD**		CPT no.:	**03** **5/12**



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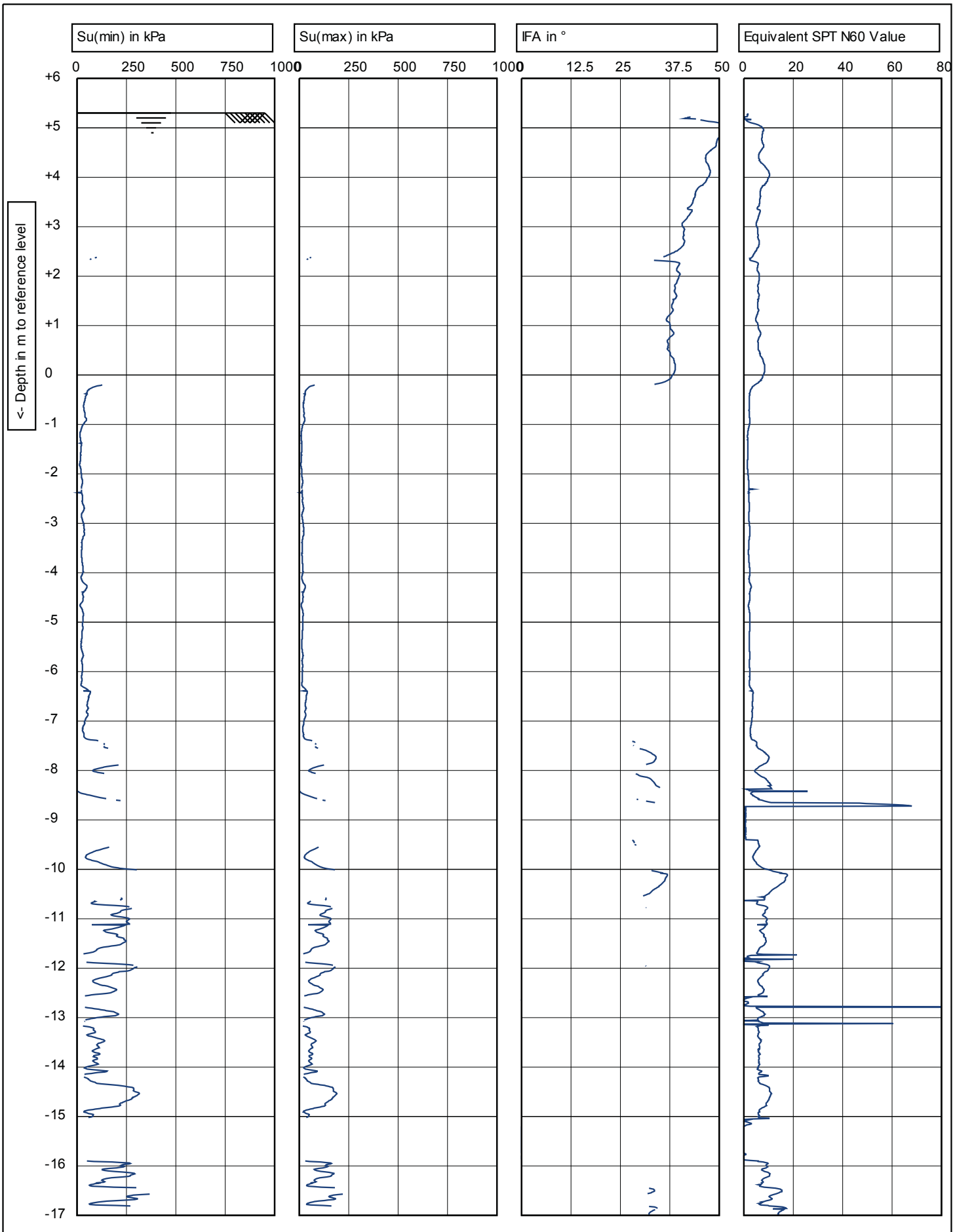
1.40

r u2 / L 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP — W.L.: **0**	Date:	**4/9/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454759, 498972 RD**	CPT no.:	**03** — **6/12**



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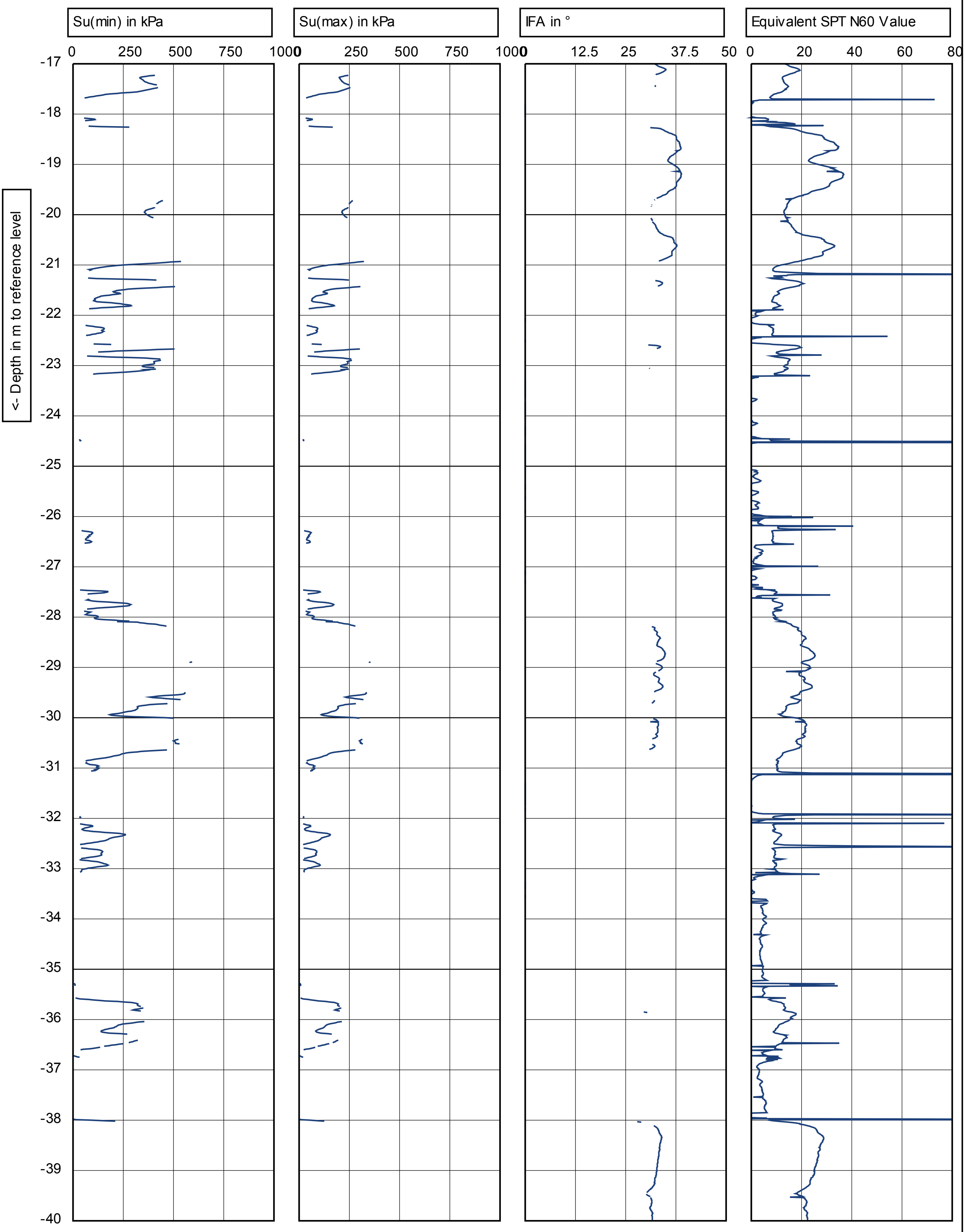
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.3 NAP — W.L.: 0	Date:	4/9/2016
Project:	2X660MW Maitree STPP	Cone no.:	S15CFIIP.S09132
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454759, 498972 RD	CPT no.:	03 — 7/12



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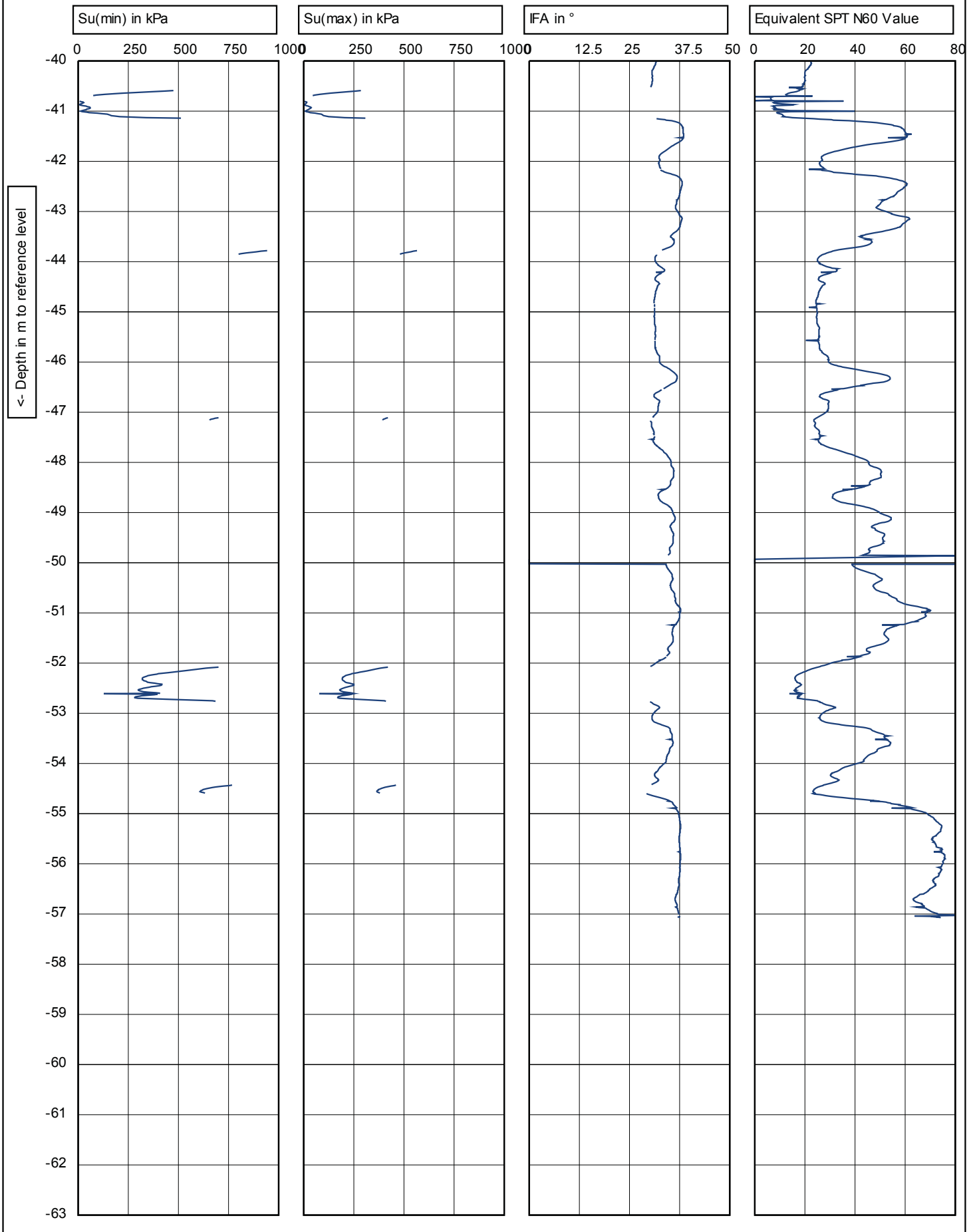
1.40

u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1		Predrill :	0 m Predrilled
	G.L. 5.3 NAP	W.L.: **0**	Date:	**4/9/2016**
Project: **2X660MW Maitree STPP**			Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**			Project no.:	**Maitree Thermal**
Position: **454759, 498972 RD**			CPT no.:	**03** — **8/12**



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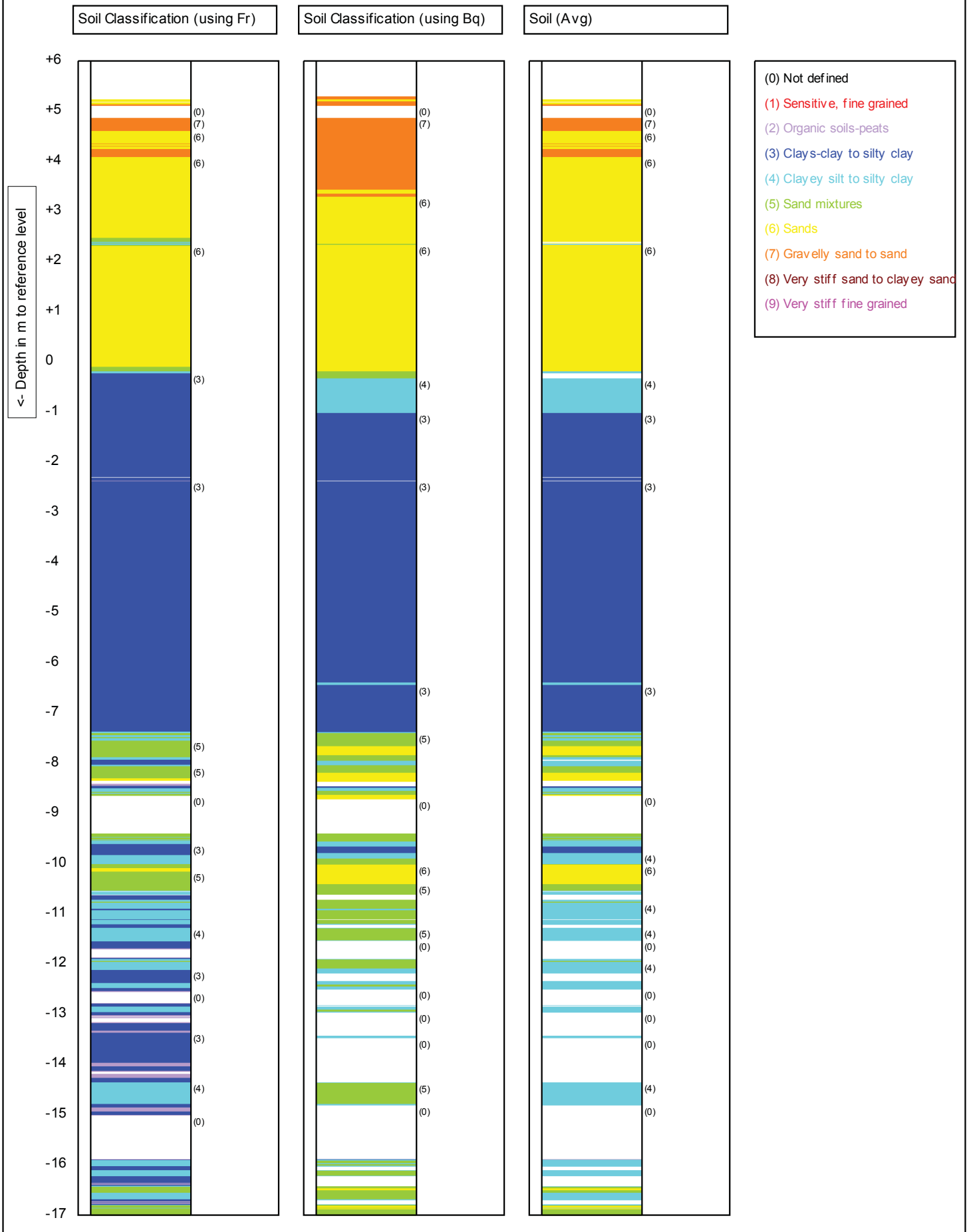
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP / W.L.: **0**	Date:	**4/9/2016**
Project: **2X660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454759, 498972 RD**		CPT no.:	**03** / **9/12**



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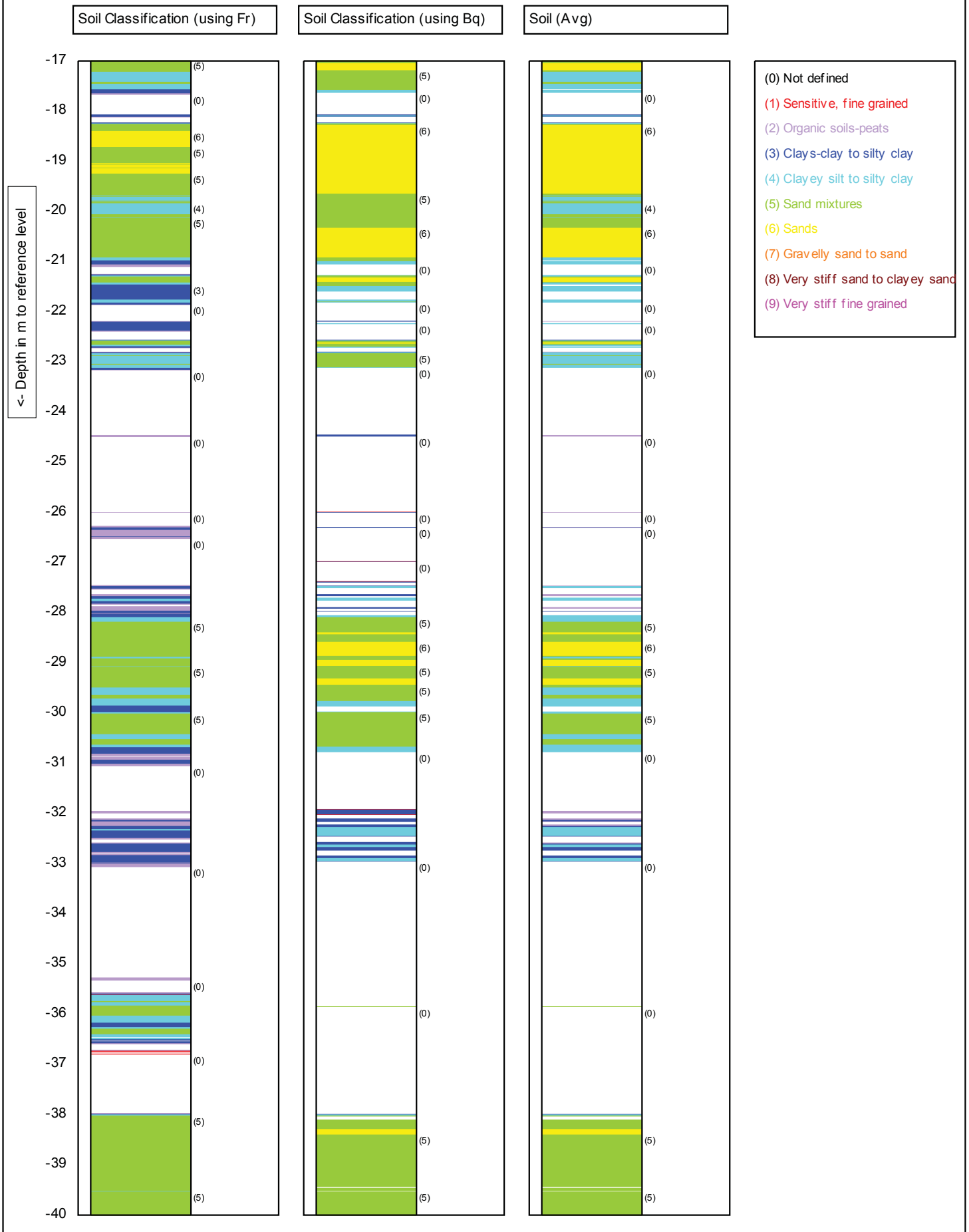
1.40

r u2 / L 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.3 NAP / W.L.: 0	Date:	4/9/2016
Project:	2X660MW Maitree STPP	Cone no.:	S15CFIP.S09132
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454759, 498972 RD	CPT no.:	03 / 10/12



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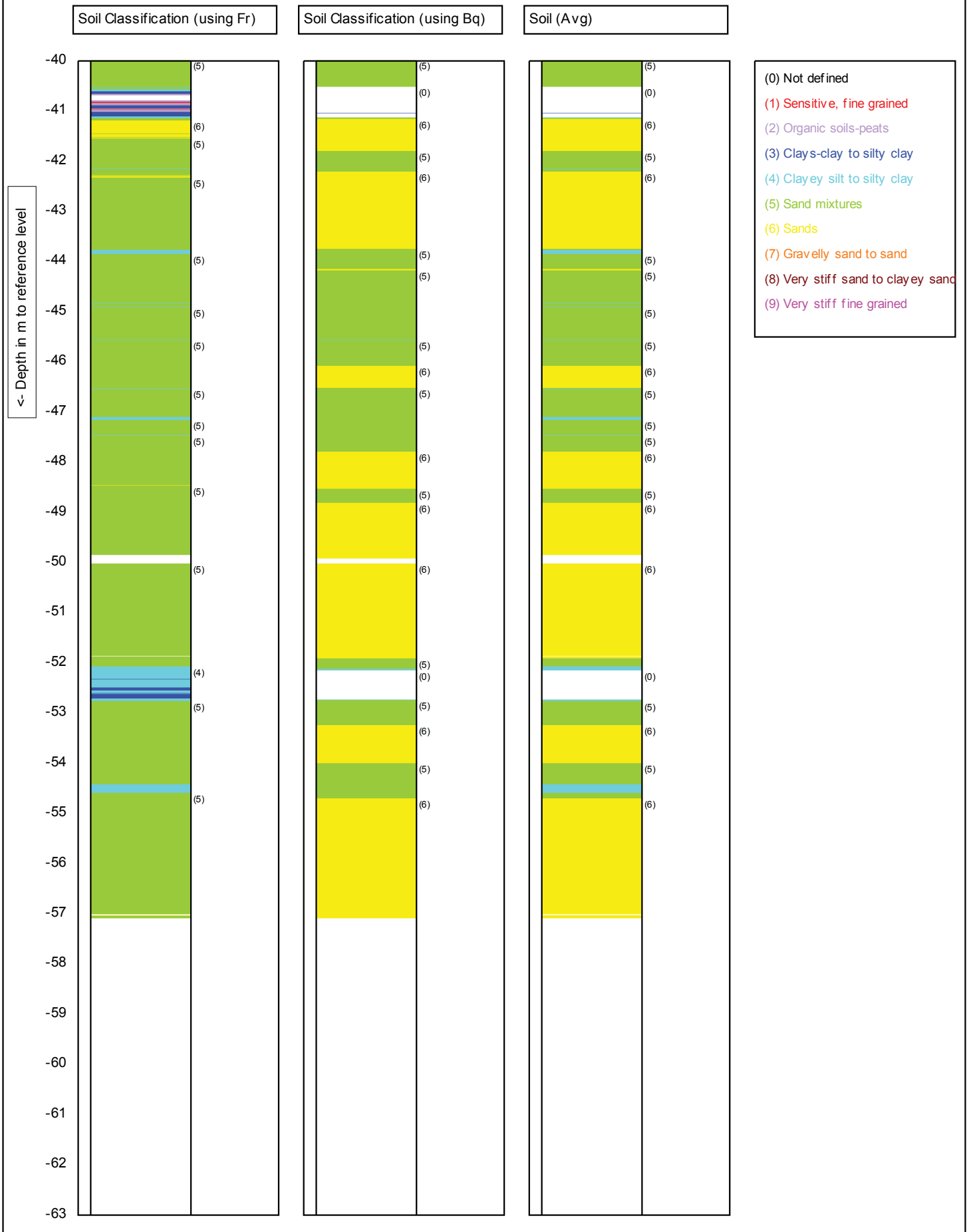
1.40

qc u2 225 cm² 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.3 NAP W.L.: 0	Date:	4/9/2016
Project: 2X660MW Maitree STPP		Cone no.:	S15CFIP.S09132
Location: Rampal		Project no.:	Maitree Thermal
Position: 454759, 498972 RD		CPT no.:	03 11/12



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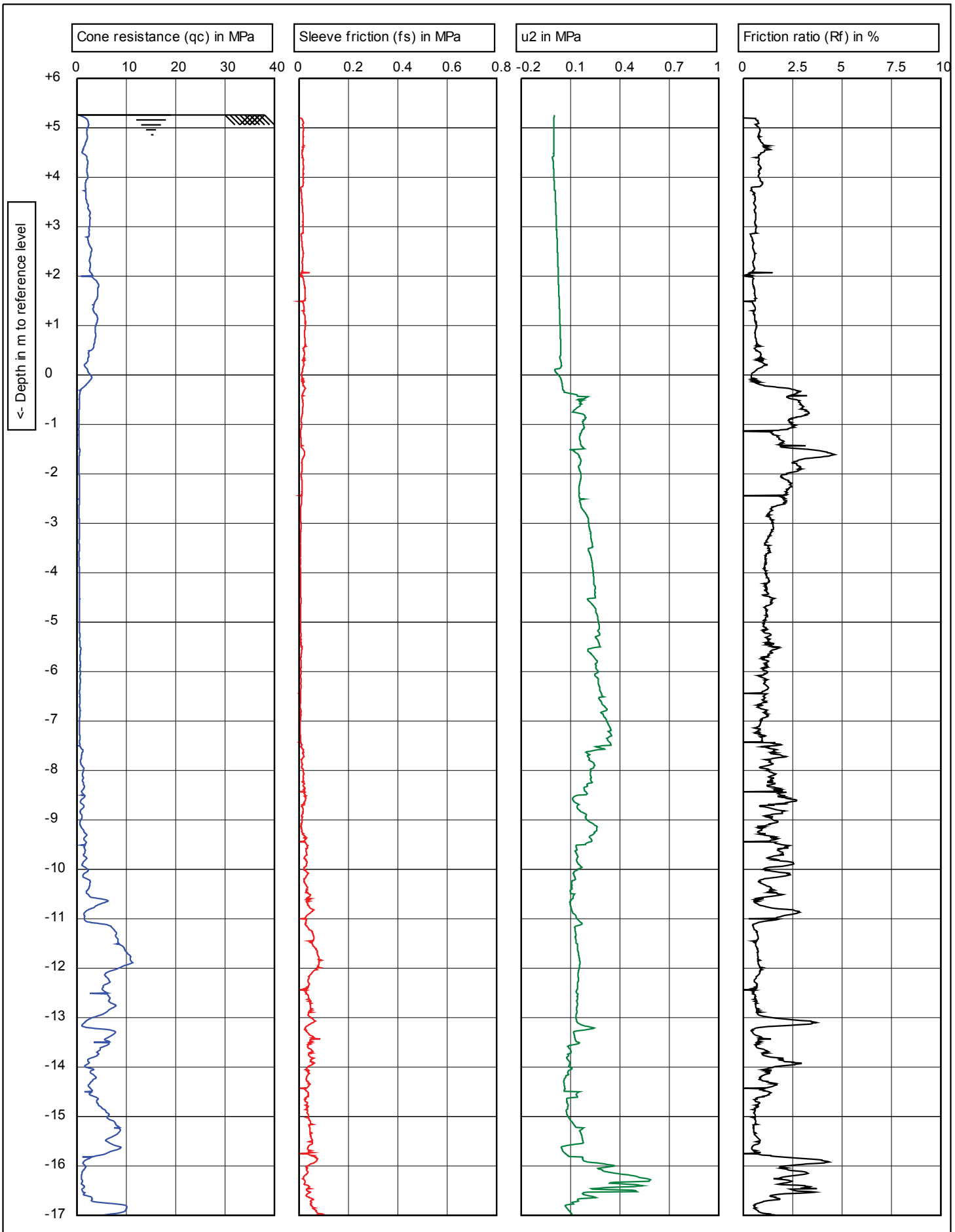
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.3 NAP / W.L.: 0	Date:	4/9/2016
Project:	2X660MW Maitree STPP	Cone no.:	S15CFIIP.S09132
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454759, 498972 RD	CPT no.:	03 12/12



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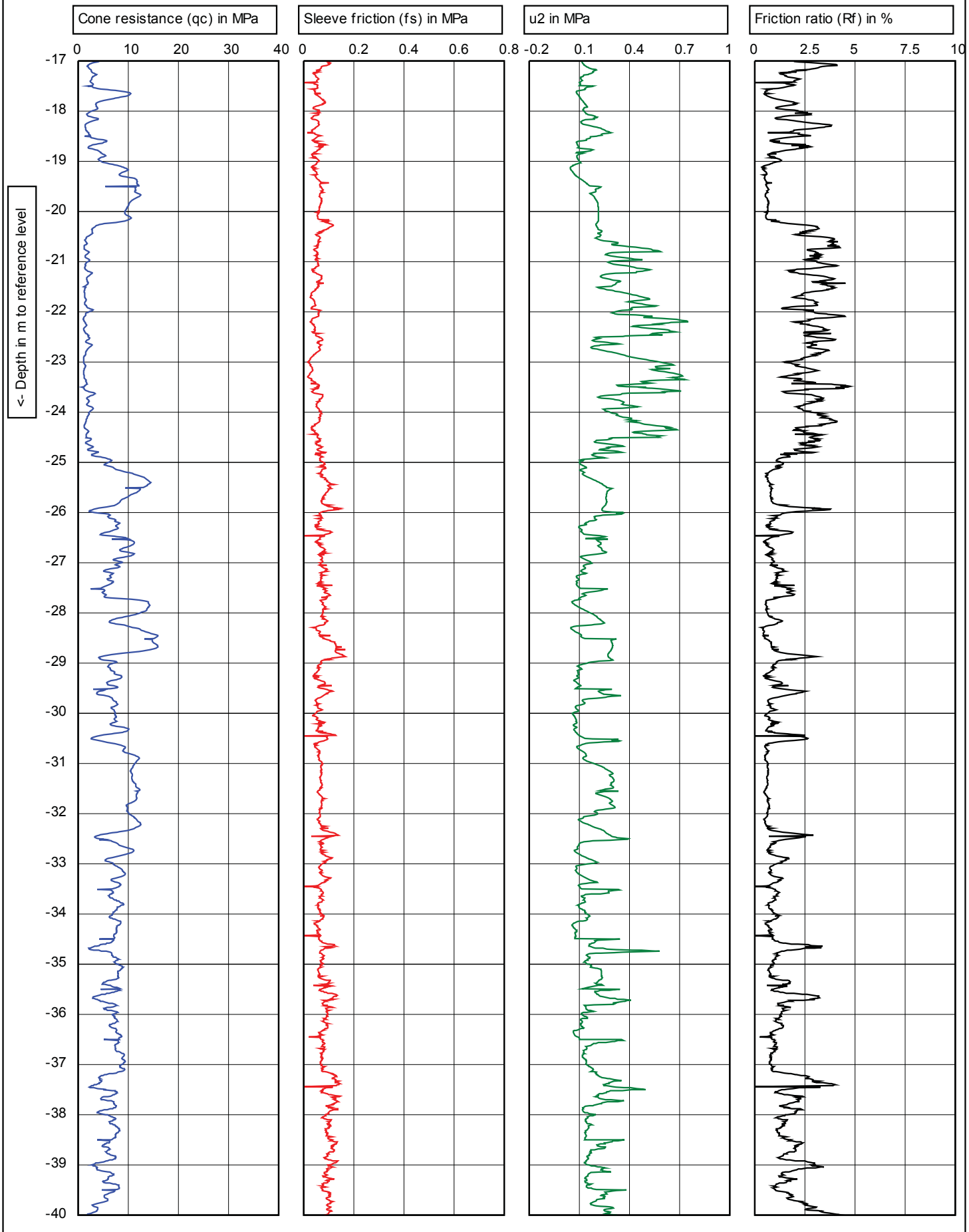
1.40

u2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.264 NAP / W.L.: **0**	Date:	**4/16/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454599, 498822 GCS**	CPT no.:	**04** 1/12



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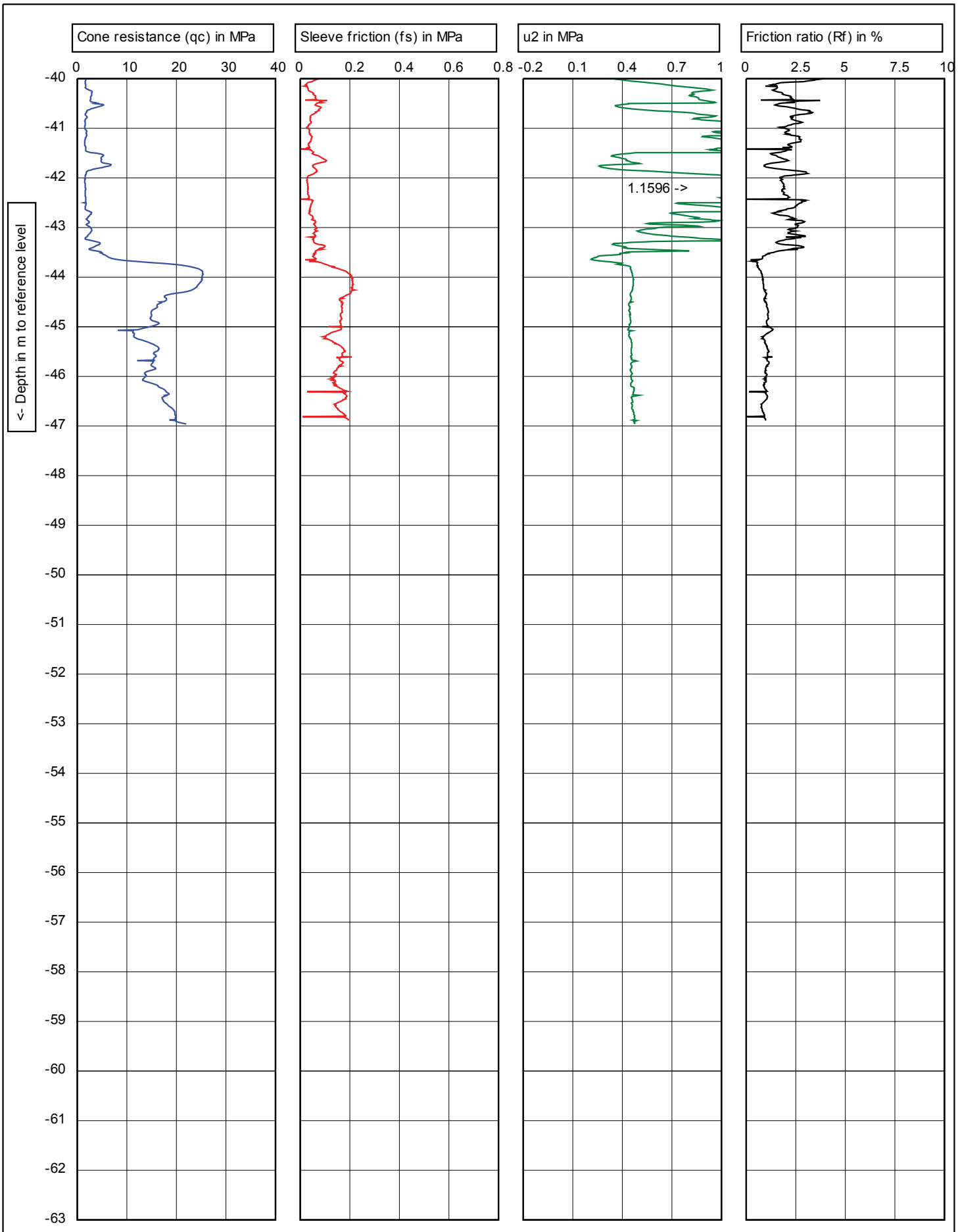
u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	0 m Predrilled
G.L. 5.264 NAP	W.L.: 0	Date:	4/16/2016
Project: 2x660MW Maitree STPP		Cone no.:	S15CFIP.S09131
Location: RampalT		Project no.:	Maitree Thermal
Position: 454599, 498822 GCS		CPT no.:	04 2/12



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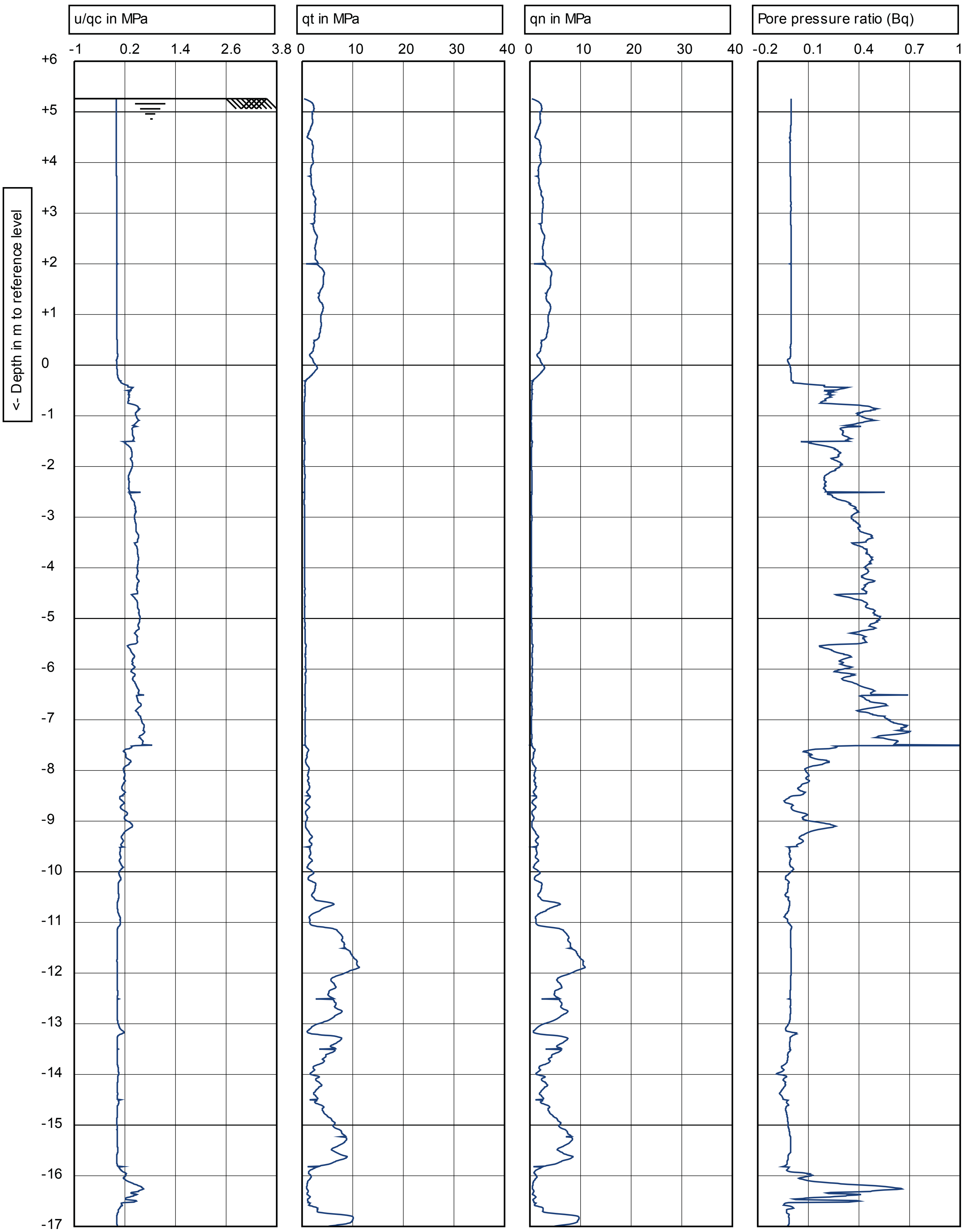
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.264 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **RampalT**
Position: **454599, 498822 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/16/2016**
Cone no.:	**S15CFIIP.S09131**
Project no.:	**Maitree Thermal**
CPT no.:	**04** 3/12



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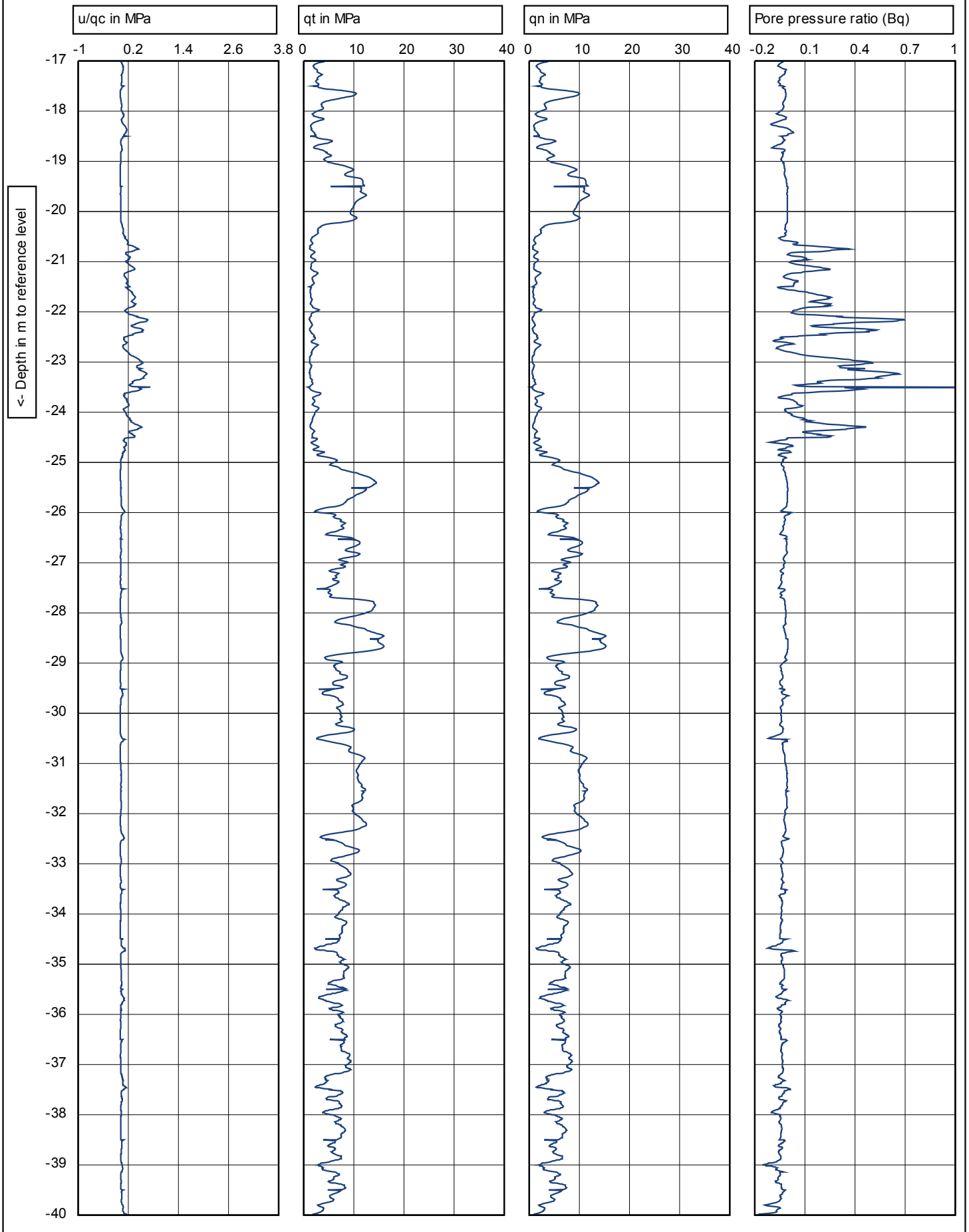
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.264 NAP	W.L.: **0**	Date:	**4/16/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454599, 498822 GCS**	CPT no.:	**04** 4/12



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1.40

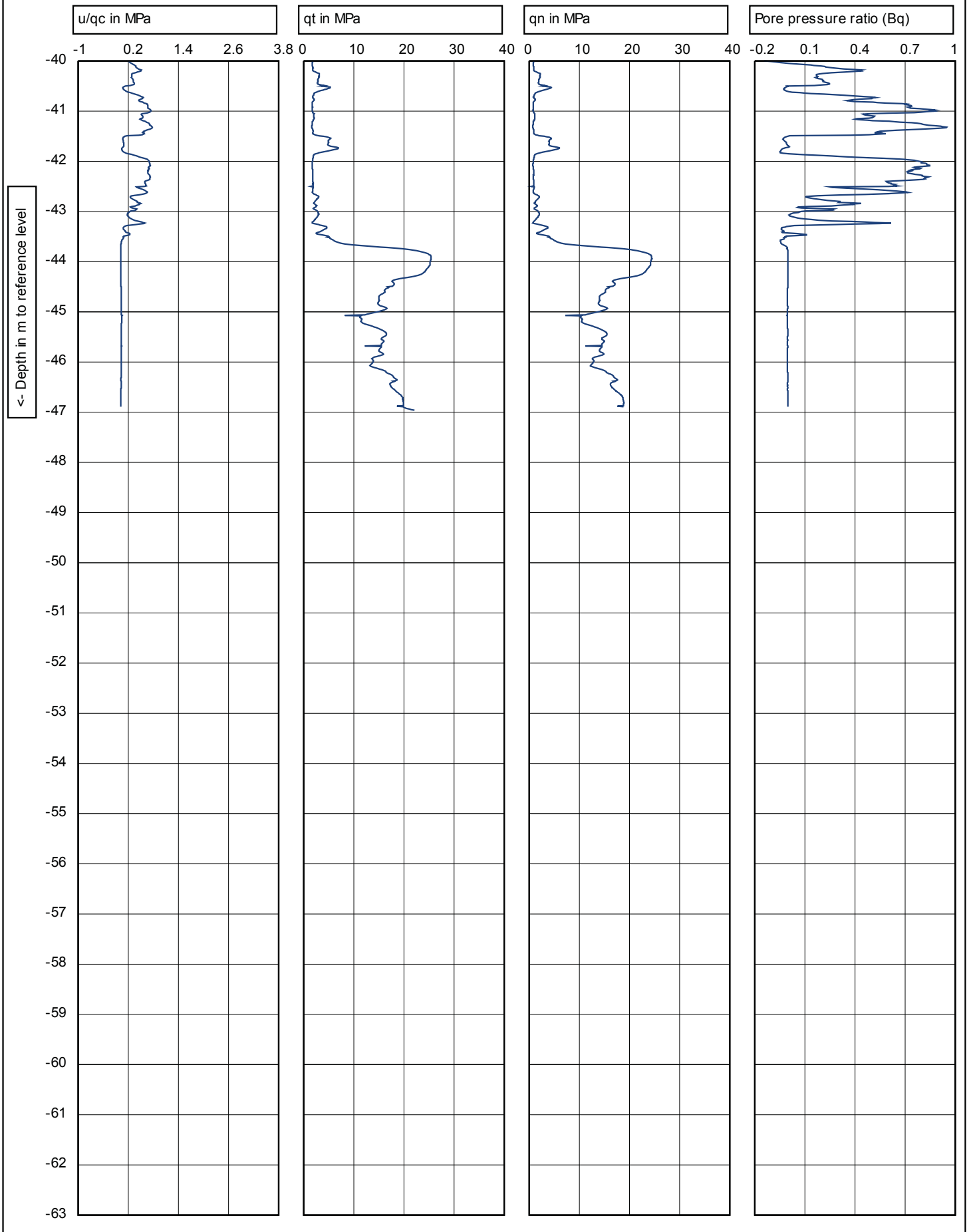
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.264 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **RampalT**
Position: **454599, 498822 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/16/2016**
Cone no.:	**S15CFIIP.S09131**
Project no.:	**Maitree Thermal**
CPT no.:	**04** **5/12**



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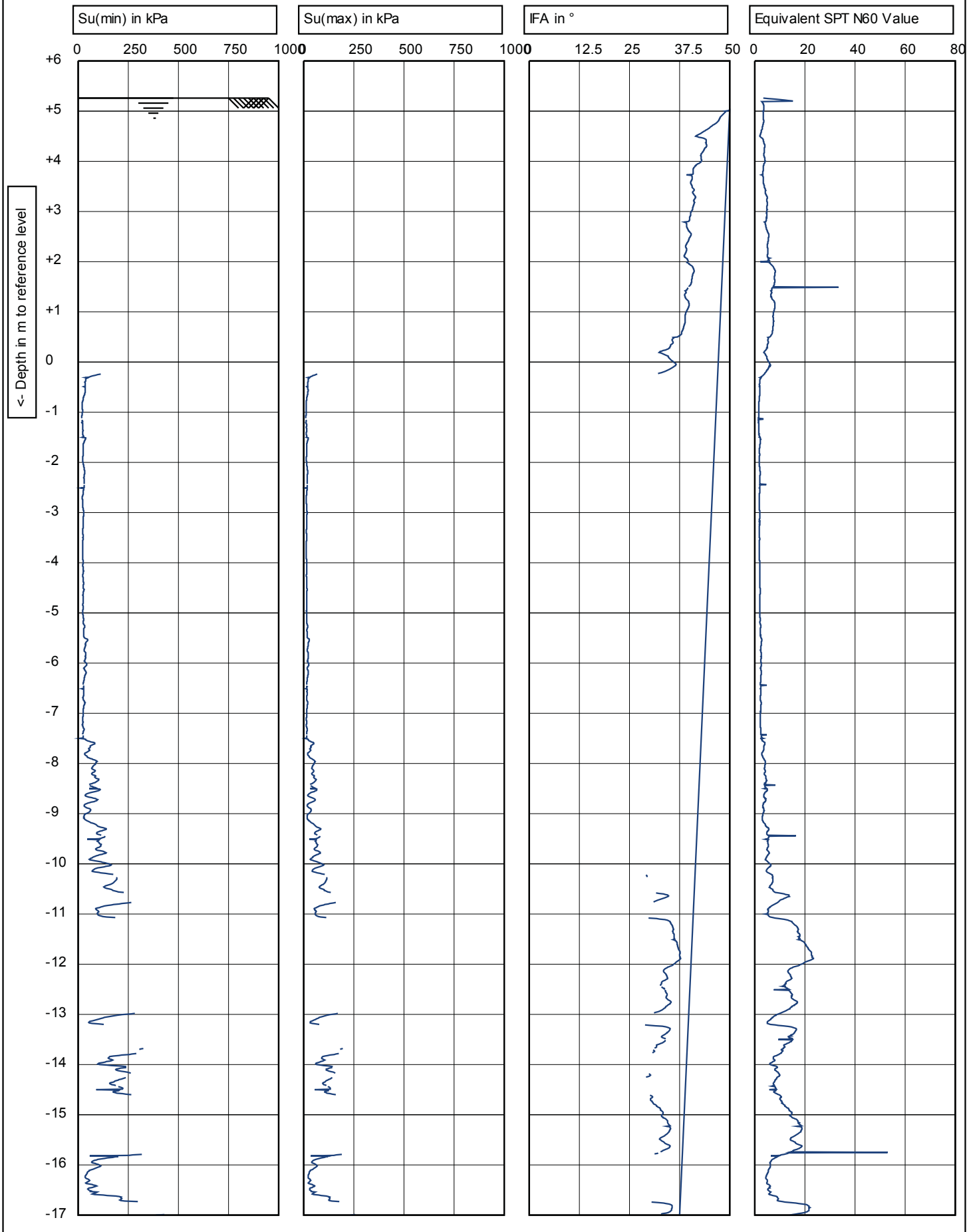
1.40

r u2
L 225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.264 NAP	W.L.: **0**	Date:	**4/16/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09131**
Location: **RampalT**		Project no.:	**Maitree Thermal**
Position: **454599, 498822 GCS**		CPT no.:	**04** **6/12**



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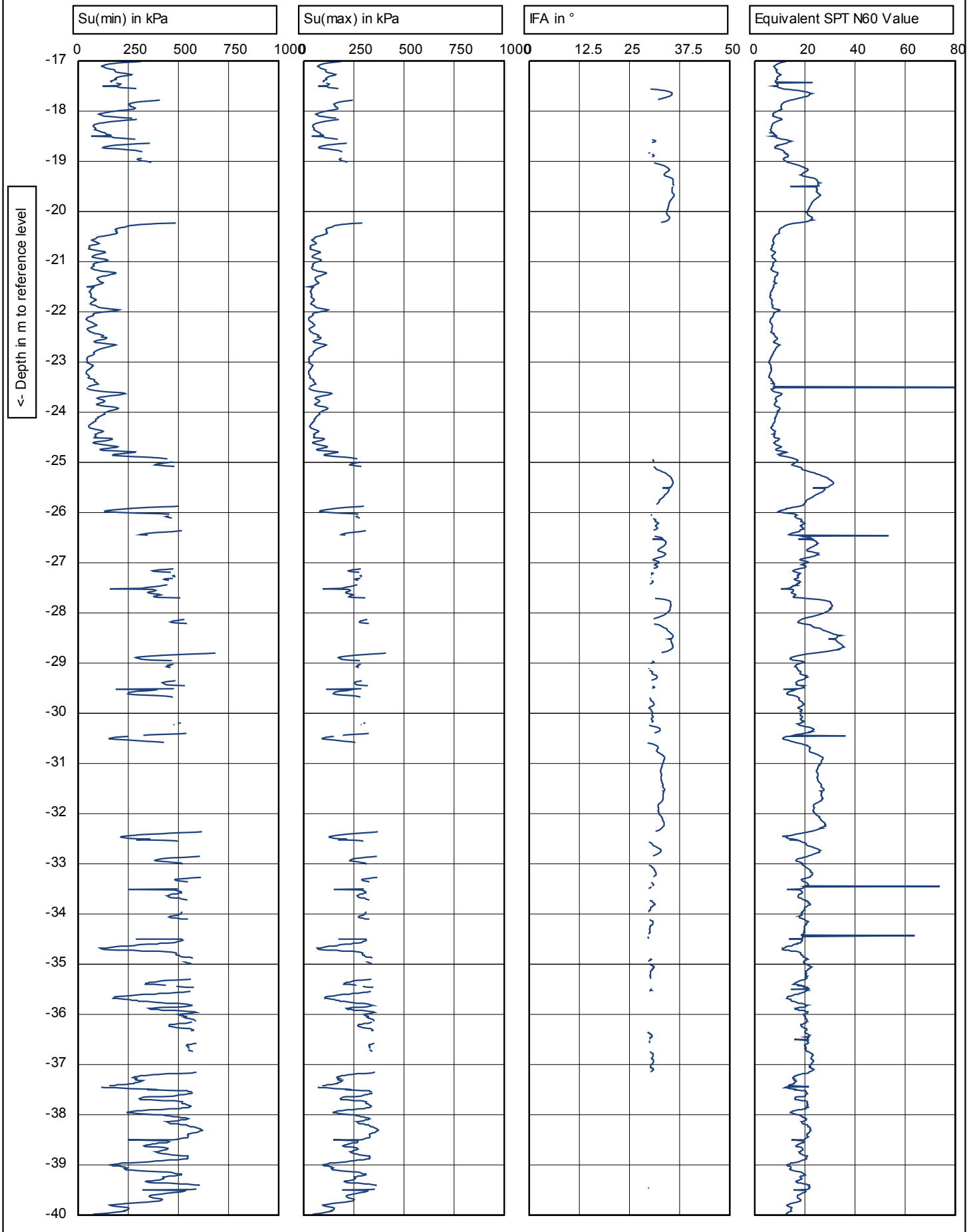
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1		Predrill : **0 m Predrilled**
	G.L. 5.264 NAP	W.L.: **0**	Date: **4/16/2016**
Project: **2x660MW Maitree STPP**			Cone no.: **S15CFIIP.S09131**
Location: **RampalT**			Project no.: **Maitree Thermal**
Position: **454599, 498822 GCS**			CPT no.: **04** **7/12**



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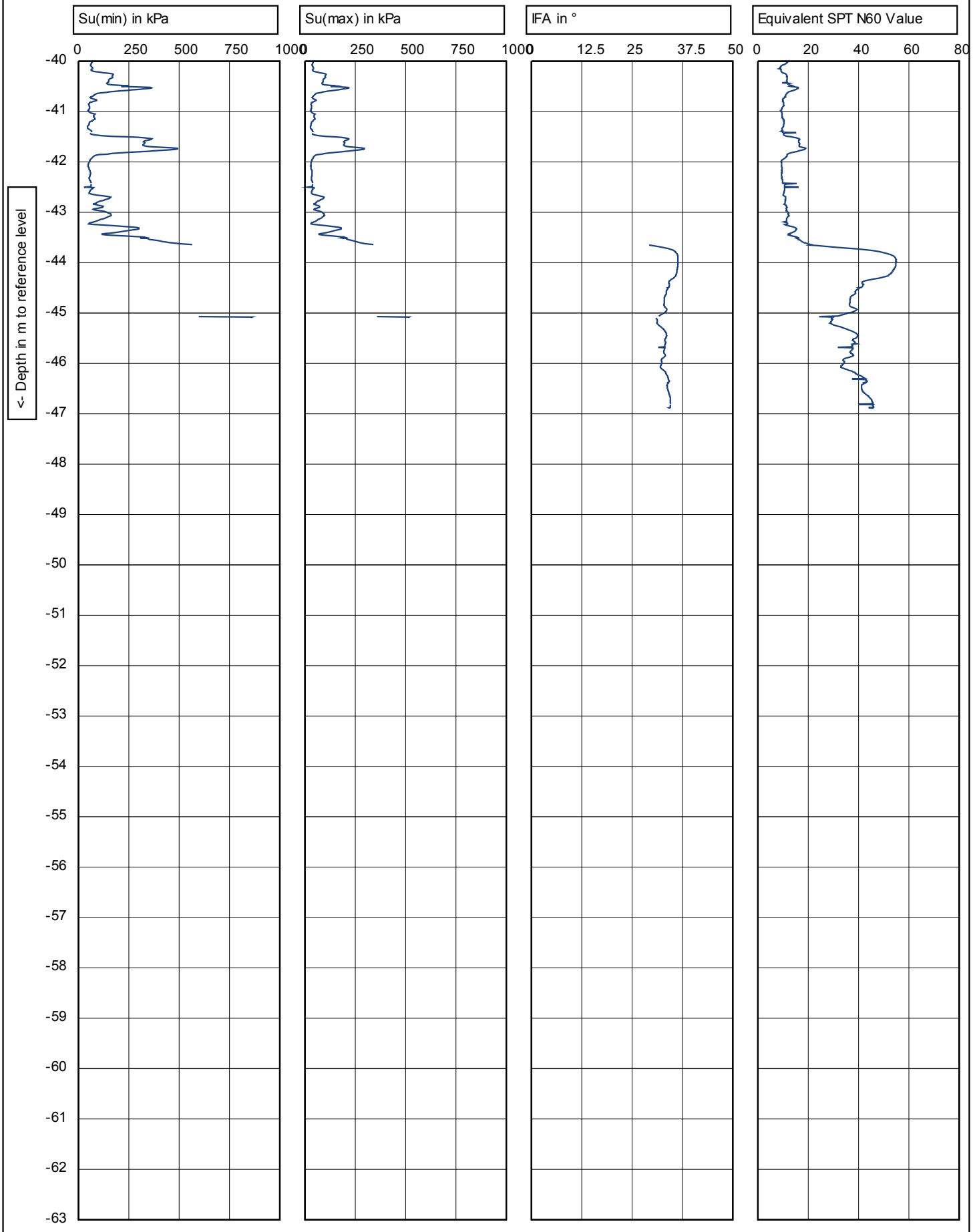
qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.264 NAP — W.L.: **0**	Date:	**4/16/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454599, 498822 GCS**	CPT no.:	**04** — **8/12**



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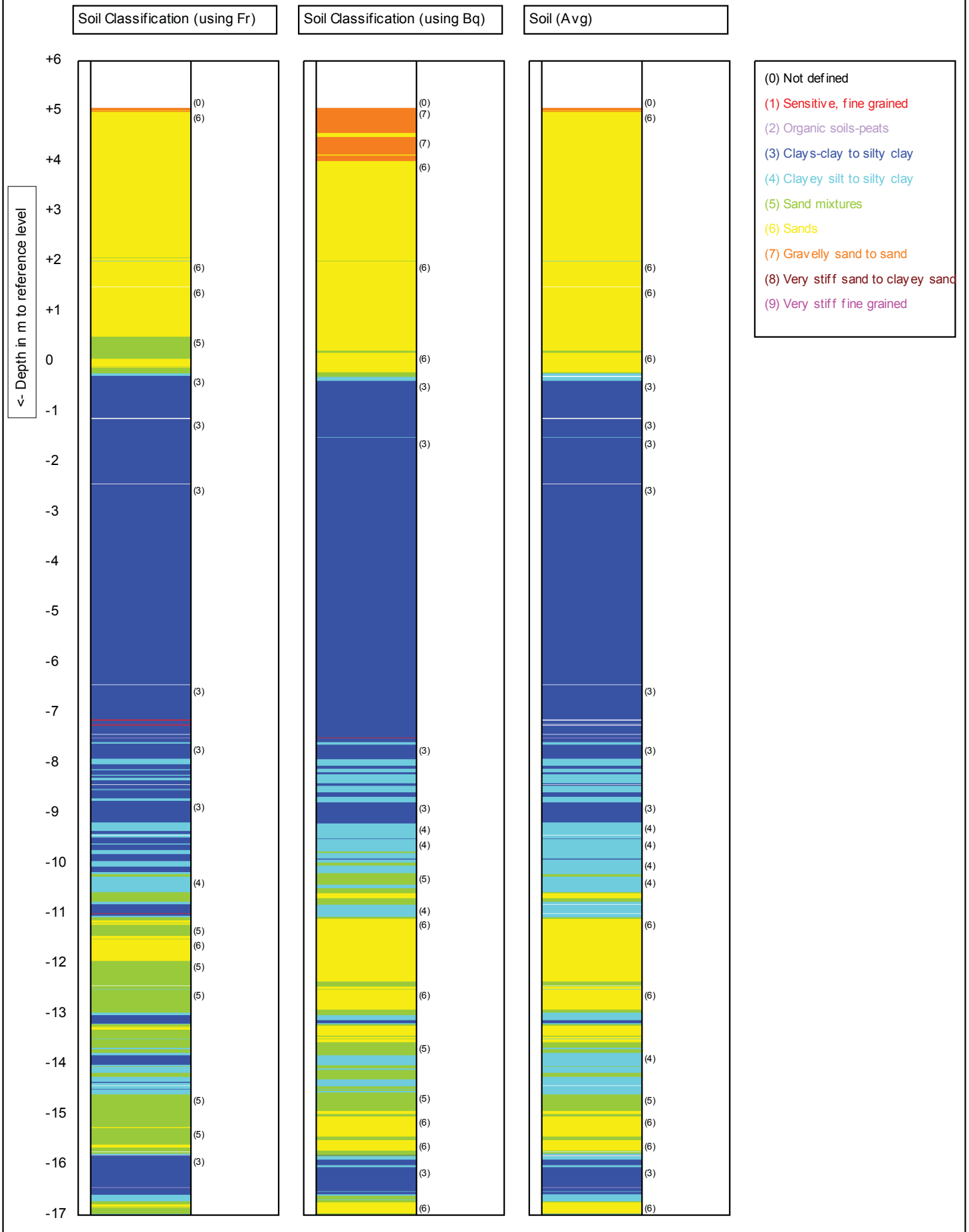
qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.264 NAP / W.L.: **0**	Date:	**4/16/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09131**
Location: **RampalT**		Project no.:	**Maitree Thermal**
Position: **454599, 498822 GCS**		CPT no.:	**04** **9/12**



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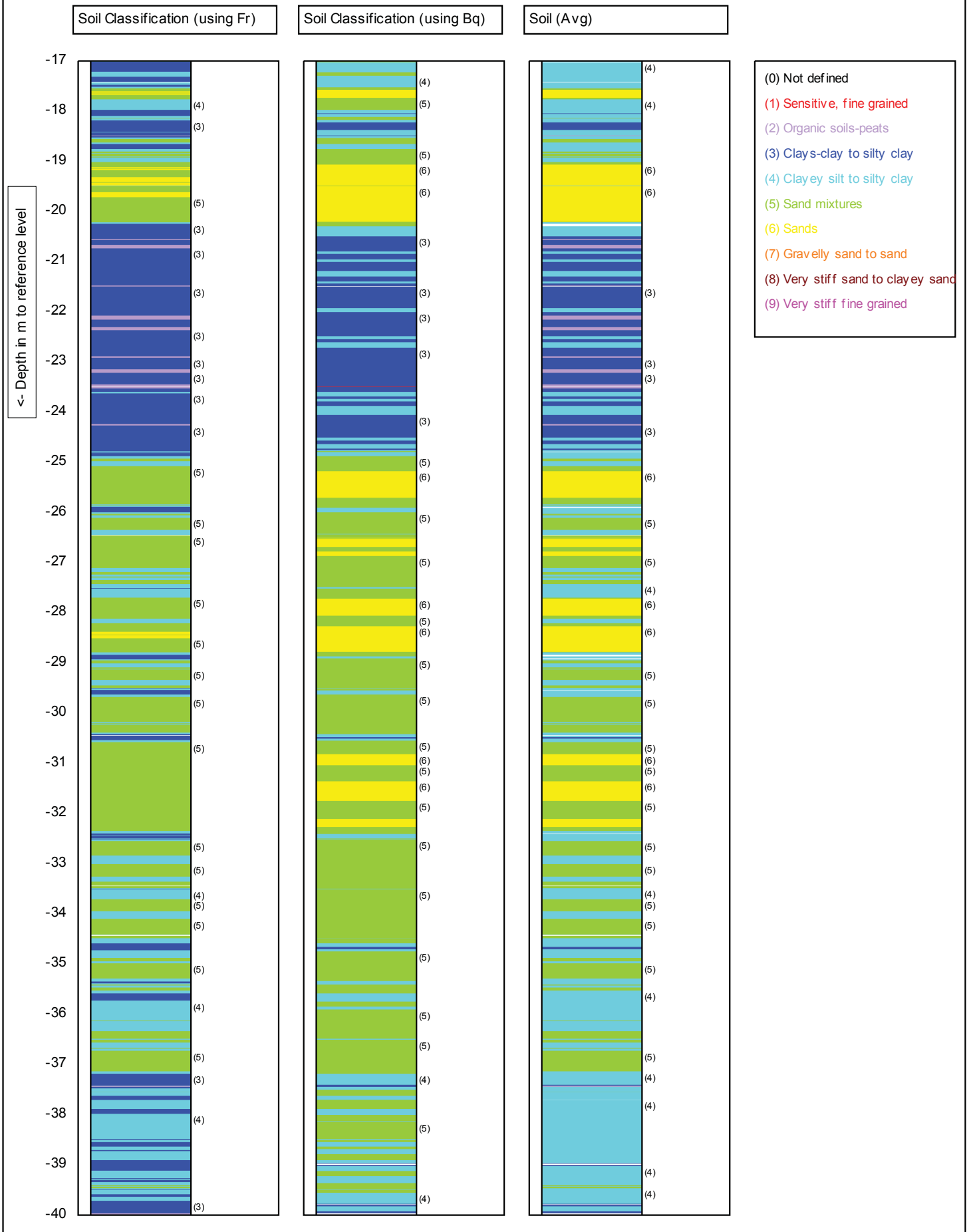
r u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.264 NAP / W.L.: **0**	Date:	**4/16/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454599, 498822 GCS**	CPT no.:	**04** / **10/12**



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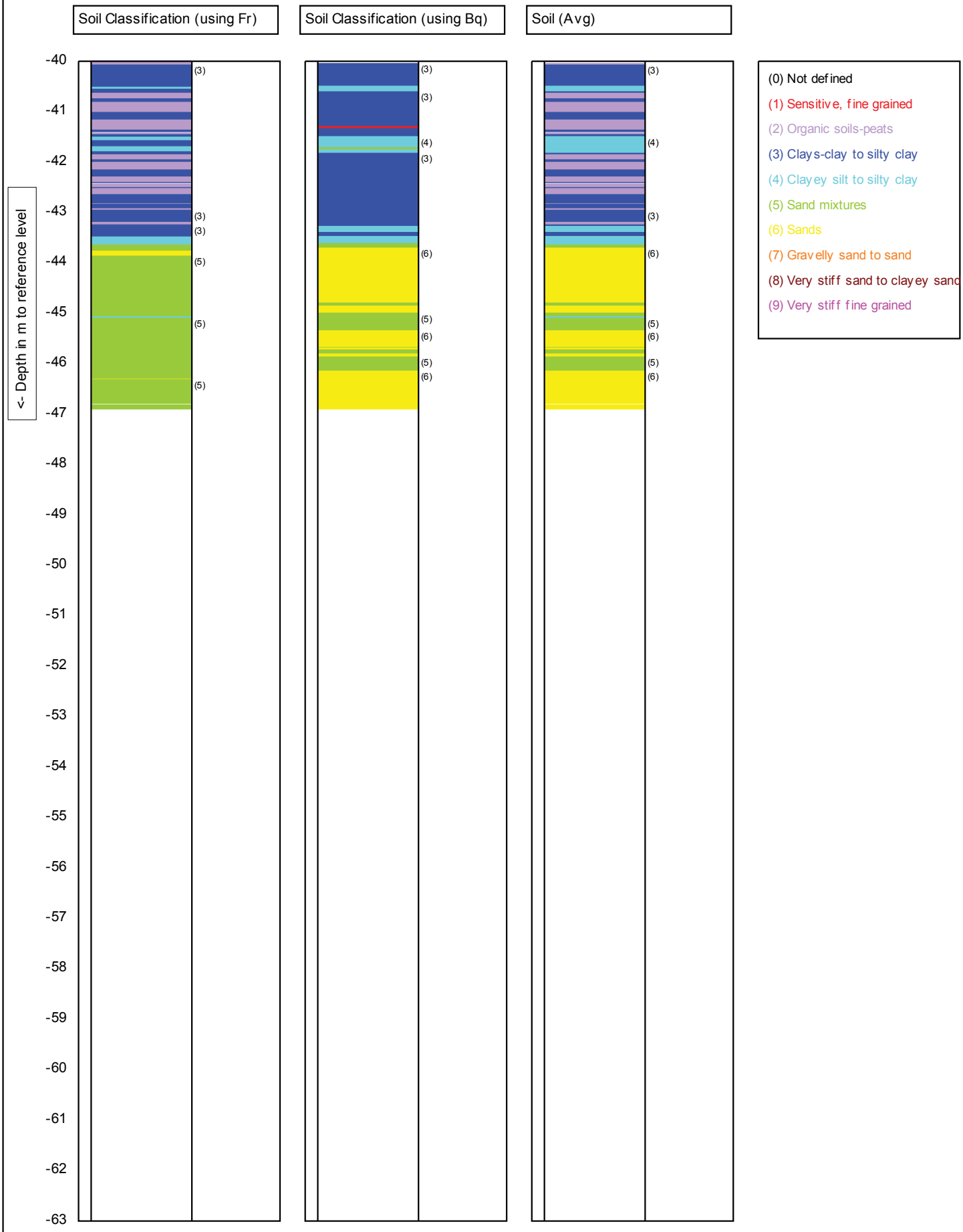
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.264 NAP / W.L.: 0	Date:	4/16/2016
Project:	2x660MW Maitree STPP	Cone no.:	S15CFIP.S09131
Location:	RampalT	Project no.:	Maitree Thermal
Position:	454599, 498822 GCS	CPT no.:	04 / 11/12



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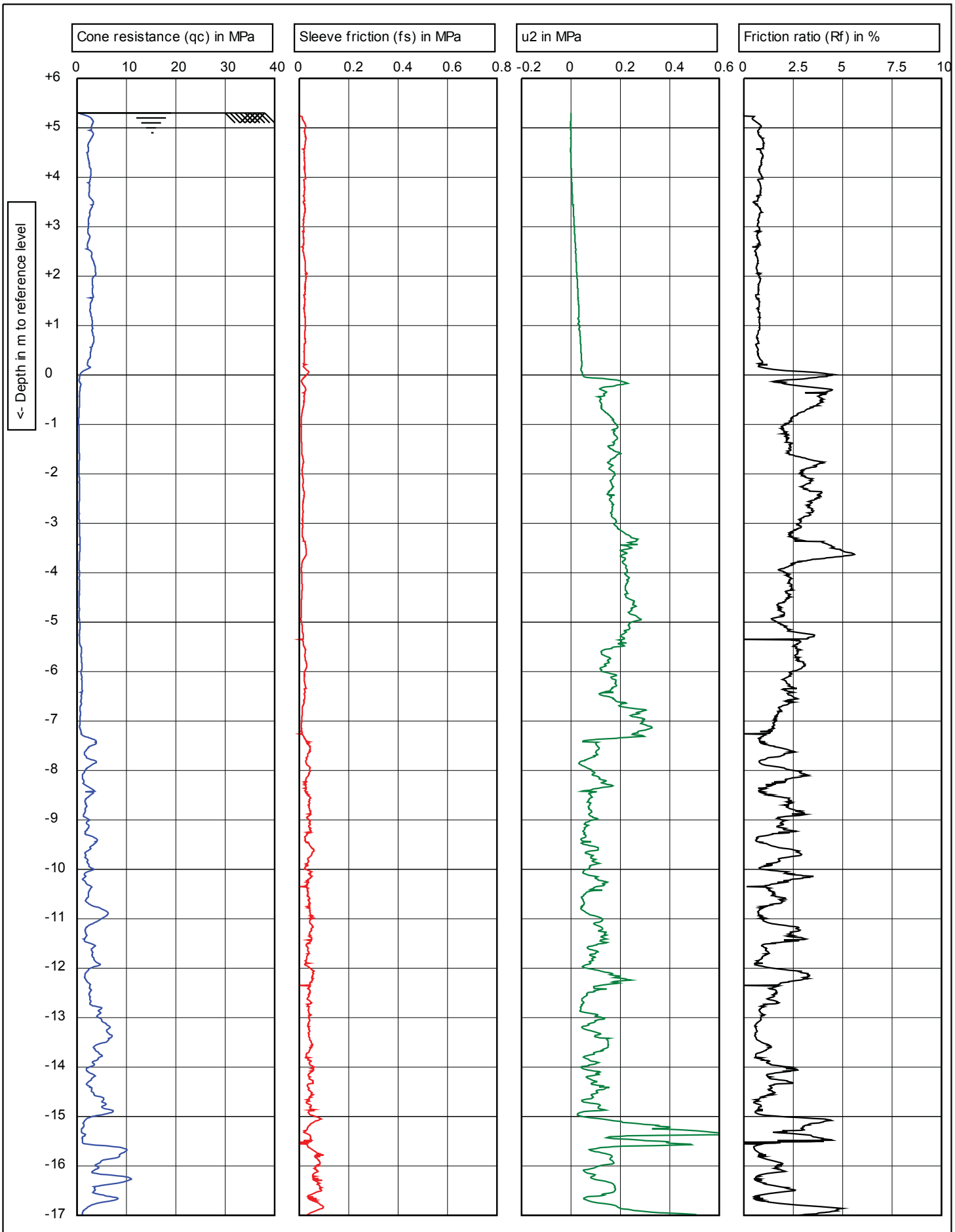
1.40

r u2 / L 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.264 NAP / W.L.: **0**	Date:	**4/16/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09131**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454599, 498822 GCS**	CPT no.:	**04** 12/12



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1.40

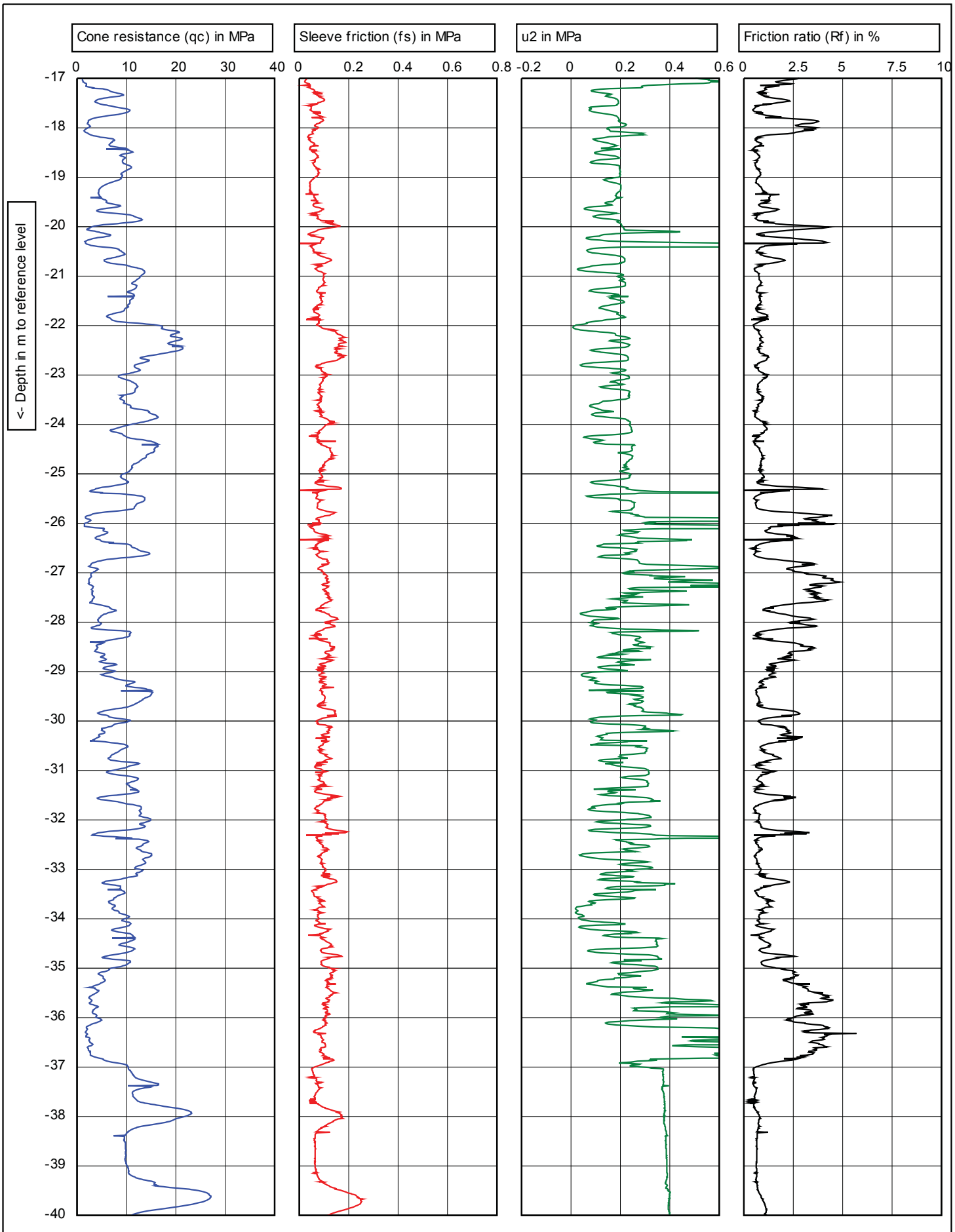
r u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.3 NAP | W.L.: 0

Project: **2x660 MW Maitree STPP**
Location: **RampalT**
Position: **454154, 499208 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/17/2016**
Cone no.:	**S15CFIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**05** 1/12



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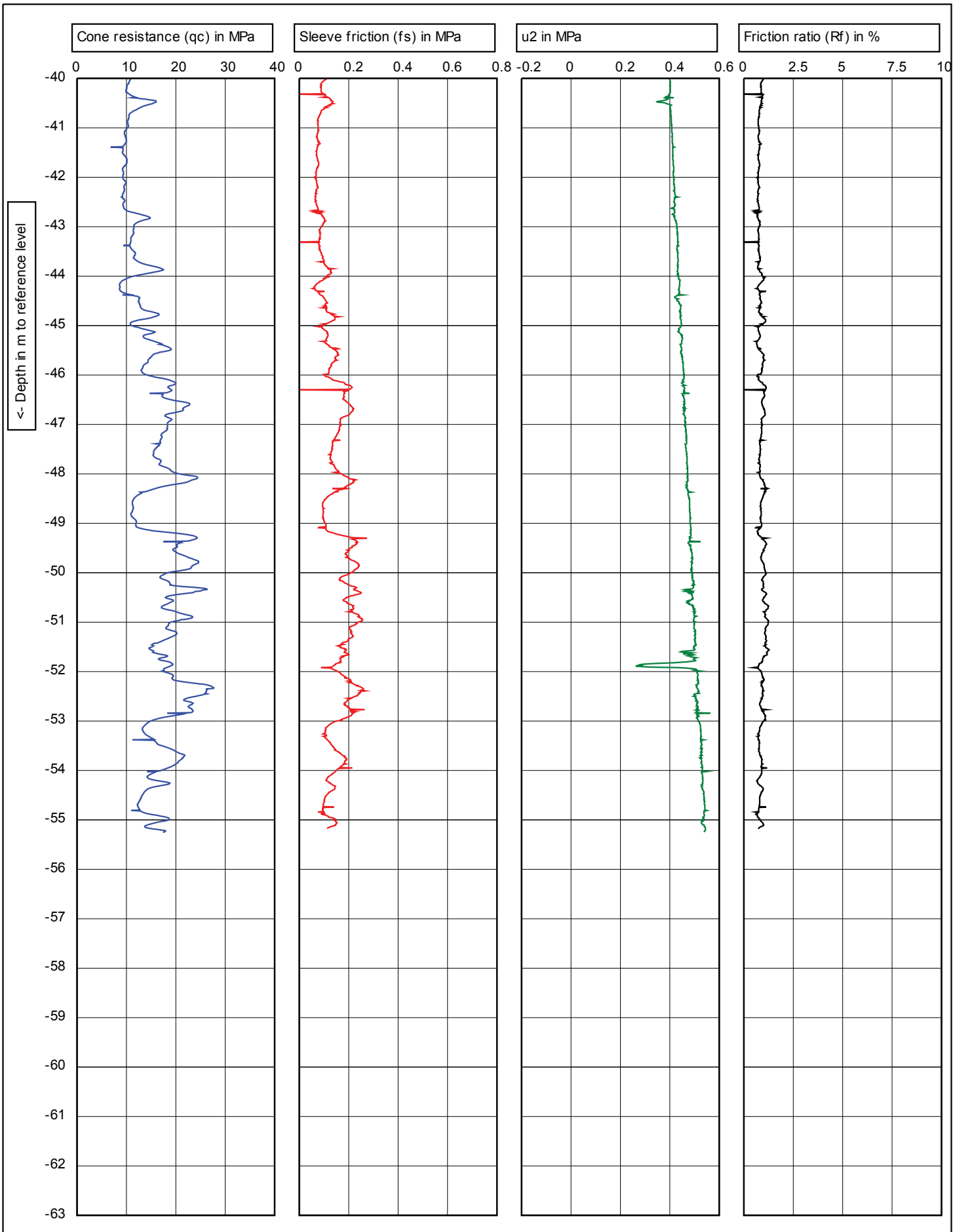
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

r u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.3 NAP	W.L.: **0**	Date:	**4/17/2016**
Project: **2x660 MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **RampalT**		Project no.:	**Maitree Thermal**
Position: **454154, 499208 GCS**		CPT no.:	**05** **2/12**



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1.40

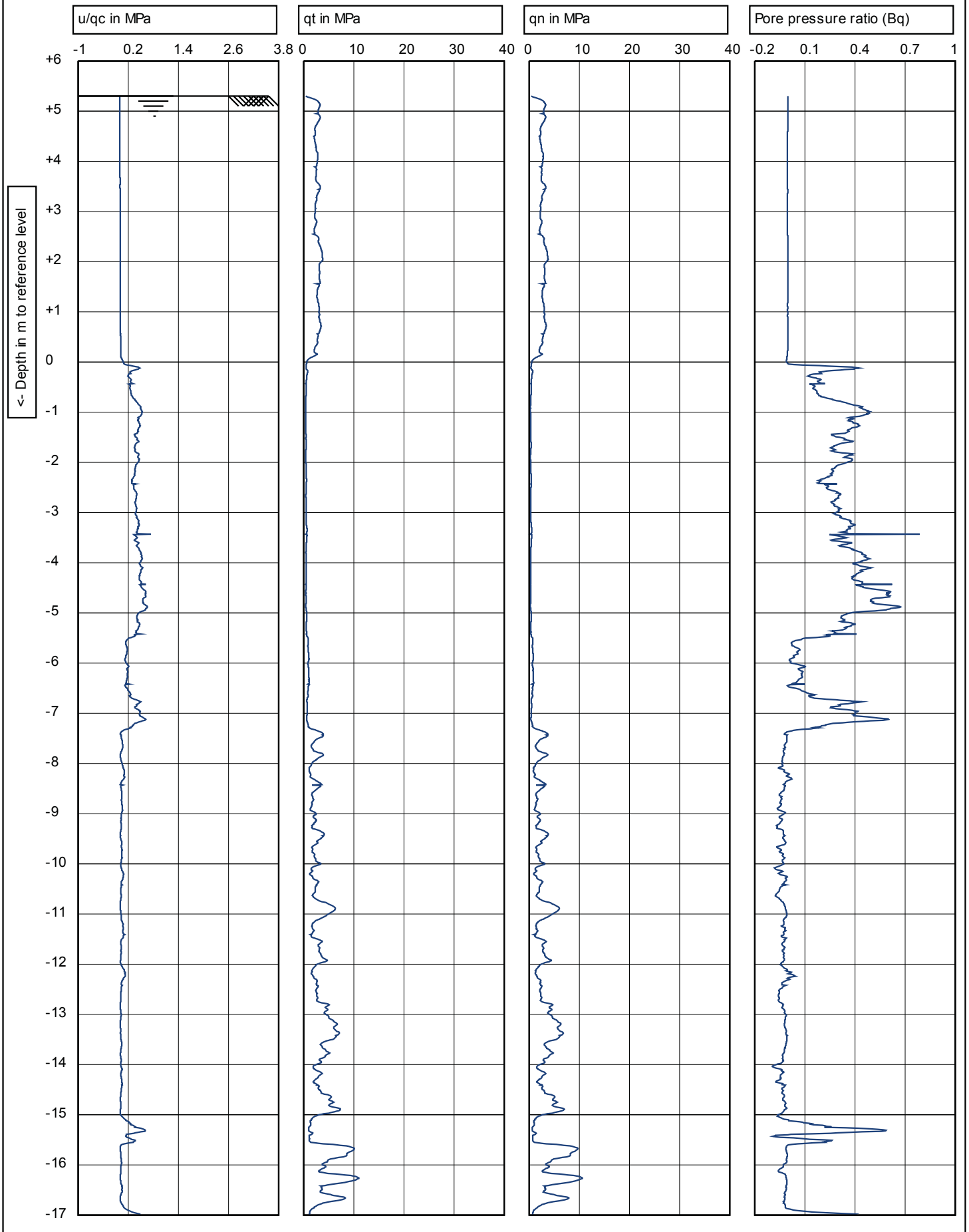
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.3 NAP | W.L.: **0**

Project: **2x660 MW Maitree STPP**
Location: **RampaIT**
Position: **454154, 499208 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/17/2016**
Cone no.:	**S15CFIIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**05** **3/12**



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1.40

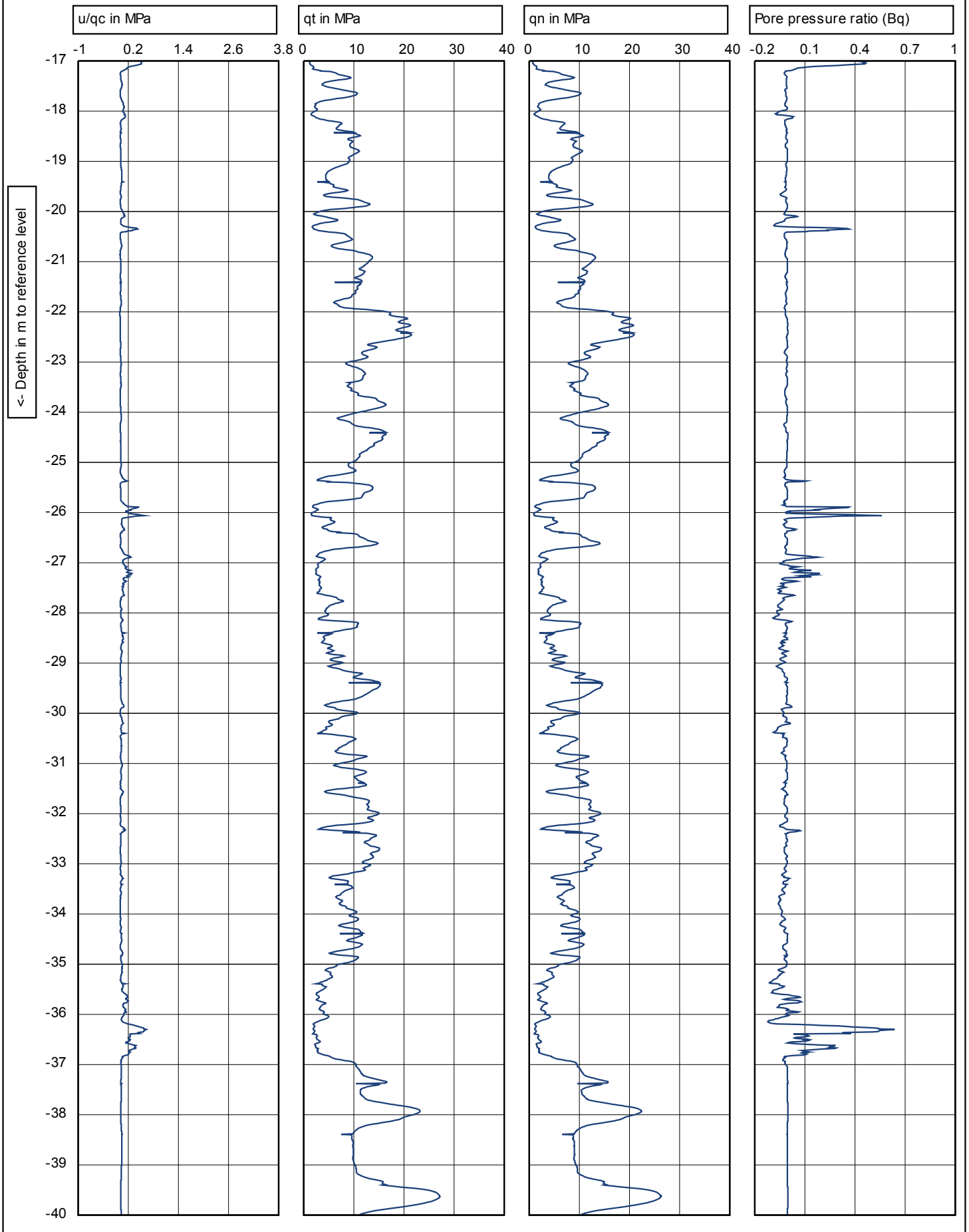
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.3 NAP | W.L.: **0**

Project: **2x660 MW Maitree STPP**
Location: **RampalT**
Position: **454154, 499208 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/17/2016**
Cone no.:	**S15CFIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**05** 4/12



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1.40

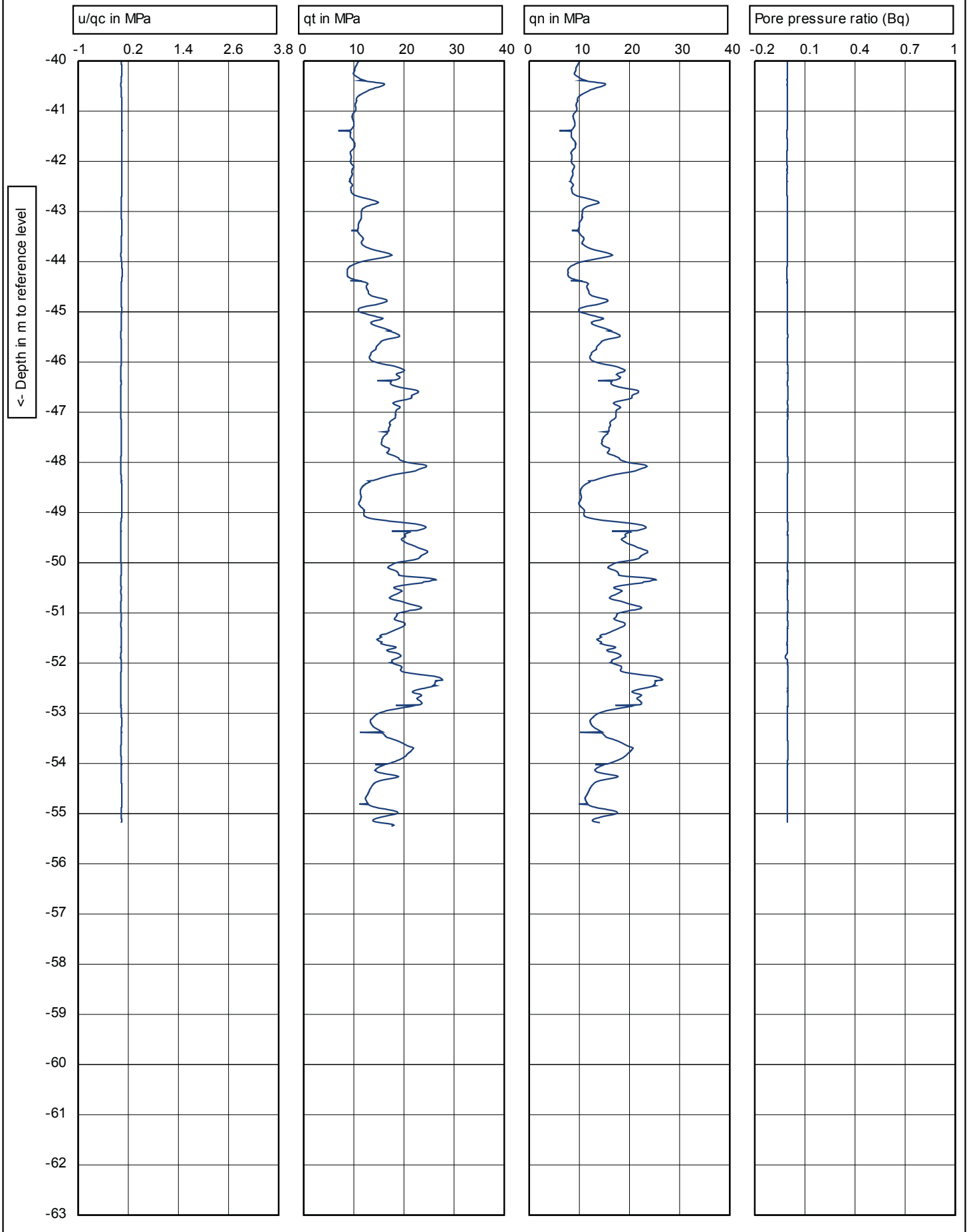
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.3 NAP | W.L.: **0**

Project: **2x660 MW Maitree STPP**
Location: **RampalT**
Position: **454154, 499208 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/17/2016**
Cone no.:	**S15CFIIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**05** **5/12**



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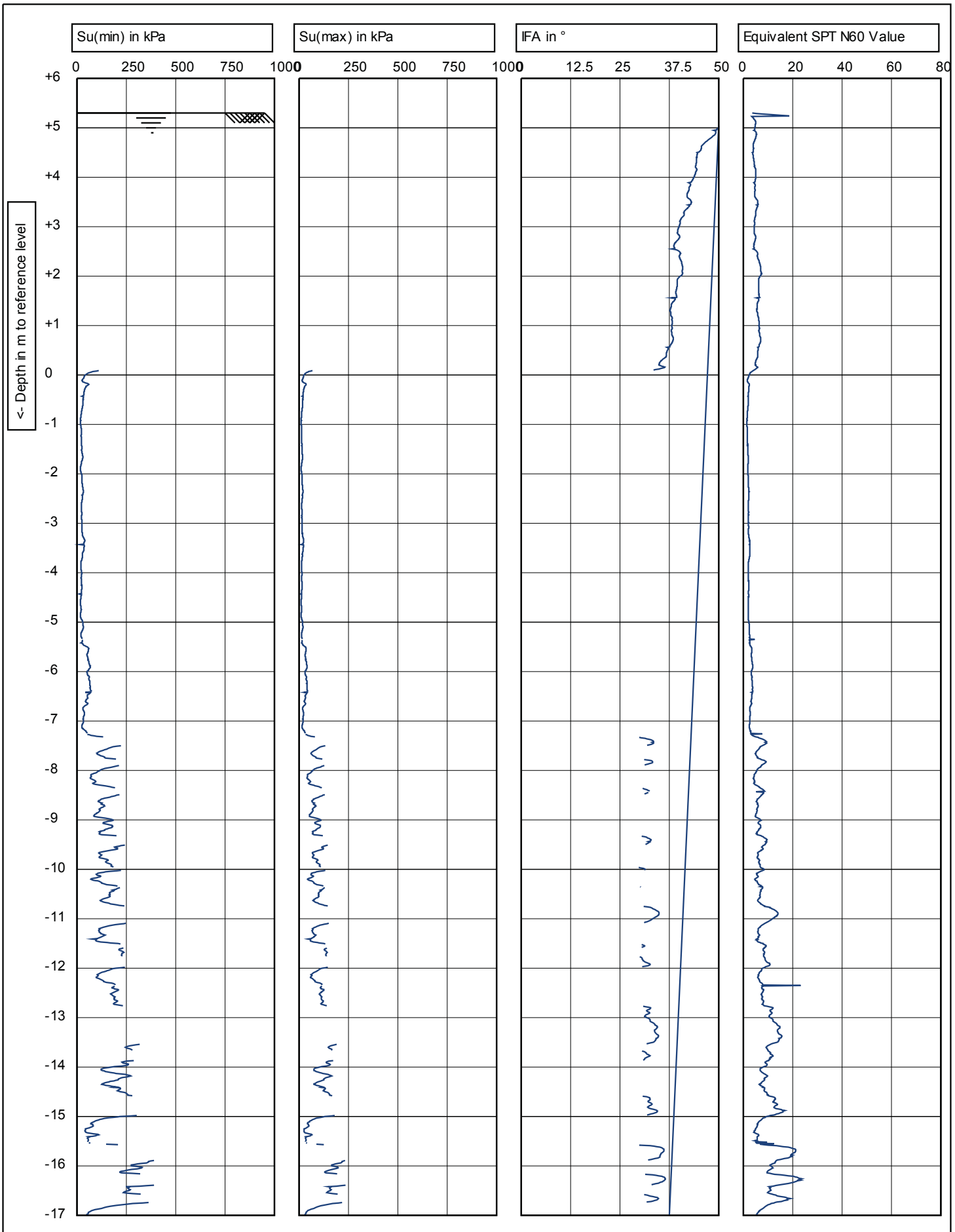
Web: http://www.dcl-fcl.com Email: dcl@dcl-fcl.com

1.40

r u2 / L 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP — W.L.: **0**	Date:	**4/17/2016**
Project: **2x660 MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **RampalT**		Project no.:	**Maitree Thermal**
Position: **454154, 499208 GCS**		CPT no.:	**05** — **6/12**



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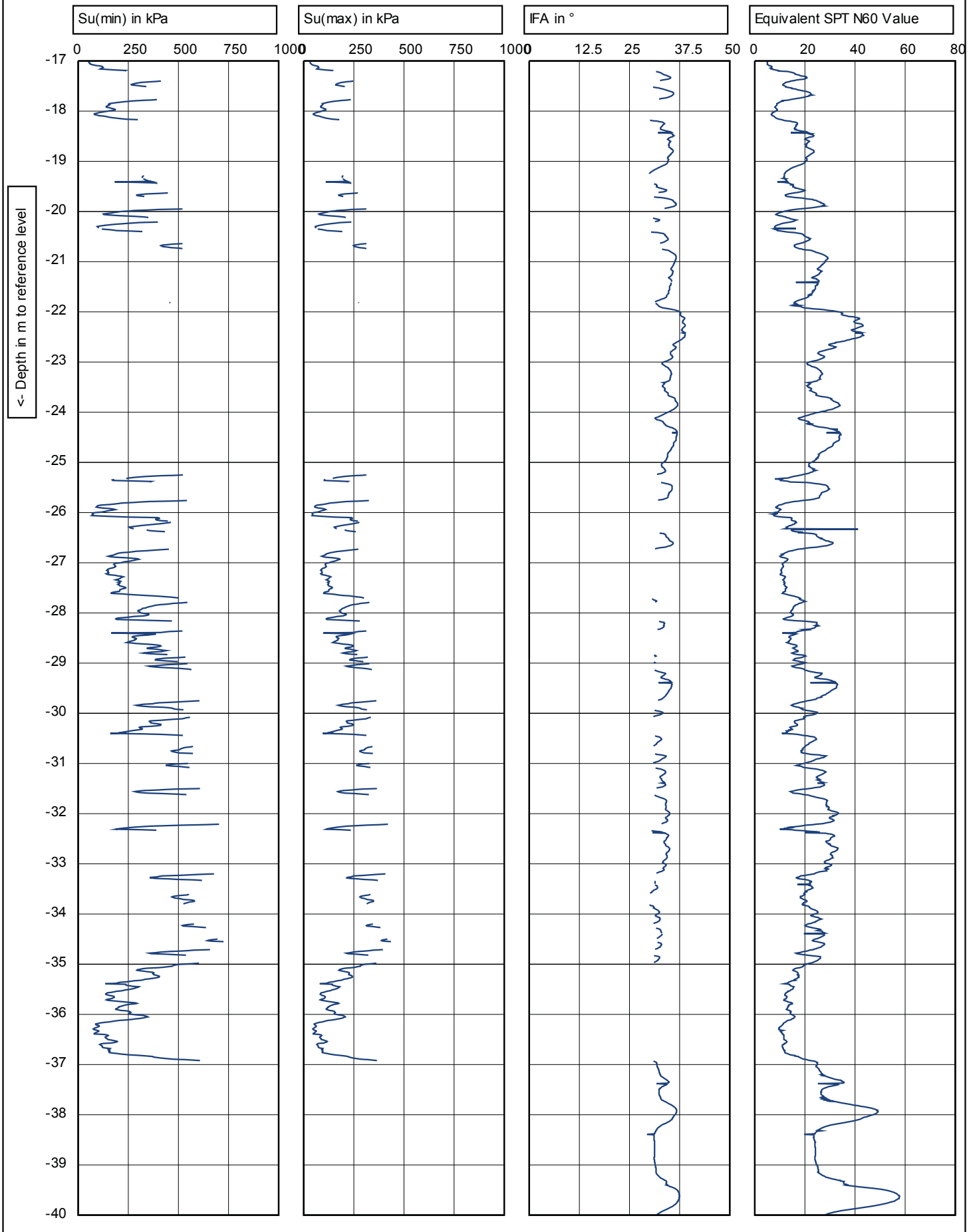
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP — W.L.: **0**	Date:	**4/17/2016**
Project:	**2x660 MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454154, 499208 GCS**	CPT no.:	**05** — **7/12**



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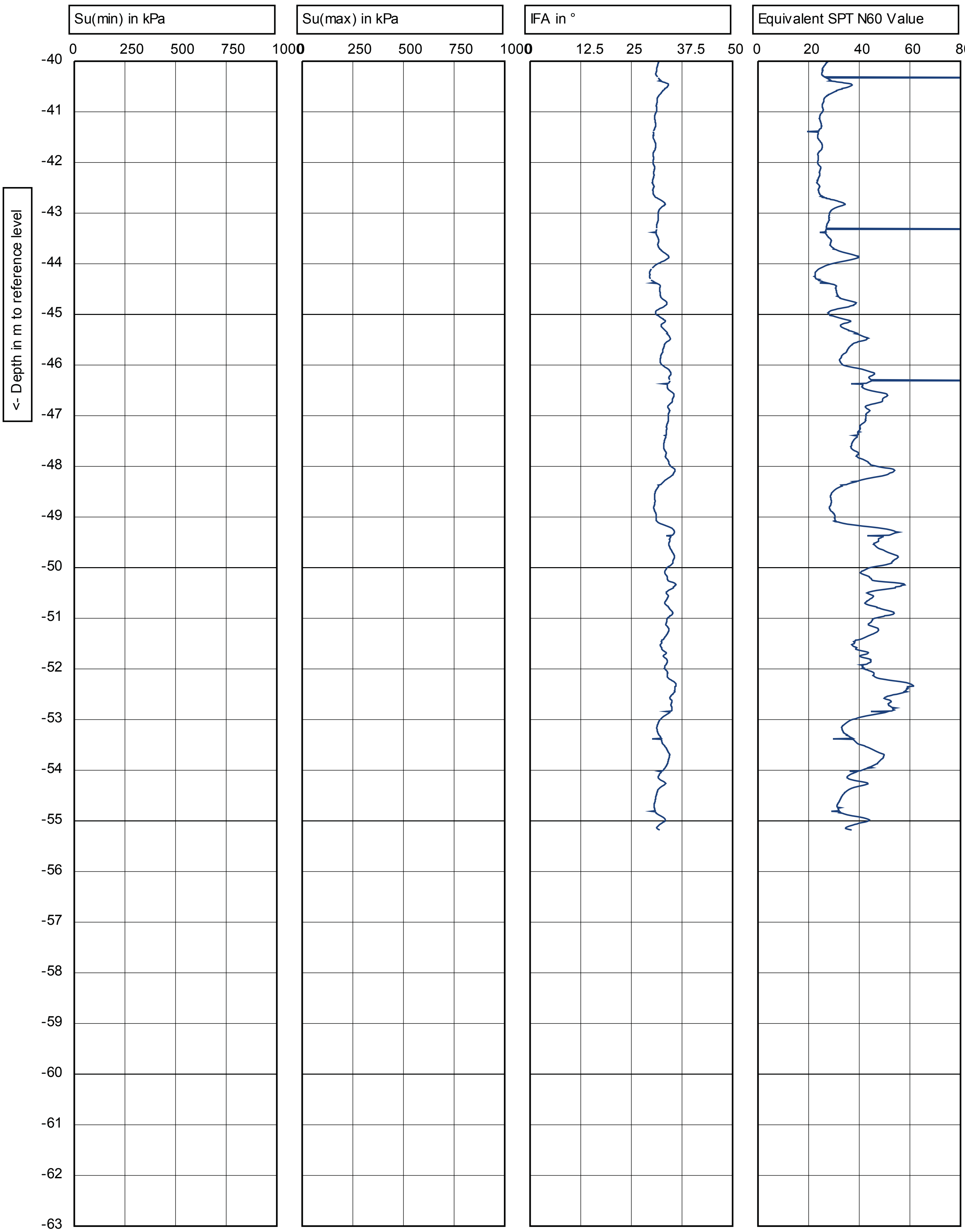
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP / W.L.: **0**	Date:	**4/17/2016**
Project:	**2x660 MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**RampalT**	Project no.:	**Maitree Thermal**
Position:	**454154, 499208 GCS**	CPT no.:	**05** 8/12



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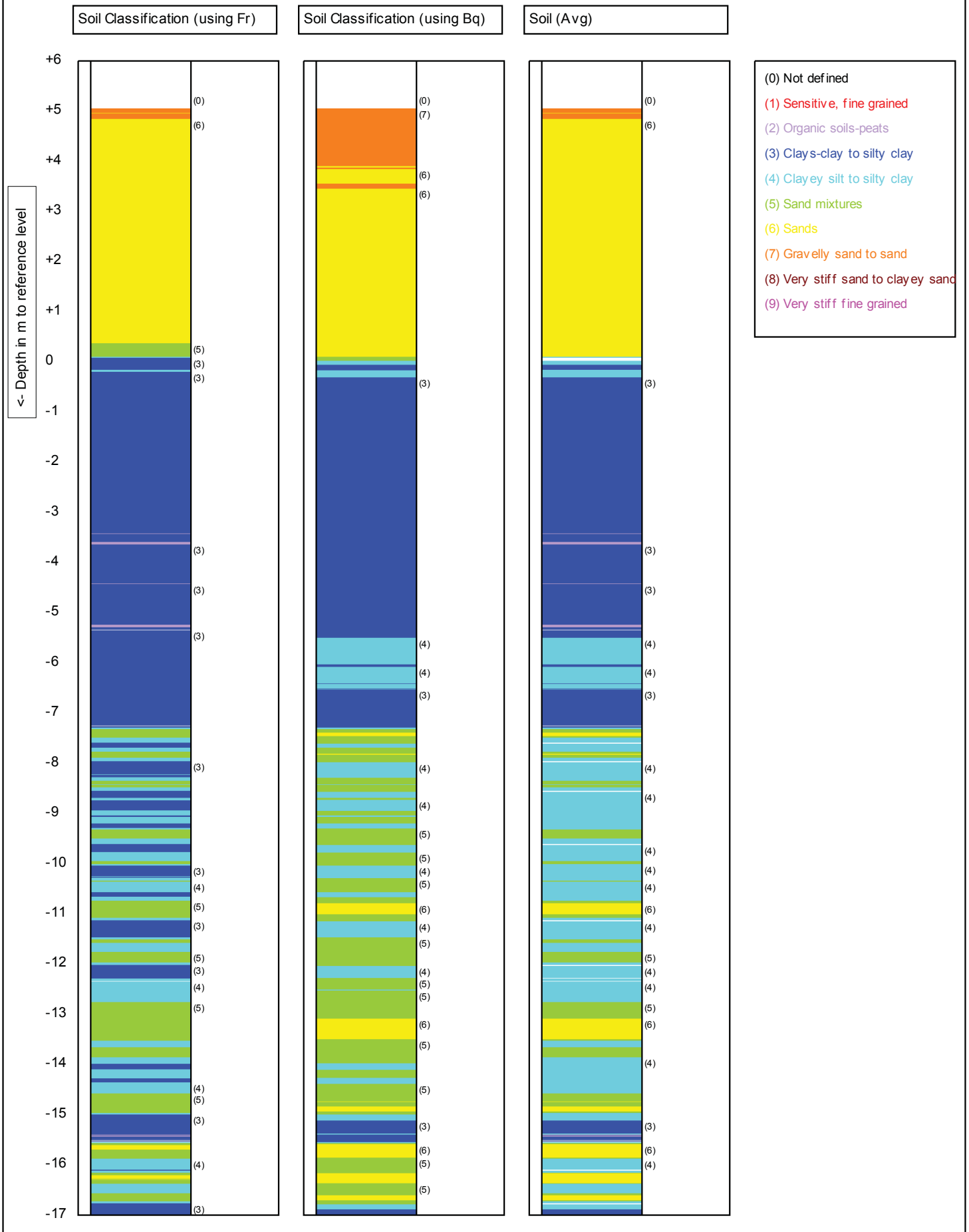
1.40

u2 225 cm² 15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.3 NAP	W.L.: **0**	Date:	**4/17/2016**
Project: **2x660 MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **RampalT**		Project no.:	**Maitree Thermal**
Position: **454154, 499208 GCS**		CPT no.:	**05** **9/12**



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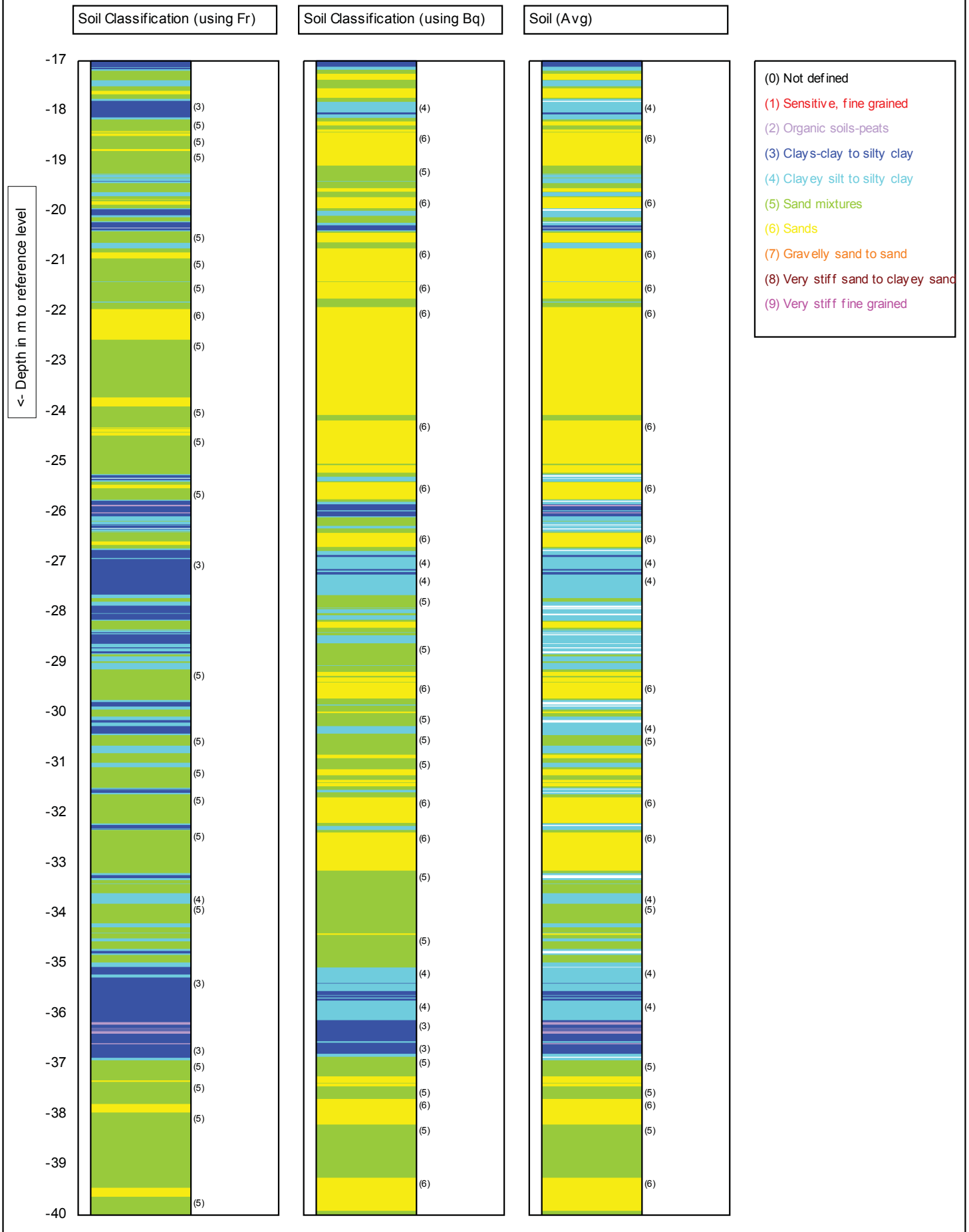
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.3 NAP / W.L.: 0	Date:	4/17/2016
Project:	2x660 MW Maitree STPP	Cone no.:	S15CFIIP.S09132
Location:	RampalT	Project no.:	Maitree Thermal
Position:	454154, 499208 GCS	CPT no.:	05 10/12



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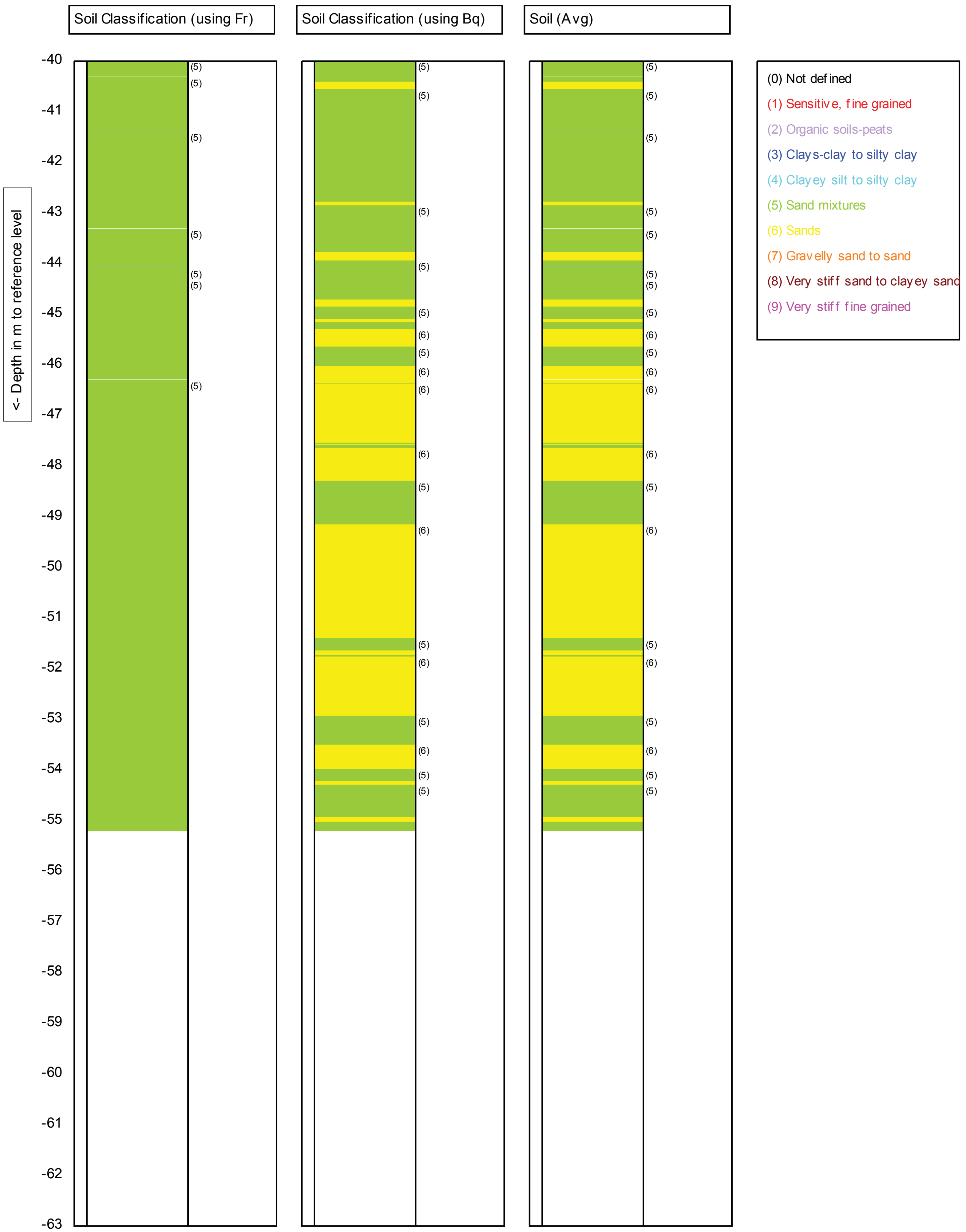
1.40

qc 225 cm² / fs 15 cm² / u2	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.3 NAP / W.L.: 0	Date:	4/17/2016
Project:	2x660 MW Maitree STPP	Cone no.:	S15CFIP.S09132
Location:	RampalT	Project no.:	Maitree Thermal
Position:	454154, 499208 GCS	CPT no.:	05 / 11/12



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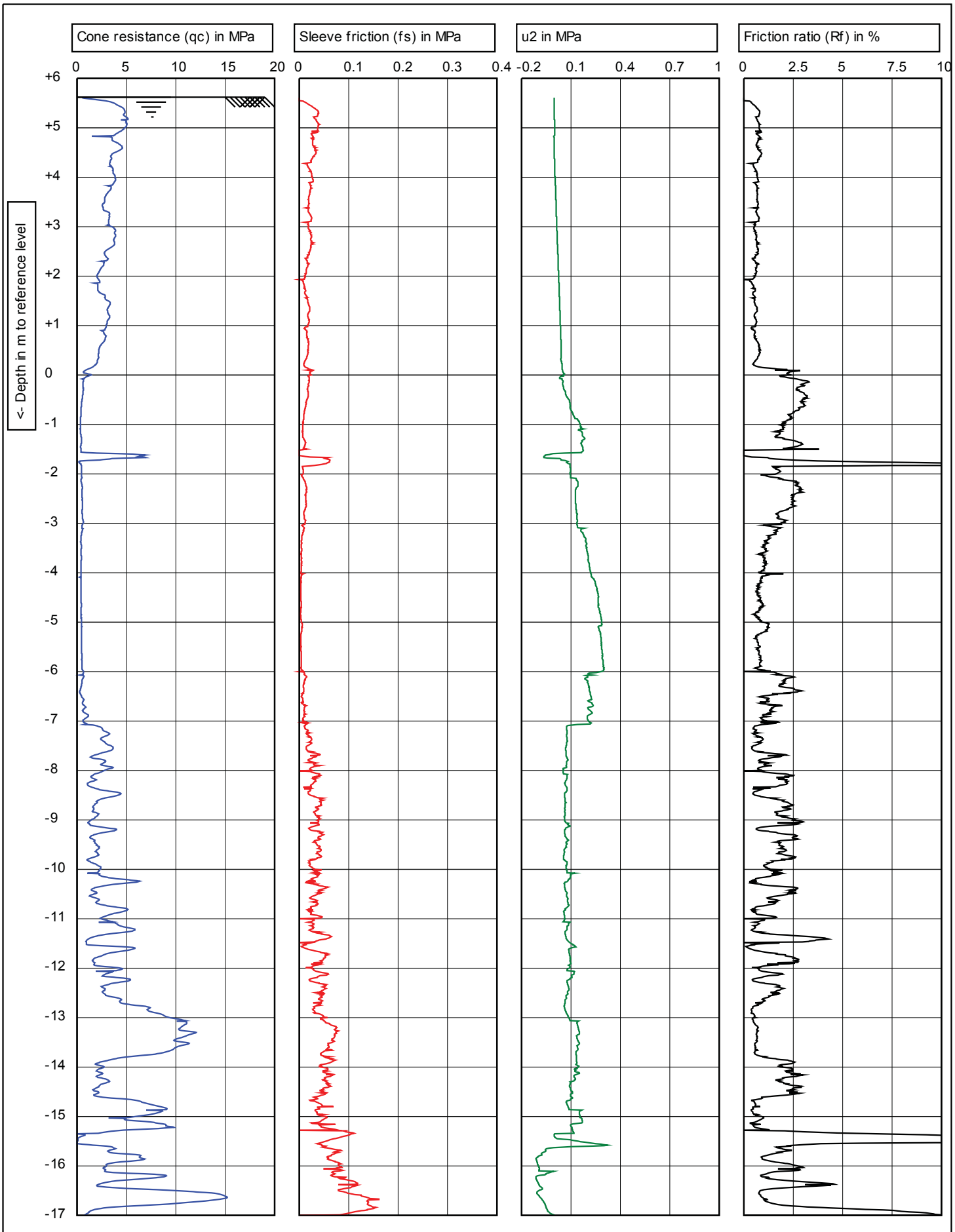
u2, 225 cm², 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.3 NAP / W.L.: **0**	Date:	**4/17/2016**
	Project: **2x660 MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
	Location: **RampalT**	Project no.:	**Maitree Thermal**
	Position: **454154, 499208 GCS**	CPT no.:	**05** 12/12

1.40



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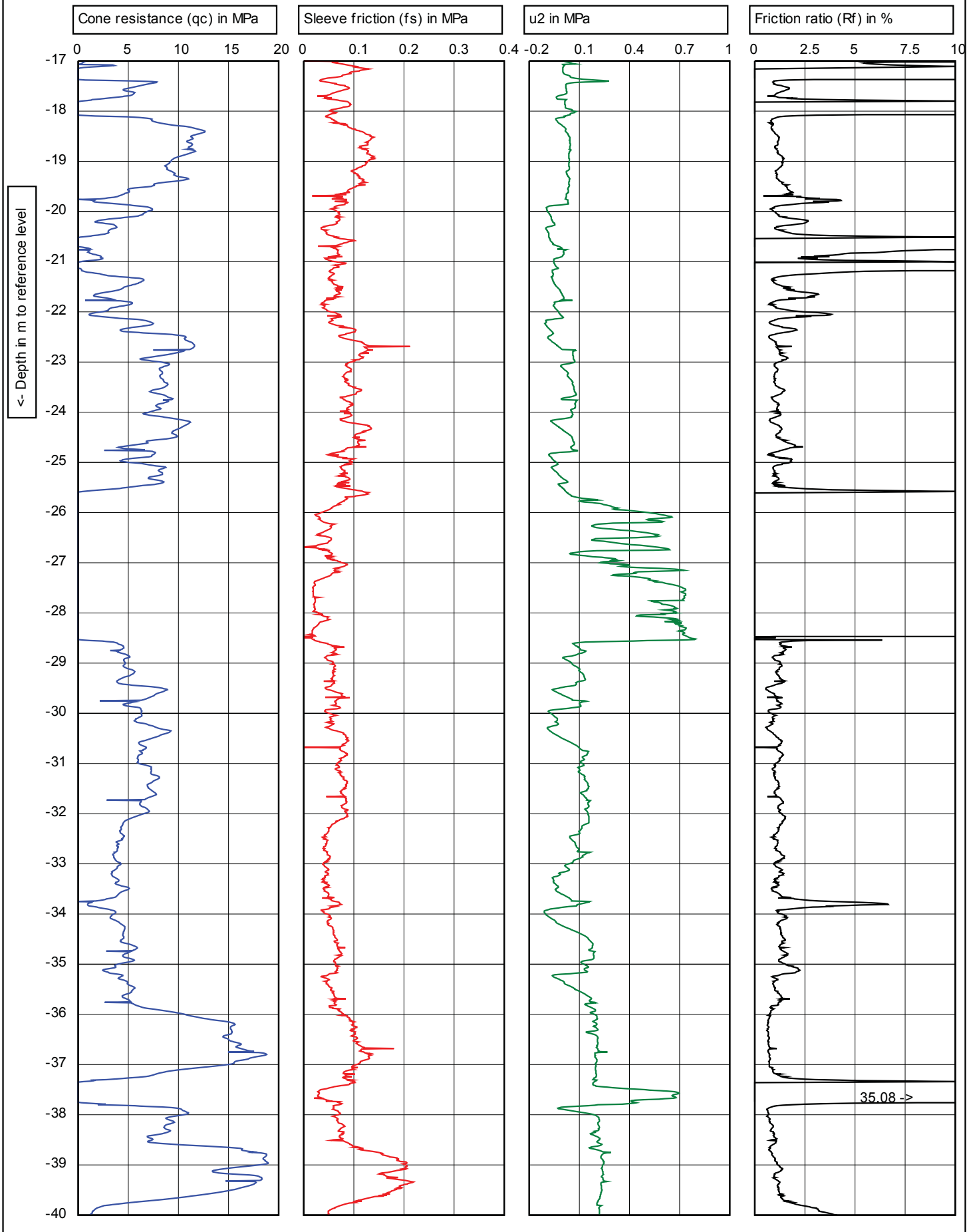
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.618 NAP	W.L.: **0**	Date:	**4/19/2016**
Project: **2X660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454154, 498948 GCS**		CPT no.:	**06** 1/12



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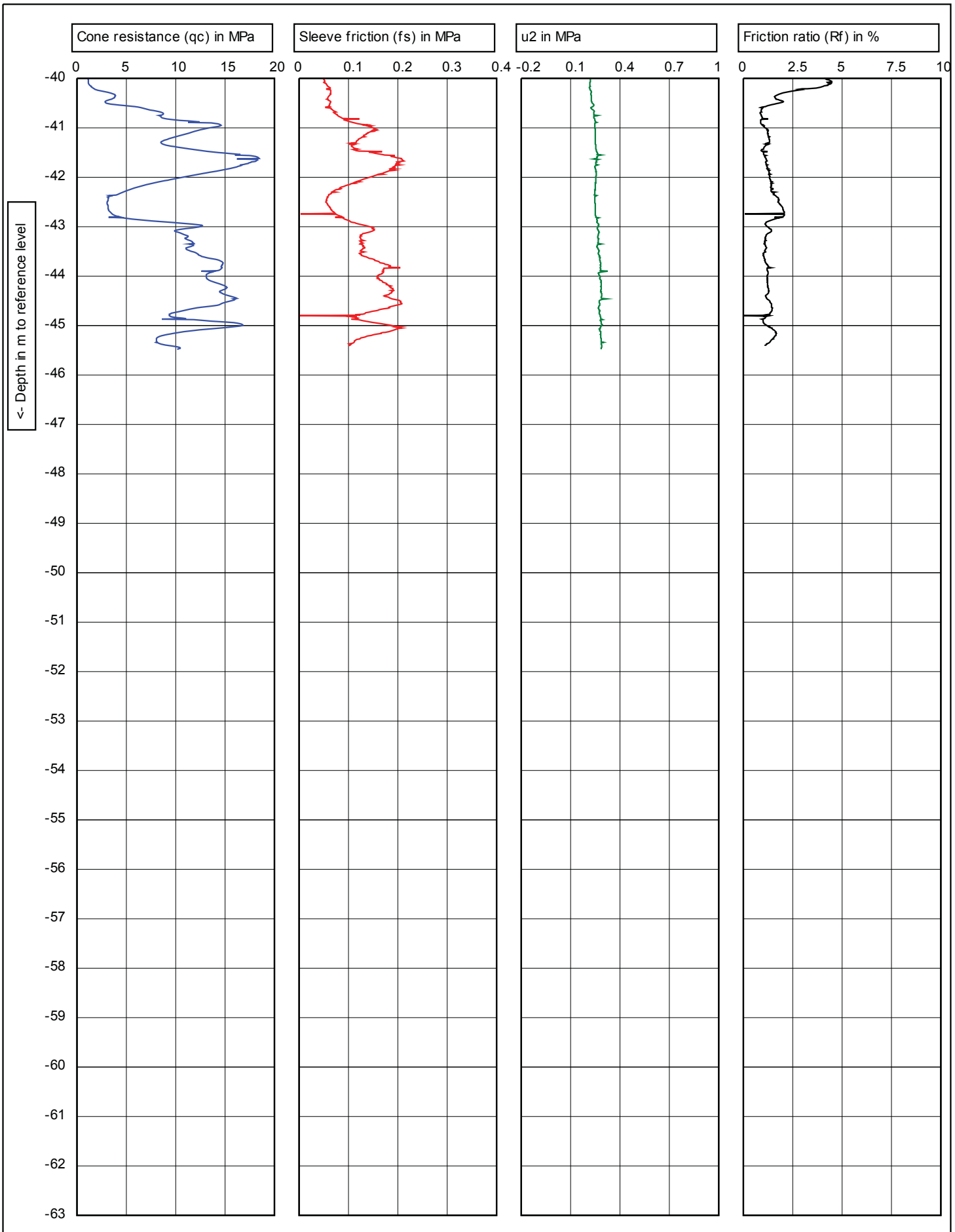
Test according NEN 5140 class 1

G.L. 5.618 NAP | W.L.: **0**

Project: **2X660MW Maitree STPP**
Location: **Rampal**
Position: **454154, 498948 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/19/2016**
Cone no.:	**S15CFIIP.S09131**
Project no.:	**Maitree Thermal**
CPT no.:	**06** 2/12



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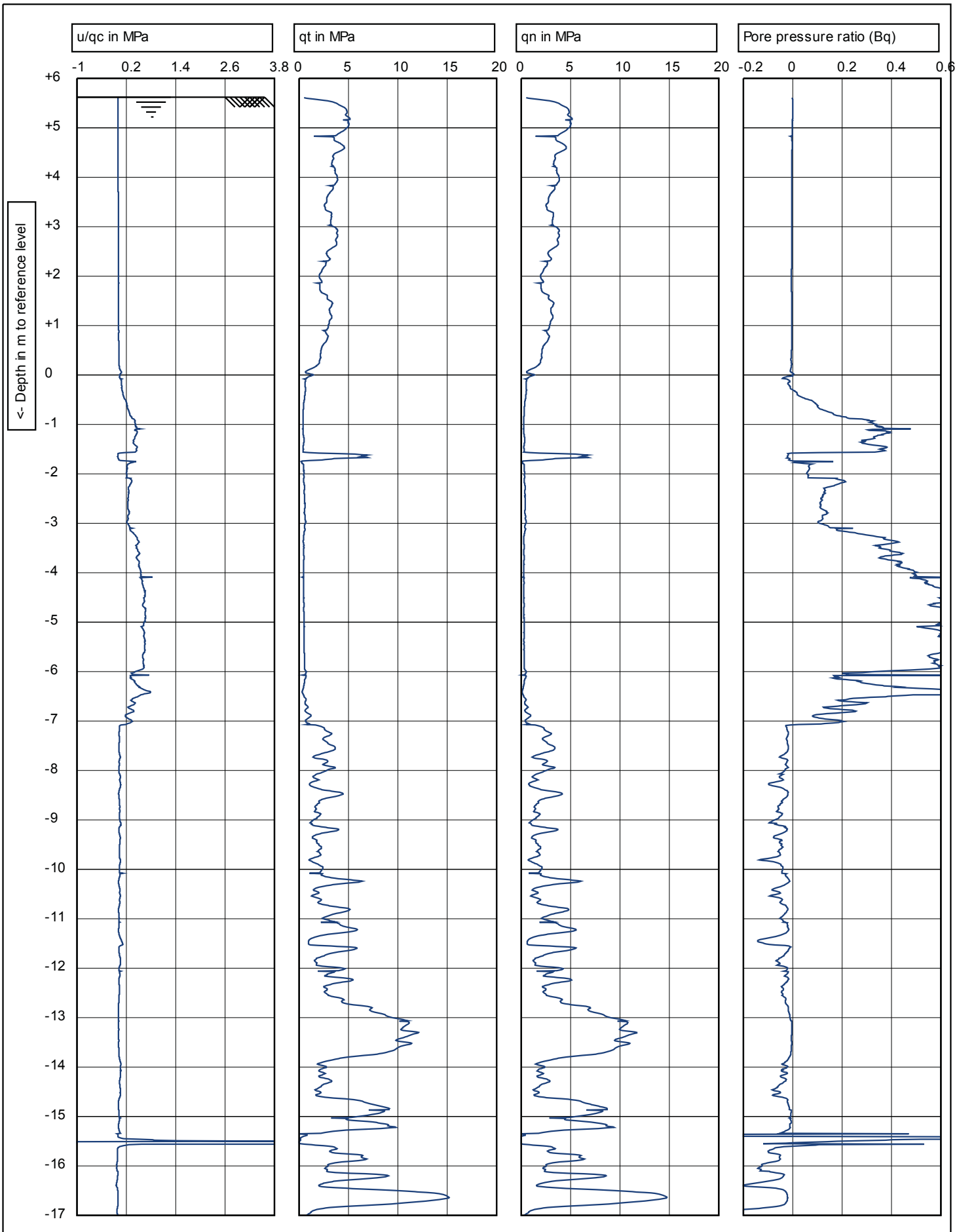
1.40

u2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.618 NAP — W.L.: **0**	Date:	**4/19/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454154, 498948 GCS**	CPT no.:	**06** — **3/12**



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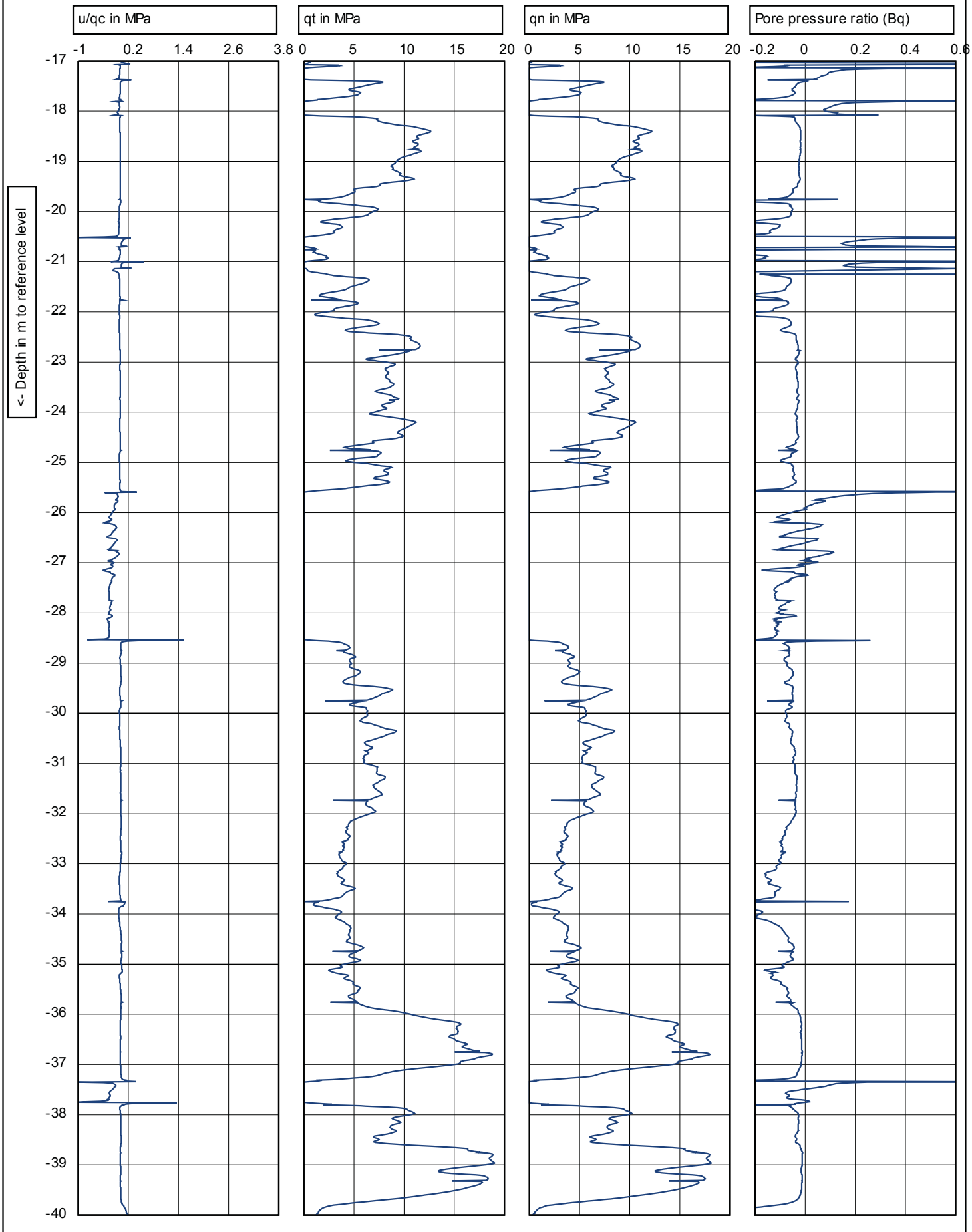
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.618 NAP	W.L.: **0**	Date:	**4/19/2016**
Project: **2X660MW Maitree STPP**		Cone no.:	**S15CFIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454154, 498948 GCS**		CPT no.:	**06** 4/12



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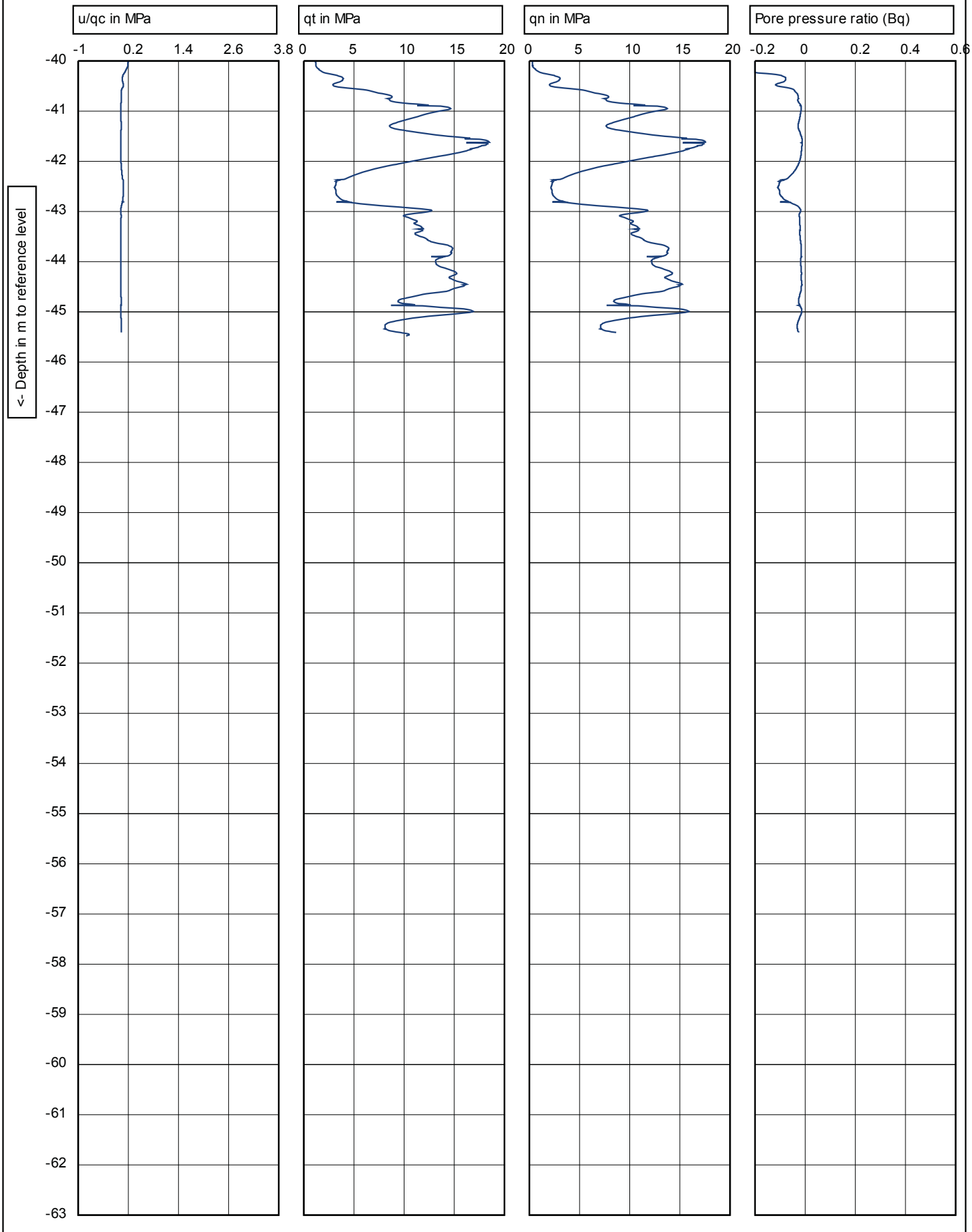
1.40

u2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.618 NAP — W.L.: **0**	Date:	**4/19/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454154, 498948 GCS**	CPT no.:	**06** — **5/12**



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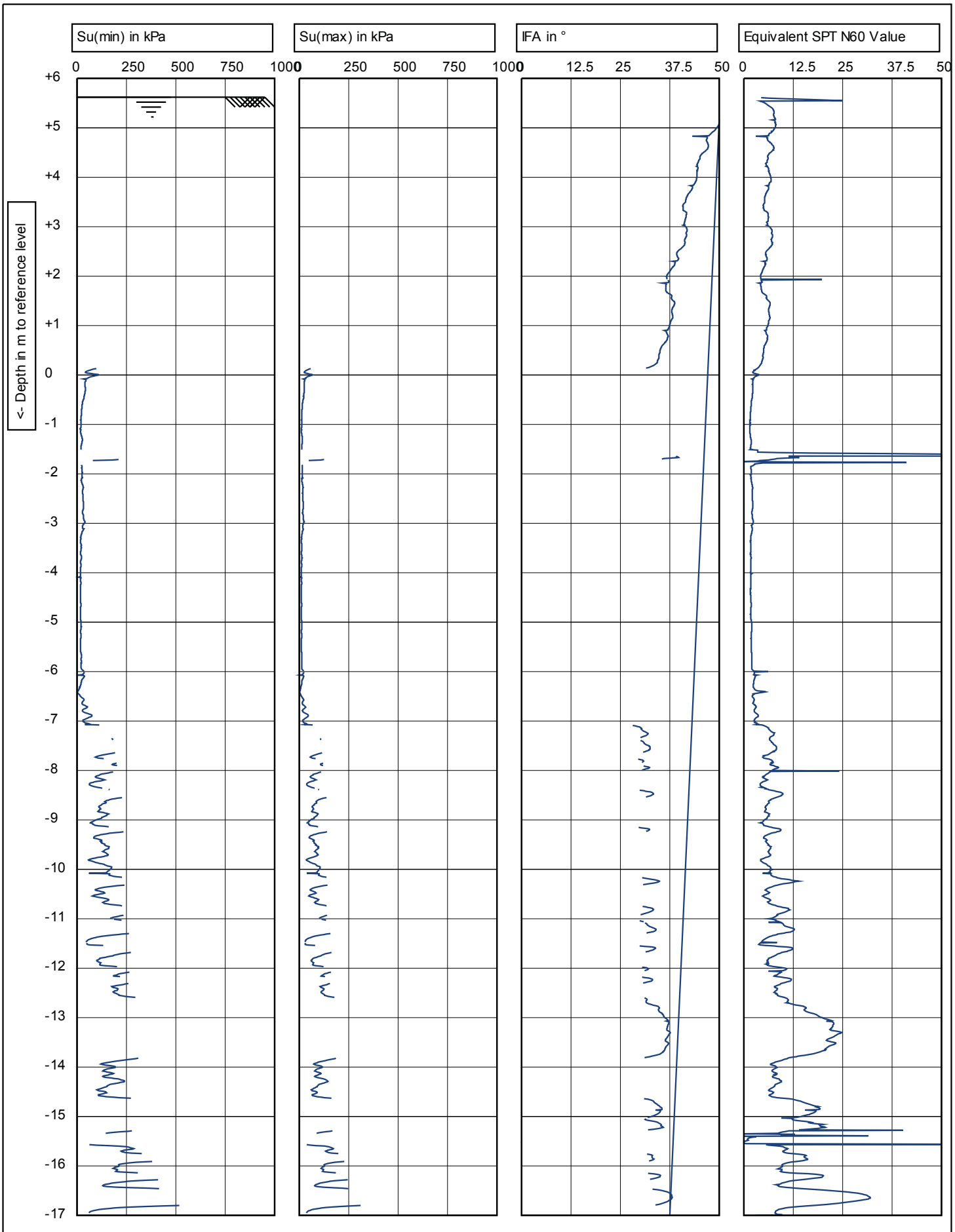
1.40

u2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.618 NAP / W.L.: **0**	Date:	**4/19/2016**
Project: **2X660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09131**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454154, 498948 GCS**		CPT no.:	**06** 6/12



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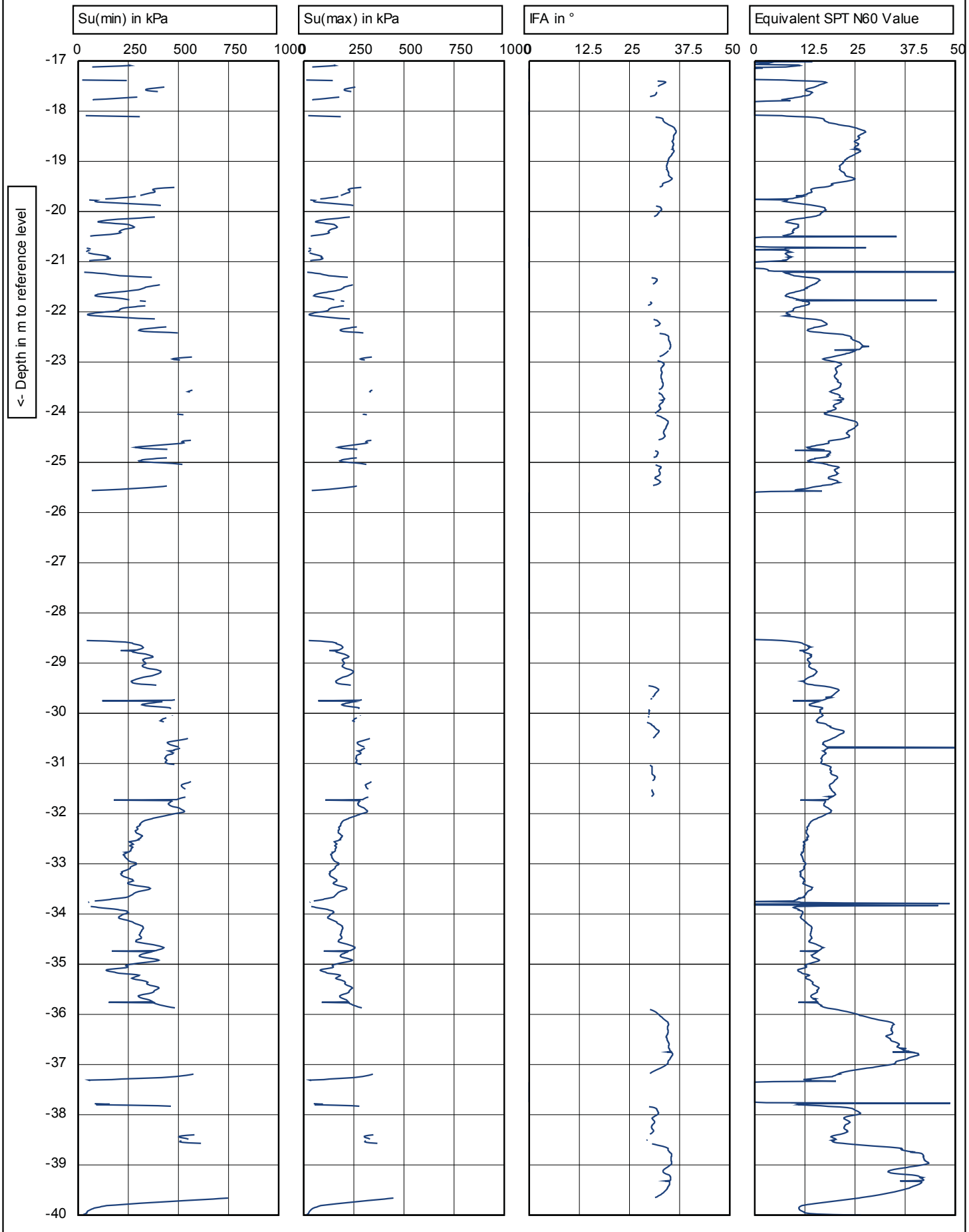
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.618 NAP / W.L.: **0**	Date:	**4/19/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454154, 498948 GCS**	CPT no.:	**06** 7/12



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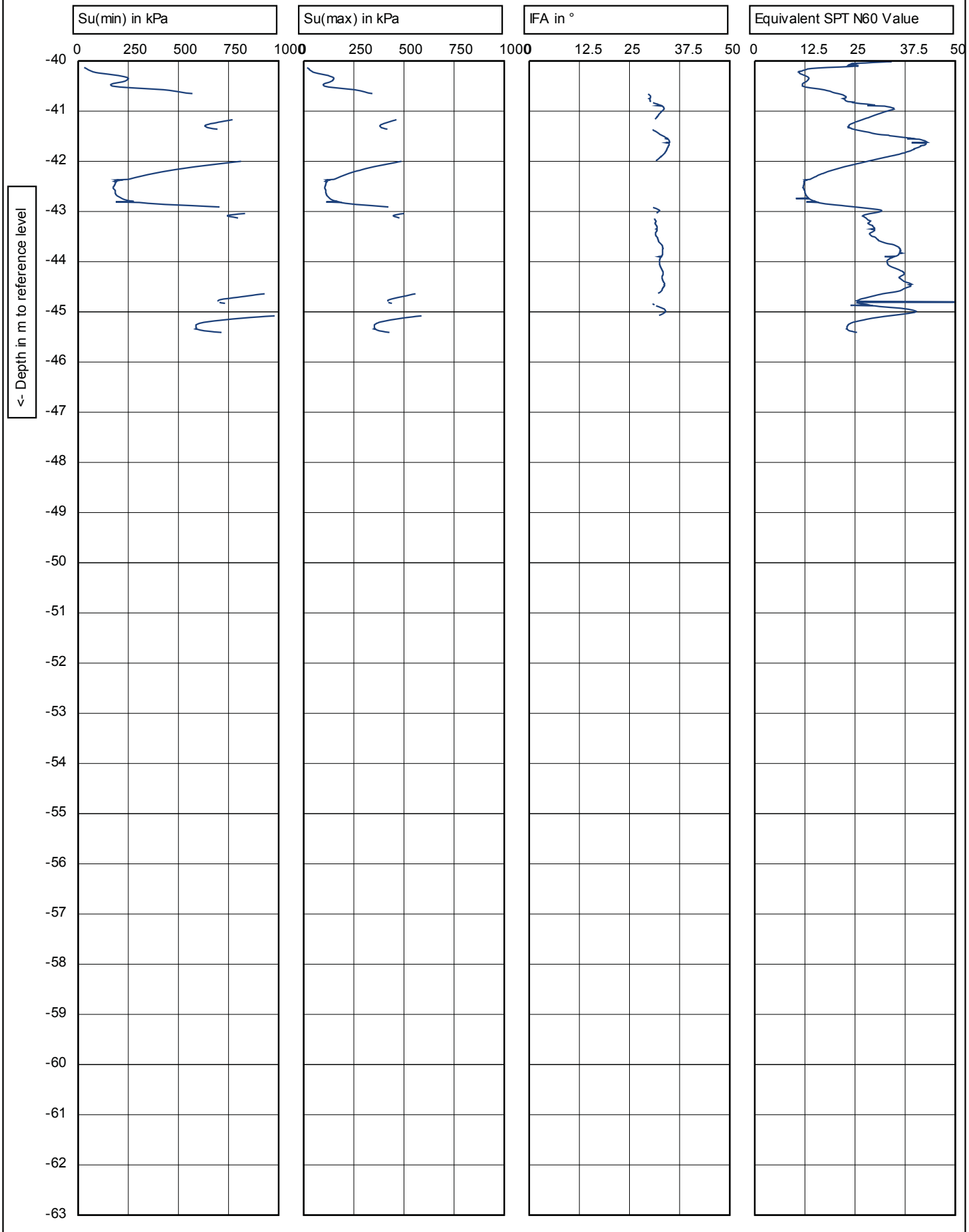
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.618 NAP / W.L.: **0**	Date:	**4/19/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454154, 498948 GCS**	CPT no.:	**06** **8/12**



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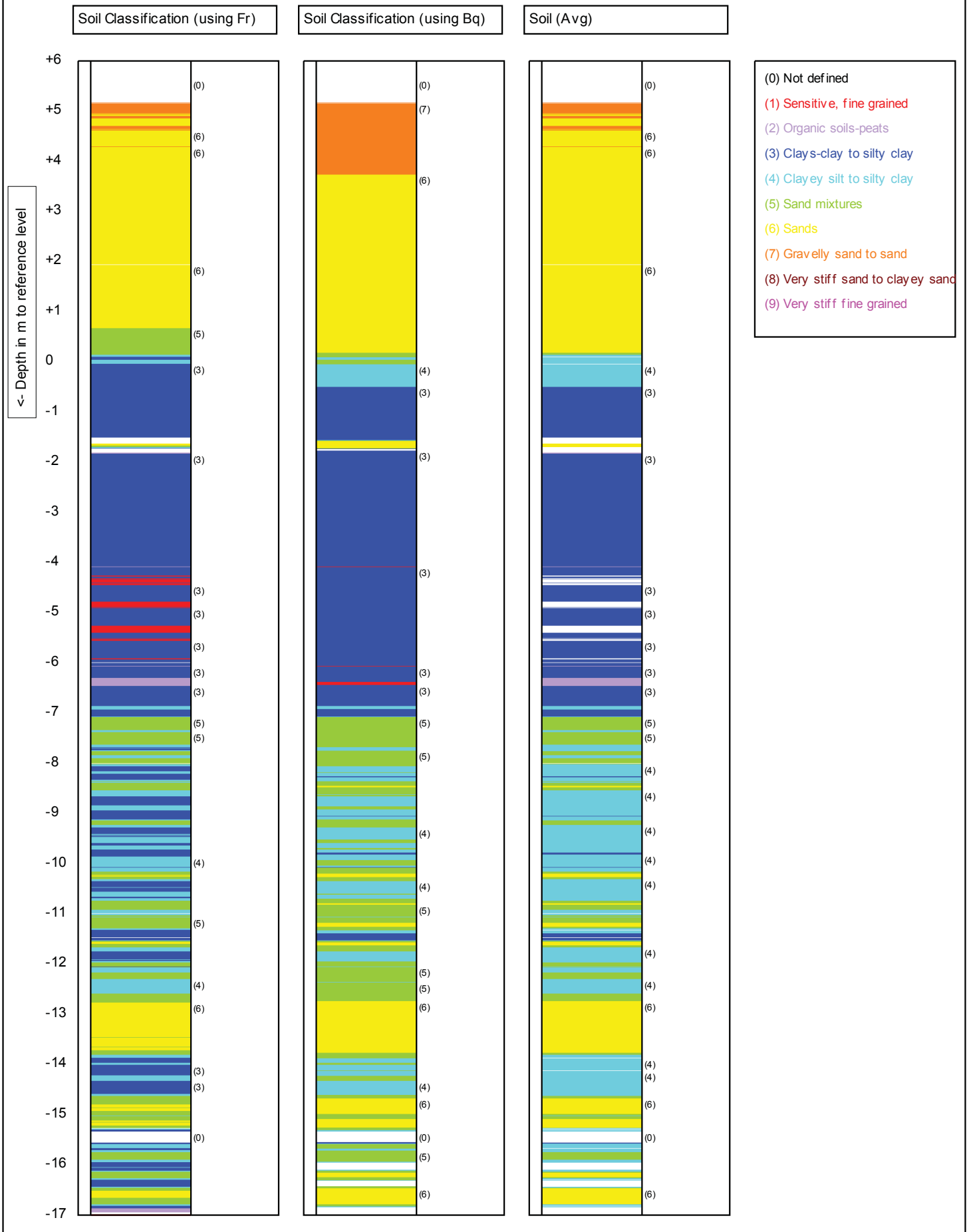
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1		Predrill : **0 m Predrilled**
	G.L. 5.618 NAP	W.L.: **0**	Date: **4/19/2016**
Project: **2X660MW Maitree STPP**			Cone no.: **S15CFIIP.S09131**
Location: **Rampal**			Project no.: **Maitree Thermal**
Position: **454154, 498948 GCS**			CPT no.: **06** **9/12**



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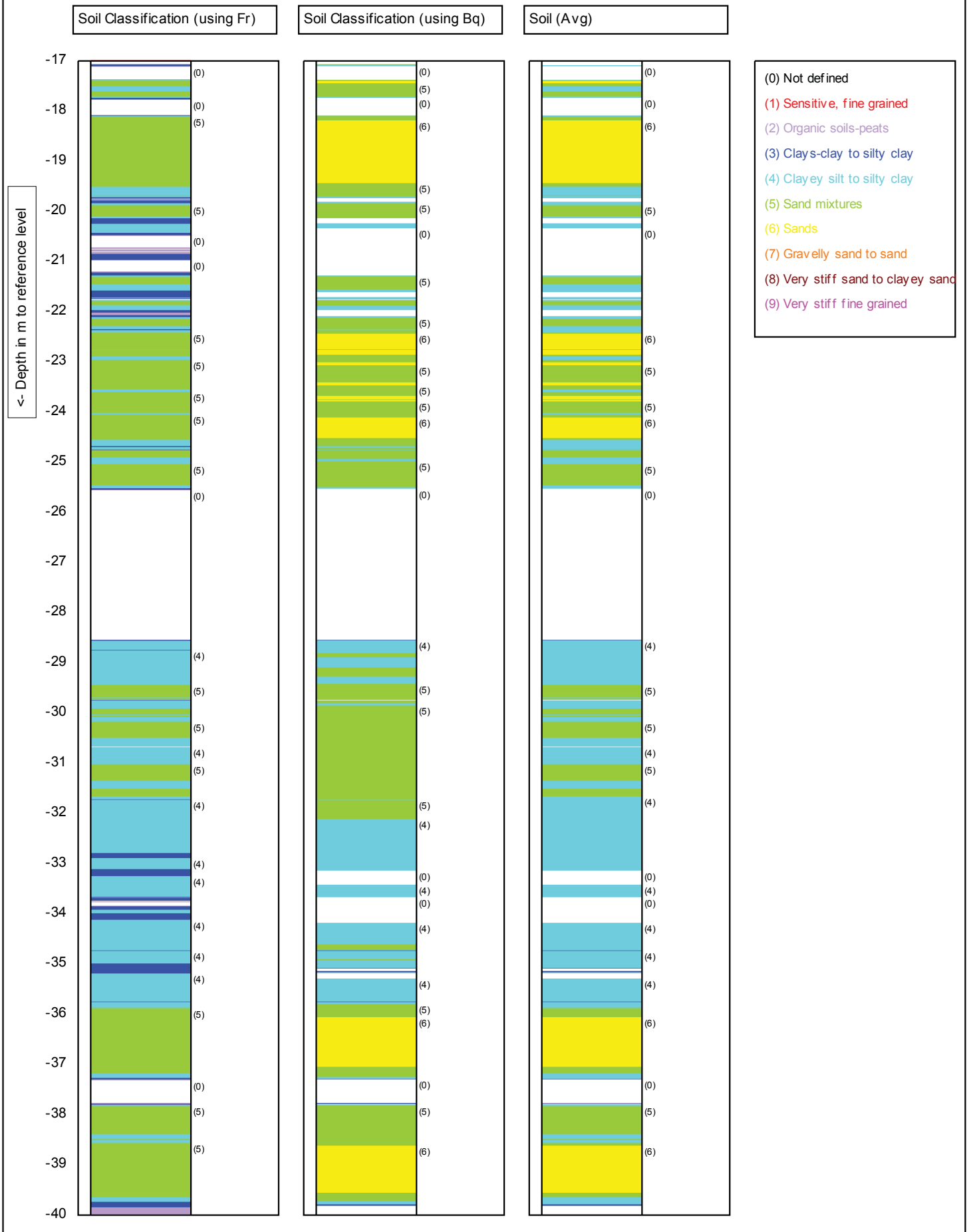
1.40

qc u2 225 cm² 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.618 NAP / W.L.: 0	Date:	4/19/2016
Project:	2X660MW Maitree STPP	Cone no.:	S15CFIIP.S09131
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454154, 498948 GCS	CPT no.:	06 10/12



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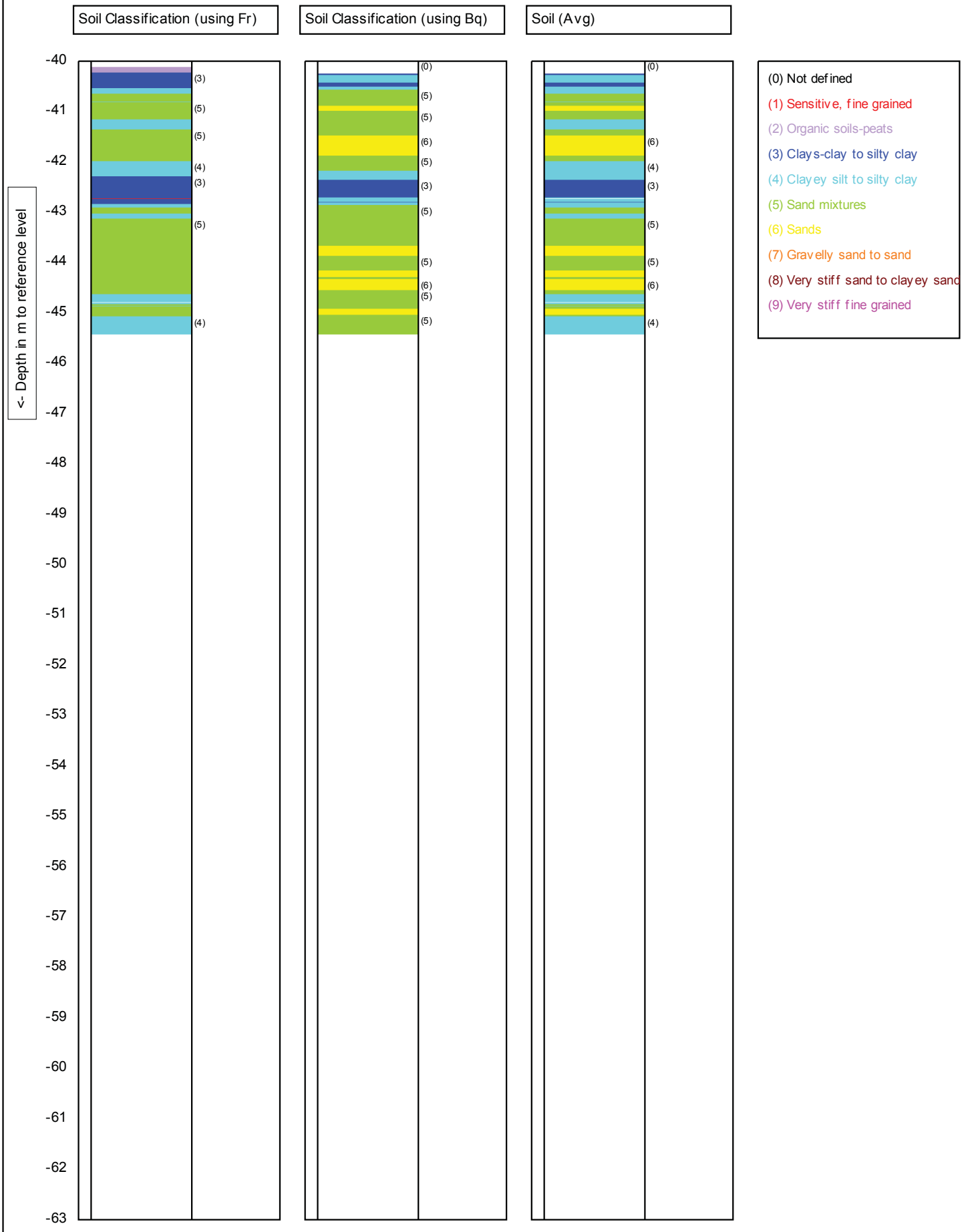
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 5.618 NAP / W.L.: 0	Date:	4/19/2016
Project:	2X660MW Maitree STPP	Cone no.:	S15CFIP.S09131
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454154, 498948 GCS	CPT no.:	06 / 11/12



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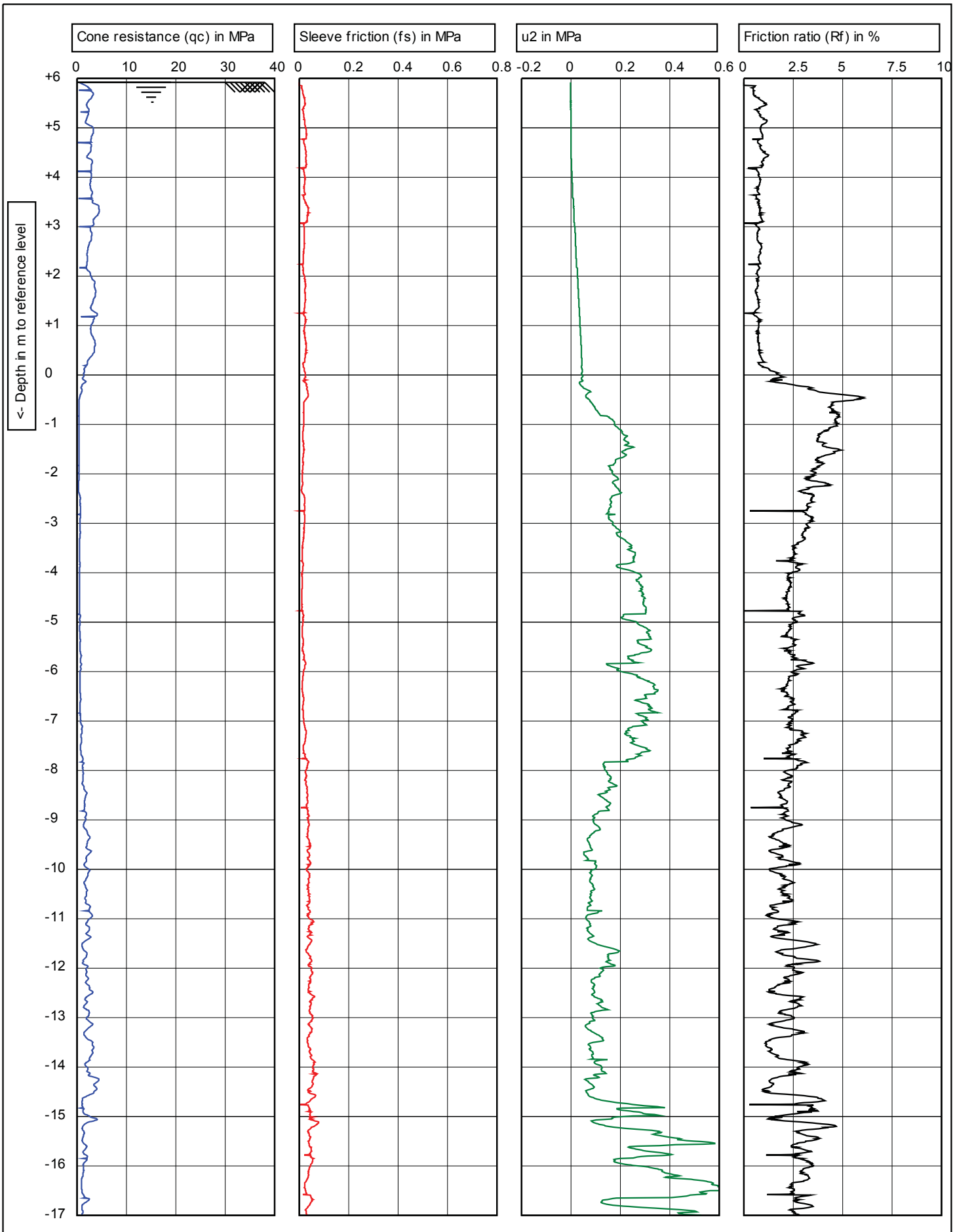
Web: http://www.dcl-fcl.com Email: dcl@dcl-fcl.com

1.40

qu2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.618 NAP — W.L.: **0**	Date:	**4/19/2016**
Project:	**2X660MW Maitree STPP**	Cone no.:	**S15CFIP.S09131**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454154, 498948 GCS**	CPT no.:	**06** — **12/12**



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Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

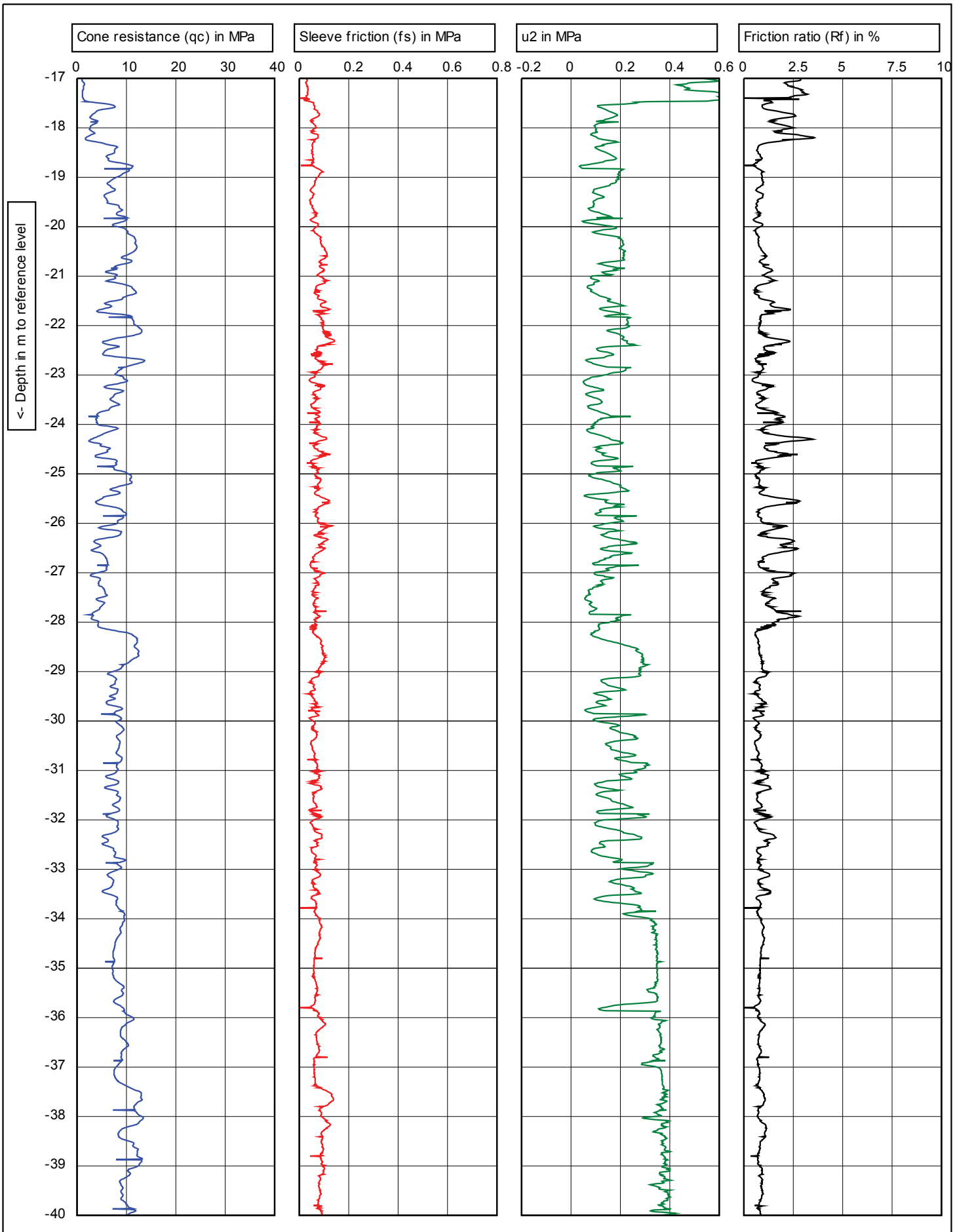
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.917 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **Rampal**
Position: **454223, 498651 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/20/2016**
Cone no.:	**S15CFIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**07** **1/12**



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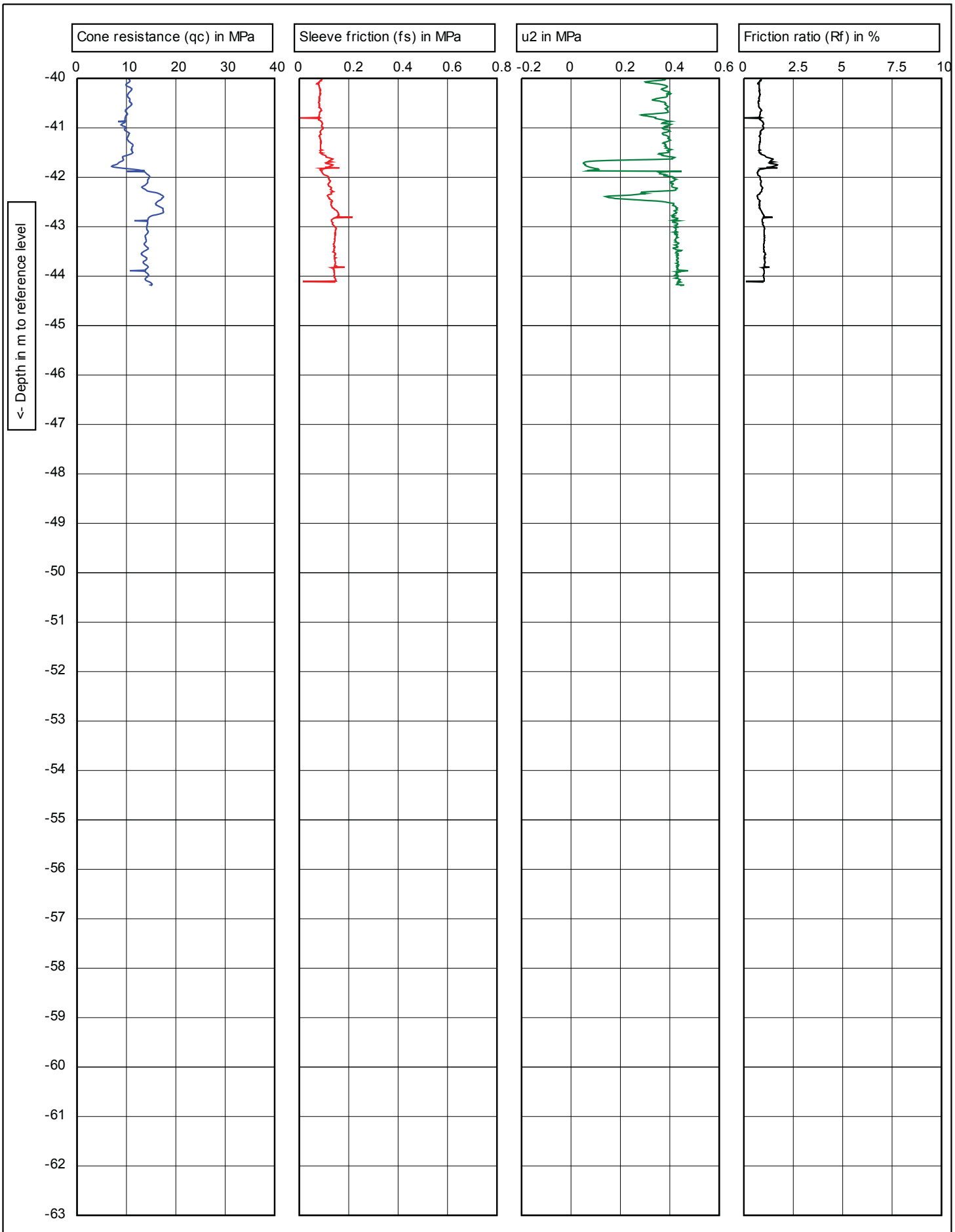
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	0 m Predrilled
G.L. 5.917 NAP	W.L.: 0	Date:	4/20/2016
Project: 2x660MW Maitree STPP		Cone no.:	S15CFIIP.S09132
Location: Rampal		Project no.:	Maitree Thermal
Position: 454223, 498651 GCS		CPT no.:	07 2/12



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Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

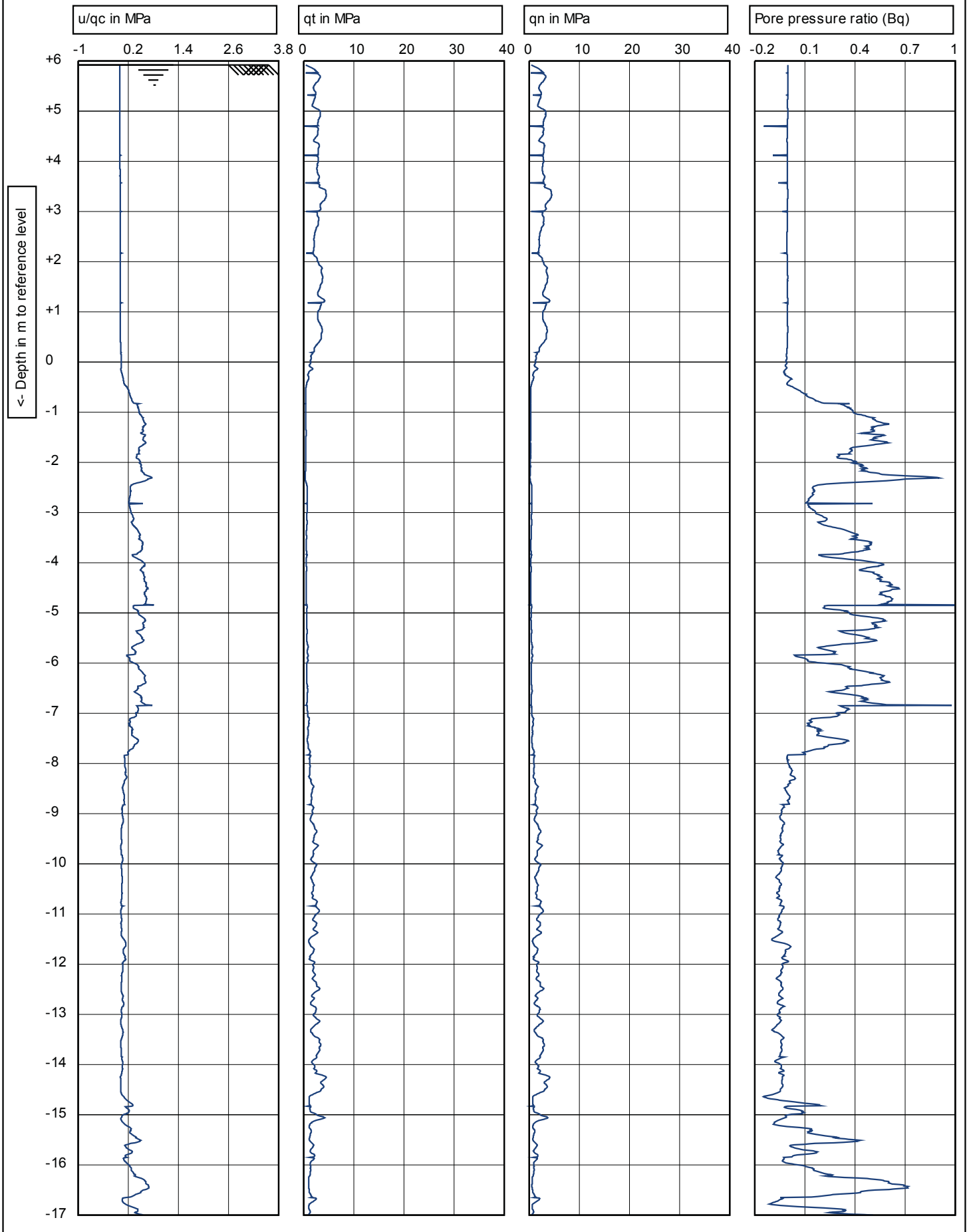
r u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.917 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **Rampal**
Position: **454223, 498651 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/20/2016**
Cone no.:	**S15CFIIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**07** **3/12**



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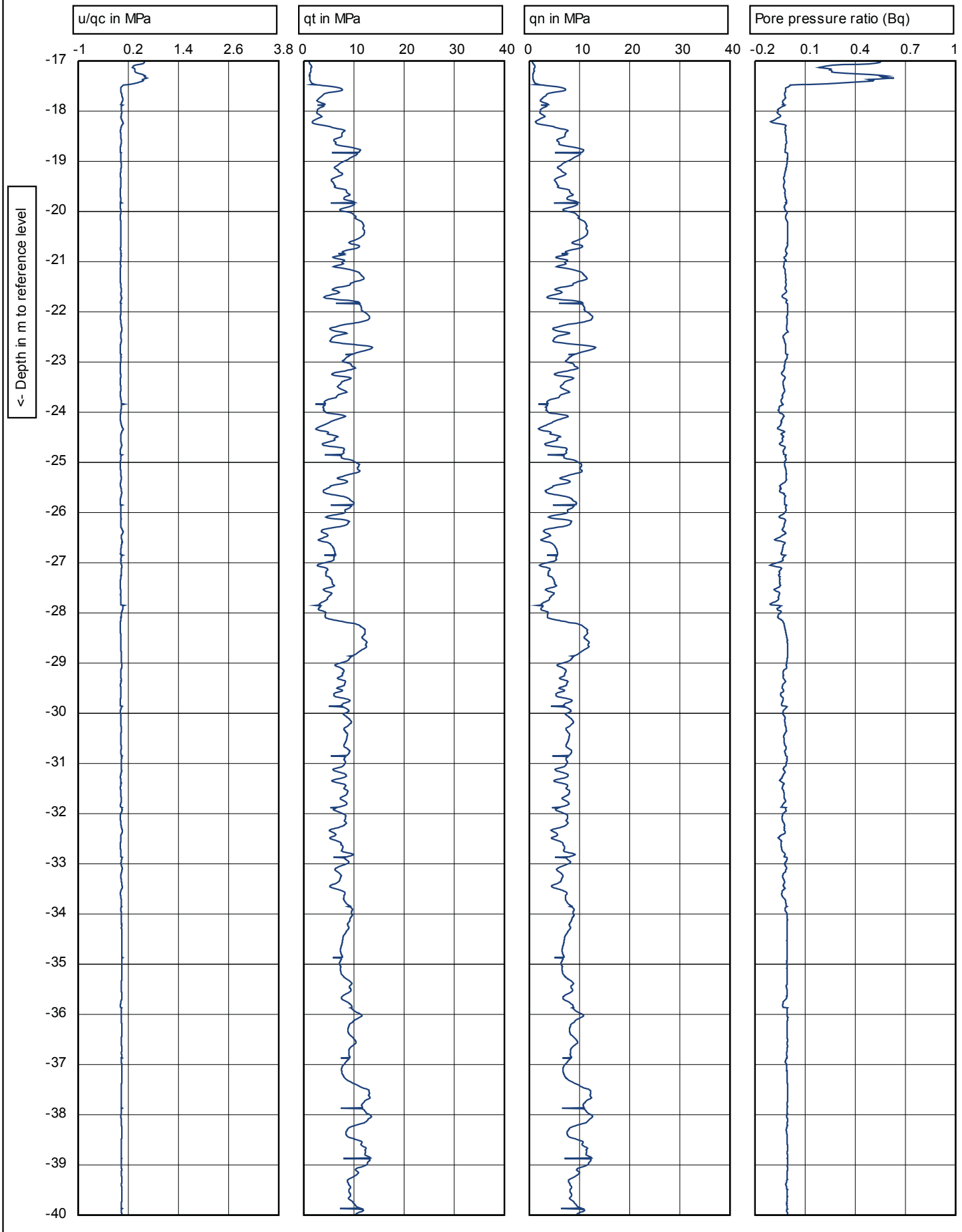
1.40

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 5.917 NAP	W.L.: **0**	Date:	**4/20/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454223, 498651 GCS**		CPT no.:	**07** 4/12



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1.40

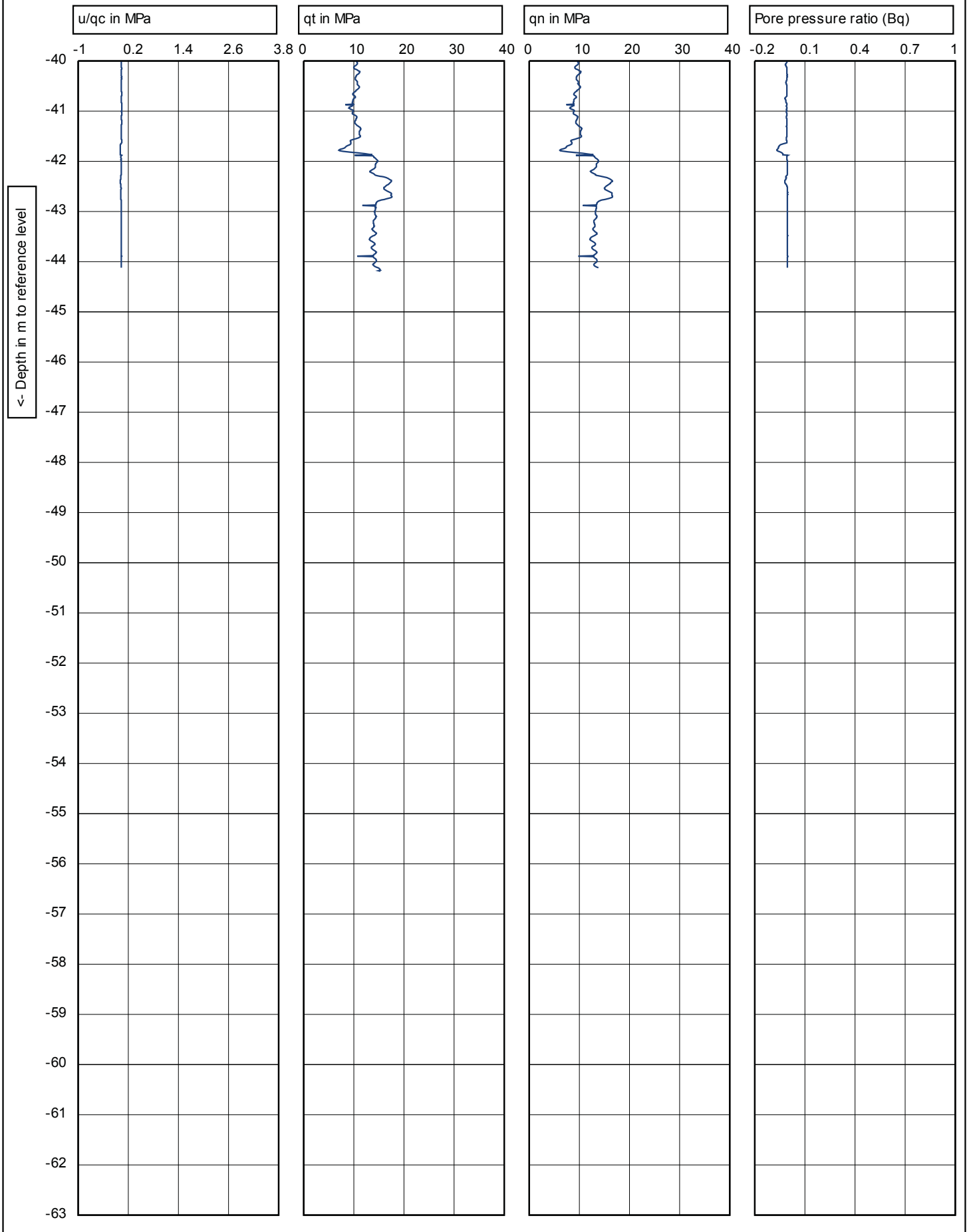
u2
225 cm²
15 cm²

Test according NEN 5140 class 1

G.L. 5.917 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **Rampal**
Position: **454223, 498651 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/20/2016**
Cone no.:	**S15CFIIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**07** **5/12**



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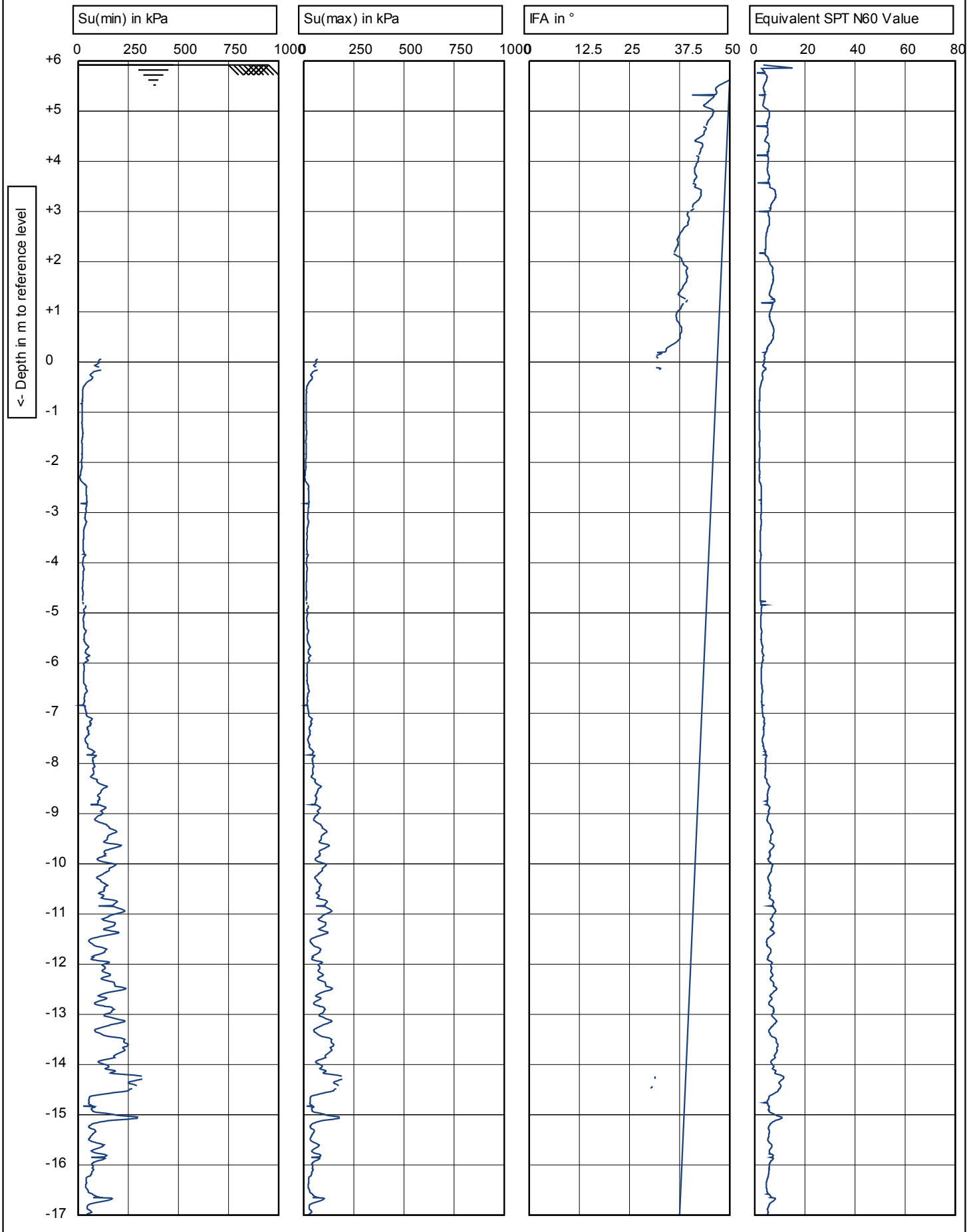
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.917 NAP — W.L.: **0**	Date:	**4/20/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454223, 498651 GCS**		CPT no.:	**07** — **6/12**



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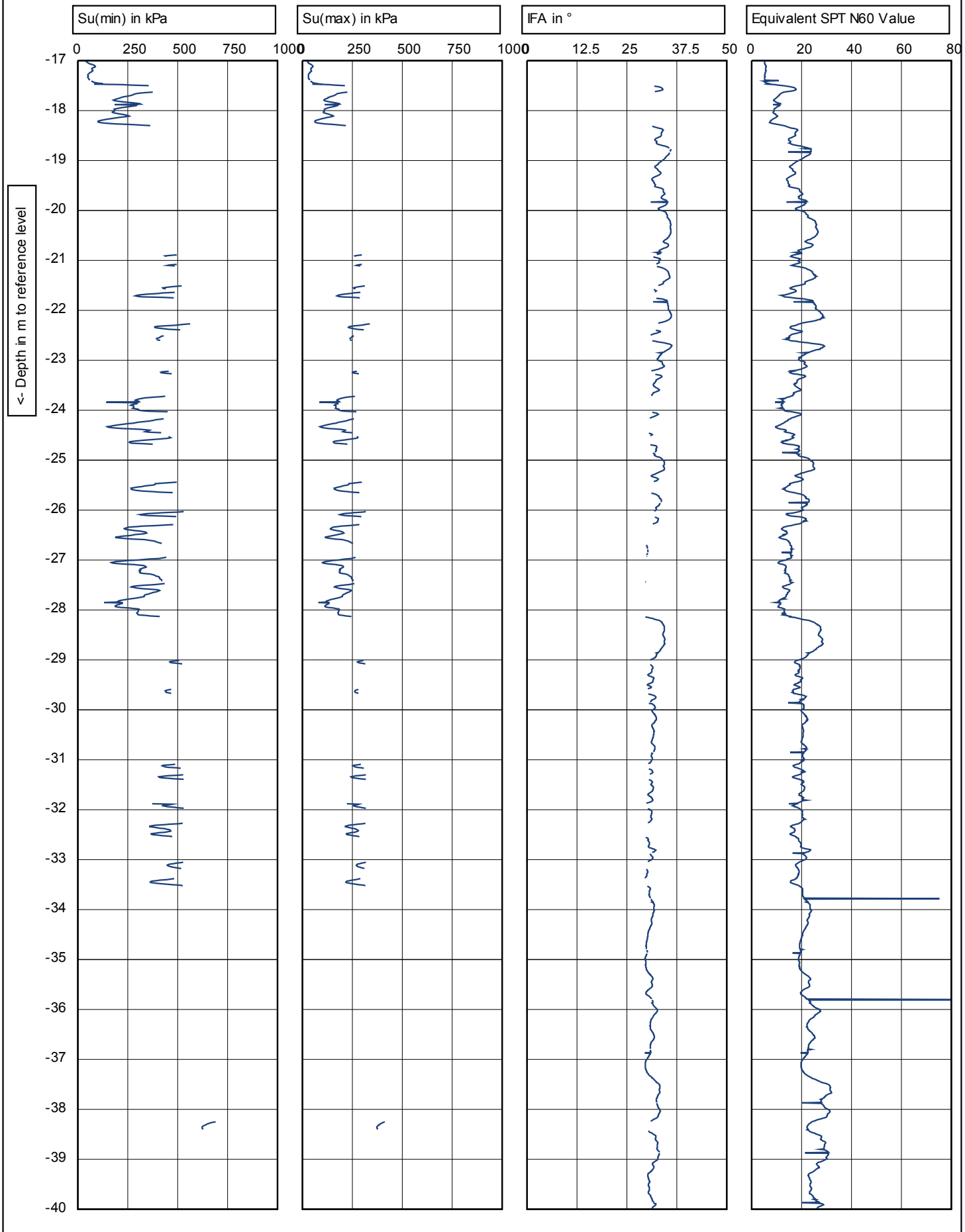
1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.917 NAP / W.L.: **0**	Date:	**4/20/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454223, 498651 GCS**	CPT no.:	**07** 7/12



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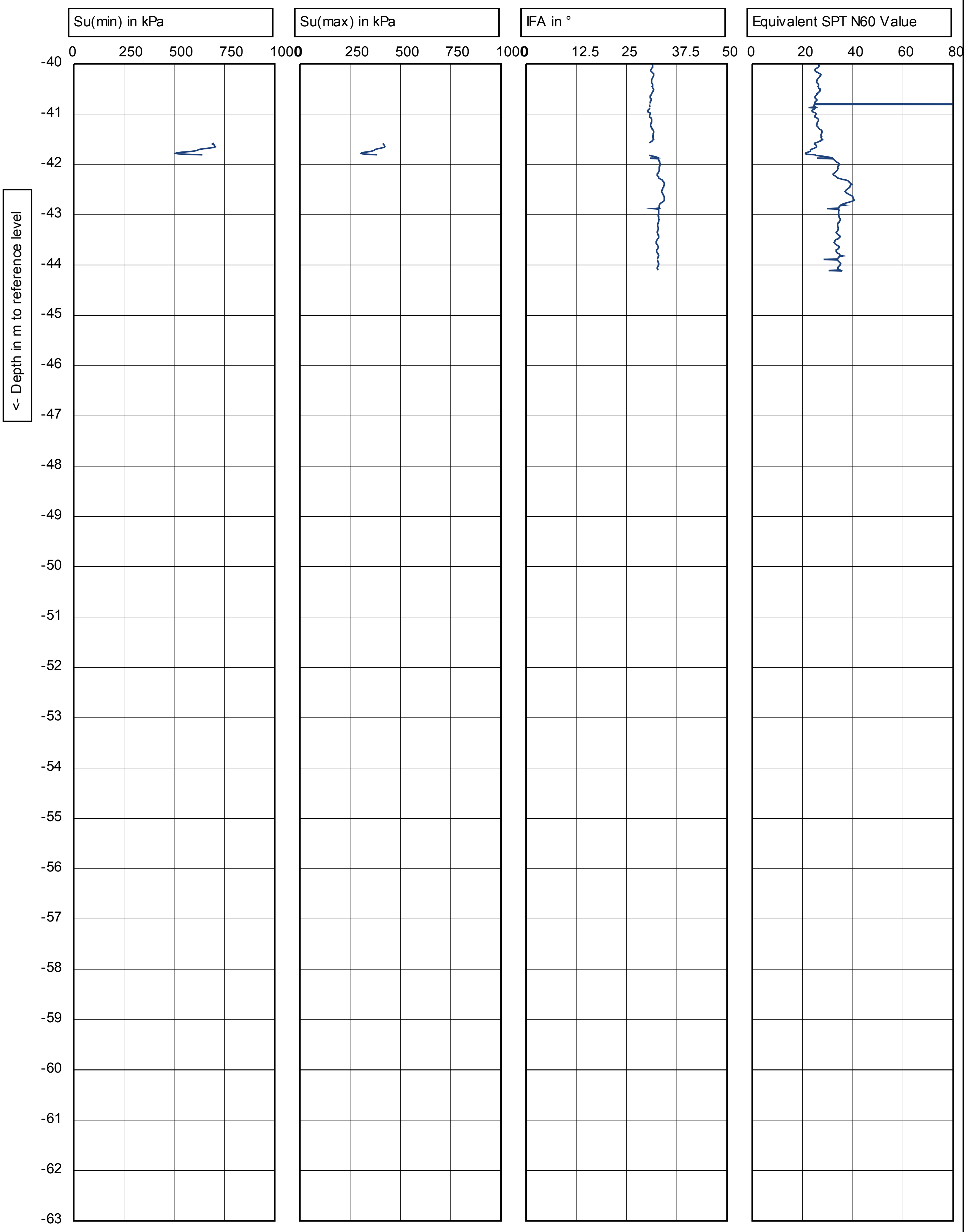
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.917 NAP / W.L.: **0**	Date:	**4/20/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454223, 498651 GCS**		CPT no.:	**07** **8/12**



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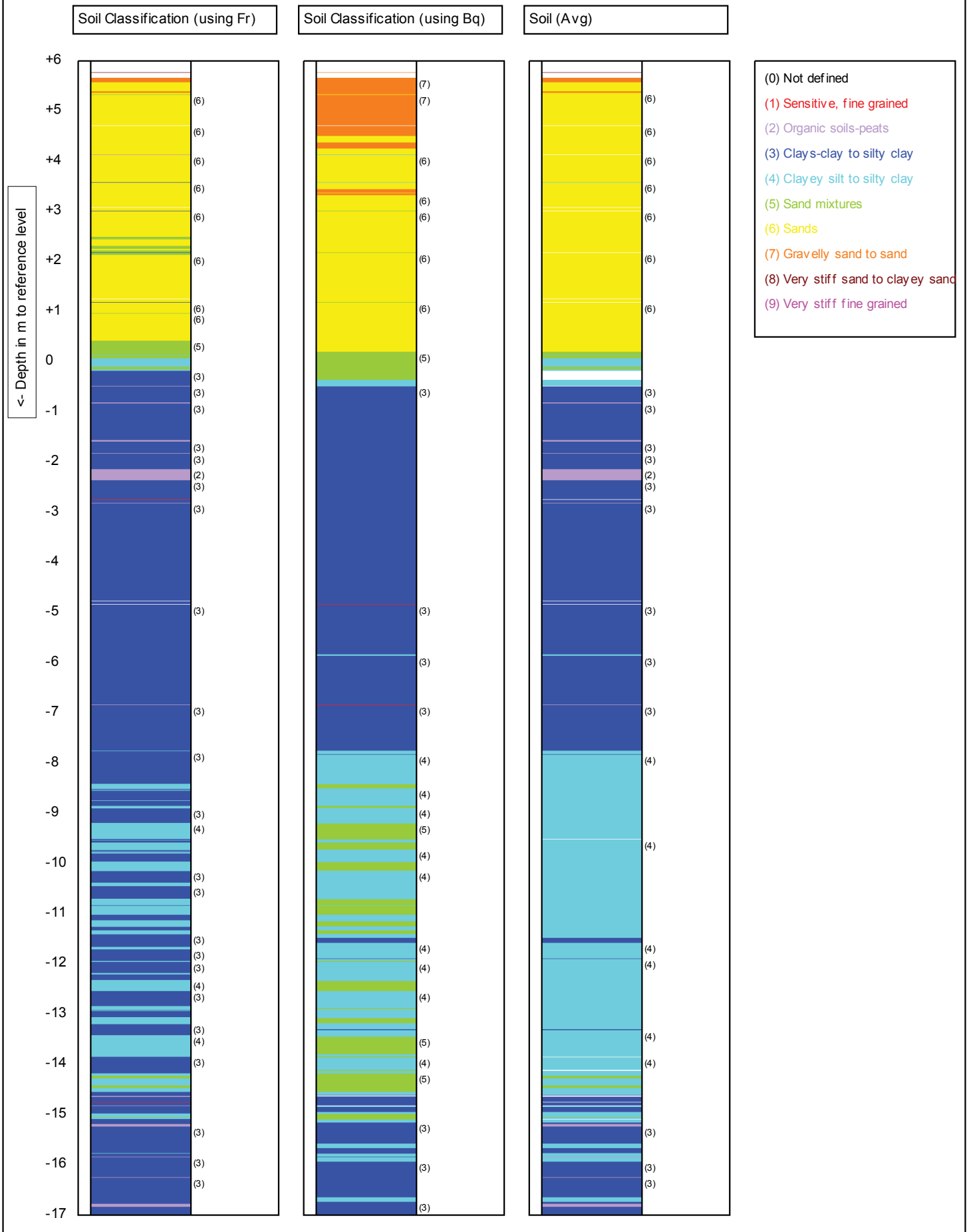
1.40

u2 225 cm² 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.917 NAP / W.L.: **0**	Date:	**4/20/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454223, 498651 GCS**	CPT no.:	**07** 9/12



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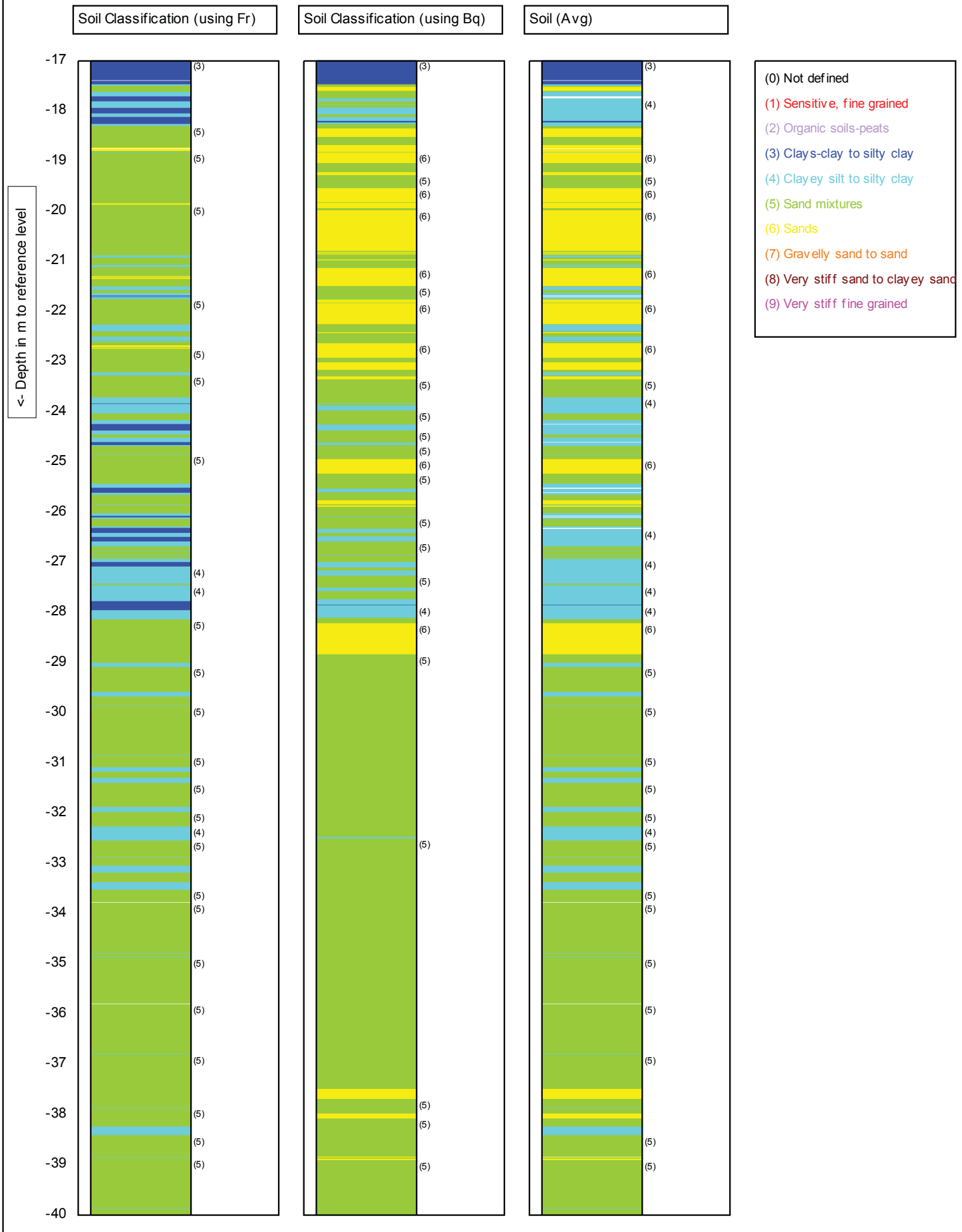
1.40

	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.917 NAP / W.L.: **0**	Date:	**4/20/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454223, 498651 GCS**	CPT no.:	**07** 10/12



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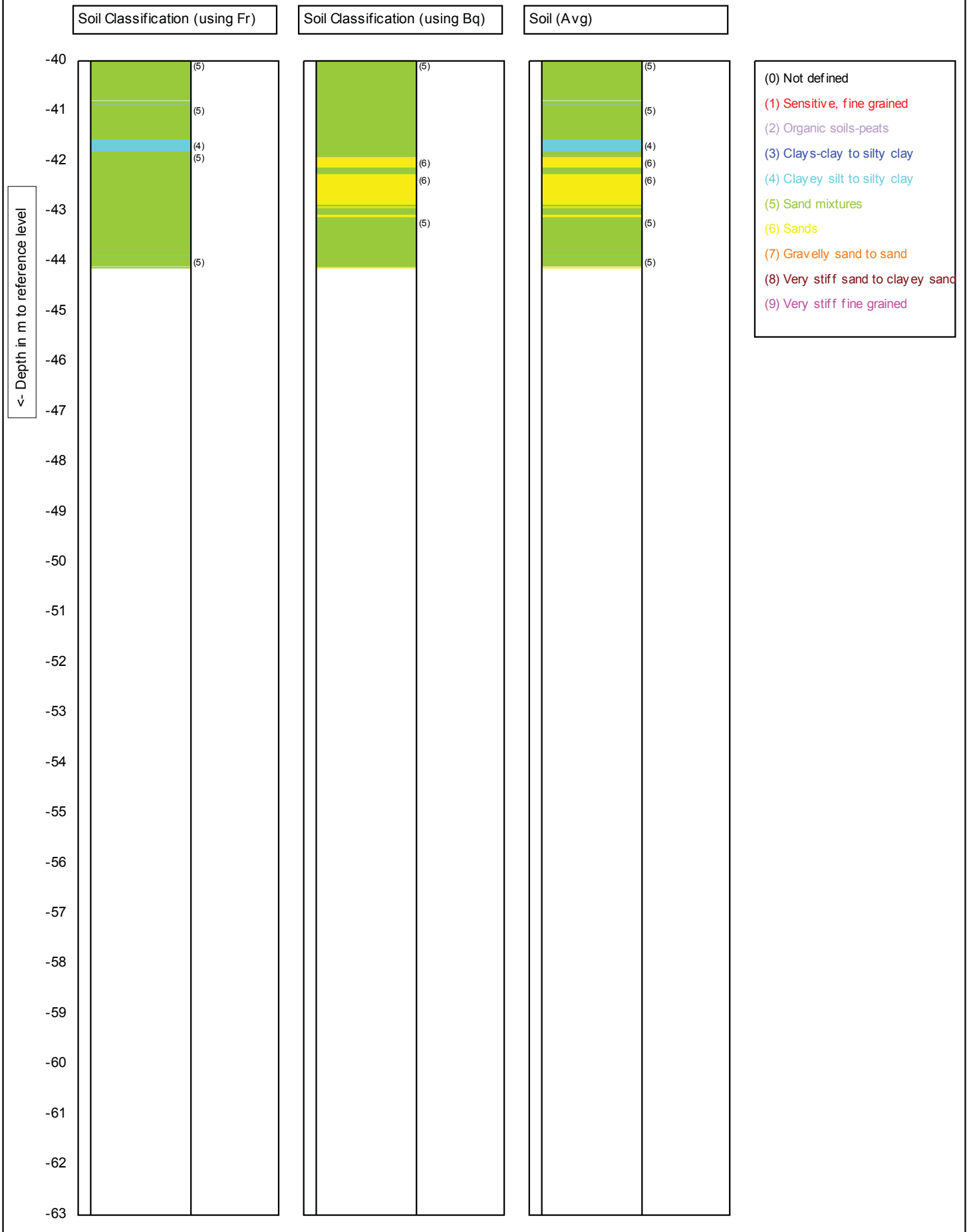
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qc 225 cm² / fs 15 cm²	Test according NEN 5140 class 1		Predrill : **0 m Predrilled**
	G.L. 5.917 NAP	W.L.: **0**	Date: **4/20/2016**
Project: **2x660MW Maitree STPP**			Cone no.: **S15CFIIP.S09132**
Location: **Rampal**			Project no.: **Maitree Thermal**
Position: **454223, 498651 GCS**			CPT no.: **07** **11/12**



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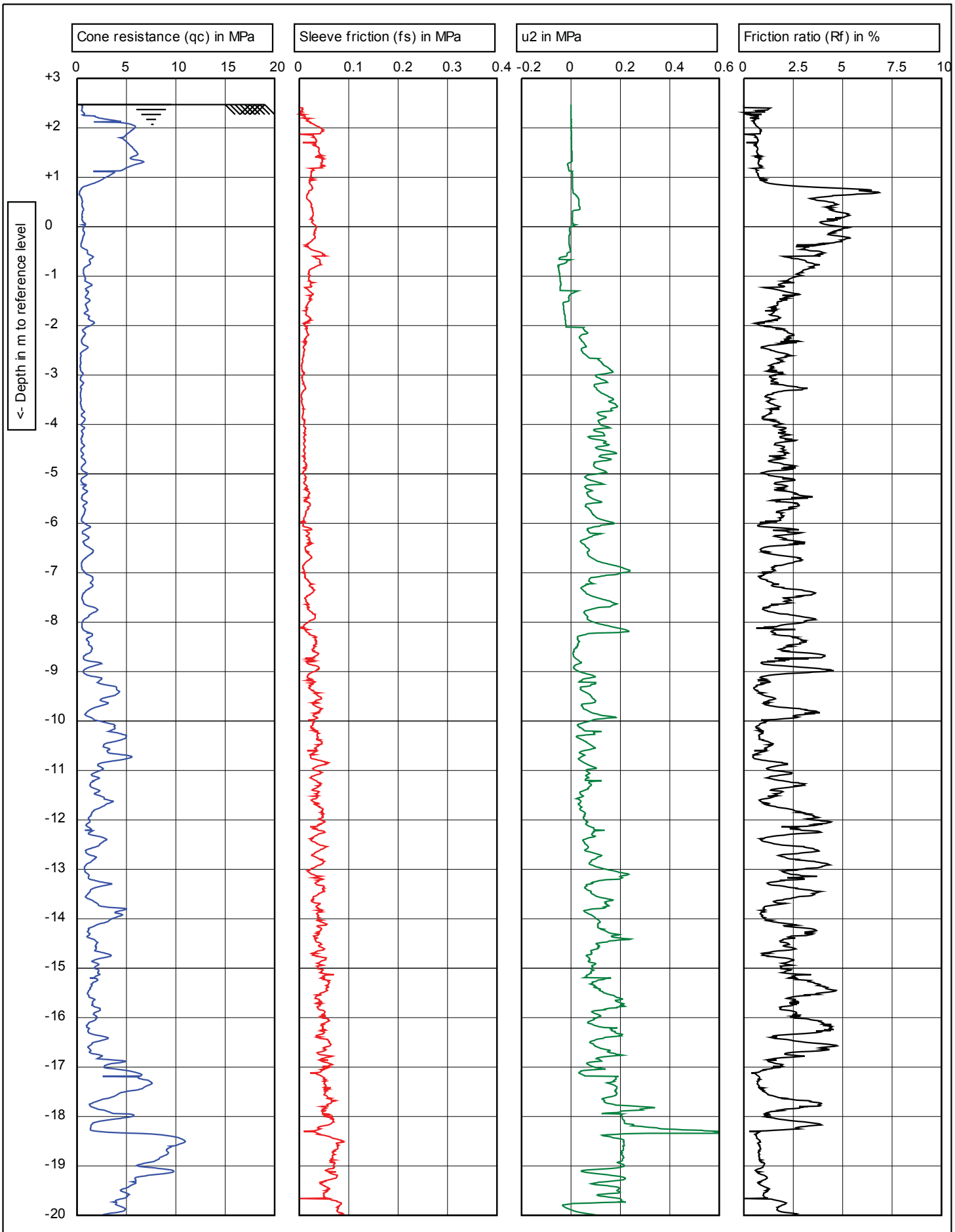
Web: http://www.dcl-fcl.com Email: dcl@dcl-fcl.com

1.40

r u2 225 cm² 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 5.917 NAP / W.L.: **0**	Date:	**4/20/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454223, 498651 GCS**	CPT no.:	**07** 12/12



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Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

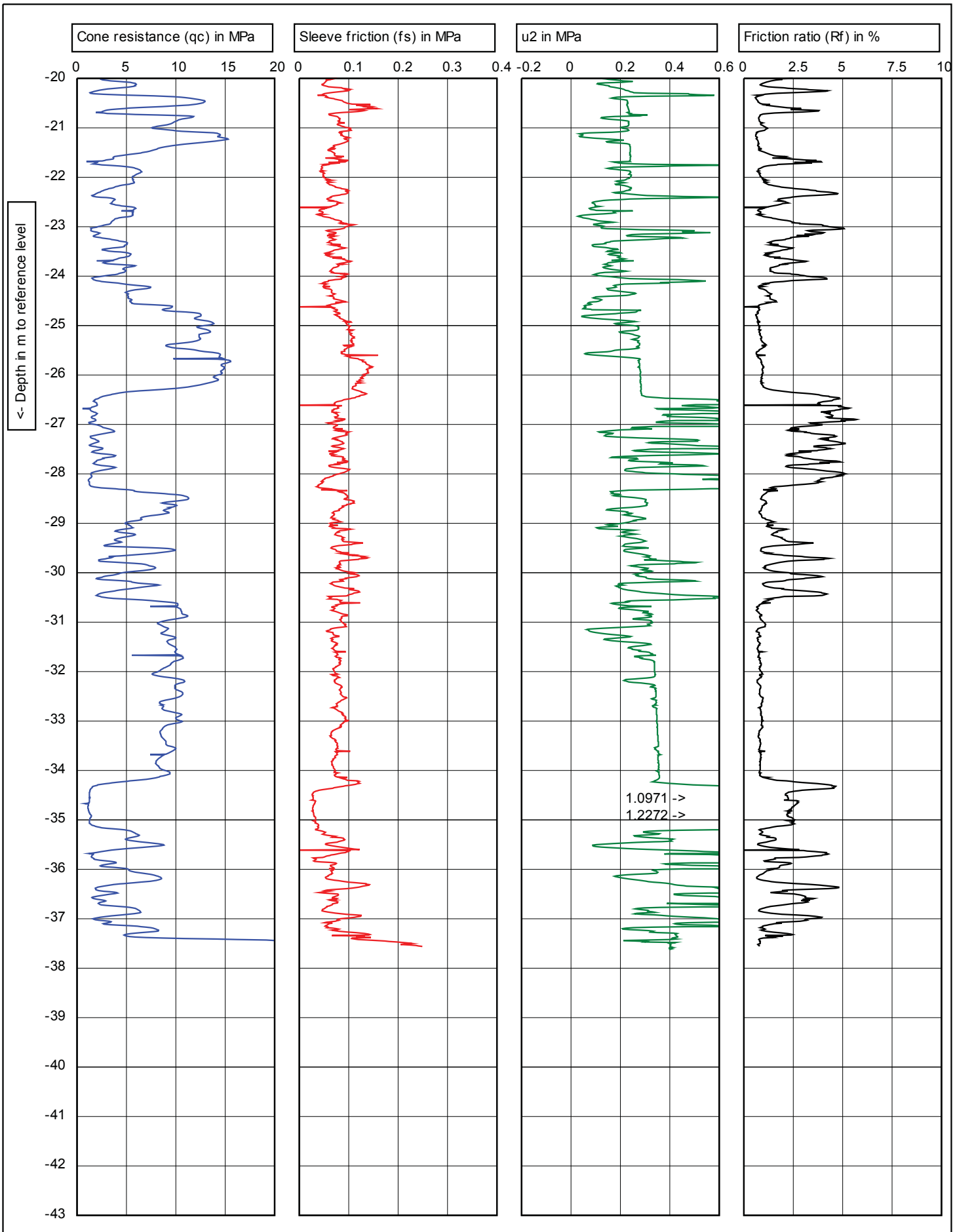
u2
225 cm²
15 cm²

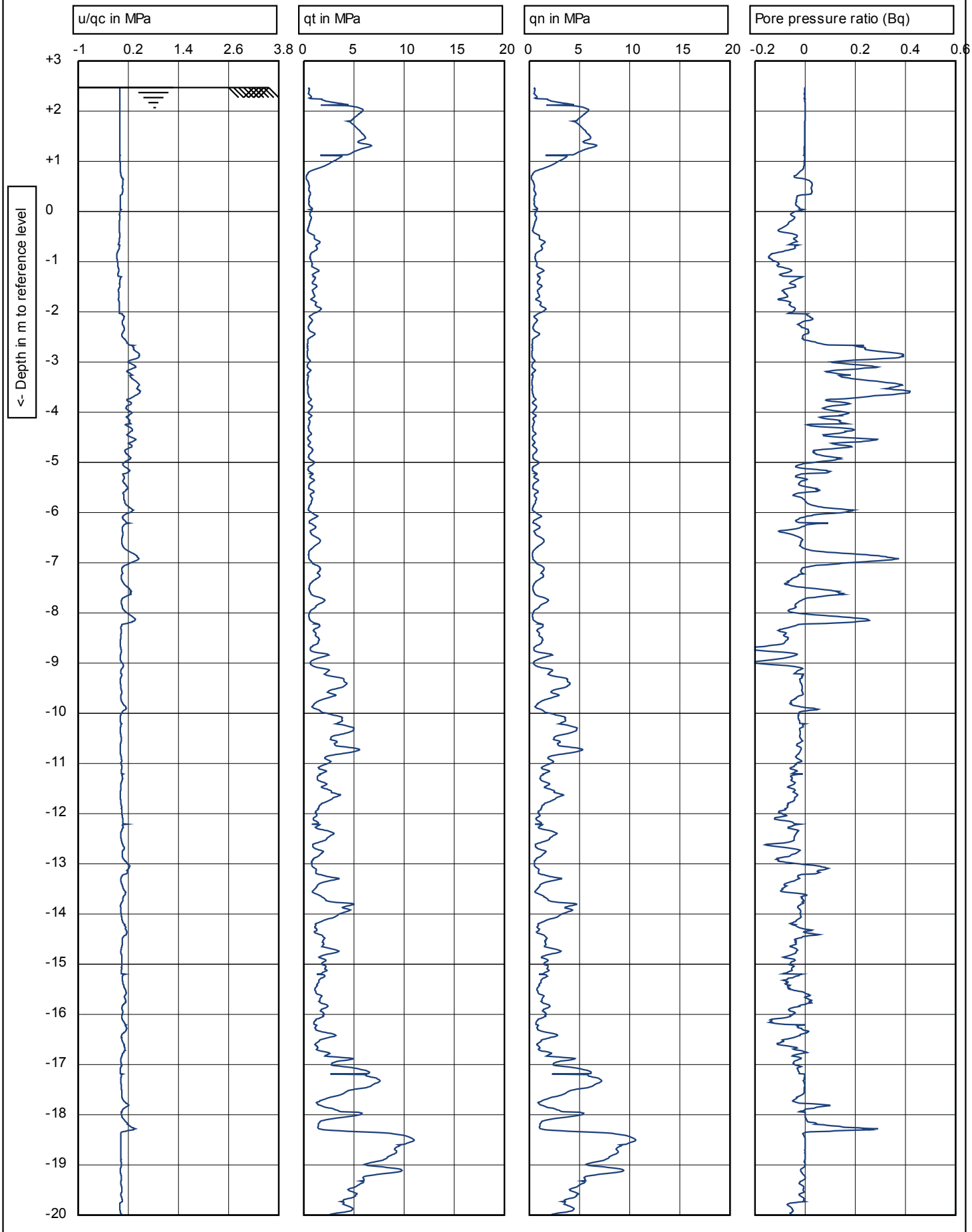
Test according NEN 5140 class 1

G.L. 2.468 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **Rampal**
Position: **454079, 497722 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/23/2016**
Cone no.:	**S15CFIIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**09** **1/8**


Cone resistance (qc) in MPa
Sleeve friction (fs) in MPa
u2 in MPa
Friction ratio (Rf) in %
<- Depth in m to reference level
1.0971 ->
1.2272 ->
DEVELOPMENT CONSTRUCTIONS LTD.
Test according NEN 5140 class 1
G.L. 2.468 NAP
W.L.: 0
Predrill : 0 m Predrilled
Date: 4/23/2016
Cone no.: S15CFIIP.S09132
Project no.: Maitree Thermal
CPT no.: 09
2/8
Project: 2x660MW Maitree STPP
Location: Rampal
Position: 454079, 497722 GCS



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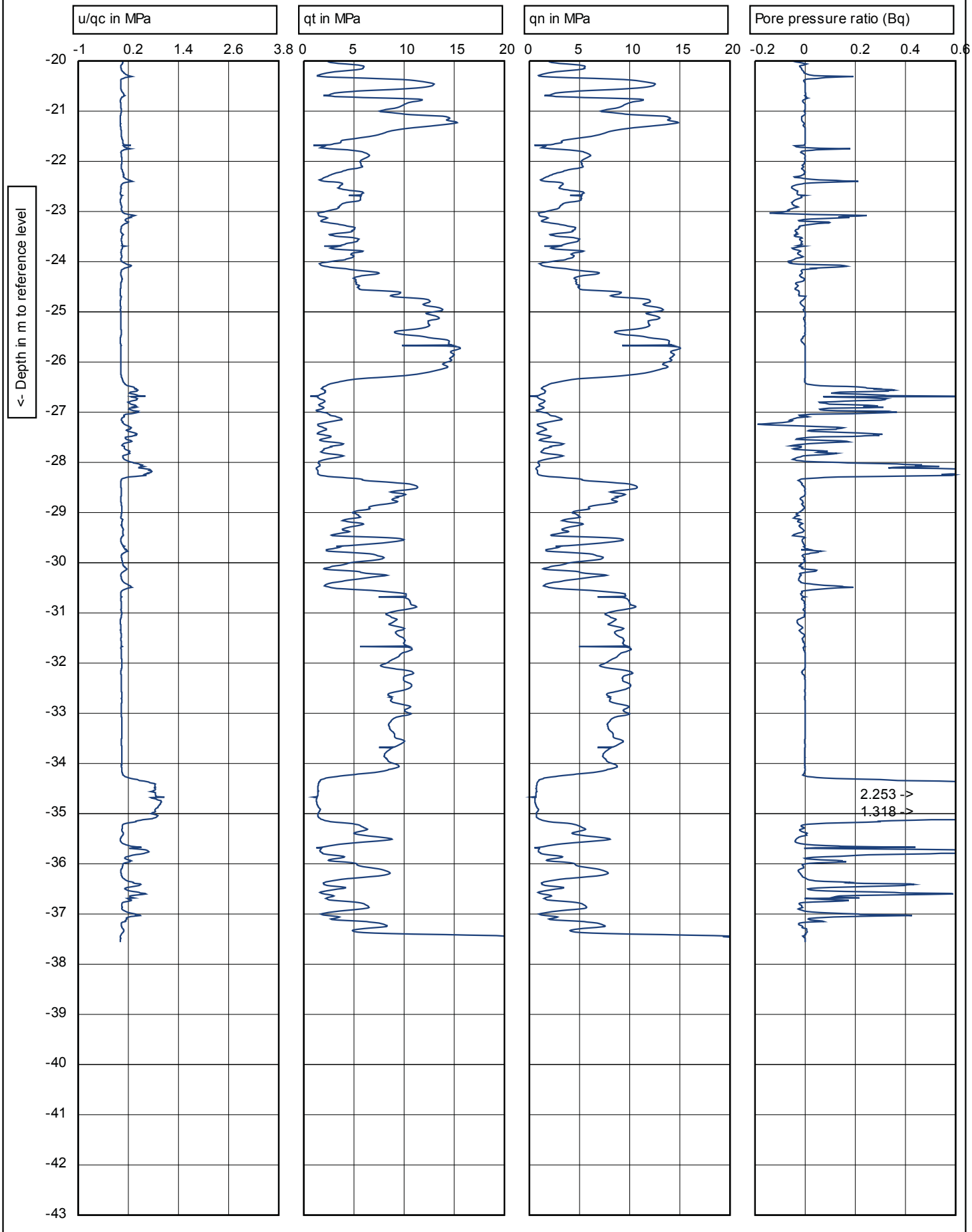
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

u2
225 cm²
15 cm²

Test according NEN 5140 class 1		Predrill :	**0 m Predrilled**
G.L. 2.468 NAP	W.L.: **0**	Date:	**4/23/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454079, 497722 GCS**		CPT no.:	**09** **3/8**



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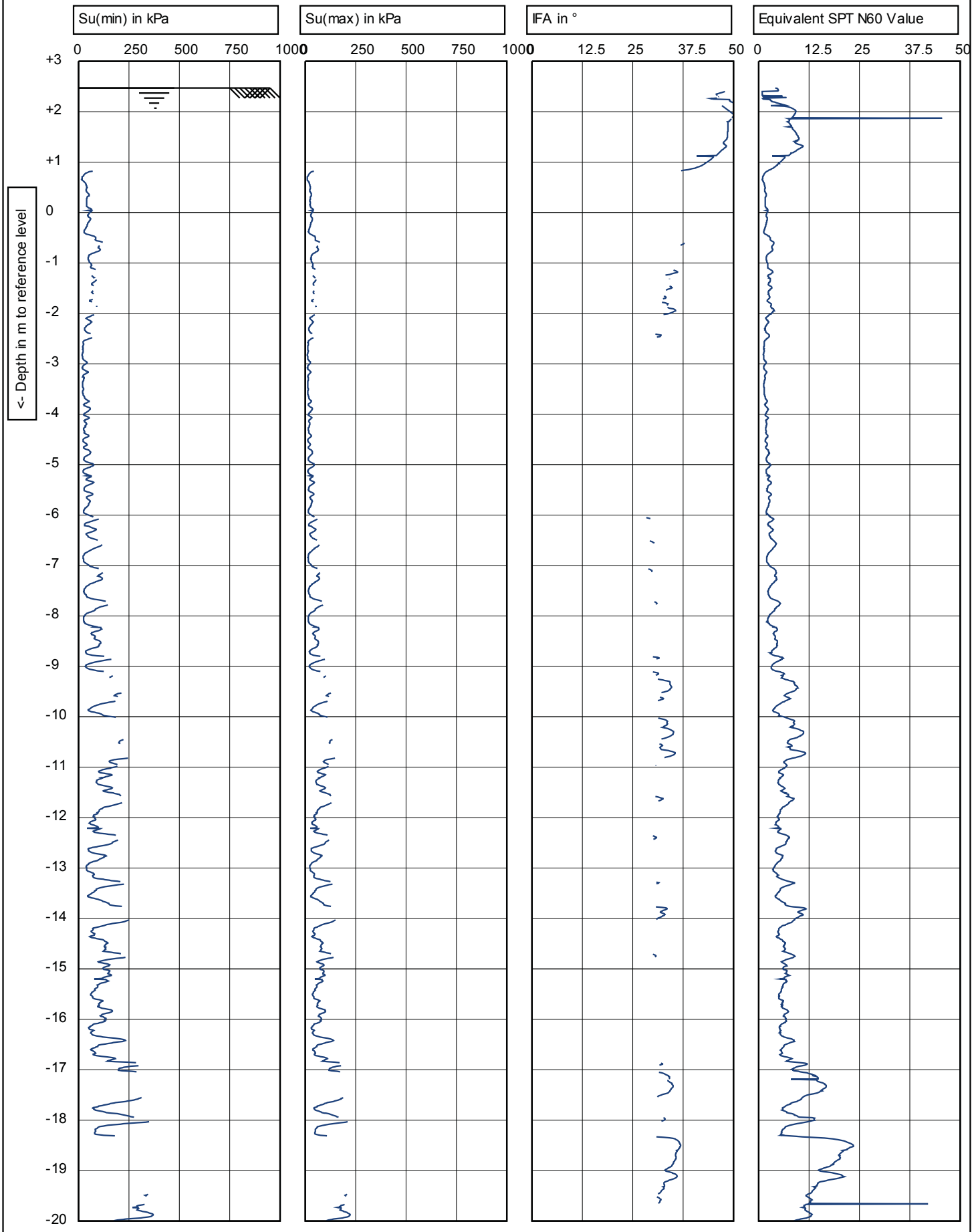
Test according NEN 5140 class 1

G.L. 2.468 NAP | W.L.: **0**

Project: **2x660MW Maitree STPP**
Location: **Rampal**
Position: **454079, 497722 GCS**

Predrill :	**0 m Predrilled**
Date:	**4/23/2016**
Cone no.:	**S15CFIIP.S09132**
Project no.:	**Maitree Thermal**
CPT no.:	**09** 4/8



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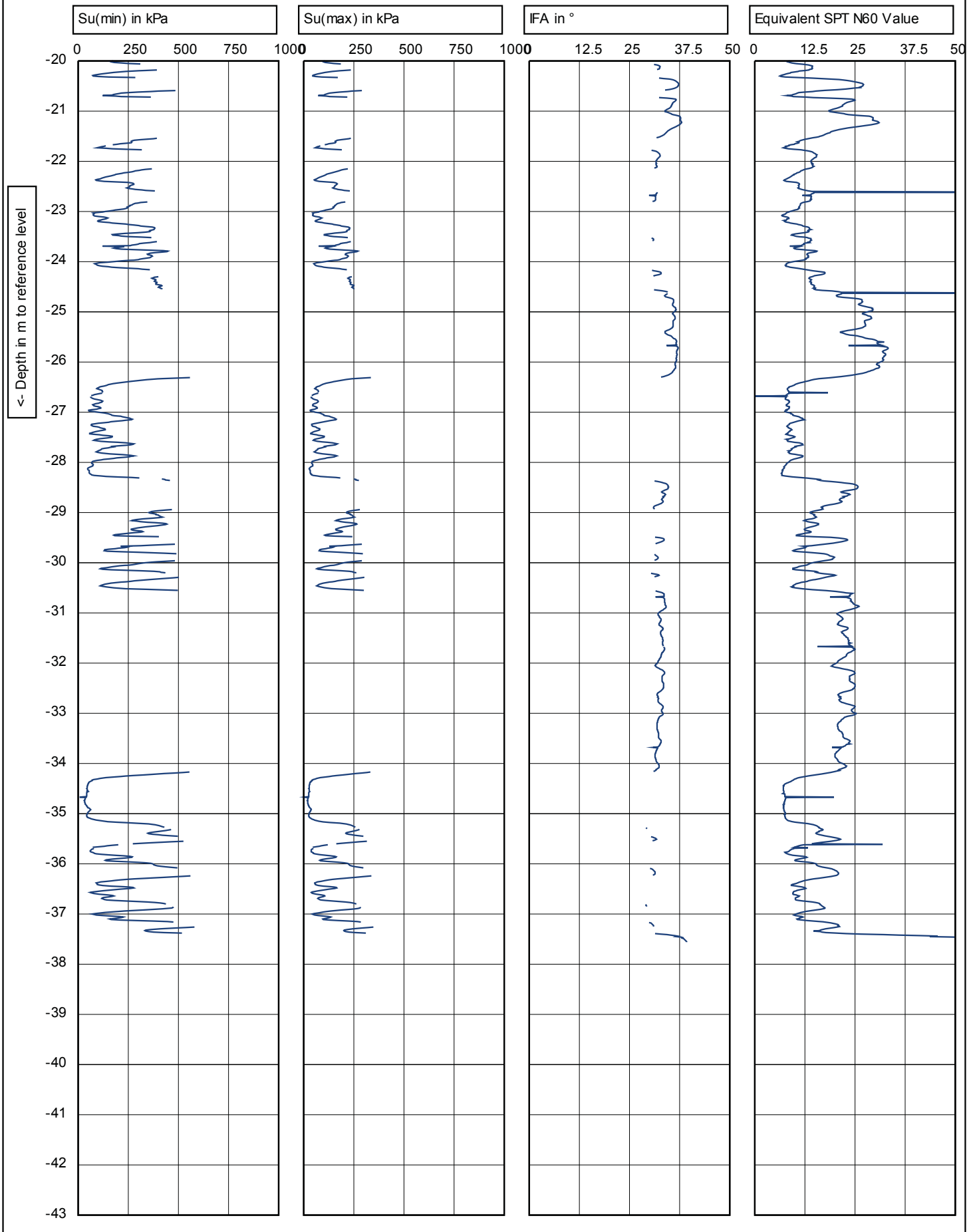
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 2.468 NAP — W.L.: **0**	Date:	**4/23/2016**
Project:	**2x660MW Maitree STPP**	Cone no.:	**S15CFIIP.S09132**
Location:	**Rampal**	Project no.:	**Maitree Thermal**
Position:	**454079, 497722 GCS**	CPT no.:	**09** — **5/8**



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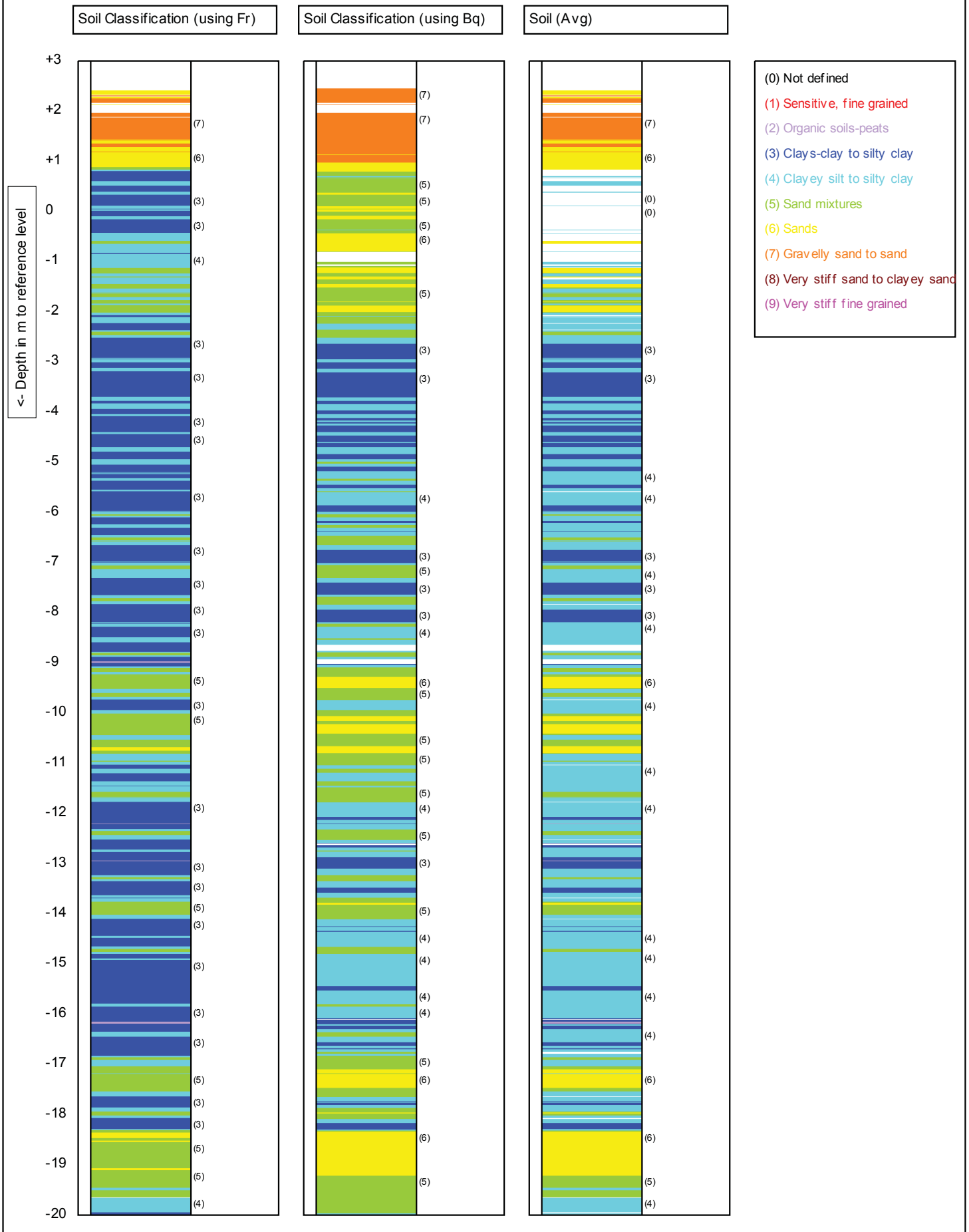
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

q u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 2.468 NAP — W.L.: **0**	Date:	**4/23/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454079, 497722 GCS**		CPT no.:	**09** — **6/8**



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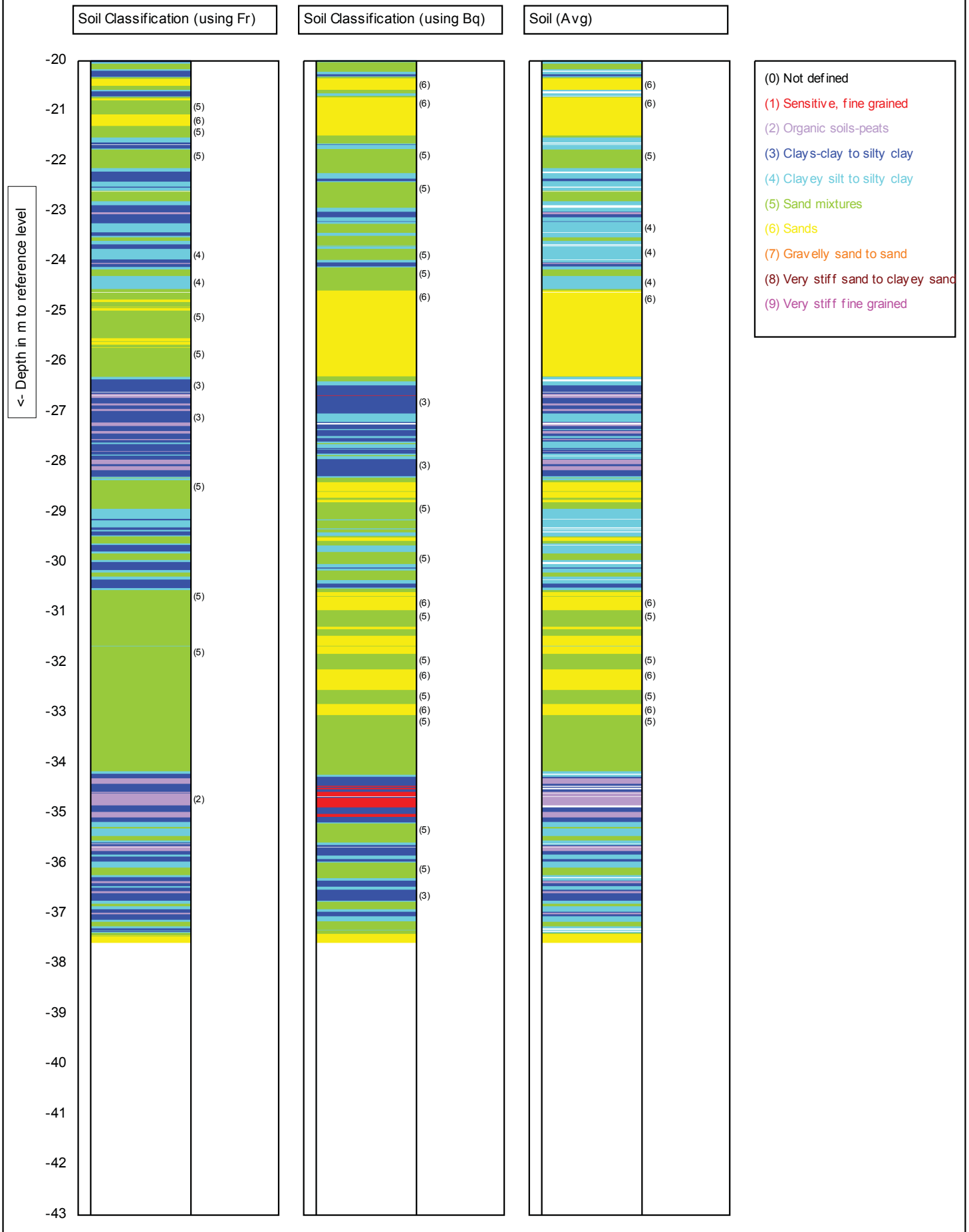
Web: http://www.dcl-ltd.com Email: dcl@dcl-ltd.com

1.40

qu2 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	0 m Predrilled
	G.L. 2.468 NAP / W.L.: 0	Date:	4/23/2016
Project:	2x660MW Maitree STPP	Cone no.:	S15CFIIP.S09132
Location:	Rampal	Project no.:	Maitree Thermal
Position:	454079, 497722 GCS	CPT no.:	09 7/8



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Web: http://www.dcl-fcl.com Email: dcl@dcl-fcl.com

1.40

r u2 / 225 cm² / 15 cm²	Test according NEN 5140 class 1	Predrill :	**0 m Predrilled**
	G.L. 2.468 NAP / W.L.: **0**	Date:	**4/23/2016**
Project: **2x660MW Maitree STPP**		Cone no.:	**S15CFIIP.S09132**
Location: **Rampal**		Project no.:	**Maitree Thermal**
Position: **454079, 497722 GCS**		CPT no.:	**09** 8/8

Appendix-B4

ELECTRICAL RESISTIVITY TEST

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project: 2x660 MW Maitree STPP	Method: Four Point (Wenner)
Client: BHEL	Equipment: Chauvin-Arnoux (CA6460)
Location: Rampal, Bagerhat.	Test Date: 19-Apr-16 to 24-Apr-16

	Position	E=454183, N=499389			Position	E=454183, N=499389	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-1	0.5	120.70	379	ERT-1	0.5	121.10	380
	1.0	88.60	557		1.0	89.20	560
	2.0	60.00	754		2.0	61.30	770
	3.0	28.80	543		3.0	30.10	567
	4.0	14.50	364		4.0	15.30	385
	6.0	4.70	177		6.0	5.10	192
	8.0	0.20	10		8.0	0.18	9
	10.0	0.10	6		10.0	0.09	6
	Position	E=454660,N=499304			Position	E=454660,N=499304	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-2	0.5	122.40	385	ERT-2	0.5	122.30	384
	1.0	90.20	567		1.0	90.10	566
	2.0	67.50	848		2.0	67.60	849
	3.0	35.40	667		3.0	35.10	662
	4.0	17.20	432		4.0	17.30	435
	6.0	8.20	309		6.0	8.10	305
	8.0	1.30	65		8.0	1.30	65
	10.0	0.33	21		10.0	0.34	21
	Position	E=454759,N=499304			Position	E=454759,N=499304	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-3	0.5	121.30	381	ERT-3	0.5	121.10	380
	1.0	89.40	562		1.0	89.30	561
	2.0	66.50	836		2.0	66.70	838
	3.0	34.40	648		3.0	34.30	647
	4.0	16.60	417		4.0	16.70	420
	6.0	7.70	290		6.0	7.60	287
	8.0	1.10	55		8.0	1.00	50
	10.0	0.33	21		10.0	0.32	20

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project:	2x660 MW Maitree STPP	Method:	Four Point (Wenner)
Client:	BHEL	Equipment:	Chauvin-Arnoux (CA6460)
Location:	Rampal, Bagerhat.	Test Date:	18-Apr-16

	Position	E=454946,N=499286			Position	E=454946,N=499286	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-4	0.5	117.50	369	ERT-4	0.5	117.60	369
	1.0	85.30	536		1.0	85.10	535
	2.0	61.70	775		2.0	62.70	788
	3.0	30.90	582		3.0	31.60	596
	4.0	13.40	337		4.0	13.70	344
	6.0	5.30	200		6.0	5.10	192
	8.0	0.80	40		8.0	0.79	40
	10.0	0.25	16		10.0	0.24	15
	Position	E=454799, N=499254			Position	E=454799, N=499254	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-5	0.5	119.30	375	ERT-5	0.5	119.50	375
	1.0	88.20	554		1.0	88.10	554
	2.0	64.70	813		2.0	65.30	821
	3.0	32.80	618		3.0	33.20	626
	4.0	14.10	354		4.0	14.00	352
	6.0	6.30	238		6.0	6.10	230
	8.0	0.83	42		8.0	0.85	43
	10.0	0.27	17		10.0	0.28	18
	Position	E=454405,N=499247			Position	E=454405,N=499247	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-6	0.5	118.70	373	ERT-6	0.5	118.50	372
	1.0	86.40	543		1.0	86.30	542
	2.0	64.70	813		2.0	65.10	818
	3.0	32.80	618		3.0	33.60	633
	4.0	13.00	327		4.0	12.70	319
	6.0	5.60	211		6.0	6.40	241
	8.0	0.81	41		8.0	0.83	42
	10.0	0.27	17		10.0	0.28	18

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project: 2x660 MW Maitree STPP	Method: Four Point (Wenner)
Client: BHEL	Equipment: Chauvin-Arnoux (CA6460)
Location: Rampal, Bagerhat.	Test Date: 16-Apr-16 to 17-Apr-16

	Position	E=454739,N=499204			Position	E=454739,N=499204	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-7	0.5	113.40	356	ERT-7	0.5	113.20	356
	1.0	86.30	542		1.0	86.50	543
	2.0	66.50	836		2.0	66.30	833
	3.0	37.40	705		3.0	37.70	711
	4.0	14.10	354		4.0	14.20	357
	6.0	5.30	200		6.0	5.00	188
	8.0	0.83	42		8.0	0.82	41
	10.0	0.28	18		10.0	0.27	17
	Position	E=454639, N=499204			Position	E=454639, N=499204	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-8	0.5	110.10	346	ERT-8	0.5	109.40	344
	1.0	80.00	503		1.0	79.70	501
	2.0	69.60	875		2.0	19.40	244
	3.0	38.20	720		3.0	8.10	153
	4.0	15.20	382		4.0	5.30	133
	6.0	5.10	192		6.0	2.00	75
	8.0	0.85	43		8.0	0.84	42
	10.0	0.26	16		10.0	0.27	17
	Position	E=454757,N=499168			Position	E=454757,N=499168	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-9	0.5	117.20	368	ERT-9	0.5	116.40	366
	1.0	87.80	552		1.0	87.60	550
	2.0	68.00	855		2.0	67.70	851
	3.0	37.10	699		3.0	36.42	687
	4.0	14.92	375		4.0	14.80	372
	6.0	30.82	1162		6.0	4.83	182
	8.0	0.76	38		8.0	0.77	39
	10.0	0.26	16		10.0	0.25	16

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project: 2x660 MW Maitree STPP	Method: Four Point (Wenner)
Client: BHEL	Equipment: Chauvin-Arnoux (CA6460)
Location: Rampal, Bagerhat.	Test Date: 15-Apr-16 to 21-Apr-16

	Position	E=454171,N=499184			Position	E=454171,N=499184	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-10	0.5	116.80	367	ERT-10	0.5	117.30	369
	1.0	88.50	556		1.0	89.10	560
	2.0	68.10	856		2.0	68.30	858
	3.0	37.40	705		3.0	37.60	709
	4.0	14.20	357		4.0	14.10	354
	6.0	4.73	178		6.0	4.77	180
	8.0	0.80	40		8.0	0.81	41
	10.0	0.27	17		10.0	0.28	18
	Position	E=455250, N=498563			Position	E=455250, N=498563	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-11	0.5	113.30	356	ERT-11	0.5	113.10	355
	1.0	91.20	573		1.0	91.30	574
	2.0	70.70	888		2.0	70.80	890
	3.0	36.80	694		3.0	37.10	699
	4.0	19.10	480		4.0	19.10	480
	6.0	10.20	385		6.0	10.30	388
	8.0	2.30	116		8.0	2.10	106
	10.0	0.28	18		10.0	0.39	25
	Position	E=454521,N=499120			Position	E=454521,N=499120	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-12	0.5	116.00	364	ERT-12	0.5	115.00	361
	1.0	85.70	538		1.0	85.00	534
	2.0	63.30	795		2.0	63.00	792
	3.0	33.20	626		3.0	32.70	616
	4.0	10.00	251		4.0	9.10	229
	6.0	2.50	94		6.0	2.40	90
	8.0	0.76	38		8.0	0.75	38
	10.0	0.26	16		10.0	0.27	17

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project:	2x660 MW Maitree STPP	Method:	Four Point (Wenner)
Client:	BHEL	Equipment:	Chauvin-Arnoux (CA6460)
Location:	Rampal, Bagerhat.	Test Date:	10-Apr-16

	Position	E=454631,N=499126			Position	E=454631,N=499126	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-13	0.5	97.50	306	ERT-13	0.5	98.00	308
	1.0	69.50	437		1.0	70.00	440
	2.0	16.10	202		2.0	15.70	197
	3.0	8.00	151		3.0	7.50	141
	4.0	6.10	153		4.0	5.20	131
	6.0	1.90	72		6.0	2.00	75
	8.0	0.97	49		8.0	1.00	50
	10.0	0.65	41		10.0	0.55	35
	Position	E=454686, N=499135			Position	E=454686, N=499135	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-14	0.5	91.50	287	ERT-14	0.5	92.00	289
	1.0	60.50	380		1.0	61.00	383
	2.0	15.10	190		2.0	14.50	182
	3.0	7.10	134		3.0	6.40	121
	4.0	4.60	116		4.0	4.10	103
	6.0	1.78	67		6.0	1.70	64
	8.0	0.85	43		8.0	0.80	40
	10.0	0.47	30		10.0	0.45	28
	Position	E=454732,N=499113			Position	E=454732,N=499113	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-15	0.5	95.00	298	ERT-15	0.5	93.00	292
	1.0	62.00	390		1.0	60.00	377
	2.0	14.41	181		2.0	13.50	170
	3.0	6.00	113		3.0	5.71	108
	4.0	3.70	93		4.0	3.31	83
	6.0	1.50	57		6.0	1.46	55
	8.0	0.75	38		8.0	0.72	36
	10.0	0.41	26		10.0	0.42	26

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project:	2x660 MW Maitree STPP	Method:	Four Point (Wenner)
Client:	BHEL	Equipment:	Chauvin-Arnoux (CA6460)
Location:	Rampal, Bagerhat.	Test Date:	12-Apr-16

	Position	E=454773,N=498998			Position	E=454773,N=498998	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-16	0.5	115.70	363	ERT-16	0.5	110.50	347
	1.0	82.00	515		1.0	63.00	396
	2.0	62.00	779		2.0	57.00	716
	3.0	32.00	603		3.0	29.60	558
	4.0	9.00	226		4.0	8.24	207
	6.0	2.70	102		6.0	2.35	89
	8.0	0.75	38		8.0	0.74	37
	10.0	0.28	18		10.0	0.26	16
	Position	E=454651, N=498977			Position	E=454651, N=498977	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-17	0.5	111.50	350	ERT-17	0.5	112.00	352
	1.0	82.50	518		1.0	83.00	522
	2.0	61.00	767		2.0	63.00	792
	3.0	32.70	616		3.0	33.50	631
	4.0	9.50	239		4.0	10.00	251
	6.0	2.65	100		6.0	2.75	104
	8.0	0.72	36		8.0	0.77	39
	10.0	0.26	16		10.0	0.27	17
	Position	E=454541,N=498949			Position	E=454541,N=498949	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-18	0.5	114.60	360	ERT-18	0.5	115.00	361
	1.0	84.60	532		1.0	85.20	535
	2.0	64.30	808		2.0	63.10	793
	3.0	33.70	635		3.0	33.80	637
	4.0	9.70	244		4.0	10.20	256
	6.0	2.80	106		6.0	2.50	94
	8.0	0.77	39		8.0	0.73	37
	10.0	0.29	18		10.0	0.27	17
Tested By:	Akbar Ali			Prepared By:	Md.Rafiqul Islam		

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project: 2x660 MW Maitree STPP	Method: Four Point (Wenner)
Client: BHEL	Equipment: Chauvin-Arnoux (CA6460)
Location: Rampal, Bagerhat.	Test Date: 15-Apr-16 to 17-Apr-16

	Position	E=454424,N=498915			Position	E=454424,N=498915	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-19	0.5	116.70	367	ERT-19	0.5	117.00	368
	1.0	87.50	550		1.0	87.00	547
	2.0	65.60	824		2.0	65.00	817
	3.0	33.70	635		3.0	33.50	631
	4.0	10.30	259		4.0	10.20	256
	6.0	3.60	136		6.0	3.50	132
	8.0	0.80	40		8.0	0.77	39
	10.0	0.27	17		10.0	0.28	18
	Position	E=454173, N=498918			Position	E=454173, N=498918	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-20	0.5	118.30	372	ERT-20	0.5	118.60	373
	1.0	88.70	557		1.0	88.50	556
	2.0	65.80	827		2.0	66.70	838
	3.0	34.50	650		3.0	34.60	652
	4.0	10.60	266		4.0	10.70	269
	6.0	4.30	162		6.0	4.30	162
	8.0	0.83	42		8.0	0.82	41
	10.0	0.27	17		10.0	0.26	16
	Position	E=454635,N=498859			Position	E=454635,N=498859	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-21	0.5	111.80	351	ERT-21	0.5	112.00	352
	1.0	79.80	501		1.0	79.00	496
	2.0	62.10	780		2.0	61.70	775
	3.0	32.00	603		3.0	31.50	594
	4.0	9.50	239		4.0	9.20	231
	6.0	2.75	104		6.0	2.80	106
	8.0	0.76	38		8.0	0.75	38
	10.0	0.26	16		10.0	0.27	17

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project: 2x660 MW Maitree STPP	Method: Four Point (Wenner)
Client: BHEL	Equipment: Chauvin-Arnoux (CA6460)
Location: Rampal, Bagerhat.	Test Date: 15-Apr-16 to 21-Apr-16

ERT-22	Position	E=454780,N=498858		ERT-22	Position	E=454780,N=498858	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
	0.5	119.50	375		0.5	119.20	374
	1.0	88.20	554		1.0	88.10	554
	2.0	68.50	861		2.0	67.20	844
	3.0	37.60	709		3.0	37.00	697
	4.0	11.00	276		4.0	10.70	269
	6.0	3.89	147		6.0	3.70	139
	8.0	0.83	42		8.0	0.81	41
	10.0	0.33	21		10.0	0.31	19
ERT-23	Position	E=454325, N=498807		ERT-23	Position	E=454325, N=498807	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
	0.5	119.30	375		0.5	119.10	374
	1.0	89.70	564		1.0	89.60	563
	2.0	67.10	843		2.0	67.20	844
	3.0	34.20	645		3.0	34.30	647
	4.0	11.70	294		4.0	11.40	287
	6.0	4.30	162		6.0	4.00	151
	8.0	0.81	41		8.0	0.83	42
	10.0	0.26	16		10.0	0.27	17
ERT-24	Position	E=454111,N=498682		ERT-24	Position	E=454111,N=498682	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
	0.5	118.90	374		0.5	119.70	376
	1.0	89.50	562		1.0	89.30	561
	2.0	68.50	861		2.0	67.10	843
	3.0	36.60	690		3.0	36.30	684
	4.0	15.20	382		4.0	15.10	380
	6.0	7.00	264		6.0	6.20	234
	8.0	0.98	49		8.0	1.00	50
	10.0	0.26	16		10.0	0.27	17
Tested By:	Akbar Ali			Prepared By:	Md.Rafiqul Islam		

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project:	2x660 MW Maitree STPP	Method:	Four Point (Wenner)
Client:	BHEL	Equipment:	Chauvin-Arnoux (CA6460)
Location:	Rampal, Bagerhat.	Test Date:	21-Apr-16

	Position	E=454221,N=498668			Position	E=454221,N=498668	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-25	0.5	123.30	387	ERT-25	0.5	123.10	387
	1.0	92.10	579		1.0	92.40	581
	2.0	69.70	876		2.0	70.10	881
	3.0	38.30	722		3.0	38.20	720
	4.0	16.40	412		4.0	16.10	405
	6.0	7.20	271		6.0	7.00	264
	8.0	1.30	65		8.0	1.20	60
	10.0	0.36	23		10.0	0.35	22
	Position	E=454422, N=498594			Position	E=454422, N=498594	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-26	0.5	122.40	385	ERT-26	0.5	122.10	384
	1.0	91.60	576		1.0	91.30	574
	2.0	70.30	883		2.0	70.10	881
	3.0	39.40	743		3.0	39.30	741
	4.0	17.30	435		4.0	17.20	432
	6.0	7.80	294		6.0	8.10	305
	8.0	1.70	85		8.0	2.00	101
	10.0	0.28	18		10.0	0.29	18
	Position	E=454462,N=498690			Position	E=454462,N=498690	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-27	0.5	124.20	390	ERT-27	0.5	124.00	390
	1.0	93.30	586		1.0	93.10	585
	2.0	70.65	888		2.0	70.70	888
	3.0	39.30	741		3.0	39.10	737
	4.0	18.10	455		4.0	18.20	457
	6.0	9.00	339		6.0	9.10	343
	8.0	2.10	106		8.0	2.05	103
	10.0	0.37	23		10.0	0.38	24

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project: 2x660 MW Maitree STPP	Method: Four Point (Wenner)
Client: BHEL	Equipment: Chauvin-Arnoux (CA6460)
Location: Rampal, Bagerhat.	Test Date: 21-Apr-16 to 24-Apr-16

	Position	E=454547,N=498700			Position	E=454547,N=498700	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-28	0.5	122.70	385	ERT-28	0.5	122.80	386
	1.0	88.80	558		1.0	89.60	563
	2.0	66.40	834		2.0	66.10	831
	3.0	35.60	671		3.0	35.70	673
	4.0	15.10	380		4.0	15.20	382
	6.0	7.30	275		6.0	7.40	279
	8.0	1.50	75		8.0	1.60	80
	10.0	0.29	18		10.0	0.29	18
	Position	E=454728, N=498692			Position	E=454728, N=498692	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-29	0.5	116.70	367	ERT-29	0.5	117.10	368
	1.0	84.10	528		1.0	85.10	535
	2.0	60.70	763		2.0	61.50	773
	3.0	31.00	584		3.0	33.10	624
	4.0	18.50	465		4.0	19.10	480
	6.0	9.00	339		6.0	9.50	358
	8.0	0.20	10		8.0	0.21	11
	10.0	0.11	7		10.0	0.10	6
	Position	E=454657,N=498577			Position	E=454657,N=498577	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-30	0.5	119.70	376	ERT-30	0.5	124.40	391
	1.0	94.40	593		1.0	95.70	601
	2.0	67.60	849		2.0	68.20	857
	3.0	19.50	368		3.0	19.70	371
	4.0	9.10	229		4.0	10.23	257
	6.0	0.41	15		6.0	0.37	14
	8.0	0.13	7		8.0	0.15	8
	10.0	0.09	6		10.0	0.08	5

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

DEVELOPMENT CONSTRUCTIONS LTD.

SOIL RESISTIVITY TEST

Project:	2x660 MW Maitree STPP	Method:	Four Point (Wenner)
Client:	BHEL	Equipment:	Chauvin-Arnoux (CA6460)
Location:	Rampal, Bagerhat.	Test Date:	24-Apr-16 to 25-Apr-16

	Position	E=45480,N=498577			Position	E=45480,N=498577	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-31	0.5	115.40	363	ERT-31	0.5	115.10	362
	1.0	83.70	526		1.0	83.10	522
	2.0	60.10	755		2.0	60.50	760
	3.0	31.10	586		3.0	31.10	586
	4.0	17.40	437		4.0	17.10	430
	6.0	6.10	230		6.0	6.10	230
	8.0	0.22	11		8.0	0.22	11
	10.0	0.14	9		10.0	0.17	11
	Position	E=453977, N=497753			Position	E=453977, N=497753	
	Direction	E-W			Direction	N-S	
	Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)		Electrode Spacing (d) (m)	R_{S-ES} (Ω)	ρ_w (Ω.m)
ERT-32	0.5	107.30	337	ERT-32	0.5	107.10	336
	1.0	68.60	431		1.0	69.70	438
	2.0	30.20	380		2.0	30.10	378
	3.0	16.81	317		3.0	17.00	320
	4.0	5.20	131		4.0	5.10	128
	6.0	0.80	30		6.0	0.81	31
	8.0	0.20	10		8.0	0.20	10
	10.0	0.11	7		10.0	0.10	6

Tested By:	Akbar Ali	Prepared By:	Md.Rafiqul Islam

ANNEXURE-2

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	Design/ Engineering and construction of 33 KV sub-station along with supply, erection, testing and commissioning of equipment and system for construction power distribution system (11 KV overhead lines, package sub-station etc.),high mast lighting / temporary illumination system including obtaining clearances from various authorities, operation & maintenance (O&M), etc of construction power network for 2x660 MW Maitree Super Thermal power project at Moidara village, Rampalupazila, Bagerhat district, Bangladesh	
Ref	1.0	Tender No. PSER:SCT:KLN-E1754:16
	2.0	BHEL's NIT, vide reference no PSER:SCT:KLN-E1754:5101, Dated 01-07-2016.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:KLN-E1754:TCN-01, dated 12-07-2016.
	4.0	BHEL's TCN-02, vide reference no PSER:SCT:KLN-E1754:TCN-02, dated 21-07-2016.
	5.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the bidder)