PRELIMINARY GROUND INVESTIGATION REPORT
PROJECT KCB2
BORSSELE, THE NETHERLANDS

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PRELIMINARY GROUND INVESTIGATION REPORT
PROJECT KCB2

EXECUTIVE SUMMARY

A preliminary geological, geotechnical, and hydro-geological investigation has been completed by Paul C. Rizzo Associates, Inc. (RIZZO) to characterize the Borssele 2 Power Plant (KCB2) Site. The objective of the investigation was to provide sufficient site-specific information to the nuclear technology vendors to allow for their understanding of the ground risk in their bid preparation. The subsurface stratigraphy and properties of the subsurface materials have been determined using the results of the desk study, field, and laboratory data acquired during the investigation program. The preliminary ground investigation undertaken at the KCB2 Site included drilling five boreholes with a total depth of 600 meters (m), performing in-situ and laboratory geotechnical testing, and conducting borehole geophysical surveys. The investigation also consisted of developing ten Monitoring Wells grouped in three clusters to evaluate hydraulic properties.

PRELIMINARY GROUND INVESTIGATION REPORT (PGIR)
PROJECT KCB2

1.0 INTRODUCTION

Paul C. Rizzo Associates, Inc. (RIZZO) has completed a preliminary geological, geotechnical, and hydro-geological investigation directed at characterization of the Borssele 2 Power Plant (KCB2) Site located near Middelburg, the Netherlands.

This Report presents the methodologies and results of the geotechnical analyses performed. In ***Section 2.0***, the site-specific geologic features are described based on the findings of the field investigation program. ***Section 3.0*** details the in-situ geotechnical testing, including geophysical surveys and laboratory testing.

2.0 GEOLOGIC FEATURES

2.1 SITE GEOLOGIC FEATURES

The Site is located on the Rijn-Maas-Schelde delta, where more than 10 kilometers (km) of largely siliciclastic both unconsolidated and consolidated sediments overlie the poorly known metamorphic basement of the Anglo-Brabant Massif, a positive structural basement high surrounded by basins (de Jager, 2007) on the Eurasian Plate.

The ground surface at the Site is located between EL 4 m and EL 6 m NAP with the surface consisting of unconsolidated fill composed of sandy soil, likely dredged from offshore locations or the harbours of Vlissingen Oost after World War II. There are some redeposited fluvial and aeolian sediments as well. Other unconsolidated deposits that exist within the subsurface of the site vicinity include Cenozoic sediments of fluvial, coastal, marine, and aeolian origin.

The Cenozoic deposits within the Site belong to the North Sea Supergroup consisting of virtually all interbedded sand and clay (TNO, 2003). This Supergroup is subdivided into the Lower, Middle, and Upper North Sea Groups; which are separated from each other by unconformities. The thickness of the North Sea Supergroup ranges from less than 300 m to over 1,150 m. In the site vicinity, the Upper North Sea Group, ranging from Miocene to Holocene in age, comprises the Naaldwijk, Boxtel, Kreftenheye, Eem, Waalre-Maassluis, Oosterhout, and Breda Formations.

The Upper North Sea Group rests unconformably or disconformably on the Late Eocene to Late Oligocene Middle North Sea Group (TNO, 2003). The Middle North Sea Group's thickness ranges from 150 m to 200 m in the north-eastern part of the site vicinity, but it pinches out to nonexistent in the south and western portions of the site vicinity (TNO, 2003). This group is made up of two distinct units: the Veldhoven Formation and the Rupel Formation (TNO, 2010). However, only the Rupel Formation is present within the site vicinity.

Below the Vessem Member sediments, specifically the Bassevelde Sand Member, lays the Lower North Sea Group. The basal unit of the Middle North Sea Group rests conformably to slightly unconformably on the Late Paleocene to Middle Eocene Lower North Sea Group. The Lower North Sea Group consists of the Dongen Formation and the Landen Formation and is present throughout the site vicinity with a maximum thickness of 500 m in the northeast and approximately 400 m in the south (TNO, 2003).

During the site investigation, one of the borings penetrated a unique sequence of soils which was not penetrated at any other boring location. Between ground surface and approximately 26.5 m depth, loose, relatively homogenous channel-filling sand was sampled by Standard Penetration Test (SPT) methods. At all other boring locations, this depth interval consisted of a recognizable sequence of interbedded sand, silt, and clay of the Naaldwijk and Boxtel Formations. Although the extent of the suspected infill channel is not known, it was observed between the ground surface and approximately depth of 26.5 m in one boring (KB-102). It is concluded that the north-northwest side of the KCB2 footprint lies atop a filled-in, reclaimed channel of the River Schelde Estuary. This claim is supported by the drilling contractor, historical accounts, photographs, and transmissivity maps of sand and clay in the River Schelde Estuary.

The site stratigraphy was determined based on the available geologic information and the site-specific information from the field investigation; subsequently, for our analysis, the stratigraphy is divided into eight stratigraphic units starting from top to bottom as:

Modern Fill: Covering the ground surface, Modern Fill is comprised of poorly to well-sorted, fine to medium sand with some sand-size sub-rounded to angular shell grains. This Layer is indicative of anthropogenic reclamation of formerly sea-level landscape since the early 1900s. During the field investigations, Modern Fill has been observed between EL 5.11 m and EL 0.0 m NAP.

Naaldwijk Formation (Holocene): The Naaldwijk Formation which was encountered between EL 0.0 m and EL -9.45 m NAP, is a sequence of coastal and shallow marine clastic deposits consisting of clays, sands, and silts with trace organics and peats. The River Schelde Estuary channel at the Site northwest is considered to be infilled with deposits of the Naaldwijk Formation which have been encountered to a depth of EL -19.9 m NAP.

Boxtel Formation (Pleistocene): The Boxtel Sand Formation is comprised of fine- to medium-grained silt, sand, and silty sand layers, indicative of a periglacial depositional environment. Plant debris is common along with small marginal marine shell fragments. The Boxtel Formation was located between EL -7.5 m and EL -20.26 m NAP.

Maassluis/Waalre Formation (Upper Pliocene to Lower Pleistocene): This Layer consists of light grey to orange sand and silt/clay intervals and includes up to five percent small angular shell grains in sand and silt (up to 10 millimeters [mm] in size). The Maassluis Formation is associated with shallow marine to coastal deposition and is contemporaneous with the

fluviatile Waalre Formation. The Waalre Formation consists of fine- to medium-grained sand alternating with silty sand and lacks shells. This Formation is seen between EL -19.5 m and EL -23.26 m NAP.

Oosterhout Formation (Pliocene): The Oosterhout Formation consists of up to 20 percent gravel-size shells in a fine- to coarse-grained quartz and shell-sand matrix indicative of a shallow marine to coastal depositional environment, and exhibits a sharp contact with the underlying Breda Formation. The Oosterhout Formation was observed between EL -20.59 m and EL -30.99 m NAP.

Breda Formation (Miocene to lower Pliocene): Breda Sands consist of dark (green to black) glauconitic sands with some silty sands, indicative of a neritic shallow-marine depositional environment, and contain up to 50 percent glauconite as fine- to medium-sand sized grains within quartz sand. The Breda Sand is known for its unexpected geotechnical properties such as high swell potential and low permeability. The Breda Formation is located between EL -28.22 m and EL -69.77 m NAP.

Rupel Formation (Eocene to Oligocene): The Rupel Formation consists of the Rupel Clay Member with gray to dark green silty fat clays and some fine-grained sand in places, and the Vessem Member (Tongeren Formation) that includes the Ruisbroek and Bassevelde Sands (poorly sorted fine- to medium-grained sands) and the Watervliet Clay (dark gray silty fat clay). Both members are indicative of shallow marine depositional environments. The Rupel Formation is between EL -63.3 m and EL -140.6 m NAP. The Rupel Clay, locally known as "Boom Clay," varies between EL -63.3 m and EL -79.8 m NAP with an average thickness of 11.2 m.

Dongen Formation (Eocene): The Dongen Formation consists of dark gray silty fat clay (Asse Clay Member) with fine-grained sands in places indicative of a shallow marine depositional environment. Additional underlying members of the Dongen Formation were not encountered within the depth of this investigation. The Asse Clay Member of the Dongen Formation was encountered below EL -140.6 m to the deepest investigation point at EL -196.04 m NAP.

Based on the results of this preliminary Site Investigation Program, two geologic cross sections were developed using desk studies, in-situ, and laboratory data. The locations of the boreholes and other investigation activities as well as the legend used in the geologic profiles are shown on ***Figure 2-1***. The geologic profiles of the Site are presented in Sections A-A'

and B-B', as shown on ***Figures 2-2 and 2-3***, respectively. The details of the Site Investigation Program are given in the following Sections of this Report.

2.2 SITE TECTONIC FEATURES

The results of the preliminary geological, seismological, and geophysical investigations performed around the Site indicate that there is no Quaternary tectonic surface faulting or fold deformation, and there are no capable tectonic sources within the site vicinity; therefore, there is no potential for tectonic surface disruption that could affect the Site. This observation is consistent with the conclusion made by other studies that geologic hazard to the Site due to tectonic activity does not exist (Worum et al., 2005; van Balen et al., 2005). However, this statement needs to be verified through more detailed investigations at the next stage of studies.

2.3 GEOLOGIC HAZARDS AT THE SITE

In general, the KCB2 Site is free from geologic hazards. Subsurface conditions and soil types at the Site are not conducive to the formation of karst conditions. According to de Swart (1993), 98 percent of the Netherlands' subsurface is thick Quaternary sediments, such as sand, clay, and peat which will not develop karst features.

Peat/organic soil zones between 0 and 15 m depth are structurally weak and prone to settlement. Some very loose sandy soils with very low N-Values are also present between 0 m and 30 m depth. Below 30 m depth, all granular soils are very dense and fine to medium grained, but contain a high percentage of glauconite which is known to expand under certain conditions. The fine-grained soils below 30 m depth, such as clay and silt, are very stiff but highly plastic (fat). Soft and compressible materials present at the Site were taken into consideration during geotechnical design.

3.0 PROPERTIES OF SUBSURFACE MATERIALS

3.1 DESCRIPTION OF FIELD INVESTIGATION ACTIVITIES

The subsurface exploration activities undertaken at the KCB2 Site included subsurface drilling to retrieve Standard Penetration Test (SPT) samples and soil cores for analysis, as well as the installation of piezometric monitoring wells. Cone Penetration Testing (CPTu) and the geophysical P-S Suspension Logging and Borehole Deviation Surveys of the deepest boring (KB-101) were also completed. The following paragraphs describe the field activities undertaken during the Site Investigation Program in June and July 2011. The number and locations of the field investigation activities are shown on ***Figure 2-1***.

3.1.1 In-situ Geotechnical Sampling and Testing

Four 100 m borings (KB-102, KB-103, KB-104, KB-105) were advanced using two sampling methods: SPT sampling coupled with side-discharge wash boring in accordance with American Society for Testing and Materials (ASTM) D 2113-06 for the initial 0-30 m depth of each borehole, and the SMET® push sampling method between 30 m and the termination depth. One 200 m boring (KB-101) was advanced using only the SMET® push sampling method. BMNED conducted the boring program. In addition to SPT and soil coring with the SMET® sampler, undisturbed sampling using thin-walled Shelby tubes was performed in each boring to obtain undisturbed samples of all soil types at targeted depths. ***Figure 3-1*** depicts examples of three soil samples derived from the above three sampling techniques. During the drilling program, boring logs were developed that contain percent recovery, lithologic description, etc. The boring logs from the Site Investigation Program are included in ***Appendix A***.

3.1.1.1 Standard Penetration Tests

All SPT borings were sampled in accordance with the general guidance as provided in the following:

- NEN 5104 (Geotechnical- Classification of Unconsolidated Soil Samples).
- ISO 22475-1:2006 (Geotechnical Investigation and Testing - Sampling Methods and Groundwater Measurements - Part 1: Technical Principles for Execution).
- ISO 22476-3:2005 (Geotechnical Investigation and Testing - Field Testing - Part 3: Standard Penetration Test).

- EN 1997-2:2007 (Eurocode 7, Geotechnical Design - Ground Investigation and Testing).

All borings were sampled continuously to acquire as much information as possible.

During SPT sampling, once the desired sampling depth was reached, the boring was cleaned until the split-barrel sampler was able to freely rest on the bottom of the hole. The sampler was driven either 450 mm or 600 mm, depending upon the recovery percentage experienced while sampling. If recovery was observed to be excessively low, increasing the length of the sample served to improve recovery, since the air/water space above the sample was decreased. This generally occurred in granular, loose soils and was not an issue in cohesive soils. The number of hammer blows for each 150 mm interval was recorded, and the blow count values for the intervals corresponding to 150-300 mm and 300-450 mm were added together to arrive at the N-Value. These specific (2nd and 3rd) intervals were added together regardless of the 450 mm or 600 mm length of the sample. This process continued for each SPT sample until refusal, which was defined as 50 blows per 150 mm penetration, or if the sampler failed to advance during 10 consecutive blows.

Once collected within the sampler, the split-barrel sample was opened; all pertinent information was recorded in the Project Geologist's Personal Digital Assistant (PDA) and on a photograph whiteboard. The soil sample was photographed, measured, and characterized. The sample was then placed in a sample jar, labeled, and stored in a designated storage facility on-site.

During the SPT sampling, energy measurements were conducted on the Donut hammer to determine the average energy transfer from the hammer to the drill rods. Various factors control the actual energy transferred to the rod, and hammer efficiency is usually 60 percent of the theoretical SPT hammer potential energy (0.475 kN-m). However, in-depth engineering analysis, such as a liquefaction potential assessment, requires more precise estimation of the actual hammer energy. The average energy transferred to the rods was determined by SPT hammer energy measurements, which were conducted in accordance with ASTM D 4633-10.

GRL Engineers, Inc. (GRL) conducted the energy measurements on 5 and 6 July 2011 during SPT sampling on a Fraste MD/XL drill rig using a 50 mm diameter Craelius drill rod with a manually controlled Donut hammer. Energy transfer measurements were made during six SPT sampling events with N-values between 5 and 50 blows per 300 mm. Prior to the test, GRL also performed the calibration of the instrumented rod used in the field testing, and

related strain gauges and accelerometers under RIZZO's Commercial Grade Dedication Program. Details of the SPT hammer energy measurements can be found in GRL (2011).

The ratio of average measured energy to the theoretical potential energy of the SPT system is the energy transfer ratio (ETR). During data analysis, it was noted that the average energy transferred differed depending on the operator of the hammer. The ETR for the Donut hammer used at the Site ranged between approximately 63.0 percent and 70.3 percent of the theoretical potential energy, with an average of 66 percent.

3.1.1.2 Sampling using SMET Sampler

Following the SPT sampling, the SMET® push sampler method was used for sampling below 30 m depth in all the boreholes with the exception of KB-101. The SMET® push sampler coring system was used to ensure high recovery percentages in challenging soil conditions so that the geologic profile of the Site can be better understood up to 200 m depth. The system consists of drilling rods, an outer coring head, an inner tube, a polyvinyl chloride (PVC) sample tube, and a threaded driving shoe. The outer coring head contains the inner tube, the driving shoe threads onto the inner tube, and the PVC sample tube nests within the inner tube. During sampling operations, the inner tube is pushed beyond the coring head for a maximum run length of 1,000 mm, collecting sample as it is advanced hydraulically. The soil core slides into the PVC sample tube, which offers protection to the sample and eases sample extraction and handling.

Once the sampler has reached its completion depth, the coring head over-drills the inner tube, removing the surrounding soils, facilitating extraction by removing friction caused by vacuum. Removal of the surrounding soils is done using mud circulation and a rotating cutting head. Once the soils have been removed from around the inner tube, the inner tube containing the sample is lifted to the surface. The 100 mm outer diameter PVC sample tube containing a 95.6 mm diameter soil core was then removed from the inner tube. No sample catcher was used and a high recovery was achieved in all the samples by using vacuum.

The PVC tube was cut open lengthwise with a powered cutting wheel; the sample was then cut lengthwise, and the tube and sample were split into two halves. The soil was then described by the Project Geologist(s) and logged using pLog software loaded onto a PDA. The sample was then photographed along with a length scale, color scale, and a whiteboard containing pertinent sample information as shown on ***Figure 3-1***. This enables the logging geologist to have a record of the sample number, depth, length, recovery, color, texture, and condition independent of the boring log. Sample halves were then put back together with

three wraps of PVC adhesive tape and placed inside of PVC storage tubes with sealed end-caps. Labels were placed on the storage tube and top end-cap and protected with clear adhesive shipping tape. Protected samples were then transported to steel shipping/storage containers outfitted with a customized system for stacking and organizing the sample tubes.

Drilling mud consisted of a mixture of brackish water and a bentonite-based drilling fluid additive known as TUNNEL-GEL™ SW Viscosifier, a Baroid Drilling product. This additive is designed to viscosify brackish or saline make-up water and assist in providing borehole stability, filtration control, and improved carrying capacity in drilled shafts, tunneling, horizontal directional drilling, and other construction applications.

Water for drilling operations was collected from a designated supply well drilled away from the center of the Site and pumped to supply tanks placed near the boring locations. Drilling mud was circulated through the boring and into a primary settlement tank to remove cuttings before overflowing into a secondary supply tank. The mud from the secondary tank was then circulated back through the boring. This drilling fluid was effective in stabilizing sections of the borehole above the Boom Clay composed of loose sand, silt, and clay (Naaldwijk, Boxtel, and Waalre-Maassluis Formations), fine shelly sand with gravel (Oosterhout Formation), and fine-grained glauconitic sand (Breda Formation).

Temporary casing was driven to a depth of approximately 4.5 m in the borings to prevent caving and raveling of the upper section (composed of fill) and also to create a tight seal promoting efficient fluid circulation. The soil samples were collected as either “disturbed” or “undisturbed” for laboratory testing.

3.1.1.3 Undisturbed Sampling

The undisturbed sampling was accomplished with thin-walled Shelby tubes pushed hydraulically through the boring to collect Type A samples of soils present within the depth of the investigation. Type A samples preserve in-situ confinement and moisture conditions with very little disturbance to the soil sample, enabling representative geotechnical laboratory analyses. As shown on ***Figure 3-1***, steel Shelby tubes with an inner diameter of approximately 101 mm and wall thickness of 2.03 mm were used to collect undisturbed samples in accordance with ASTM D 1587-08 and International Organization for Standardization (ISO) 22475-1:2006.

The tubes were pushed a maximum of 550 mm into the soil and extracted. Once extracted, the sample tube was inspected for damage, the sample recovery was measured, and the

outside of the sample tube was cleaned. The top and bottom of the recovered material was scraped in order to collect a small amount of soil for description. Melted micro-crystalline paraffin wax was poured into the top end of the tube and allowed to cool and harden in order to seal the sample and prevent moisture loss. Any void space in the top was then filled with clean sand and a flexible plastic cap was fitted onto the tube and wrapped with adhesive PVC tape. The bottom end of the sample was prepared in a similar fashion with wax, sand (if necessary), and a sealed end-cap. A label filled with all necessary sample information was affixed to the top and side of the sample tube and protected with clear shipping tape. After preparation, the Shelby tube samples were kept upright in the natural position at all times, including during transport and storage.

3.1.1.4 Cone Penetration Testing

Cone Penetration Test with pore water pressure measurement was performed at thirteen locations throughout the Site as shown on ***Figure 2-1***. Cone Penetration Test (CPT) soundings are used in subsurface characterization and geotechnical analysis, such as estimation of strength parameters and liquefaction potential. For further details, the CPTu logs from all test locations are included in ***Appendix B***.

The CPTu were carried out in accordance with the Dutch Standard NEN 5140 and ASTM D 5778-07 using an electrical cone and friction sleeve. During CPTu soundings, the pore water pressure was measured in addition to tip resistance and sleeve friction every 20 mm. The filter for the pore pressure is situated behind the cone (u_2). MOS Grondmechanica B.V. of Rhoon, Netherlands, performed the CPT soundings under RIZZO's supervision. During the CPT surveys, cones with a 15 square centimeter (cm^2) base area were used as defined by ASTM D 5778-07, Section 7.1.2. This larger diameter cone enabled deeper penetration depths and prevented early refusal in the stiff Oosterhout Sands. The tests were terminated at approximately 60 m below ground surface (bgs).

Prior to the execution of the CPTu, testing with a magneto-cone was performed for detection of the Unexploded Ordnance (UXO) at CPT locations. No anomalies were detected at the test locations. The locations were hand-augured for utility clearance to 1.5 m from the ground surface.

Also, prior to execution of the tests, the cones used in this Site Investigation Program were calibrated. RIZZO observed the calibration process under a Commercial Grade Dedication Program. Baseline readings or Zero Load readings for both cone and friction sleeve load

cells and pore water pressure transducers were taken and recorded before and after each sounding.

The CPT logs include tip resistance (q_c), sleeve friction (f_s), friction ratio (R_f) as q_c/f_s and pore pressure (u). Corrected tip resistance and soil classification based on Robertson (1990) are also included in the CPT logs.

The majority of the subsurface layers were clearly identified in the CPT logs with their distinct "fingerprint" from tip resistance and friction ratio. The tip resistance measurements at each CPTu location are shown along with the geologic profiles on ***Figures 2-2 and 2-3***. Several layers such as the Oosterhout Sand and the Naaldwijk Clay/Peat have shown relatively high and low CPTu sounding patterns, respectively. Zones with high fine content in the Boxtel Sand layers are also identified with relatively high friction ratios. Similarly, due to quick dilation of the Oosterhout and Breda Sands, negative pore pressures are measured in these formations.

To illustrate the characteristic CPTu pattern at the Site, the tip resistance and friction ratios measured from KCPT4A are shown on ***Figure 3-2***. The Boxtel Sands yielded tip resistance up to 33 megapascals (MPa). Tip resistances in the Oosterhout Formation are measured as high as 56 MPa. The tip resistance in the Breda Sand was measured up to 35 MPa. The Peat Layer in the Naalwijk Formation (EL -4 m NAP) yielded very low tip resistance values.

3.1.1.4.1 Dissipation Tests

During the CPT soundings, at selected intervals, pore pressure dissipation tests were performed in accordance with ASTM D 5778, "Standard Test Method for Electric Friction Cone and Piezocone Penetration Testing," Section 12.3.6. For dissipation tests, penetration of the cone was stopped at the selected depth and the dissipation of any excess pore pressure generated around the cone was monitored. The rate of dissipation depends upon the coefficient of consolidation, which, in turn, depends on the compressibility and permeability of the soil. Based on the results of the dissipation tests, the permeability value and the coefficient of consolidation were determined. The dissipation tests in the Oosterhout Sand were conducted to observe the recovery of the negative pore pressures due to dilation to hydrostatic water pressure levels. The test logs and results of the dissipation tests are reported in ***Appendix B***.

3.1.1.4.2 Cone Pressuremeter Testing

At two locations (KCPT 7 and KCPT 17) (***Figure 2-1***), seven Cone Pressuremeter Testing (CPM) tests were performed at various depths to determine soil elastic deformation characteristics. The pressuremeter apparatus was attached to the CPT for these tests. These tests were conducted in accordance with typical industry practices such as outlined in Withers et al., (1989). The pressuremeter cones were calibrated for membrane pressure readings and displacement arms. Prior to execution of the tests, the cone pressuremeter probe used in this Site Investigation Program was calibrated. RIZZO observed the calibration process under a Commercial Grade Dedication Program. Baseline readings or Zero Load readings were taken and recorded before and after each sounding.

During CPM testing, the number of cycles included one initial loading and two unloadings/reloadings, which were followed by a final unloading. One CPM test was completed with one unload/reload cycle due to high stiffness of the tested soil section. The results are used in the estimation of the soil deformation (stiffness) modulus (E_{50}). Soil stiffness modulus values from CPM tests generally represent upper bound values when compared with the modulus estimated using laboratory or CPT based correlations. For further details, the cone pressuremeter test logs are presented in ***Appendix B***.

3.1.2 Field Observation and Logs

During all site investigation activities, Field Boring Logs, Daily Field Reports, and other task specific field records were maintained by the Project Geologist or Engineer assigned to each drill rig. The Project Geologist visually described the soil samples and cores and noted the presence of distinguishing geologic features wherever possible. Field Coordinators or Senior Geologists reviewed field data collection and classification activities and supervised logging operations.

3.1.3 Borehole Geophysical Surveys

One P-S Suspension survey and one borehole deviation survey, both at Boring KB-101 were carried out. Due to the limited scope of this preliminary Site Investigation Program, a representative seismic wave velocity profile of the Site was determined at the approximate center of the Site at KB-101, the deepest boring advanced during this investigation (200 m depth).

3.1.3.1 P-S Suspension Survey

In-situ P- and S-wave velocities were measured at KB-101 at 0.5 m intervals with the OYO/Robertson Suspension P-S Logging system (Suspension system) by GEOVision, Inc., of Corona, California, US. As an industry standard for Nuclear Power Plant (NPP) site characterization, the P-S logging method directly determines the average P-wave and S-wave velocity of a 1-m segment of the soil column surrounding the boring using a downhole source. The downhole source generates pressure waves in the borehole fluid, which are converted to P- and S-wave in the surrounding stratum. The seismic waves are captured by two receivers located above the source. During P-S logging, seismic velocities calculated between each receiver and source (i.e., receiver to receiver and source to receiver) enables an independent check of measured velocities. The details of the P-S logging procedure are given in the Borssele Boring KB-101 Boring Geophysics Report (GEOVision, 2011).

Calibration procedures and records for the Suspension P-S Measurement System and GEOVision standard field log sheets are presented in GEOVision (2011). The P-S Suspension Survey was performed in an uncased borehole below the surface casing. The surface casing was maintained through unstable surface soils. The survey was conducted in a water-filled borehole.

The seismic velocity profile including compressional and shear waves are presented on ***Figure 3-3***, in which survey measurements are included as discrete points. The shear wave seismic velocities in the Oosterhout Formation were measured as high as 550 meters per second (m/s). A reduction in the seismic wave velocities in Boom Clay (EL -65 m NAP) and Asse Clay (EL -145 m NAP) layers was observed from P-S Suspension Logging results. The geologic stratigraphy and seismic velocity profiles show excellent agreement.

3.1.3.2 Borehole Deviation Survey

Borehole Deviation Survey was performed using the Robertson HiRAT probe by GEOVision, Inc., at KB-101. The probe is 1.62 m long and 42 mm in diameter. Borehole Deviation Survey was collected at 0.002-m intervals. A fluxgate magnetometer is enclosed in the probe to monitor magnetic north. All pre-processed televiewer data are referenced to magnetic north and the processed data are referenced to true-north. The probe also contains a three-axis accelerometer. Boring deviation data are recorded during the logging runs to permit correction of the structure dip angle from apparent dip (referenced to boring axis) to true dip (referenced to a vertical axis). Details of the Borehole Deviation Survey are presented in the Borssele Boring KB-101 Boring Geophysics Report (GEOVision, 2011).

Both upward and downward deviation logs in KB-101 agree to within 0.05-degree inclination and 2.0 degrees azimuth. KB-101 was inclined at 0.2 degree from vertical, and the maximum error in depth value was less than 0.1 m in 122 m, or less than 0.1 percent. This error is less than depth errors from other causes, and no adjustment of log depths is indicated.

3.1.4 Field Hydraulic Conductivity Testing

Hydrogeological field investigations at the KCB2 Site took place in the same period as the geotechnical investigations. Ten monitoring wells were grouped in three clusters to evaluate the vertical distribution of hydraulic properties and hydraulic head at three separate locations. This effort included hydraulic testing (pumping tests, slug tests) to estimate hydraulic properties of each hydrostratigraphic unit and the collection of groundwater level data.

3.1.4.1 Pumping Tests

Individual pumping tests were performed in two pumping wells to estimate hydraulic properties of the Boxtel, Massluis Waalre, Oosterhout, Breda, and Rupel Formations at the KCB2 Site. Observation wells were employed to determine the extent of drawdown within the subsurface layer (or layers) directly affected by pumping. Furthermore, the degree of connection between the tested hydrostratigraphic zone and the overlying and underlying zones was monitored.

Pumping tests were run continuously over a 72-hour period. Two pumping tests utilized average pumping rates of 26.73 and 26.24 cubic meters per hour (m^3/hr), respectively. Prior to pumping, transducers were placed in the pumping wells and nearby observation wells to collect detailed water level readings during each test (i.e., drawdown data). Upon completion of each pumping test, the transducers continued to collect water levels (i.e., recovery data) for an additional 72 hours.

Drawdown and recovery data were analyzed using the software program AquiferTest Pro 2011.1 (Schlumberger Water Services, 2011) to estimate values of hydraulic conductivity and transmissivity for the hydrostratigraphic zone corresponding to each test well. Analysis of the data from pumping wells and associated drawdown data in nearby observation wells was conducted using the Hantush-Jacob method (Rohrich, 2007), which is appropriate for a leaky, confined aquifer. Recovery data measured in observation wells during the pumping tests were analyzed using both the Agarwal and Theis methods (Rohrich, 2007). Estimates of hydraulic properties from each analysis are listed in ***Table 3-1***.

3.1.4.2 Slug Tests

Slug tests (i.e., rising or falling head tests) were performed in all ten wells installed at the Site for the purpose of measuring the spatial distribution of hydraulic conductivity across the Site. Data collected from the slug tests were analyzed using the software program AquiferTest Pro 2011.1 (Schlumberger Water Services, 2011). The Butler High-K method was used to estimate horizontal hydraulic conductivity for both the rising and falling head slug tests (Butler et al., 2003). Estimates of hydraulic conductivity for each slug test are listed in ***Table 3-2.***

3.2 MANAGEMENT OF SOIL SAMPLES

After field classifying, documenting, labeling, and photographing, the retrieved soil samples were transferred to an enclosed storage facility with adequate temperature control. All samples were logged in and out of the enclosed storage facility by field personnel, using appropriate log in/out forms. SPT samples, Shelby tubes, and soil core samples were preserved immediately after collection. Selective undisturbed soil samples were delivered to Deltares Laboratories in Delft in accordance with ASTM D 4220-95 Standard Practices for Preserving and Transporting Soil Samples. Shock indicators were attached to the Shelby tubes. The disturbed samples were sent to Geotechnics, Inc. in the US for selected testing. All samples selected for laboratory testing were controlled by Chain-of-Custody (COC) procedures.

3.3 LABORATORY TESTING

After completion of the Site Investigation Program, a Laboratory Testing Program was implemented to obtain soil classification and engineering properties of the subsurface materials in accordance with Regulatory Guide (RG) 1.138, “Laboratory Investigation of Soils and Rocks for Engineering Analysis and Design of Nuclear Power Plant” (US NRC, 2003). Two qualified laboratories were retained to perform testing, namely Deltares of Delft, The Netherlands, and Geotechnics, Inc. of Pittsburgh, Pennsylvania, US. The majority of the soil laboratory testing was performed by Deltares, except particle size distribution (PSD) analysis, for which their laboratory equipment did not satisfy the RIZZO Quality Assurance (QA) program. Soil samples assigned for PSD analysis along with Atterberg Limit testing were assessed in a qualified laboratory at Geotechnics, Inc.

Sixty-seven representative disturbed and undisturbed samples were selected to attain an understanding of the subsurface conditions for engineering analysis and design parameters. The selection of the test samples was based on the information shown on the boring logs and

data obtained from in-situ tests. The soil samples for laboratory testing were selected based on the following criteria:

1. Samples were selected from target depth ranges, including near and below the Power Block area foundation subgrade which is proposed at EL -15 m NAP.

2. Samples were selected to characterize the different soil types within the boreholes.

3. Samples were targeted for various soil layers identified or developed based on the field classification and observations.

In Deltares' Geotechnical Testing Facility, the undisturbed samples were stored in the temperature controlled (at 11 degrees Celsius) storage facility with a high relative humidity (95-100 percent) directly after reception. The temperature and humidity were monitored and registered constantly.

Laboratory tests were performed in accordance with applicable ASTM Standards, International Organization for Standardization (ISO) Standards, and other approved procedures, as listed in ***Table 3-3***. The detailed results of the laboratory tests performed as part of the subsurface investigation are provided in ***Appendix C*** by the following reports:

- Project Middelburg, Laboratory Testing Project KCB2, Deltares, 1205088-001-GEO-0001, August 2011.
- Geotechnics, Laboratory Test Results KCB-2 Delta 104472, 10 August 2011.

In the following Sections, the procedures followed during the laboratory testing and a brief summary of the results are provided in terms of index, strength, and deformation properties.

3.3.1 Index Testing

Particle Size Distribution (ASTM D 422-63)

A total of 27 representative samples from undisturbed and disturbed samples were selected for particle-size analysis per ASTM D 422-63. This test determines the distribution of the soil particle sizes quantitatively. The amount of soil particles retained on each of the sieves of the standard sieve stack is determined gravimetrically. The material retained on each sieve is weighed on a balance and the sum of the masses retained on all the sieves used should be equal or very close to the original mass of the sample retained on the No. 200 sieve. The distribution of particle sizes passing the No. 200 sieve (smaller than 75 micrometer [μm]) is determined by a sedimentation process, using a standard ASTM hydrometer.

Analysis results are used in classification and to correlate general engineering behavior of soils. The classifications of the tested samples based on Unified Soil Classification System (USCS) are shown in ***Table 3-4***.

Atterberg Limits (ASTM D 4318-05)

Atterberg Limit tests are used to evaluate the plasticity characteristics of fine-grained soils in accordance with ASTM D 4318-05. Materials greater than 425-µm (No. 40 sieve) were removed. The liquid limit test requires dropping a brass cup containing the specimen in a standard mechanical device repeatedly until the groove line previously dividing the specimen in the brass cup is closed. The liquid limit is then determined by plotting the data points obtained from three or more trials of the liquid limit test over a range of water content. The plastic limit is the water content determined by pressing together and rolling the specimen into a 3.2-mm-diameter thread until the thread crumbles and can no longer be pressed together and re-rolled. The plasticity index (PI) is the difference between the liquid limit and the plastic limit. A wide variety of soil engineering properties have been correlated to the liquid and plastic limits. They are also used to classify fine-grained soil in accordance with the USCS.

A total of 42 representative samples were selected for this test. A summary of test results along with the corresponding PI statistical analysis is presented in ***Table 3-4***.

Specific Gravity (ASTM D 5550-06)

This test method determines the specific gravity of soil grains according to ASTM D 5550-06. A total of 15 representative site samples were selected for the test. This methodology requires the sample to be dried in the oven until a constant mass is achieved. The sample is placed in a gas pycnometer chamber to measure its volume (+/- 5 E-8 cubic meters [cm^3]). The mass of the samples is measured and the specific gravity is calculated. The specific gravity values range from 1.45 to 2.72. The lower value was determined from the peat samples. The specific gravity values are presented in ***Table 3-4***.

Relative Density (ASTM D 4253-00 [2006], ASTM D 4254-00 [2006] e1)

The relative density is calculated by means of the maximum and minimum index density according to Standards ASTM D 4253-00 (2006) and ASTM D 4254-00 (2006) e1, respectively. A total of eight representative samples were selected for this test. The

maximum index density was performed on saturated and oven dry samples. Both samples were mixed to provide an even particle size distribution and minimum segregation. The appropriate mold was filled using a scoop or funnel to prevent segregation. The mold was placed on an electromagnetic vibrating table or a cam-driven vibrating table to reach the peak density/unit weight. Volume change is measured placing a dial indicator gage on opposite sides of the surcharge plates.

The minimum index density was performed on saturated and oven dry samples. Both samples were appropriately mixed to provide an even particle size distribution and minimum segregation. The material was placed as loosely as practical and was poured at a distance that allows a continuous flow. The mold was filled up to a maximum of 25 mm from the borders of the container. The relative density values from laboratory testing are included in ***Table 3-4***.

Moisture Content (ISO/TS 17892-1)

The determination of the moisture content was performed fulfilling the guidelines established by the ISO/TS 17892-1. A total of 45 soil samples representative of the site conditions were selected for the test. The moisture content was determined gravimetrically during laboratory testing in accordance with ISO/TS 17892-1. The moisture content throughout the KCB2 subsurface is shown in ***Table 3-4***. The moisture content measurements, with respect to depth from the laboratory testing, are shown on ***Figure 3-4***.

Unit Weight (ISO/TS 17892-2)

This test determines the density of a soil sample in accordance with ISO/TS 17892-2. All samples were removed from the Shelby tubes prepared for the assigned laboratory tests (i.e., triaxial compression). The volume was calculated by measuring the samples in three different sections along its length. The mass of the material is weighed to the nearest 0.01 gram (g), with linear measurement. The mass of the sample is divided by its volume to obtain the density. The unit weight of the sample can be determined by multiplying the density by the gravitational acceleration, g. The results of the moist (in-situ) unit weight measurements are included in ***Table 3-4*** and shown on ***Figure 3-4***.

Organic Content (ASTM D 2974-07a)

This test determines the percentage of organic matter or peat of a sample based on ASTM D 2974. Eight representative samples were selected for this test. The samples were placed in a

furnace at high temperature until the sample was completely ashed. The percent of organic matter was calculated as the ratio between the soil and ash mass. The laboratory test results reported 84.1 percent from a peat sample and as low as 1.30 percent, from Boxtel Sand. The organic content measurements are reported in ***Table 3-4***.

3.3.2 Classification of Soils for Engineering Purposes

To classify the subsurface materials using the USCS, both particle-size analysis and Atterberg Limit tests are required. A total of 27 representative samples were selected for the classification. This classification system divides soils into three categories: coarse-grained soils, fine-grained soils, and highly organic soils. These three categories are further subdivided into 15 basic soil groups. Based on visual observation, particle-size analysis, and Atterberg Limit tests, this standard classifies soils into categories and assigns a group name and symbols with descriptive information. The USCS classification of the tested samples is listed in ***Table 3-4***. The classification supports the evaluation of the soils for engineering use.

3.3.3 Deformation and Strength Testing

Consolidation and Swell Testing (ISO/TS 17892-5)

The goal of this test is to determine the compression, swell, and consolidation of the samples in accordance with ISO/TS 17892-5. Twelve undisturbed samples were selected for the one-dimensional consolidation test and five for one-dimensional swell. During the consolidation and swell tests, the samples were placed into a test cell, in which the top and bottom porous plates are placed with filter papers between the soil and the plates. After the deformation gauge was positioned, the initial readings were recorded and the time was set to zero. Five loading steps and one unload/reload step were performed during consolidation tests. The maximum applied pressure was larger than the maximum vertical stress in-situ. The deformations of the specimen were recorded with sufficient accuracy to determine the coefficient of consolidation (C_v). The consolidation coefficients determined from the current testing program are reported in ***Table 3-5.***

For one-dimensional swell, the cell was filled with water and the vertical stress was increased until equilibrium is reached. This pressure was considered as the swelling pressure. The swell tests were conducted on 12 undisturbed samples, which were primarily clay samples identified in the boring logs and evaluated based on in-situ test results. No swell potential was measured from the tested samples.

Triaxial Compression Testing (ISO/TS 17892-9)

This test determines the stress-strain relationships as well as the effective stress paths of saturated cylindrical samples based on ISO/TS 17892-9. The laboratory reported 16 samples were tested with the Consolidated Drained triaxial test and 12 samples were tested under consolidated undrained conditions. The triaxial test type was selected based on the sample type. Due to time limitations, samples with high fine content were tested under undrained shearing conditions with pore pressure measurements. All other samples were tested with drained conditions. Pore pressures were measured during both test types. The shearing stage was performed anisotropically based on the foundation pressures and horizontal in-situ pressures predicted using the approach described by Terzaghi et al., (1996).

For three of the undisturbed samples (KB-103_ST-1, KB-103_ST-3, and KB-103_ST-6), not enough sample was retrieved from the Shelby tube; therefore, triaxial compression tests were conducted with multi-stage shearing. In these tests, the maximum strain was monitored at each load step and limited to a certain level such that sample did not reach failure, and the test was continued after increasing the confining stress. The failure was reached at the last (third) loading stage. The results of the triaxial compression tests are presented in ***Table 3-5*** and are plotted with sample elevations on ***Figure 3-5***.

Hydraulic Conductivity Testing (ISO/TS 17892-11)

This test helps to define the coefficient of water permeability through saturated soils based on ISO/TS 17892-11. Five tests were conducted using a flexible wall permeameter test set-up. Three samples (KB-104_ST-2, KB-104A_ST-5, KB-105A_ST-1) were tested using the triaxial compression test set-up under constant head conditions. The coefficient of permeability was determined until the variation of permeability reading was less than 10 percent. The laboratory results are reported in ***Table 3-4***.

The permeability values measured from the laboratory tests (***Table 3-4***) are clearly lower than values calculated based on the field tests (i.e., pumping and slug tests) (***Tables 3-1 and 3-2***). It is known that laboratory tests represent the lower bound vertical permeability due to sample size effect. On the other hand, the field values represent the horizontal permeability from a large test section. During the engineering calculations described in the following Sections, field based permeability values were used when available.

3.4 SUBSURFACE MATERIALS ENGINEERING PROPERTIES

After evaluating the in-situ and laboratory test results, engineering properties of subsurface materials are determined to be used in the subsequent engineering analysis. The following Sections describe the methodology used in the strength and deformation parameters determination.

3.4.1 Soil Strength Parameters

The effective soil strength parameters are estimated based on the triaxial test data, CPT data, and guidance provided in the Eurocode 7, "Geotechnical Design, Part 2: Ground Investigation and Testing" (BS EN 1997-2-2007). Although there are CPT data at various locations around the Site, the effective friction angle is estimated based on the CPT data at KCPT-4. This is because KCPT-4 is located closest to the prospective center point of the Power Block area and the Turbine Building. The effective cohesion values assigned at the depth of 60 m and below were obtained from the triaxial tests.

The estimated effective friction angle for sand layers (i.e., Boxtel and Breda Sands) is obtained based on the correlation provided in the CPT Guide by Cooperative Highway Research Program (Mayne, 2007). The manual (Mayne, 2007) suggests several methods; one of these two is by Robertson and Campanella (1983):

$$\phi' = \arctan[0.1 + 0.38 \log(q_t/\sigma'_{vo})] \qquad \text{(Equation 3-1)}$$

where,

ϕ' = Effective peak friction angle for clean sands
q_t = corrected cone resistance
σ'_{vo} = effective vertical overburden stress

The second method suggested for sands is by Kulhawy and Mayne (1990):

$$\phi' = 17.6 + 11^o \log(q_{t1}) \qquad \text{(Equation 3-2)}$$

where,

$$q_{t1} = (q_t/\sigma_{atm})/\sqrt{(\sigma'_{vo}/\sigma_{atm})} \qquad \text{(Equation 3-3)}$$

where,

σ_{atm} = 98.1 kPa.

Eurocode 7, "Geotechnical Design, Part 2: Ground Investigation and Testing," defines the upper and lower boundary of the friction angle using the tip resistance, q_c. The friction angle estimates from Equations 3-1 and 3-2 were compared with those suggested in Eurocode 7 as typical values for each soil type. As suggested in Eurocode 7, where available, the friction angle is reduced by three. The results of the triaxial tests were used where available. The lowest strength c' and ϕ' values obtained among the CPT data, triaxial test results, and the Eurocode 7 values were chosen as representative values for each soil layer. The effective cohesion and internal friction angle values selected for the design of the KCB2 Site are shown in ***Table 3-6***. These parameters are used in the engineering calculations, such as settlement analysis, and bearing capacity estimation.

3.4.2 Deformation Parameters

The soil deformation modulus is used in the settlement/deformation calculation and the foundation design of the proposed NPP. The effective soil modulus parameters are estimated using the available triaxial test data, CPT data, and P-S Suspension Logging results.

The Hardening Soil model is used in the settlement analysis. The Hardening Soil approach is an advanced model for the simulation of soil behavior. Soil stiffness is described by using two different input stiffnesses: the reference stiffness modulus E_{50}^{ref} and the unloading stiffness E_{ur}^{ref} at reference confining pressure, $p_{ref.}$ The term "ref" refers to the triaxial cell pressure applied to the soil sample during testing and is interpreted to be the horizontal stress at a certain geological depth. During the calculation of the elastic modulus, "p_{ref}" is assigned based on the depth of sample or the in-situ test location.

The reference stiffness modulus, E_{50}^{ref}, obtained from the triaxial test result is the slope of the line connecting the origin at zero stress-strain to deviatoric stress-strain curve at the 50 percent ultimate stress. The numerical code used in the settlement analysis automatically calculates E_{50} (Equation 3-4c) for the existing stress based on p_{ref}. It also calculates the initial stiffness, E_i from E_{50} (Equation 3-4b). Finally the strains are estimated by a hyperbolic type equation (Equation 3-4a).

$$-\varepsilon_1 = \frac{1}{E_i}\ \frac{q}{1-\frac{q}{q_a}}\ (a)\ \ ;\qquad E_i = \frac{2E_{50}}{2-R_f}\ (b);\quad E_{50} = E_{50}^{ref}\left[\frac{c\cos\varphi-\sigma_3^{'}\sin\varphi}{c\cos\varphi+p^{ref}\sin\varphi}\right]^m\ (c)\ \text{(Equation 3-4)}$$

where,

ε_1 = vertical strain
q = deviatoric stress
q_a = asymptotic value of the shear strength
E_{50} = confining stress dependent stiffness modulus for primary loading
E_i = initial stiffness
R_f = failure ratio (R_f = 0.9 is chosen as a suitable default setting by Plaxis)
E^{ref}_{50} = reference stiffness modulus corresponding to p_{ref}, secant to 50 percent of the failure strength
p_{ref} = reference in-situ effective confining pressure, σ'_3, prior to loading
c = cohesion of the material
ϕ = friction angle of the material
σ'_3 = effective minor principal stress
m = amount of stress dependency, 0.5<m<1, 0.5 for sands, 1 for soft clays

One of the methods considered in estimating soil modulus for clean sands is based on the CPT guide (Robertson and Cabal, 2010). The soil modulus is defined at 0.1 percent shear strain, and given as:

$$E_i = E_{0.1\%} = \alpha_E(q_t - \sigma_{vo}) \quad \text{(Equation 3-5)}$$

where,

$E_{0.1\%}$ = Soil Modulus at 0.1 percent shear strain level
α_E = parameter is given as:

$$\alpha_E = 0.015[10^{(0.55I_c+1.68)}] \quad \text{(Equation 3-6)}$$

where,

$$I_c = ((3.47 - logQ_t)^2 + (\log F_r + 1.22)^2)^{0.5} \quad \text{(Equation 3-7)}$$

where,

Q_t = Normalized cone penetration resistance (dimensionless):

$$Q_t = (q_t - \sigma_{vo})/\sigma'_{vo} \quad \text{(Equation 3-8)}$$

where,

F_r = normalized friction ratio in percent and given as:

$$F_r = \left(\frac{f_s}{q_t - \sigma_{vo}}\right) \cdot 10 \quad \text{(Equation 3-9)}$$

where,

f_s = measured side friction.

Finally, $E_{0.1\%}$ can be converted to E_{50} as:

$$E_{50} = 0.55 \cdot E_{0.1\%} \quad \text{(Equation 3-10)}$$

Similarly, the small strain (<< 10^{-4} percent) shear modulus can be estimated from the equation below using the in-situ shear wave velocities measured at the Site:

$$G_{0.0001\,\%} = \rho \cdot V_S^2 \quad \text{(Equation 3-11)}$$

where,

V_S = Shear wave velocity
ρ = mass density of soil ($\rho = \gamma/g$)
γ = total soil unit weight of soil
g = acceleration of gravity

Seed and Idriss (1970) reported the modulus reduction curves for sands and clays. A shear modulus reduction ratio of 0.2 was applied to sands and clays to obtain the shear modulus at 0.1 percent strain. By using a 0.2 reduction, the shear modulus at 0.1 percent strain will be:

$$G_{0.1\,\%} = 0.2 \text{ x } G_{0.0001\,\%} \quad \text{(Equation 3-12)}$$

0.1 percent shear modulus, $G_{0.1\,\%}$, can be converted to $E_{0.1\%}$ as discussed in Equation 3-13 below:

$$E_{0.1\%} = E_i = 2(1 + v)x\ G_{0.1\,\%} \quad \text{(Equation 3-13)}$$

where,

v = Poisson's ratio and assumed to be 0.3

Finally, Equation 3-11 can be used to obtain E_{50}.

The deformation modulus values obtained from various methods described above were compiled and evaluated to estimate a representative deformation modulus for each layer encountered at the Site. The compatibility was assured between the chosen modulus and the stress and strain levels at various strata depths. For instance, since the P-S suspension test is performed in low strain levels, the modulus obtained from this method were reduced by factor of 0.2 to represent the modulus corresponding to high strain levels (e.g., 0.1 percent strain level). ***Table 3-7*** summarizes the calculated deformation modulus values and the selected value for each layer. The elastic modulus obtained from laboratory and in-situ tests are plotted on ***Figure 3-6***. Usually, the E_{50} from shear wave velocity and triaxial tests are averaged. Exceptions are shown in ***Table 3-7***. The unload/reload modulus values are calculated by multiplying the E_{50} values by three.

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TABLES

TABLE 3-1
PUMPING TEST RESULTS

SOIL FORMATION	PUMPING WELL	OBSERVATION WELL	HORIZONTAL DISTANCE FROM PUMPING WELL (m)	TEST TYPE/ ANALYSIS METHOD	HYDRAULIC CONDUCTIVITY (m/sec)
Boxtel	KPW01	KMW01B	11.5	Pumping/Hantush	2.73E-04
				Recovery/Theis	2.64E-04
				Recovery/Agarwal	2.50E-04
Arithmetic Mean					**2.62E-04**
Oosterhout/Breda	KPW02	KMW01C	10.9	Pumping/Hantush	5.72E-05
				Recovery/Theis	5.57E-05
				Recovery/Agarwal	5.28E-05
		KMW01D	10.8	Pumping/Hantush	5.09E-05
				Recovery/Theis	5.49E-05
				Recovery/Agarwal	5.30E-05
Arithmetic Mean					**5.41E-05**

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Notes:

m = meters

m/sec = meters per second

NA = Not Available

TABLE 3-2
SLUG TEST RESULTS

Soil Formation	Aquifer Type	Well ID	Hydraulic Conductivity (m/sec)				Average Hydraulic Conductivity (m/sec)
			fh1[1)]	rh1[1)]	fh2[1)]	rh2[1)]	
Naaldwijk	Confined	KMW01A	1.09E-04	8.21E-05	1.08E-04	1.48E-04	1.12E-04
		KMW03A	4.75E-05	5.91E-05	NA	NA	5.34E-05
Boxtel	Confined	KPW01	9.28E-05	1.35E-04	NA	NA	1.14E-04
		KMW02B	1.91E-04	3.08E-04	2.18E-04	3.44E-04	2.65E-04
Lower Boxtel/Maassluis-Waalre/ Oosterhout/Breda	Confined	KMW01B	1.18E-04	2.25E-04	1.64E-04	1.19E-04	1.56E-04
		KMW03B	1.97E-04	2.30E-04	NA	NA	2.14E-04
Oosterhout/Breda	Confined	KMW01C	1.47E-04	1.41E-04	1.64E-04	2.09E-04	1.66E-04
		KMW01D	1.01E-04	7.29E-05	1.09E-04	1.22E-04	1.01E-04
		KPW02	7.21E-05	4.14E-05	NA	NA	5.68E-05

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Notes:

[1)] Test type: falling head 1 (fh1), rising head 1 (rh1), falling head 2 (fh2), rising head 2 (rh2)

m/sec = meters per second

NA = Not Available

TABLE 3-3
STANDARD METHODS FOLLOWED DURING THE LABORATORY TESTING

TEST	STANDARD
Particle Size Analysis	ASTM D 422-63
Atterberg Limits	ASTM D 4318-05
Moisture Content	ISO/TS 17892-1
Unit Weight	ISO/TS 17892-2
Specific Gravity Of Soil Solids	ASTM D 5550-06
Organic Content	ASTM D 2974-07a
Minimum Density	ASTM D 4254-00(2006)e1
Maximum Density	ASTM D 4253-00(2006)
Isotropically Consolidated Undrained Triaxial Test (Cu) with Pore Pressure Measurements	ISO/TS 17892-9
Isotropically Consolidated Drained Triaxial Test (Cd)	ISO/TS 17892-9
One-Dimensional Consolidation	ISO/TS 17892-5
One-Dimensional Swell	ISO/TS 17892-5
Permeability	ISO/TS 17892-11

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TABLE 3-4
SUMMARY OF LABORATORY INDEX TESTS

Stratum	Geological Formation	Stratum Elevation (m NAP)		Borehole & Sample ID	Sample Elevation (m NAP)		USCS[1]		Unit Weight (kN/m³)		Water Content w (%)	G_s	Permeability k (m/s)	Atterberg Limits			% Finer #200 Sieve	$\gamma_{d\ min}$ (kN/m³)	$\gamma_{d\ max}$ (kN/m³)	Relative Density, D_r[2]	Organic Content (%)	
		From	To		From	To	Classification	Symbol	γ_{wet}	γ_{dry}				LL (%)	PL (%)	PI (%)					Org. Mat'l	$CaCO_3$
2	Naaldwijk - Sand 1	0	-6.1	KB-104A_S-5	+0.14	-0.56	SILTY SAND	SM				2.65				NP	28.4					
				KB-101_R-5	-1.29	-2.19	POORLY GRADED SAND	SP								NP	4.7	13.6	16.6	N/A		
				KB-103_ST-1	-3.58	-4.18	FAT CLAY	CH	20.3	16.0	26.7			55	23	32	98.8				84.1	6.0
				KB-103_ST-1C	-3.66	-3.68	peat	pt				1.45										
				KB-103_ST-1D	-3.77	-3.84	lean clay	cl	16.1	10.9	48.3											
				KB-103_ST-1E	-4.16	-4.76	lean clay	cl				2.60										
				KB-104A_ST-3	-4.06	-4.66	lean clay	cl	17.4	12.4	40.2	2.63										
				KB-104A_ST-3A	-4.16	-4.26	lean clay	cl						52	32	20						
				KB-103_S-16	-4.63	-5.23	LEAN CLAY	CL			43.6	2.67		41	20	21	96.0				3.6	12.2
				KB-101_ST-1	-5.37	-5.92	silty sand & silty clay with sand	sm&cl-ml	20.6	17.6	17.1											
				Minimum					16.1	10.9	17.1	1.45		41.00	20.00	20.00	4.70	-	-	-	3.6	6.0
				Average					18.6	14.2	35.2	2.40		49.33	25.00	24.33	56.98	13.60	16.60	N/A	43.9*	9.1*
				Maximum					20.6	17.6	48.3	2.67		55.00	32.00	32.00	98.80	-	-	-	84.1	12.2
4	Naaldwijk - Clay 2	-6.1	-9.14	KB-105_S-18	-6.41	-6.86	silt	ml						38	29	9						
				KB-101_R-11	-8.07	-9.1	SILTY CLAY	CL-ML			21.9			25	18	7	85.9					
				KB-102A_S-21	-8.5	-9.1	POORLY GRADED SAND WITH SILT	SP-SM			25.1					NP	9.4					
				Minimum							21.9			25.0	18.0	7.0	9.4					
				Average							23.5			31.5	23.5	8.0	47.7					
				Maximum							25.1			38.0	29.0	9.0	85.9					
5	Boxtel - Silt 1	-9.14	-11.7	KB-101_R-12	-9.1	-10.01	poorly graded sand	sp										15.0	18.8	N/A		
6	Boxtel - Sand 1	-11.7	-12.6	KB-101_R14A	-12.15	-12.18	sandy organic soil	ol/oh													5.8	10.9
8	Boxtel - Sand 3	-12.6	-16.6	KB-103_S-28	-13.53	-14.13	SANDY SILT	ML			30.8	2.66				NP	64.4				1.3	3.6
				KB-103_ST-5	-14.13	-14.73	poorly graded sand with silt	sp-sm													1.4	3.2
				KB-103_ST-5D	-14.24	-14.34	poorly graded sand with silt	sp-sm	18.6	14.5	28.4											
				KB-105_ST-7	-14.04	-14.54	poorly graded sand	sp	18.7	15.5	20.8											
				KB-102A_S-30	-14.5	-15.1	POORLY GRADED SAND WITH SILT	SP-SM			25.6					NP	8.3					
				KB-105_ST-7	-14.51	-14.54	poorly graded sand	sp	18.7	15.9	17.4											
				KB-104A_ST-5	-15.46	-16.06	poorly graded sand with silt	sp-sm	19.6	15.5	24.7		4.4E-07									
				KB-101_R-19	-16.06	-17.04	POORLY GRADE SAND	SP								NP	2.3	12.9	14.6	N/A		
				KB-104A_S-28	-16.06	-16.66	SILTY SAND	SM				2.63				NP	34.9				2.8	3.1
				Minimum					18.6	14.5	17.4	2.63	4.4E-07			-	2.3	-	-	-	1.3	3.1
				Average					18.9	15.4	24.6	2.64	4.4E-07			-	27.5	12.9	14.6	N/A	1.8	3.3
				Maximum					19.6	15.9	30.8	2.66	4.4E-07			-	64.4	-	-		2.8	3.6

TABLE 3-4
SUMMARY OF LABORATORY INDEX TESTS
(CONTINUED)

Stratum	Geological Formation	Stratum Elevation (m NAP)		Borehole & Sample ID	Sample Elevation (m NAP)		USCS[1]		Unit Weight (kN/m³)		Water Content w (%)	G_s	Permeability k (m/s)	Atterberg Limits			% Finer #200 Sieve	$\gamma_{d\ min}$ (kN/m³)	$\gamma_{d\ max}$ (kN/m³)	Relative Density, D_r[2]	Organic Content (%)	
		From	To		From	To	Classification	Symbol	γ_{wet}	γ_{dry}				LL (%)	PL (%)	PI (%)					Org. Mat'l	$CaCO_3$
10	Boxtel - Sand 5	-16.6	-18.6	KB-105_ST-8	-16.39	-16.89	lean clay	cl	19.2	15.4	25.3											
10a	Boxtel - Sand 6	-18.6	-20.1																			
12	Maassluis/Waalre - Clay 1	-20.1	-22.6	KB-105_S-43	-20.63	-21.23	CLAYEY SAND	SC						20	12	8	21.1					
				KB-103_ST-6	-21.93	-22.53	lean clay	cl	26.9	22.3	20.5	2.67									2.6	2.7
				KB-103_ST-6D	-22.22	-22.26	lean clay	cl	18.9	15.2	25.0		9.6E-07									
				KB-101_R-25A	-22.08	-22.48	SILTY, CLAYEY SAND	SC-SM						22	15	7	33.5					
				KB-104A_ST-6	-22.06	-22.66	silty sand	sm	20.1	16.9	18.6	2.70		26	16	10						
				KB-103_S-41	-22.53	-23.13	SILTY, CLAYEY SAND	SC-SM						23	15	8	40.2					
				KB-101_R-25A	-22.48	-27.58	SANDY LEAN CLAY	CL						31.5	15	17	66.4					
				KB-101_R-25B	-22.48	-27.98	SILTY, CLAYEY SAND	SC-SM						21	14	7	30.0					
				Minimum					18.9	15.2	18.6	2.67	9.6E-07	20.0	12.0	7.0	21.1				-	-
				Average					22.0	18.1	21.4	2.68	9.6E-07	23.9	14.5	9.5	38.2				2.6	2.7
				Maximum					26.9	22.3	25.0	2.70	9.6E-07	31.5	16	17	66.4				-	-
13	Oosterhout - Sand 1	-22.6	-30.7	KB-101_R-28	-24.79	-25.61	POORLY GRADED SAND	SP								NP	3.7	12.3	15.9	99.7		
				KB-104_R-2	-25.86	-26.61	POORLY GRADED SAND WITH SILT	SP-SM								NP	6	13.5	16.4	85.0		
				KB-103A_ST-1	-27.00	-27.53	poorly graded sand	sp	18.9	15.5	22.1											
				KB-102_R-4	-26.69	-27.58	POORLY GRADED SAND	SP				2.70				NP	3.9					
				KB-105A_ST-1	-28.78	-29.33	poorly graded sand	sp	20.0	16.29	22.6		6.2E-09									
				Minimum					18.9	15.5	22.1	2.70	6.2E-09					12.3	15.9	85.0		
				Average					19.4	15.9	22.3	2.70	6.2E-09					12.9	16.2	92.4		
				Maximum					20.0	16.3	22.6	2.70	6.2E-09					13.5	16.4	99.7		
14	Breda - Sand 1	-30.7	-64.1	KB-101_R-40	-35.91	-36.84	POORLY GRADED SAND	SP								NP	3.2	13.3	16.8	80.5		
				KB-105A_ST-2	-37.45	-37.93	poorly graded sand	sp	19.4	16.0	21.5											
				KB-104_ST-2	-49.4	-49.9	poorly graded sand	sp	19.8	16.0	24.0		1.1E-06									
				KB-102_R-32	-54.29	-55.26	POORLY GRADED SAND WITH SILT	SP-SM				2.72				NP	10.9					
				KB-102_ST-1	-55.26	-55.81	poorly graded sand	sp	19.7	16.0	23.3											
				KB-103A_R-38	-61.06	-62.06	SILTY SAND	SM								NP	12.1	12.9	17	80.0		
				KB-101_R-66	-61.57	-62.54	SILTY SAND	SM								NP	12.8	13.8	16.1	95.6		
				Minimum					19.4	16.0	21.5	2.72	1.1E-06			-	3.2	12.9	16.1	80.0		
				Average					19.6	16.0	22.9	2.72	1.1E-06			-	9.8	13.3	16.6	87.8		
				Maximum					19.8	16.0	24.0	2.72	1.1E-06			-	12.8	13.8	17.0	95.6		

TABLE 3-4
SUMMARY OF LABORATORY INDEX TESTS
(CONTINUED)

Stratum	Geological Formation	Stratum Elevation (m NAP)		Borehole & Sample ID	Sample Elevation (m NAP)		USCS[1]		Unit Weight (kN/m³)		Water Content w (%)	G_s	Permeability k (m/s)	Atterberg Limits			% Finer #200 Sieve	$\gamma_{d\ min}$ (kN/m³)	$\gamma_{d\ max}$ (kN/m³)	Relative Density, D_r[2]	Organic Content (%)	
		From	To		From	To	Classification	Symbol	γ_{wet}	γ_{dry}				LL (%)	PL (%)	PI (%)					Org. Mat'l	$CaCO_3$
15	Rupel - Clay 1	-64.1	-75.2	KB-105A_ST-3	-64.78	-65.32	fat clay	ch	18.6	15.0	24.2											
				KB-101_ST-3B	-68.41	-68.47	fat clay	ch	19.2	15.2	26.3		1.20E-11									
				KB-101_ST-3A	-68.47	-68.51	fat clay	ch						78	47	31						
				KB-103A_ST-4D	-70.06	-70.6	fat clay	ch	20.0	16.0	24.7	2.64										
				KB-103A_ST-4D	-70.56	-70.6	fat clay	ch						78	24	55						
				KB-102_ST-2	-70.59	-71.14	fat clay	ch	19.5	15.7	24.3											
				KB-103A_ST-6	-73.43	-73.98	fat clay	ch	19.6	15.6	25.6	2.61										
				KB-103A_ST-6D	-73.94	-73.98	fat clay	ch						80	20	61						
				KB-104A_ST-5	-73.97	-74.52	fat clay	ch	19.5	15.2	28.1											
				Minimum					18.6	15.0	24.2	2.61	1.2E-11	78.0	20.0	31.0						
				Average					19.4	15.4	25.5	2.62	1.2E-11	78.7	30.3	49.0						
				Maximum					20.0	16.0	28.1	2.64	1.2E-11	80.0	47.0	61.0						
16	Ruisbroek - Sand 1	-75.16	-91.6	KB-104_ST-5	-74.48	-74.52	fat clay	ch						102	30	71						
				KB-101_R-79	-76.09	-76.96	SILTY SAND	SM								NP	29.4					
				KB-101_R-79A	-76.39	-76.49	sandy clay	sc						65	18	47						
				KB-105A_ST-5	-79.46	-80.01	poorly graded sand	sp	19.4	16.0	21.5											
				KB-103A_ST-9	-80.02	-80.57	silty clayey sand	sc-sm	19.3	15.6	23.2	2.68										
				KB-104_ST-7	-83.5	-84	poorly graded sand	sp	19.5	16.2	20.9											
				KB-104_ST-7D	-83.96	-84	poorly graded sand	sp	19.9	16.6	19.9		2.5E-07									
				KB-103A_ST-10	-88.99	-89.4	SILTY SAND	SM	19.8	16.4	20.8					NP	26.7					
				KB-105A_ST-6	-90.63	-91.18	fat clay	ch	19.2	15.2	26.0											
				KB-105A_ST-6C	-91.14	-91.18	fat clay	ch						54	23	31						
				Minimum					19.2	15.2	19.9	2.68	2.5E-07	54.0	18.0	31.0	26.7					
				Average					19.5	16.0	22.1	2.68	2.5E-07	73.7	23.7	49.7	28.1					
				Maximum					19.9	16.6	26.0	2.68	2.5E-07	102.0	30.0	71.0	29.4					

TABLE 3-4
SUMMARY OF LABORATORY INDEX TESTS
(CONTINUED)

Stratum	Geological Formation	Stratum Elevation (m NAP)		Borehole & Sample ID	Sample Elevation (m NAP)		USCS[1]		Unit Weight (kN/m³)		Water Content w (%)	G_s	Permeability k (m/s)	Atterberg Limits			% Finer #200 Sieve	$\gamma_{d\ min}$ (kN/m³)	$\gamma_{d\ max}$ (kN/m³)	Relative Density, D_r[2]	Organic Content (%)	
		From	To		From	To	Classification	Symbol	γ_{wet}	γ_{dry}				LL (%)	PL (%)	PI (%)					Org. Mat'l	$CaCO_3$
17	Watervliet - Clay 1	-91.61	-98.8	KB-104_ST-8E	-92.34	-93.38	poorly graded sand & fat clay	sp&ch	20.1	16.47	22.0		2.7E-10									
				KB-101_ST-5	-92.28	-92.33	FAT CLAY	CH						59	17	42	89.5					
				KB-101_ST-5D	-92.7	-92.75	fat clay	ch	18.7	15.28	22.4		4.6E-08									
				KB-101_ST-5C	-92.79	-92.83	fat clay	ch						61	18	42						
				KB-104A_ST-8	-92.96	-93.46	fat clay	ch	19.4	15.7	23.5											
				KB-102_ST-6	-93.21	-93.76	fat clay	ch	19.4	15.6	24.2	2.68										
				KB-104_ST-8D	-93.42	-93.46	fat clay	ch						51	26	25						
				KB-101_ST-6	-97.8	-98.35	fat clay	ch	18.8	14.3	31.5											
				Minimum					18.7	14.3	22.0	2.68	2.7E-10	51.0	17.0	25.0	-					
				Average					19.3	15.5	24.7	2.68	2.3E-08*	57.0	20.3	36.3	89.5					
				Maximum					20.1	16.5	31.5	2.68	4.6E-08	61.0	26.0	42.0	-					
18	Bassevelde - Sand 1	-98.8	-140.6	KB-101_ST-7	-103.36	-103.91	SANDY LEAN CLAY	CL	19.1	15.6	22.5			38	20	18	52.8					
				KB-101_ST-8	-110.86	-111.43	fat clay & poorly graded sand & sandy silt	ch&sp&sm	18.6	15.2	22.6											
				KB-101_R-119	-116.34	-117.31	poorly graded sand	sp										12.5	16.2	85.3		
				KB-101_ST-9	-131.9	-132.45	poorly graded sand	sp	19.0	15.8	20.6											
				Minimum					18.6	15.2	20.6			-	-	-	-	-	-	-		
				Average					18.9	15.5	21.9			38	20	18	52.8	12.5	16.2	85.3		
				Maximum					19.1	15.8	22.6			-	-	-	-	-	-	-		
19	Dongen Asse - Clay 1	-140.6	-196.0	KB-101_ST-10A	-140.86	-140.9	fat clay	ch						188	33	154						
				KB-101_ST-11	-150.91	-151.46	fat clay	ch	18.6	14.3	30.3											
				KB-101_ST-11C	-151.42	-151.46	fat clay	ch						119	28	91						
				KB-101_R-159	-157.4	-158.4	FAT CLAY	CH						114	28	86	95.4					
				KB-101_R-159A	-158.16	-158.28	fat clay	ch						141	35	106						
				KB-101_ST-14C	-180.37	-180.41	fat clay	ch						110	24	85						
				Minimum					18.6	14.3	30.3			110	24.0	85.0	-					
				Average					18.6	14.3	30.3			134.4	29.6	104.4	95.4					
				Maximum					18.6	14.3	30.3			188.0	35.0	154.0	-					

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γ_{wet} = Moist Unit Weight; LL = Liquid Limit; Dr = Relative Density; γ_{dry} = Dry Unit Weight; PL = Plastic Limit; w = Water content; PI = Plasticity Index; G_s = Specific Gravity; $\gamma_{d\ min}$ = Minimum Density; k = Permeability; $\gamma_{d\ max}$ = Maximum Density

Notes:

1) Laboratory verified classification is indicated in upper case. Classification based on geologist's field visual observation is shown in lower case.

2) D_r values are calculated by using the average dry unit weight from the engineering layer in which the sample was taken.

* High variance in the laboratory data within the same stratum.

TABLE 3-5
SUMMARY OF LABORATORY STRENGTH AND DEFORMATION TESTS

Stratum	Geological Formation	Stratum Elevation (m NAP)		Stratum Depth (m NAP)		Borehole & Sample ID	Sample Elevation (m NAP)		USCS[1]		φ' (°)	c' (kPa)	C_r	C_c	C_α	P_c (kPa)	e_0	n
		From	To	From	To		From	To	Classification	Symbol								
2	Naaldwijk - Sand 1	0	-6.1	4.9	11.0	KB-103_ST-1	-3.58	-4.18	FAT CLAY	CH	36.7	8.0						
						KB-103_ST-1D	-3.77	-3.84	lean clay	cl			0.065	0.58	0.013	104.0	1.35	0.57
						KB-104A_ST-3	-4.06	-4.66	lean clay	cl			0.031	0.29	0.0065	82.8	1.08	0.52
						KB-101_ST-1	-5.37	-5.92	silty sand & silty clay with sand	sm&cl-ml	36.6	36.7						
						Minimum					36.6	8.0	0.031	0.290	0.007	82.800	1.08	0.52
						Average					36.7	22.3*	0.048	0.435	0.010	93.400	1.22	0.55
						Maximum					36.7	36.7	0.065	0.580	0.013	104.000	1.35	0.57
4	Naaldwijk - Clay 2	-6.1	-9.14	11.0	14.0	KB-103_ST-3	-7.63	-8.23	silt	ml	43.0	9.2						
						KB-105_ST-4	-7.31	-7.93	silty clay with sand	cl-ml	38.4	0**						
						KB-103_ST-3A	-7.81	-7.86	silty clay	cl-ml			0.0027	0.018	0.00025	97.8	0.57	0.36
						Minimum					38.4	0						
						Average					40.7	4.6						
						Maximum					43.0	9.2						
8	Boxtel - Sand 3	-12.6	-16.6	17.5	21.5	KB-103_ST-5D	-14.24	-14.34	poorly graded sand with silt	sp-sm	36.6	0**						
						KB-105_ST-7	-14.04	-14.54	poorly graded sand	sp	38.0	0**						
						KB-104A_ST-5	-15.46	-16.06	poorly graded sand with silt	sp-sm			0.0065	0.039	0.00061	253	0.64	0.39
						Minimum					36.6	0						
						Average					37.3	0						
						Maximum					38.0	0						
10	Boxtel - Sand 5	-16.6	-18.6	21.5	23.5	KB-105_ST-8	-16.39	-16.89	lean clay	cl	33.3	56.3						
12	Maassluis/Waalre - Clay	-20.1	-22.6	25.0	27.5	KB-103_ST-6	-21.93	-22.53	lean clay	cl	24.2	40.0						
						KB-104A_ST-6	-22.06	-22.66	silty sand	sm	24.9	48.3	0.0048	0.096	0.0002	218.5	0.56	0.36
						Minimum					24.2	40.0						
						Average					24.6	44.2						
						Maximum					24.9	48.3						
13	Oosterhout - Sand	-22.6	-30.7	27.5	35.6	KB-103A_ST-1	-27.00	-27.53	poorly graded sand	sp	35.1	55.0						
						KB-105A_ST-1	-28.78	-29.33	poorly graded sand	sp	32.6	45.7						
						Minimum					32.6	45.7						
						Average					33.8	50.3						
						Maximum					35.1	55.0						

TABLE 3-5
SUMMARY OF LABORATORY STRENGTH AND DEFORMATION TESTS
(CONTINUED)

Stratum	Geological Formation	Stratum Elevation (m NAP)		Stratum Depth (m NAP)		Borehole & Sample ID	Sample Elevation (m NAP)		USCS[1]		φ' (°)	c' (kPa)	C_r	C_c	C_α	P_c (kPa)	e_0	n
		From	To	From	To		From	To	Classification	Symbol								
14	Breda - Sand	-30.7	-64.1	35.6	69.0	KB-105A_ST-2	-37.45	-37.93	poorly graded sand	sp	32.3	41.5						
						KB-104_ST-2	-49.4	-49.9	poorly graded sand	sp	35.5	16.3						
						KB-102_ST-1	-55.26	-55.81	poorly graded sand	sp		13.1						
						Minimum					32.3	13.1						
						Average					33.9	23.6						
						Maximum					35.5	41.5						
15	Rupel - Clay	-64.1	-75.2	69.0	80.1	KB-105A_ST-3	-64.78	-65.32	fat clay	ch	21.3	95.0						
						KB-103A_ST-4D	-70.06	-70.6	fat clay	ch			0.064	0.22	0.0045	1053.5	0.61	0.38
						KB-102_ST-2	-70.59	-71.14	fat clay	ch	19.8	130.2	0.050	0.21	0.0055	1190.5	0.63	0.39
						KB-103A_ST-6	-73.43	-73.98	fat clay	ch	26.1	25.8	0.074	0.20	0.0035	1023.4	0.61	0.38
						KB-104A_ST-5	-73.97	-74.52	fat clay	ch			0.096	0.22	0.0060	836.80	0.69	0.41
						Minimum					19.8	25.8	0.050	0.200	0.004	836.8	0.61	0.38
						Average					22.4	83.7*	0.071	0.213	0.005	1026.1	0.64	0.39
						Maximum					26.1	130.2	0.096	0.220	0.006	1190.5	0.69	0.41
16	Ruisbroek - Sand	-75.16	-91.6	80.1	96.51	KB-105A_ST-5	-79.46	-80.01	poorly graded sand	sp	33.0	0**						
						KB-103A_ST-9	-80.02	-80.57	silty clayey sand	sc-sm	27.9	31.7	0.03	0.15	0.0025	971.8	0.68	0.40
						KB-104_ST-7	-83.5	-84	poorly graded sand	sp	32.7	35.7						
						KB-103A_ST-10	-88.99	-89.4	SILTY SAND	SM	36.0	19.6						
						KB-105A_ST-6	-90.63	-91.18	fat clay	ch	21.2	105.5						
						Minimum					21.2	0.0					0.68	0.40
						Average					30.1	38.5*					0.68	0.40
						Maximum					36.0	105.5					0.68	0.40
17	Watervliet - Clay	-91.61	-98.8	96.51	103.7	KB-104A_ST-8	-92.96	-93.46	fat clay	ch			0.037	0.17	0.0024	1166	0.67	0.40
						KB-102_ST-6	-93.21	-93.76	fat clay	ch	25.2	51.2	0.060	0.19	0.0054	1263.4	0.67	0.40
						KB-101_ST-6	-97.8	-98.35	fat clay	ch	19.8	193.2						
						Minimum					19.8	51.2	0.037	0.170	0.002	1166.0	0.67	0.40
						Average					22.5	122.2	0.049	0.180	0.004	1214.7	0.67	0.40
						Maximum					25.2	193.2	0.060	0.190	0.005	1263.4	0.67	0.40
18	Bassevelde - Sand	-98.8	-140.6	103.7	145.5	KB-101_ST-7	-103.36	-103.91	SANDY LEAN CLAY	CL	27.5	62.5						
						KB-101_ST-8	-110.86	-111.43	fat clay & poorly graded sand & sandy silt	ch&sp&sm	30.4	0**						
						KB-101_ST-9	-131.9	-132.45	poorly graded sand	sp	30.6	25.4						
						Minimum					27.5	0.0						
						Average					29.5	29.3*						
						Maximum					30.6	62.5						

TABLE 3-5
SUMMARY OF LABORATORY STRENGTH AND DEFORMATION TESTS
(CONTINUED)

STRATUM	GEOLOGICAL FORMATION	STRATUM ELEVATION (m NAP)		STRATUM DEPTH (m NAP)		BOREHOLE & SAMPLE ID	SAMPLE ELEVATION (m NAP)		USCS[1]		φ' (°)	c' (kPa)	C_r	C_c	C_α	P_c (kPa)	e_0	n
		FROM	TO	FROM	TO		FROM	TO	CLASSIFICATION	SYMBOL								
19	Dongen Asse - Clay	-140.6	-196.0	145.5	200.94	KB-101_ST-11	-150.91	-151.46	fat clay	ch	20.9	0**						

LT-091

USCS = Unified Soil Classification System; φ' = Effective Angel of Internal Friction; c' = Effective Cohesion; C_r = Recompression Index; C_c = Compression Index; C_α = Secondary Compression Index; P_c = Preconsolidation Pressure; e_0 = Initial Void Ratio; n = Porosity

Notes:

1) Laboratory verified classification is indicated in upper case. Classification based on geologist's field visual observation is shown in lower case.

* High variance in the laboratory data within the same stratum.

** Negative cohesion values reported in the laboratory results are taken as zero.

TABLE 3-6

SUMMARY OF EFFECTIVE COHESION AND INTERNAL FRICTION ANGLE FOR ENGINEERING ANALYSIS

STRATUM	GEOLOGICAL FORMATION	STRATUM ELEVATION (m NAP)		u_o	σ'_{vo}	qt	fs	u2	Q_{tn}	ϕ' FROM TRIAXIAL TESTS	c' FROM TRIAXIAL TESTS	ϕ' BY KULHWAY & MAYNE_1990	ϕ' BY ROB& CAMP _1983	ϕ' EUROCODE 7	WITH 3° REDUCTION FOR FINES IN EUROCODE 7	ϕ' and c from NEN 6740		SELECTED ϕ'	SELECTED c'
		FROM	TO	[kPa]	[kPa]	[kPa]	[kPa]	[kPa]		^{o}	[kPa]	^{o}	^{o}	^{o}	^{o}	(ϕ□□)	c [kPa]	^{o}	[kPa]
1	Modern Fill-Sand 1	4.9	0	0.0	62.8	3969.9	29.1	1.0	49.8	-	-	36	39	35	32	27-32.5	-	32	0
2	Naaldwijk - Sand 1	0	-6.1	30.0	125.8	2982.3	41.9	13.6	25.5	36.7	22.3	33	33	29	-	27-32.5	-	29	0
4	Naaldwijk - Clay 2	-6.1	-9.14	74.9	169.3	4582.9	57.2	-4.0	33.6	40.7	4.6	34	32	32	-	27.5-32.5	0-1	30	0
5	Boxtel - Silt 1	-9.14	-11.7	102.3	196.0	10485.5	92.7	-7.6	73.3	-	-	38	36	37	34	25-30	-	30	0
6	Boxtel - Sand 1	-11.7	-12.6	119.2	212.4	20881.1	178.1	-0.4	141.7	-	-	40	36	40	37	30	-	32	0
8	Boxtel - Sand 3	-12.6	-16.6	143.2	235.7	13659.4	101.7	-3.2	87.2	37.3	0.0	39	36	37	34	27-32.5	-	32	0
10	Boxtel - Sand 5	-16.6	-18.6	172.8	264.4	16912.5	106.9	-1.8	102.2	33.3	56.3	39	37	37	34	27-32.5	-	32	0
10a	Boxtel - Sand 6	-18.6	-20.1	189.9	281.0	14112.0	93.0	19.6	82.1	-	-	39	37	37	34	27-32.5	-	32	0
12	Maassluis/Waalre-Clay	-20.1	-22.6	209.5	300.1	12139.0	139.9	20.9	67.7	24.6	44.2	38	35	37	34	22.5-27.5	13-15	22	14
13	Oosterhout - Sand	-22.6	-30.66	261.3	350.4	37932.5	184.3	-12.4	201.4	33.8	50.3	43	41	40	37	27-32.5	-	32	0
14	Breda - Sand	-30.66	-64.13	384.9	469.7	26452.2	546.0	-22.3	119.6	33.9	23.6	40	37	40	37	27-32.5	-	32	0
15	Rupel - Clay	-64.13	-75.16	-	-	-	-	-	-	22.4	83.7	-	-	-	-	22.5-27.5	13-15	22	14
16	Ruisbroek - Sand	-75.16	-91.61	-	-	-	-	-	-	30.1	38.5	-	-	-	-	25-30	-	30	0
17	Watervliet - Clay	-91.61	-98.76	-	-	-	-	-	-	22.5	122.2	-	-	-	-	22.5-27.5	13-15	22	14
18	Bassevelde-Sand	-98.76	-140.6	-	-	-	-	-	-	29.5	29.3	-	-	-	-	25-30	-	29	0
19	Dongen Asse-Clay	-140.6	-196.04	-	-	-	-	-	-	20.9	0	-	-	-	-	17.5	5	17	5

LT-092

u_0 = Hydrostatic Stress; u2 = Dynamic Pore Pressure; σ'_{vo} = Effective Vertical Overburden Stress; Q_{tn} = Normalized Cone Penetration Resistance; qt = Corrected Cone Resistance; φ' = Effective Angel of Internal Friction

fs = Measured Side Friction; c' = Effective Cohesion

TABLE 3-7
SUMMARY OF DEFORMATION PARAMETERS FOR ENGINEERING ANALYSIS

ZONE	NAME	El. (GWT) (m NAP)		E_{50} P AND S WAVE SUSPENSION	E_{50} TRIAXIAL	E_{50} CPT	E_{ur} PRESSUREMETER	E_{50} SELECTED 1)	E_{ur} 2)	P_{ref} 3)
		TOP	BOTTOM	(kPa)	(Pa)	(kPa)		(kPa)	(kPa)	(kPa)
1	Modern Fill-Sand 1	4.90	0.00	N/A	N/A	16500		16500	49499	23
2	Naaldwijk - Sand 1	0.00	-6.10	10289	25900	23362	6737	18095	54284	61
4	Naaldwijk - Clay 2	-6.10	-9.14	18359	N/A	35583		18359	55077	82
5	Boxtel - Silt 1	-9.14	-11.70	26924	N/A	53844	288600	26924	80772	95
6	Boxtel - Sand 1	-11.70	-12.60	56963	N/A	83347		56963	170890	103
8	Boxtel - Sand 3	-12.60	-16.60	35819	17550	66456	180267	26684	80053	115
10	Boxtel - Sand 5	-16.60	-18.60	34768	N/A	74843		34768	104303	129
10a	Boxtel - Sand 6	-18.60	-20.10	40553	N/A	71505		40553	121659	137
12	Maassluis/Waalre-Clay	-20.10	-22.60	60579	N/A	79027	110500	60579	181738	146
13	Oosterhout - Sand	-22.60	-30.66	173207	45600	123037	451100	109403	328210	170
14	Breda – Sand	-30.66	-64.13	114737	55300	186750		85018	255055	267
15	Rupel - Clay	-64.13	-75.16	69335	29767	N/A		49551	148653	370
16	Ruisbroek - Sand	-75.16	-91.61	93511	48075	N/A		70793	212379	434
17	Watervliet - Clay	-91.61	-98.76	91915	69600	N/A		80758	242273	489
18	Bassevelde-Sand	-98.76	-140.60	104730	55767	N/A		80248	240745	603
19	Dongen Asse- Clay	-140.60	-196.04	70172	48600	N/A		59386	178158	829

LT-093

E_{50} = Confining Stress Dependent Stiffness Modulus for Primary Loading

Notes:

1) It is the average of Soil Modulus from P and S Wave Suspension and the Triaxial tests, Soil Modulus from CPT and Pressuremeter is not included.

2) $E_{ur} = 3 \times E_{50}$

3) P_{ref} = Horizontal Efffective stress in the middle of that layer, horizontal earth pressure coefficient at rest is taken as 0.5.

FIGURES

CAD FILE NUMBER	10-4472-B78
SIGNATURES ON FILE	
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CC	MMD
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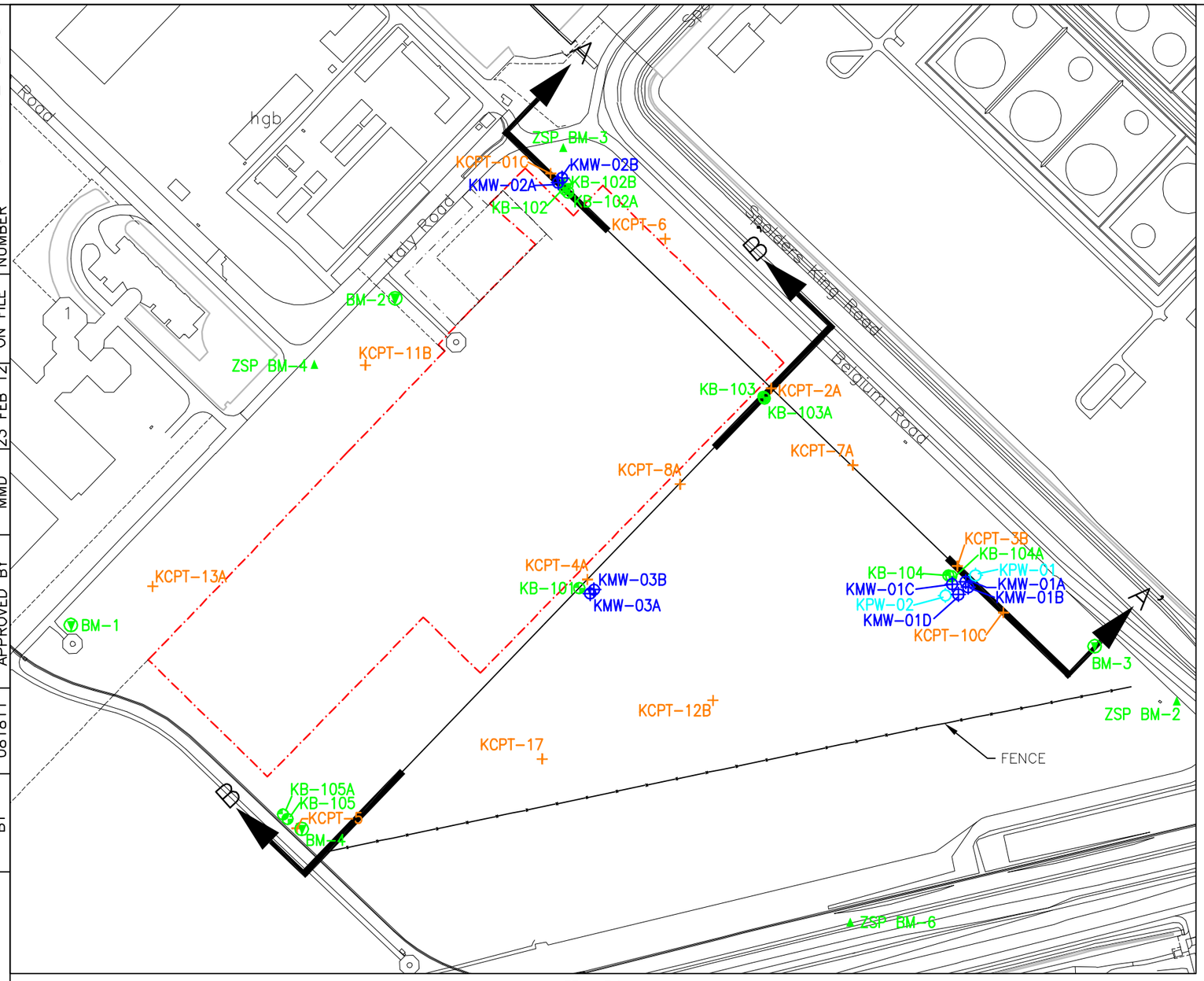


Key Plan

Notes:

1. The boring logs and related information depict subsurface conditions only at the specific locations and dates indicated. Soil conditions and water levels at other locations may differ from conditions occurring at these boring locations. Also the passage of time may result in a change in the conditions at these boring locations.
2. The depth and thickness of the subsurface strata indicated on the sections were generalized from and interpolated between the test borings. Information on actual subsurface conditions exists only at the location of the test borings and it is possible that subsurface conditions between the test borings may vary from those indicated.
3. Survey data collected from field between June 2011 and July 2011
4. Reference RIZZO boring logs for site.
5. Elevations are reported in meters referenced to NAP.

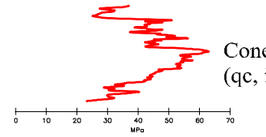
LITHOLOGIC SYMBOLS AND PATTERNS (USCS)

- MH - elastic silt
- ML - silt
- SM - silty sand
- SP - poorly graded sand
- SP-SM - poorly graded sand with silt
- CH - high plasticity clay
- CL - low plasticity clay
- CL-ML - low plasticity silty clay
- PT - peat
- SC - clayey sand
- SC-SM - silty clayey sand
- SP-SC - poorly graded sand with clay
- OL/OH - organic soil
- GW/GM - well graded gravel with silt
- SW - well graded sand

PRIMARY SOIL TYPES

- SAND
- SILT
- CLAY
- GRAVEL
- ORGANIC SOIL
- PEAT

LEGEND



Cone Resistance (qc, in MPa)

30+100 N-Value + % Recovery

+ SPT Sample

⊥ Total Depth in meters

T.D.=32.0m

References for Soil Descriptions:

Slupik, A.A. and Janse, A.C. (2008) The geological record of the Breda Formation in the subsurface of the Island of Noord-Beveland (Province of Zeeland, The Netherlands) from the Colijnsplaat borehole (42G24-I): A sequence-stratigraphic approach. DEINSEA 12:37-52.

van der Meulen, M.J., van Gessel, S.F. and Veldkamp, J.G., (2005) Aggregate Resources in the Netherlands. Netherlands Journal of Geosciences -Geologie en Mijnbouw. 84-3: 379-387.

Figure 2-1
Borehole and Cross-Section Locations with Geological Legend for Cross Sections

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DELTA Energy Project KCB2

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ENGINEERS / CONSULTANTS / CM

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APPROVED BY	MMD	2/15/12

SIGNATURES ON FILE

CAD FILE NUMBER 10-4472-B58

A

A'

KCPT-1C G.S.=5.03

KB-102/102A G.S.=5.10

KCPT-6 G.S.=5.10

KB-103/103A G.S.=4.74

KCPT-2A G.S.=4.78

KCPT-7 G.S.=4.74

KB-104/104A G.S.=4.94

KCPT-3B G.S.=4.89

KCPT-10C G.S.=4.95

NAALDWIJK FORMATION CHANNEL FILL

MODERN FILL

NAALDWIJK FORMATION

BOXTEL FORMATION

MAASSLUIS/WAALRE FORMATION

OOSTERHOUT FORMATION

BREDA SAND FORMATION

RUPEL CLAY MEMBER

RUISBROEK SAND

VESSEM MEMBER

RUPEL FORMATION

WATERVLIET CLAY

NO DATA

T.D.= 60.04m

T.D.= 36.18m

T.D.= 31.26m

T.D.= 59.98m

T.D.= 60.80m

T.D.= 60.02m

T.D.= 101.84m

T.D.= 100.68m

T.D.= 100.42m

0 10 20 30 40 50 60 70 80 MPa

ELEVATION, METERS NAP

10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100

DISTANCE, METERS

0 50 100 150 200 250 300 350 400 450 500 550

4x VERTICAL EXAGGERATION

Horizontal Scale: 20 0 20 40 meters

Vertical Scale: 5 0 5 10 meters

Datum: Amersfoort; Projection: RD_New
Vertical Datum: NAP

Figure 2-2
Geologic Cross Section A-A'

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J.S.S.	
062211	
DRAWN BY	

B KB-105/KB-105A G.S.=5.11 — KCPT-5 G.S.=5.13 — KCPT-17 PROJ. 76.18m NW G.S.=5.14 — KB-101 G.S.=4.90 — KCPT-4A G.S.=4.76 — KCPT-8A G.S.=4.72 — KB-103/KB-103A G.S.=4.74 — KCPT-2A G.S.=4.78 — B'

T.D.=59.90m · T.D.=38.62m · T.D.=60.14m · T.D.=59.88m · T.D.=59.98m · T.D.=100.23m · T.D.=100.58m · T.D.=200.94m

MODERN FILL
NAALDWIJK FORMATION
BOXTEL FORMATION
MAASSLUIS/WAALRE FORMATION
OOSTERHOUT FORMATION
BREDA FORMATION
RUPEL CLAY MEMBER
RUISBROEK SAND
WATERVLIET CLAY
VESSEM MEMBER
RUPEL FORMATION
BASSEVELDE SAND
DONGEN FORMATION ASSE CLAY MEMBER

ELEVATION, METERS NAP

DISTANCE, METERS

2x VERTICAL EXAGGERATION

Horizontal Scale 20 0 20 40 meters

Vertical Scale 10 0 10 20 meters

Datum: Amersfoort; Projection: RD_New
Vertical Datum: NAP

Figure 2-3
Geologic Cross Section B-B'

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MLS 7 NOV 11	APPROVED BY	MMD	6 FEB 12 23 FEB 12	

1.



2.



3.



1. Prepared SPT Split Spoon Sample

2. Prepared SMET Soil Core

3. Prepared Shelby Tube-Undisturbed Sample

Note: The structures shown in the core are not naturally occurring; they are caused by the action of the saw blade used to split the sample.

Figure 3-1

Soil Sampling and Characterization Methods

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DRAWN BY	CHECKED BY	CC	15 FEB 12	GIS FILE NUMBER
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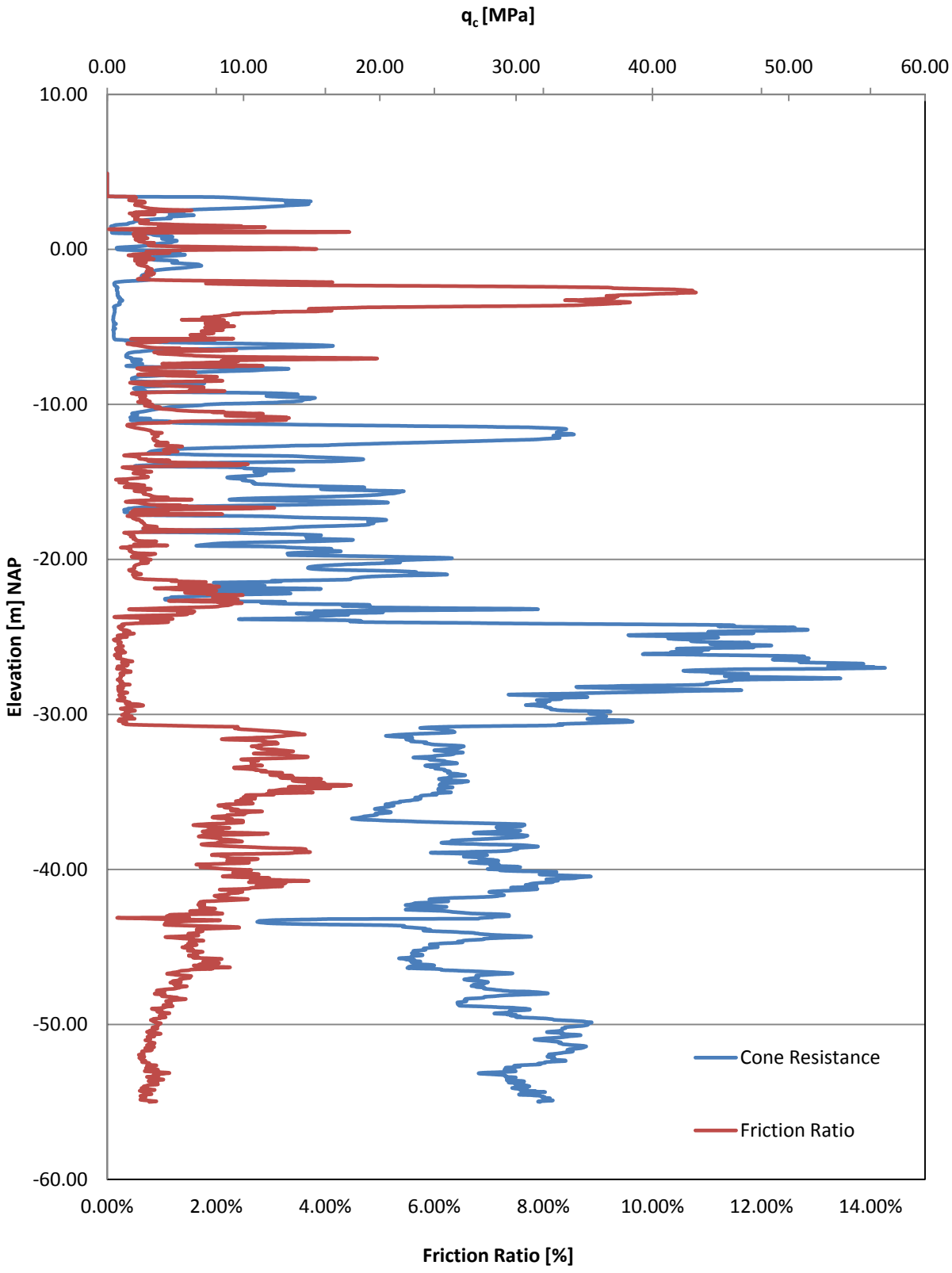

Figure 3-2

KCPT4A Cone Tip Resistance (q_c) and Friction Ratio

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DRAWN BY	CHECKED BY	CC	6 FEB 12	GIS FILE NUMBER	10-4472-GIS-A137
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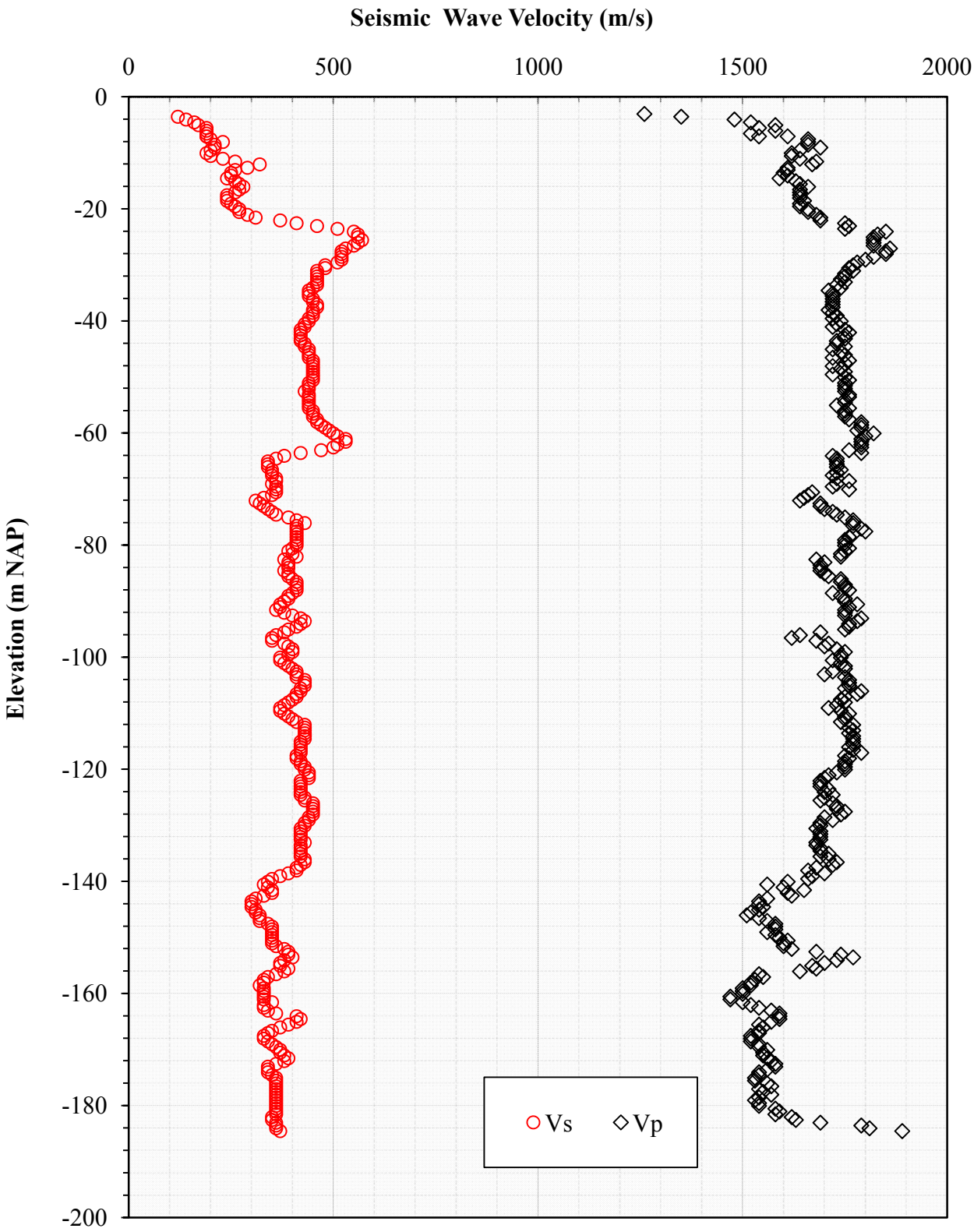

Figure 3-3

Site Seismic Velocity Profile

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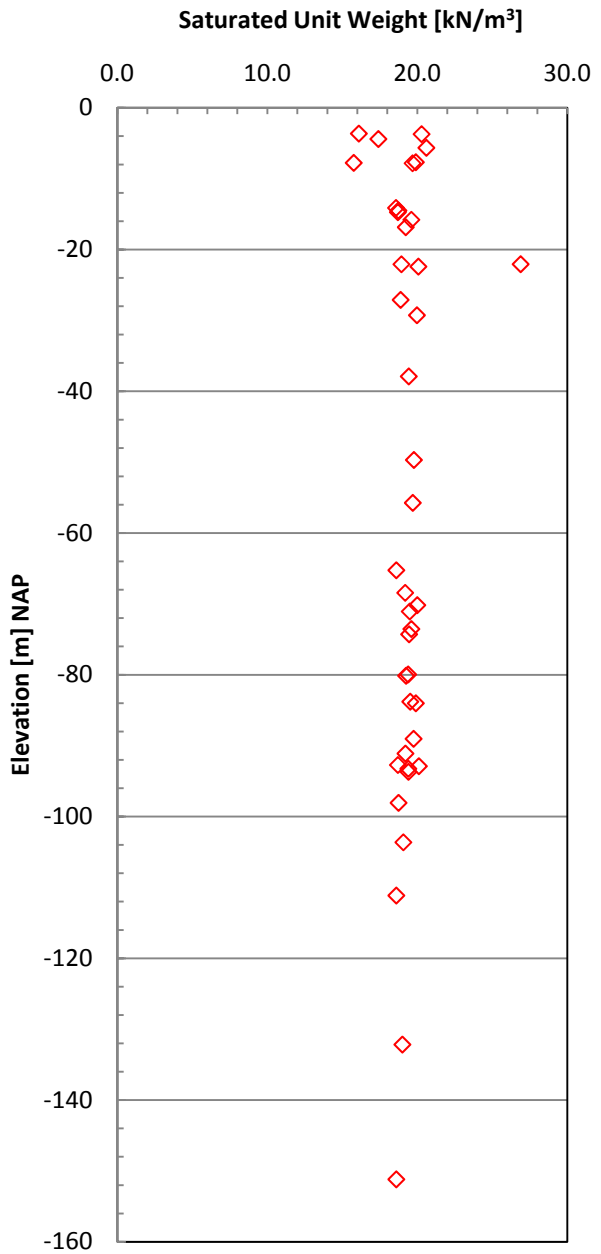
DRAWN BY	SDS	CHECKED BY	CC	6 FEB 12	GIS FILE NUMBER	10-4472-GIS-A144
	18 NOV 11	APPROVED BY	MMD	23 FEB 12		(SIGNATURES ON FILE)



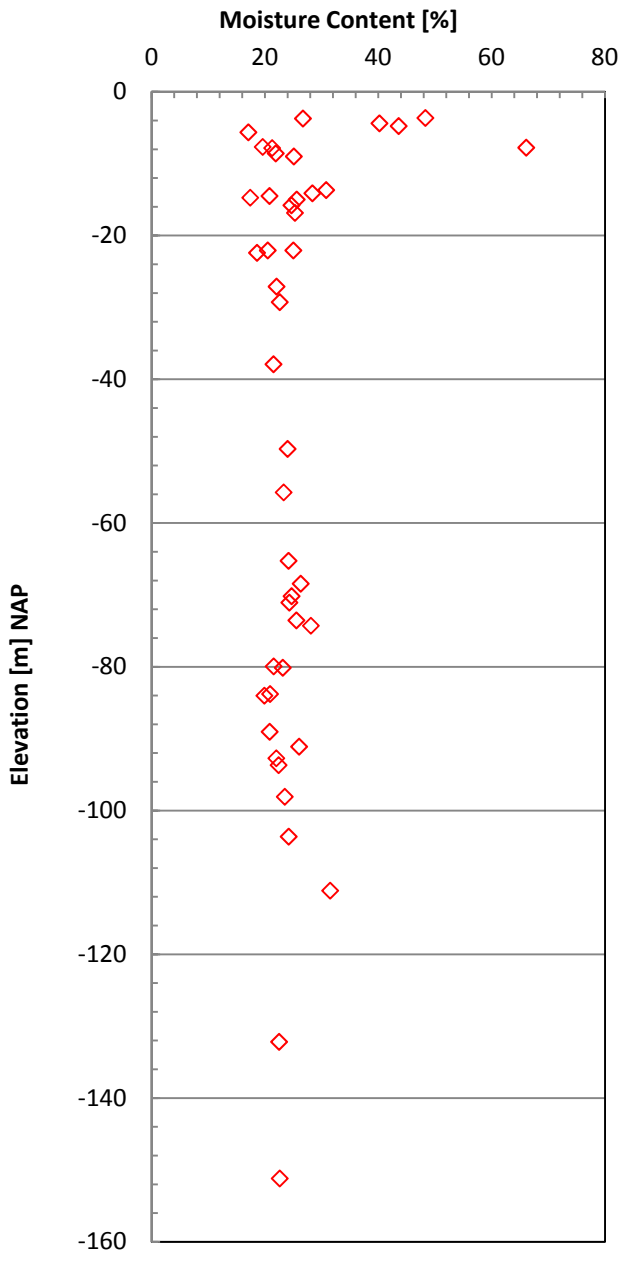


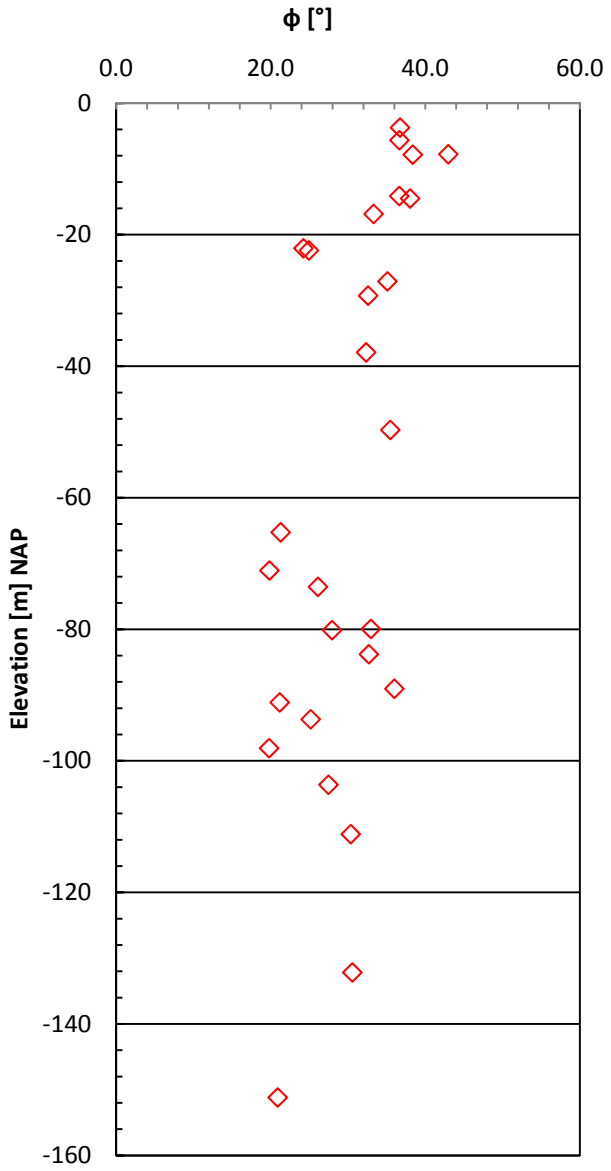
Figure 3-4

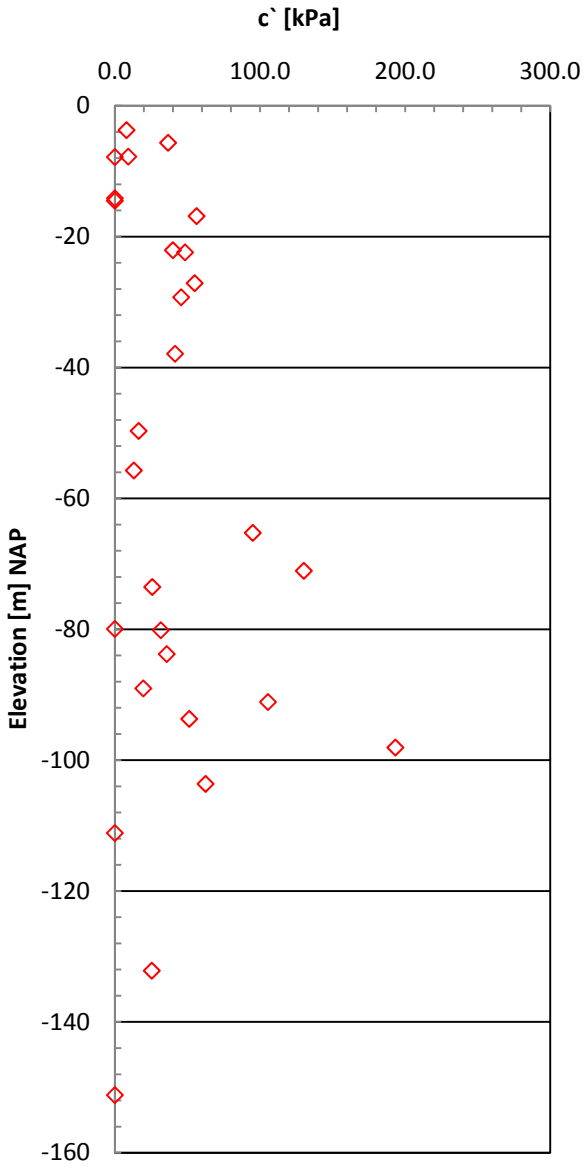
Moisture Content and Moist Unit Weight Profile

PREPARED FOR

DELTA Energy Project KCB2

Paul C. Rizzo Associates, Inc.
ENGINEERS/CONSULTANTS/CM





DRAWN BY	CHECKED BY	CC	GIS FILE NUMBER
SDS	APPROVED BY	MMD	10-4472-GIS-A145
18 NOV 11		23 FEB 12	(SIGNATURES ON FILE)
		6 FEB 12	

Figure 3-5

Effective Cohesion and Effective Friction Angle from Triaxial Compression Tests

PREPARED FOR

DELTA Energy Project KCB2

Paul C. Rizzo Associates, Inc.
ENGINEERS/CONSULTANTS/CM

DRAWN BY	MLS	7 NOV 11
CHECKED BY	APPROVED BY	
CC	MMD	23 FEB 12
		6 FEB 12
GIS FILE NUMBER	10-4472-GIS-A141 (SIGNATURES ON FILE)	

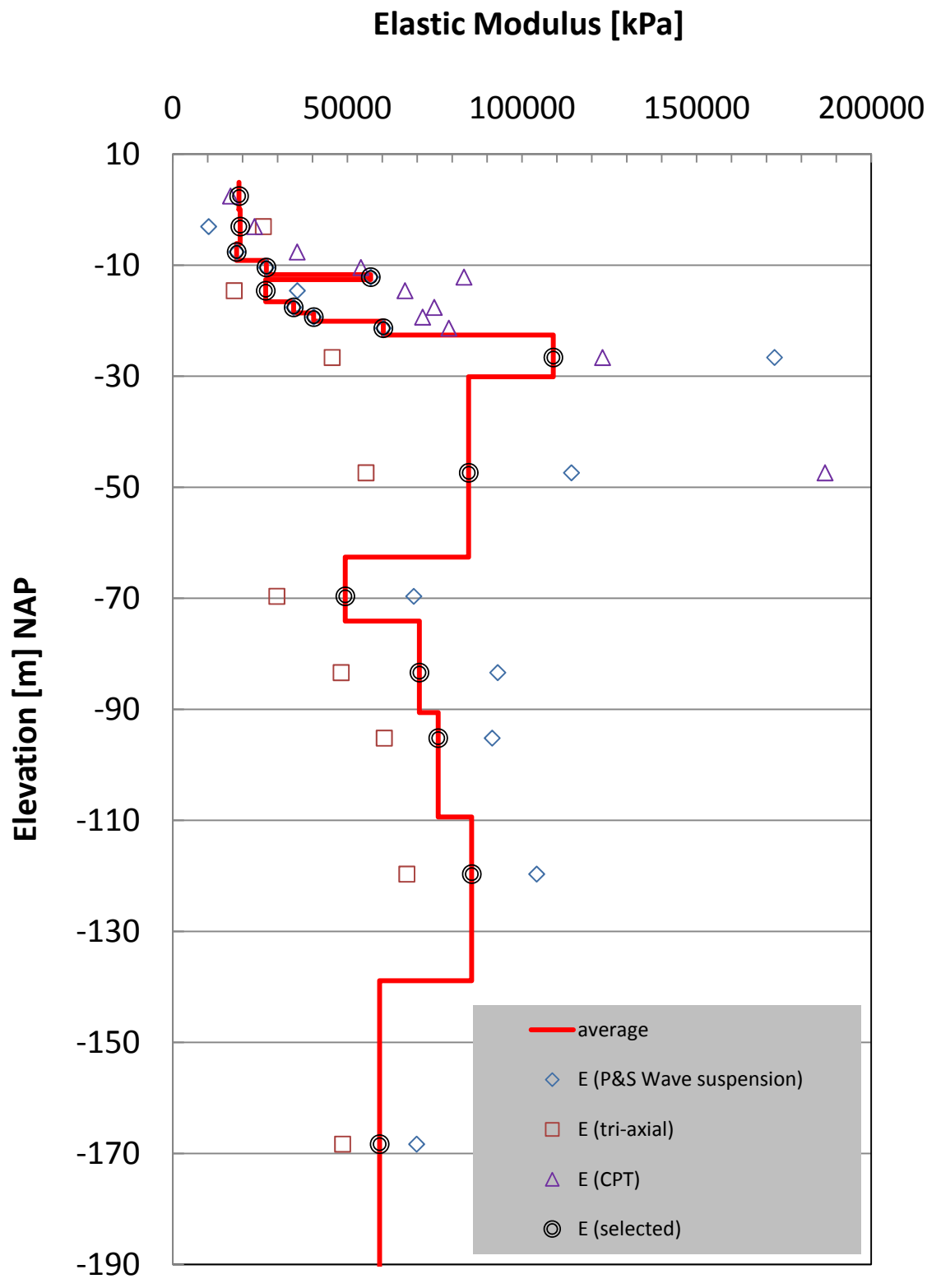


Figure 3-6

Elastic Modulus Profile

PREPARED FOR

DELTA Energy Project KCB2

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APPENDIX A

SITE INVESTIGATION BORING LOGS

Paul C. Rizzo Associates, Inc.
ENGINEERS/CONSULTANTS/CM

Paul C. Rizzo Associates, Inc
500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
www.rizzoassoc.com

REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
4.5	0.5				0.0-2.0 m Unsampled.		At 0 m on 01 July 2011; Field geologist: DAR/KDR, Driller: Bart Caers
4.0	1.0						
3.5	1.5						
3.0	2.0						
2.5	2.5	R-1	76%		2.0-4.78 m Well graded sand, (sw), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; medium gray (N5) and dark gray (N3), organic odor, moist to wet, strong HCl reaction, some organics, with shell fragments, (Fill).	sw	
2.0	3.0						
1.5	3.5	R-2	71%				3.5 - 3.65 m, Organic materials present.
1.0	4.0						3.85 - 3.87 m, Black clay seam.
0.5	4.5	R-3	90%				4.63 - 4.78 m, Black coloring from organic content.
0.0					4.78-4.98 m Peat, (pt), 15% sand; black (N1), organic odor, moist,	pt	

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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ENGINEERS/CONSULTANTS/CM

Paul C. Rizzo Associates, Inc
500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
www.rizzoassoc.com

REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
		R-3	90%	(Lacustrine).		
-0.5	5.5	R-4	60%	4.98-6.0 m Poorly graded sand, (sp), 100% sand, fine to medium, subrounded, spherical, medium hardness; light olive gray (5Y 6/1), organic odor, moist to wet, weak HCl reaction, homogeneous, little shell fragments, trace organics, with glauconite, glauconite is approximately 20% of sand (Littoral).	sp	
-1.0	6.0					5.85 - 6.0 m, laminated, black, organic rich
-1.5	6.5	R-5	60%	6.0-6.8 m POORLY GRADED SAND, (SP), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; grayish black (N2), organic odor, moist, strong HCl reaction, homogeneous, some shell fragments, some organics, with glauconite, glauconite is approximately 25% of sand (Littoral).	SP	6.0 - 6.05 m, fine to very fine silty sand
-2.0	7.0			6.8-7.7 m POORLY GRADED SAND, (SP), 100% sand, fine to medium, subrounded, spherical, medium hardness; dark gray (N3) and medium dark gray (N4), organic odor, moist to wet, weak HCl reaction, homogeneous, little fine sand sized Shell fragments, trace organics, with glauconite, glauconite is approximately 20% of sand, black fine silty sand lenses present (Littoral).	SP	
-2.5	7.5	R-6	56%	7.7-8.45 m Peat, (pt), brownish black (5YR 2/1), organic odor, moist, trace sand, (Lacustrine).	pt	7.7 - 7.85 m, 50% sand
-3.0	8.0					
-3.5	8.5	R-7	100%	8.45-9.42 m Silty sand, (sm), 70% sand, fine, rounded, spherical, soft hardness; 30% fines, low plasticity; medium dark gray (N4), moist to wet, strong HCl reaction, homogeneous, trace shell fragments, (Marine).	sm	Shells present at 8.83 and 8.96 m (with organism)
-4.0	9.0					
-4.5	9.5	R-8	89%	9.42-9.52 m Peat, (pt), brownish black (5YR 2/1), organic odor, moist, firm consistency.	pt sm	At 9.27 m on 01 July 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-5.0						

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
www.rizzoassoc.com

REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-5.5	10.5	R-8	89%	9.52-10.5 m Silty sand, (sm), 70% sand, fine to medium, rounded, spherical, soft hardness; 30% fines, low plasticity; grayish black (N2) and medium gray (N5), moist, strong HCl reaction, mottled, trace organics, (Marine).	sm	
		ST-1	100%	10.5-12.08 m SILTY CLAY WITH SAND, (CL-ML), 70% fines, low plasticity, rapid dilatancy; 30% sand, fine to medium, rounded, spherical; olive gray (5Y 4/1) to dark greenish gray (5GY 4/1), moist, strong HCl reaction, very soft consistency, trace organics.	CL-ML	
-6.0	11.0					
-6.5	11.5	R-9	100%			
-7.0	12.0			12.08-12.23 m Peat, (pt), brownish black (5YR 2/1), firm consistency.	pt	
-7.5	12.5	R-10	35%	12.23-14.09 m SILTY CLAY WITH SAND, (CL-ML), 70% fines, low plasticity, rapid dilatancy; 30% sand, fine to medium, rounded, spherical; olive gray (5Y 4/1) to dark greenish gray (5GY 4/1), moist, strong HCl reaction, trace organics, material is very soft.	CL-ML	Material is difficult to recover, tends to slide out of the sample barrel.
-8.0	13.0					
-8.5	13.5	R-11	24%			
-9.0	14.0					
-9.5	14.5	R-12	100%	14.09-15.0 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky yellow green (5GY 5/2) to dark greenish gray (5GY 4/1), moist to wet, strong HCl reaction, homogeneous, trace glauconite.	sp	
-10.0		R-13				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-10.5	15.5	R-13	100%		15.0-17.17 m Sandy organic soil, (ol/oh), 60% fines; 40% sand, fine to medium, subrounded, spherical; grayish brown (5YR 3/2) to dark yellowish brown (10YR 4/2), organic odor, moist, weak HCl reaction, with peat.	ol/oh	
-11.0	16.0						
-11.5	16.5	R-14	27%				
-12.0	17.0						
-12.5	17.5	R-15	100%		17.17-22.79 m Poorly graded sand with silt, (sp-sm), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky yellow green (5GY 5/2) to dark greenish gray (5GY 4/1), moist to wet, strong HCl reaction, homogeneous, little glauconite, trace shell fragments, grades in and out of silty sand.	sp-sm	
-13.0	18.0						
-13.5	18.5	R-16	93%				
-14.0	19.0						
-14.5	19.5	R-17	98%				
-15.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.5	20.5	R-18	94%		17.17-22.79 m Poorly graded sand with silt, (sp-sm), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky yellow green (5GY 5/2) to dark greenish gray (5GY 4/1), moist to wet, strong HCl reaction, homogeneous, little glauconite, trace shell fragments, grades in and out of silty sand.	sp-sm	20.96 - 21.94 R-19 lab classification SP
-16.0	21.0						
-16.5	21.5	R-19	94%				
-17.0	22.0						22.27 - 22.37 m, Silt layer,with trace mica, very little fine grained sand.
-17.5	22.5	R-20	92%				
-18.0	23.0				22.79-23.6 m Silt with sand, (ml), 85% fines, medium plasticity; 15% sand, fine; dark greenish gray (5GY 4/1), moist, weak HCl reaction, soft consistency, trace mica.	ml	
-18.5	23.5	R-21	98%		23.6-24.33 m Poorly graded sand with silt, (sp-sm), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky yellow green (5GY 5/2) to dark greenish gray (5GY 4/1), moist to wet, strong HCl reaction, homogeneous, little glauconite, trace shell fragments, grades in and out of silty sand.	sp-sm	23.6 - 23.67 m, Sand has a grayish black (N2) color.
-19.0	24.0						
-19.5	24.5	R-22	95%		24.33-26.17 m Poorly graded sand, (sp), 95% sand, fine to coarse, subrounded, spherical; 5% fines; grayish black (N2) to dark greenish gray (5GY 4/1), moist to wet, weak HCl reaction, lensed, trace of fine gravel-sized shell fragments, maximum grain size = 20 mm, coarse sand fraction is composed of shell fragments, contact with sand layer above is marked by fine grained lenses 1-2 cm thick, 1-10 cm spacing.	sp	
-20.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-20.5	25.5	R-23	83%		24.33-26.17 m Poorly graded sand, (sp), 95% sand, fine to coarse, subrounded, spherical; 5% fines; grayish black (N2) to dark greenish gray (5GY 4/1), moist to wet, weak HCl reaction, lensed, trace of fine gravel-sized shell fragments, maximum grain size = 20 mm, coarse sand fraction is composed of shell fragments, contact with sand layer above is marked by fine grained lenses 1-2 cm thick, 1-10 cm spacing.	sp	
-21.0	26.0						
-21.5	26.5	R-24	100%		26.17-26.79 m Clayey sand, (sc), 60% sand, fine to medium, subrounded, spherical; 40% fines, medium plasticity; light olive gray (5Y 5/2) to olive gray (5Y 4/1), dry, no HCl reaction, varved, trace glauconite, overall thin laminations of sand and clay with dark varves within fine sandy silt layers.	sc	26.32-26.46 m, 100% clay seam
-22.0	27.0				26.79-27.7 m SILTY CLAYEY SAND, (SC-SM), 65% sand, fine to coarse, subangular, spherical; 30% fines; 5% gravel, fine, angular, flat, medium hardness; olive gray (5Y 4/1) to olive gray (5Y 3/2), moist, weak HCl reaction, gravel and coarse sand are composed of shell fragments, small clay lenses occur rarely, grades in and out from sandy clay to clayey sand. sand is dominant however.	SC-SM	
-22.5	27.5	R-25	100%				27.38 - 27.58 m, lab approved Lean clay (CL)
-23.0	28.0				27.7-29.0 m Poorly graded sand with gravel, (sp), 80% sand, fine to coarse, subangular, spherical; 15% gravel, fine, angular, flat, medium hardness; 5% fines; dark greenish gray (5GY 4/1), moist, strong HCl reaction, trace glauconite, gravel and coarse sand is large mostly intact shell fragments and pieces, most are relatively flat lying.	sp	
-23.5	28.5	R-26	100%				
-24.0	29.0						
-24.5	29.5	R-27	100%		29.0-35.56 m POORLY GRADED SAND, (SP), 95% sand, fine to coarse, subangular, spherical; 5% gravel, fine, angular, flat, medium hardness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace glauconite, coarse sand and fine gravel is shell fragments, up to 5 cm thick concentrations of fine gravel/coarse sand sized shell fragments, spaced 50-100 cm apart (Marine).	SP	29.42 m, color change at 29.42 m to grayish olive green (5 GY 3/2)
-25.0		R-28	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-25.5	30.5	R-28	100%		29.0-35.56 m POORLY GRADED SAND, (SP), 95% sand, fine to coarse, subangular, spherical; 5% gravel, fine, angular, flat, medium hardness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace glauconite, coarse sand and fine gravel is shell fragments, up to 5 cm thick concentrations of fine gravel/coarse sand sized shell fragments, spaced 50-100 cm apart (Marine).		
-26.0	31.0	R-29	100%				
-26.5	31.5	R-30	100%				
-27.0	32.0						
-27.5	32.5	R-31	100%			SP	
-28.0	33.0						
-28.5	33.5	R-32	100%				
-29.0	34.0						
-29.5	34.5	R-33	100%				
-30.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-30.5	35.5	R-34	86%			SP	35.56 - 36.29 m, 5-10% shell fragments, sharp decrease below 36.29 m.
-31.0	36.0				35.56-50.6 m POORLY GRADED SAND, (SP), 95% sand, fine to medium, subrounded, spherical; 5% fines; greenish black (5G 2/1) to dusky green (5G 3/2), moist, weak HCl reaction, mottled, with glauconite, some mottling of sand to light olive gray (5Y 5/2) color, less glauconite in light olive gray sand, trace dusky yellow (5Y 6/4) mottling from concentrations of fines (Marine).		35.56 - 69.03 m, (Miocene) Breda Fm.
-31.5	36.5	R-35	100%				
-32.0	37.0						
-32.5	37.5	R-36	100%				37.21 - 37.25 m, Decomposed, soft shell fragments.
-33.0	38.0					SP	
-33.5	38.5	R-37	100%				
-34.0	39.0						
-34.5	39.5	R-38	100%				
-35.0		R-39	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-35.5	40.5	R-39	100%		35.56-50.6 m POORLY GRADED SAND, (SP), 95% sand, fine to medium, subrounded, spherical; 5% fines; greenish black (5G 2/1) to dusky green (5G 3/2), moist, weak HCl reaction, mottled, with glauconite, some mottling of sand to light olive gray (5Y 5/2) color, less glauconite in light olive gray sand, trace dusky yellow (5Y 6/4) mottling from concentrations of fines (Marine).	SP	Below 40.0 m sand is approximately 60% quartz and 40% glauconite.
-36.0	41.0	R-40	100%				At 40.81 m on 02 July 2011; Field geologist: DAR/KDR, Driller: Bart Caers
-36.5	41.5						
-37.0	42.0	R-41	100%				
-37.5	42.5						
-38.0	43.0	R-42	100%				
-38.5	43.5						
-39.0	44.0	R-43	100%				
-39.5	44.5						
-40.0		R-44	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-40.5	45.5	R-44	100%		35.56-50.6 m POORLY GRADED SAND, (SP), 95% sand, fine to medium, subrounded, spherical; 5% fines; greenish black (5G 2/1) to dusky green (5G 3/2), moist, weak HCl reaction, mottled, with glauconite, some mottling of sand to light olive gray (5Y 5/2) color, less glauconite in light olive gray sand, trace dusky yellow (5Y 6/4) mottling from concentrations of fines (Marine).	SP	48.41 - 48.45 m, Rectangular block of clay, light olive gray (5Y 5/2)
-41.0	46.0	R-45	100%				
-41.5	46.5						
-42.0	47.0	R-46	100%				
-42.5	47.5						
-43.0	48.0	R-47	100%				
-43.5	48.5						
-44.0	49.0	R-48	100%				
-44.5	49.5						
-45.0		R-49	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-45.5	50.5	R-49	100%			SP	No mottles below 50.6m
-46.0	51.0	R-50	100%		50.6-58.0 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is approximately 40% glauconite and 60% quartz, glauconite is fine grained sized sand (Marine).		
-46.5	51.5						
-47.0	52.0	R-51	100%				
-47.5	52.5						
-48.0	53.0	R-52	100%			sp	
-48.5	53.5						
-49.0	54.0	R-53	100%				
-49.5	54.5						
-50.0		R-54	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-50.5	55.5	R-54	100%		50.6-58.0 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is approximately 40% glauconite and 60% quartz, glauconite is fine grained sized sand (Marine).	sp	
-51.0	56.0	R-55	100%				
-51.5	56.5						
-52.0	57.0	R-56	100%				
-52.5	57.5						
-53.0	58.0	R-57	100%		58.0-69.03 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is approximately 50% glauconite and 50% quartz, glauconite is fine grained sized sand (Marine).	sp	
-53.5	58.5						
-54.0	59.0	R-58	100%				
-54.5	59.5						
-55.0		R-59	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-55.5	60.5	R-59	100%		58.0-69.03 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is approximately 50% glauconite and 50% quartz, glauconite is fine grained sized sand (Marine).	sp	64.10 - 67.40 m, Intact whole shells, broken whole shells and shell fragments 64.3 m, Broken whole shell 64.82 m, Whole intact shell, 9 cm x 6 cm.
-56.0	61.0	R-60	100%				
-56.5	61.5						
-57.0	62.0	R-61	100%				
-57.5	62.5						
-58.0	63.0	R-62	100%				
-58.5	63.5						
-59.0	64.0	R-63	100%				
-59.5	64.5						
-60.0		R-64	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-60.5	65.5	R-64	100%		58.0-69.03 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is approximately 50% glauconite and 50% quartz, glauconite is fine grained sized sand (Marine).		
-61.0	66.0	R-65	100%				
-61.5	66.5						66.47 - 67.74 m, R-66 lab classification SM
-62.0	67.0	R-66	100%			sp	
-62.5	67.5						
-63.0	68.0	R-67	100%				
-63.5	68.5						
-64.0	69.0	R-68	100%				
-64.5	69.5				69.03-69.44 m Fat clay, (ch), 90% fines, medium plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, strong HCl reaction, very stiff consistency, weak cementation, little mica, some glauconite, (Marine).	ch	69.03 - 80.06 m, (Oligocene) Rupel Fm. (Boom Clay)
-65.0		R-69	100%		69.44-69.92 m Clayey sand, (sc), 70% sand, fine, rounded, spherical, medium hardness; 30% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, weak cementation, little mica, little	sc	

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
				glauconite, gradual transition to underlying lithology (Marine).	ch	
-65.5	70.5	R-69	100%	69.92-70.67 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, little glauconite, (Marine).	ch	
-66.0	71.0	R-70	100%	70.67-71.26 m Clayey sand, (sc), 80% sand, fine, rounded, spherical, medium hardness; 20% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, homogeneous, weak cementation, little mica, little glauconite, gradual transition to adjacent lithologies (Marine).	sc	
-66.5	71.5			71.26-72.0 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, strong HCl reaction, very stiff consistency, weak cementation, little mica, some glauconite, (Marine).	ch	At 71.36 m on 02 July 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-67.0	72.0	R-71	89%			
-67.5	72.5	ST-2	100%	72.0-74.9 m Fat clay with sand, (ch), 80% fines, medium plasticity, no dilatancy, high toughness; 20% sand, fine, rounded, spherical; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, strong HCl reaction, very stiff consistency, weak cementation, little mica, some glauconite, (Marine).		
-68.0	73.0	ST-3	100%			
-68.5	73.5				ch	
-69.0	74.0	R-72	0%			74.9 m, Sand is soft and fine between the fingers, but still plainly visible with lens.
-69.5	74.5	R-73	100%			
-70.0					sc	

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-73	100%		74.9-76.5 m Clayey sand, (sc), 80% sand, fine, subrounded, spherical; 20% fines; grayish olive green (5GY 3/2) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, homogeneous, little glauconite, fines content fluctuates +\- 10%, more firm and cohesive in some spots, more crumbly and sandy in other spots.		
-70.5	75.5						
		R-74	100%			sc	
-71.0	76.0						
-71.5							
	76.5	ST-4	100%		76.5-78.36 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; grayish olive green (5GY 3/2) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, some glauconite, (Marine).		
-72.0	77.0						
-72.5		R-75	95%			ch	
	77.5						
-73.0	78.0						
-73.5		R-76	100%		78.36-78.71 m Clayey sand, (sc), 80% sand, fine, subrounded, spherical; 20% fines; grayish olive green (5GY 3/2) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, homogeneous, little glauconite.	sc	
	78.5				78.71-78.98 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; grayish olive green (5GY 3/2) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, some glauconite, (Marine).	ch	
-74.0	79.0					sc	
-74.5		R-77	100%		78.98-79.08 m Clayey sand, (sc), 80% sand, fine, subrounded, spherical; 20% fines; grayish olive green (5GY 3/2) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, homogeneous, little glauconite.	ch	
	79.5						
-75.0		R-78					

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-75.5	80.5	R-78	43%		79.08-80.06 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; grayish olive green (5GY 3/2) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, some glauconite, (Marine).		80.06 - 99.00 m, (L. Eocene to E. Oligocene) Zelzate Member of the Tongeren Fm. (Ruisbroek Sand)
-76.0	81.0				80.06-85.0 m Clayey sand, (sc), 85% sand, fine, subrounded, spherical; 15% fines; grayish olive green (5GY 3/2) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, homogeneous, some glauconite.		80.06 - 82.0 m, 1-5 mm scale laminations and 1-2 cm inclusions of clay and sand within a clayey sand body
-76.5	81.5	R-79	100%				80.99 - 81.86 m, R-79 lab classification SM
-77.0	82.0						81.29-81.39 m, Fat clay (ch)
-77.5	82.5	R-80	100%			sc	
-78.0	83.0						82.90 m, Becoming sandier overall, fines and sand are more seperated into lenses, not as homogeneously mixed.
-78.5	83.5	R-81	100%				81.29 - 81.38, 83.03 - 83.13, 84.56 - 84.64 m, sandy clay lenses
-79.0	84.0						
-79.5	84.5	R-82	100%				
-80.0		R-83	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-80.5	85.5	R-83	100%		85.0-94.2 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, some glauconite, trace mica, approaching 100% fine to medium sand with depth.	sp	86.81 m, Brown/black hard phosphorite/sandstone pebbles found in core. 15 pieces, ranging in size from 1-6 cm, all within a 10 cm thick horizon.
-81.0	86.0	R-84	95%				
-81.5	86.5						
-82.0	87.0	R-85	100%				
-82.5	87.5						
-83.0	88.0	R-86	100%				88.22 m, 3 x 2 cm shell fossil, yellowish gray (5Y 8/1). 88.46 m, Hard brown/black phosphorite/sandstone pebbles, 3cm.
-83.5	88.5						
-84.0	89.0	R-87	100%				
-84.5	89.5	R-88	0%				
-85.0		R-89	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-85.5	90.5	R-89	100%		85.0-94.2 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, some glauconite, trace mica, approaching 100% fine to medium sand with depth.		
-86.0	91.0	R-90	100%				
-86.5	91.5						
-87.0	92.0	R-91	100%			sp	
-87.5	92.5						
-88.0	93.0	R-92	100%				
-88.5	93.5	R-93	100%				
-89.0	94.0						
-89.5	94.5	R-94	100%		94.2-96.51 m Poorly graded sand, (sp), 90% sand, fine, subrounded, spherical, medium hardness; 10% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, homogeneous, some glauconite, trace mica, fine glauconite up to 20% of fine sand (Littoral).	sp	At 94.13 m on 03 July 2011; Field geologist: DAR/KDR, Driller: Bart Caers
-90.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-90.5	95.5	R-94			94.2-96.51 m Poorly graded sand, (sp), 90% sand, fine, subrounded, spherical, medium hardness; 10% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, homogeneous, some glauconite, trace mica, fine glauconite up to 20% of fine sand (Littoral).		
-91.0	96.0	R-95	100%			sp	
-91.5	96.5						
-92.0	97.0	R-96	100%		96.51-98.42 m SANDY FAT CLAY, (CH), 65% fines, medium plasticity, slow dilatancy, high toughness; 35% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5G 4/1) and grayish olive (10Y 4/2), no odor, dry, weak HCl reaction, homogeneous, stiff consistency, little mica, little glauconite, sandy pockets common (Marine).		96.51 - 121.00 m, (L. Eocene to E. Oligocene) Zelzate Member of the Tongeren Fm. (Watervliet Clay)
-92.5	97.5	ST-5	100%			CH	
-93.0	98.0	R-97	100%				
-93.5	98.5				98.42-99.0 m Clayey sand, (sc), 80% sand, fine, rounded, spherical, soft hardness; 20% fines, medium plasticity, slow dilatancy, medium toughness; dark greenish gray (5G 4/1) and dark greenish gray (5GY 4/1), moist, strong HCl reaction, some glauconite, trace mica, (Marine).	sc	
-94.0	99.0	R-98	100%		99.0-99.75 m Sandy fat clay, (ch), 65% fines, medium plasticity, slow dilatancy, medium toughness; 35% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5G 4/1) and grayish olive (10Y 4/2), no odor, moist, strong HCl reaction, homogeneous, very stiff consistency, little mica, some glauconite, fine glauconite sand grains common (Marine).	ch	
-94.5	99.5						
-95.0		R-99	100%			sc	

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-95.5	100.5	R-99	100%		99.75-100.67 m Clayey sand, (sc), 80% sand, fine, rounded, spherical, soft hardness; 20% fines, low plasticity, rapid dilatancy, low toughness; grayish olive (10Y 4/2) and dark greenish gray (5GY 4/1), moist, weak HCl reaction, some glauconite, little mica, (Marine).	sc	100.17 m, clay inclusion, dusky yellow (5Y 6/2), 30 mm diameter
-96.0	101.0	R-100	66%		100.67-103.42 m Fat clay with sand, (ch), 85% fines, high plasticity, slow dilatancy, high toughness; 15% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5G 4/1) and grayish olive (10Y 4/2), no odor, dry, strong HCl reaction, homogeneous, very stiff consistency, trace mica, some glauconite, fine glauconite sand grains common, sand content can very between 5 and 20%, 1-2 mm diameter grayish black spots common (Marine).	ch	
-96.5	101.5						
-97.0	102.0	R-101	100%				
-97.5	102.5						
-98.0	103.0	ST-6	100%				
-98.5	103.5	R-102	100%		103.42-104.3 m Clayey sand, (sc), 75% sand, fine, rounded, spherical, soft hardness; 25% fines, low plasticity, rapid dilatancy, medium toughness; dark greenish gray (5GY 4/1), dry, strong HCl reaction, with glauconite, little mica, fine glauconite sand grains common, up to 20% (Marine).	sc	
-99.0	104.0						
-99.5	104.5	R-103	100%		104.3-107.2 m Silty sand, (sm), 85% sand, fine, rounded, spherical, soft hardness; 15% fines, low plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), moist, strong HCl reaction, with glauconite, little mica, trace shell fragments, fine glauconite sand grains common up to 30%, fines content may vary between 10-20% (Marine).	sm	
-100.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-100.5	105.5	R-103	100%		104.3-107.2 m Silty sand, (sm), 85% sand, fine, rounded, spherical, soft hardness; 15% fines, low plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), moist, strong HCl reaction, with glauconite, little mica, trace shell fragments, fine glauconite sand grains common up to 30%, fines content may vary between 10-20% (Marine).	sm	
-101.0	106.0	R-104	100%				
-101.5	106.5	R-105	100%				
-102.0	107.0						
-102.5	107.5	R-106	100%		107.2-108.7 m Poorly graded sand, (sp), 95% sand, fine, rounded, spherical, soft hardness; 5% fines, low plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and greenish black (5G 2/1), moist, weak HCl reaction, with glauconite, little mica, fine glauconite sand grains present, up to 20% of sand (Marine).	sp	108.26 - 108.81 m, lab classification CL
-103.0	108.0						
-103.5	108.5	ST-7	100%				
-104.0	109.0	R-107	100%		108.7-109.42 m Silty sand, (sm), 85% sand, fine, rounded, spherical, soft hardness; 15% fines, low plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), moist, strong HCl reaction, with glauconite, little mica, fine glauconite sand grains common, up to 30% (Marine).	sm	
-104.5	109.5						
-105.0		R-108	100%			sp-sm	

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-105.5	110.5	R-108	100%		109.42-111.86 m Poorly graded sand with silt, (sp-sm), 90% sand, fine, rounded, spherical, soft hardness; 10% fines, low plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and greenish black (5G 2/1), moist, weak HCl reaction, with glauconite, little mica, fine glauconite sand grains present, up to 20%, silt content varies between 5-20% from location to location (Marine).	sp-sm	110.55 - 110.65 m, Numerous hard phosphorite pebbles
-106.0	111.0						
-106.5	111.5	R-109	100%				
-107.0	112.0				111.86-112.42 m Sandy silty clay, (cl-ml), 65% fines, medium plasticity, slow dilatancy, medium toughness; 35% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5G 4/1), no odor, dry, weak HCl reaction, homogeneous, little mica, with glauconite, fine glauconite sand grains common (Marine).	cl-ml	
-107.5	112.5	R-110	100%		112.42-114.33 m Poorly graded sand with silt, (sp-sm), 90% sand, fine, rounded, spherical, soft hardness; 10% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, with glauconite, little mica, fine glauconite sand grains present, up to 20%, silt content varies between 5-20% from location to location (Marine).	sp-sm	
-108.0	113.0						
-108.5	113.5	R-111	100%				
-109.0	114.0						
-109.5	114.5	R-112	100%		114.33-114.72 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, some glauconite, fine black specks of glauconite (Marine).	ch	
-110.0		R-113	100%			sp-sm	

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-110.5	115.5	R-113	100%		114.72-115.3 m Poorly graded sand with silt, (sp-sm), 90% sand, fine, rounded, spherical, soft hardness; 10% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, with glauconite, little mica, fine glauconite sand grains present, up to 20%, silt content varies between 5-20% from location to location (Marine).	sp-sm	115.25 m, Few hard nodules
-111.0	116.0	ST-8	100%		115.3-116.0 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, some glauconite, fine black specks of glauconite (Marine).	ch	Contact is estimated, occured in shelby tube.
-111.5	116.5	R-114	100%		116.0-120.67 m Poorly graded sand with silt, (sp-sm), 90% sand, fine, rounded, spherical, soft hardness; 10% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, with glauconite, little mica, fine glauconite sand grains present, up to 20%, silt content varies between 5-20% from location to location (Marine).		
-112.0	117.0						
-112.5	117.5	R-115	100%				117.47 - 117.72 m, Silty clay layer.
-113.0	118.0					sp-sm	
-113.5	118.5	R-116	100%				
-114.0	119.0						
-114.5	119.5	R-117	100%				
-115.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-115.5	120.5	R-117	100%		116.0-120.67 m Poorly graded sand with silt, (sp-sm), 90% sand, fine, rounded, spherical, soft hardness; 10% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, with glauconite, little mica, fine glauconite sand grains present, up to 20%, silt content varies between 5-20% from location to location (Marine).	sp-sm	
-116.0	121.0	R-118	100%		120.67-121.0 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, some glauconite, fine black specks of glauconite (Marine).	ch	
-116.5	121.5				121.0-145.5 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, soft hardness; 5% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, little mica, fine glauconite sand grains present, up to 20%, fines content varies between 5-20%, sp to sm/sc, throughout formation, contains some thin lenses of fines (Marine).		121.00 - 145.50 m, (L. Eocene to E. Oligocene) Zelzate Member of the Tongeren Fm. (Bassevelde Sand)
-117.0	122.0	R-119	100%				
-117.5	122.5						
-118.0	123.0	R-120	100%			sp	At 123.12 m on 03 July 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-118.5	123.5						
-119.0	124.0	R-121	100%				
-119.5	124.5						
-120.0		R-122	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-120.5	125.5	R-122	100%		121.0-145.5 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, soft hardness; 5% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, little mica, fine glauconite sand grains present, up to 20%, fines content varies between 5-20%, sp to sm/sc, throughout formation, contains some thin lenses of fines (Marine).	sp	126.03 m, Hard nodules,1x3 cm size, phosphorite/sandstone pebbles.
-121.0	126.0	R-123	100%				
-121.5	126.5	R-124	100%				
-122.0	127.0	R-125	100%				
-123.0	128.0	R-126	100%				
-123.5	128.5	R-127	100%				
-124.5	129.5	R-128	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-125.5	130.5	R-128	100%		121.0-145.5 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, soft hardness; 5% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, little mica, fine glauconite sand grains present, up to 20%, fines content varies between 5-20%, sp to sm/sc, throughout formation, contains some thin lenses of fines (Marine).	sp	
-126.0	131.0						
-126.5	131.5	R-129	100%				
-127.0	132.0						
-127.5	132.5	R-130	100%				
-128.0	133.0						
-128.5	133.5	R-131	100%				
-129.0	134.0						
-129.5	134.5	R-132	100%				
-130.0		R-133	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-130.5	135.5	R-133	100%		121.0-145.5 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, soft hardness; 5% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, little mica, fine glauconite sand grains present, up to 20%, fines content varies between 5-20%, sp to sm/sc, throughout formation, contains some thin lenses of fines (Marine).	sp	
-131.0	136.0						
-131.5	136.5	R-134	100%				
-132.0	137.0	ST-9	100%				
-132.5	137.5						
-133.0	138.0	R-135	100%				
-133.5	138.5						
-134.0	139.0	R-136	100%				
-134.5	139.5						139.62 - 139.64 m, Fine grained clay lense
-135.0		R-137	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-135.5	140.5	R-137	100%		121.0-145.5 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, soft hardness; 5% fines, low plasticity, rapid dilatancy, low toughness; greenish black (5GY 2/1) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, little mica, fine glauconite sand grains present, up to 20%, fines content varies between 5-20%, sp to sm/sc, throughout formation, contains some thin lenses of fines (Marine).		140.07 - 140.18 m, Fine grained clay lense.
-136.0	141.0	R-138	100%				141.00 m, Sand becoming finer, almost fine sand/silt sized. becoming more dense and difficult to cut with hand saw. still crumbly though. mottled with lighter, less glauconite rich sand.
-136.5	141.5	R-139	100%				
-137.0	142.0						
-137.5	142.5	R-140	100%			sp	
-138.0	143.0						
-138.5	143.5	R-141	100%				
-139.0	144.0						
-139.5	144.5	R-142	100%				
-140.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-140.5	145.5	R-142	100%			sp	145.00 m, Sand is very fine and contains mm scale wavy lenses of a lighter gray fine sand, appear to be possibly animal burrows. cohesive at first, then crumbles easily with handling. borderline sand/silt grain-sized
		ST-10	100%		145.5-147.52 m Fat clay, (ch), 100% fines, high plasticity, high toughness; grayish olive green (5GY 3/2) to dark greenish gray (5GY 4/1), dry, no HCl reaction, very stiff consistency, trace mica, trace silt, trace fine sand, becomes sandier and siltier with depth (Marine).		Contact occurs in ST-10. depth estimated.
-141.0	146.0						145.5 - 200.94 m, (Eocene) Dongen Fm. (Asse Clay)
		R-143	100%				
-141.5	146.5					ch	
-142.0	147.0						
		R-144	100%				
-142.5	147.5						
					147.52-147.82 m Silty sand, (sm), 65% sand, fine, rounded, spherical, soft hardness; 35% fines, medium plasticity, slow dilatancy, medium toughness; dark greenish gray (5GY 4/1), no odor, dry, no HCl reaction, homogeneous, trace mica, (Marine).	sm	
-143.0	148.0						At 147.82 m on 04 July 2011; Field geologist: DAR/KDR, Driller: Bart Caers
		R-145	100%		147.82-158.44 m Fat clay, (ch), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, with silt, trace fine sand, gradual transition to underlying layer (Marine).		
-143.5	148.5						
-144.0	149.0					ch	
		R-146	100%				
-144.5	149.5						
-145.0		R-147	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
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FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-145.5	150.5	R-147	100%		147.82-158.44 m Fat clay, (ch), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, with silt, trace fine sand, gradual transition to underlying layer (Marine).	ch	152.43 - 152.58 m, Hard pyrite nodules 0.5-1 cm diameter.
-146.0	151.0						
-146.5	151.5	R-148	100%				
-147.0	152.0						
-147.5	152.5	R-149	100%				
-148.0	153.0						
-148.5	153.5	R-150	100%				
-149.0	154.0						
-149.5	154.5	R-151	100%				
-150.0		R-152	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

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DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-150.5	155.5	R-152	100%		147.82-158.44 m Fat clay, (ch), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, with silt, trace fine sand, gradual transition to underlying layer (Marine).	ch	154.91, 155.43 m, Pyritic nodules
-151.0	156.0	ST-11	100%				
-151.5	156.5						
-152.0	157.0	R-153	100%				
-152.5	157.5						
-153.0	158.0	R-154	100%				
-153.5	158.5				158.44-161.83 m Poorly graded sand, (sp), 90% sand, fine, rounded, spherical, medium hardness; 10% fines; dark greenish gray (5GY 4/1), moist, no HCl reaction, homogeneous, trace mica, mostly quartz, sand, silt content varies from 5-15% by location (Marine).	sp	
-154.0	159.0	R-155	100%				
-154.5	159.5						
-155.0		R-156	100%				

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-155.5	160.5	R-156	100%		158.44-161.83 m Poorly graded sand, (sp), 90% sand, fine, rounded, spherical, medium hardness; 10% fines; dark greenish gray (5GY 4/1), moist, no HCl reaction, homogeneous, trace mica, mostly quartz, sand, silt content varies from 5-15% by location (Marine).	sp	
-156.0	161.0	R-157	100%				
-156.5	161.5	R-158	100%				
-157.0	162.0				161.83-162.47 m FAT CLAY, (CH), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, with silt, gradual transition to adjacent lithologies (Marine).	CH	Below this depth clay is expansive when removed from boring.
-157.5	162.5	R-159	100%		162.47-177.1 m FAT CLAY, (CH), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, trace silt, trace fine sand, gradual transition to adjacent lithologies (Marine).		
-158.0	163.0						
-158.5	163.5	R-160	100%			CH	163.4 - 163.7 m, Up to 15% sand
-159.0	164.0						
-159.5	164.5	R-161	100%				
-160.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-160.5	165.5	R-161	100%		162.47-177.1 m FAT CLAY, (CH), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, trace silt, trace fine sand, gradual transition to adjacent lithologies (Marine).	CH	167.34 m, Pyrite nodule
-161.0	166.0	R-162	100%				
-161.5	166.5	R-163	100%				
-162.0	167.0	R-164	100%				
-162.5	167.5	R-165	100%				
-163.0	168.0	R-166	100%				
-163.5	168.5						
-164.0	169.0						
-164.5	169.5						
-165.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
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FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

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DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-165.5	170.5	R-166 ST-12	100%		162.47-177.1 m FAT CLAY, (CH), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, trace silt, trace fine sand, gradual transition to adjacent lithologies (Marine).	CH	At 172.19 m on 04 July 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-166.0	171.0	R-167	100%				
-166.5	171.5	R-168	0%				
-167.0	172.0						
-167.5	172.5	R-169	100%				
-168.0	173.0						
-168.5	173.5	R-170	100%				
-169.0	174.0						
-169.5	174.5	R-171	25%				
-170.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

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COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-170.5	175.5	R-171	25%		162.47-177.1 m FAT CLAY, (CH), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, very stiff consistency, some glauconite, trace silt, trace fine sand, gradual transition to adjacent lithologies (Marine).	CH	Material from R-171 recovered in R-172
		R-172	100%				
-171.0	176.0						
-171.5	176.5	R-173	23%				Material from R-173 recovered in R-174
-172.0	177.0	R-174	100%				177.00 m, Silt/sand constituent increasing, feels more gritty on teeth.
-172.5	177.5				177.1-178.0 m Sandy fat clay, (ch), 60% fines, high plasticity; 40% sand, fine, subrounded, spherical; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), dry, no HCl reaction, very stiff consistency, weak cementation, trace mica, trace glauconite, this is a thin layer in an overall coarsening downward sequence (Marine).	ch	
		R-175	88%				
-173.0	178.0				178.0-178.75 m Clayey sand, (sc), 60% sand, fine, subrounded, spherical; 40% fines, low plasticity; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), dry, no HCl reaction, homogeneous, trace mica, little glauconite, (Marine).	sc	
-173.5	178.5	ST-13	100%				Contact b/w clayey sand and clay occurs in ST-13.
-174.0	179.0				178.75-198.5 m Fat clay, (ch), 100% fines, high plasticity, high dry strength, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, homogeneous, very stiff consistency, some glauconite, little silt, trace fine sand, gradual transition to adjacent lithologies (Marine).	ch	
-174.5	179.5	R-176	100%				
-175.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
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GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-175.5	180.5	R-177	100%		178.75-198.5 m Fat clay, (ch), 100% fines, high plasticity, high dry strength, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, homogeneous, very stiff consistency, some glauconite, little silt, trace fine sand, gradual transition to adjacent lithologies (Marine).		
-176.0	181.0						
-176.5	181.5	R-178	100%				
-177.0	182.0						
-177.5	182.5	R-179	100%			ch	182.39 m, 1 cm pyrite nodules 182.62 m, 1 cm pyrite nodules
-178.0	183.0						
-178.5	183.5	R-180	100%				
-179.0	184.0						
-179.5	184.5	R-181	100%				
-180.0		ST-14	100%				184.76 m, 1 cm pyrite nodule

DATE/TIME STARTED: 01 July 2011 / 15:30
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DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-180.5	185.5	ST-14	100%		178.75-198.5 m Fat clay, (ch), 100% fines, high plasticity, high dry strength, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, homogeneous, very stiff consistency, some glauconite, little silt, trace fine sand, gradual transition to adjacent lithologies (Marine).		185.40 m, pyrite nodule.
-181.0	186.0	R-182	100%				186.20 m, Large pyrite nodules, 3-4 cm round pieces.
-181.5	186.5	R-183	100%				186.60 m, Large pyrite nodules visible, 5cm.
-182.0	187.0						186.90 m, Breaks in core are mechanical.
-182.5	187.5	R-184	0%			ch	
-183.0	188.0	R-185	100%				Extra recovery in Run 185 is from the lost recovery of Run 184.
-183.5	188.5	R-186	100%				188.86 m, Pyrite nodule
-184.0	189.0						
-184.5	189.5	R-187	16%				At 189.32 m on 05 July 2011; Field geologist: DAR/KDR, Driller: Bart Caers
-185.0							

DATE/TIME STARTED: 01 July 2011 / 15:30
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FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

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DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
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GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-185.5	190.5	R-187	16%		178.75-198.5 m Fat clay, (ch), 100% fines, high plasticity, high dry strength, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, homogeneous, very stiff consistency, some glauconite, little silt, trace fine sand, gradual transition to adjacent lithologies (Marine).	ch	
-186.0	191.0	R-188	100%				190.87 m, 31x20 mm pyrite nodule
-186.5	191.5	R-189	100%				
-187.0	192.0						
-187.5	192.5	R-190	100%				193.04 m, Pyrite nodule
-188.0	193.0						
-188.5	193.5	R-191	0%				
-189.0	194.0						
-189.5	194.5	R-192	100%				
-190.0							

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DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
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ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-190.5	195.5	R-193	100%		178.75-198.5 m Fat clay, (ch), 100% fines, high plasticity, high dry strength, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, no HCl reaction, homogeneous, very stiff consistency, some glauconite, little silt, trace fine sand, gradual transition to adjacent lithologies (Marine).	ch	
-191.0	196.0						
-191.5	196.5	R-194	100%				
-192.0	197.0						
-192.5	197.5	R-195	0%				
-193.0	198.0						
-193.5	198.5	R-196	100%		198.5-199.34 m Fat clay, (ch), 60% fines, high plasticity; 40% sand, fine, subrounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, strong HCl reaction, very stiff consistency, some quartz, trace mica, trace shell fragments, sand grains are mostly glauconite, sometimes in 1 cm diameter patches (Marine).	ch	
-194.0	199.0						
-194.5	199.5	R-197	100%			ch	
-195.0		R-198					

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-101

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384585.88 m E. 39058.54 m
GROUND SURFACE ELEVATION: 4.90 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-195.5	200.5	R-198	100%		199.34-200.94 m Fat clay, (ch), 70% fines, high plasticity, high dry strength, no dilatancy, high toughness; 30% sand, fine to medium, rounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, strong HCl reaction, homogeneous, very stiff consistency, some glauconite, little shell fragments, trace fine sand, sand is mostly glauconite, gradual change from overlying layer, sand is mostly in pockets ~1-2 cm diameter (Marine).	ch	P-S Suspension logging completed on July 8, 2011.
-196.0					---- Bottom of Boring at 200.94 m.----		Borehole closure completed on July 12, 2011, using 9.45 cubic meters of cement bentonite grout and tremie pipe.

DATE/TIME STARTED: 01 July 2011 / 15:30
DATE/TIME FINISHED: 05 July 2011 / 14:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 1 July 2011: partly cloudy, 15-25º C; 2 July 2011: partly cloudy 15-25º C; 3 July 2011: sunny, clear, 15-20º C; 4 July 2011: cloudy, 15-20º; 5 July 2011: clear, light rain, 15-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
5.0 / 4.5 / 4.0 / 3.5 / 3.0 / 2.5 / 2.0 / 1.5 / 1.0 / 0.5	0.5 / 1.0 / 1.5 / 2.0 / 2.5 / 3.0 / 3.5 / 4.0 / 4.5				0.0-29.96 m Destructive Drilling, refer to Boring Log KB-102A for description.		See KB-102A Boring Log for 0.0 - 29.98 m soil description At 0 m on 27 June 2011; Field geologist: DAR/KDR, Driller: Bart Caers

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
0.0					0.0-29.96 m Destructive Drilling, refer to Boring Log KB-102A for description.		
-0.5	5.5						
-1.0	6.0						
-1.5	6.5						
-2.0	7.0						
-2.5	7.5						
-3.0	8.0						
-3.5	8.5						
-4.0	9.0						
-4.5	9.5						

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-5.0	10.0				0.0-29.96 m Destructive Drilling, refer to Boring Log KB-102A for description.		
-5.5	10.5						
-6.0	11.0						
-6.5	11.5						
-7.0	12.0						
-7.5	12.5						
-8.0	13.0						
-8.5	13.5						
-9.0	14.0						
-9.5	14.5						

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-10.0	15.0				0.0-29.96 m Destructive Drilling, refer to Boring Log KB-102A for description.		
-10.5	15.5						
-11.0	16.0						
-11.5	16.5						
-12.0	17.0						
-12.5	17.5						
-13.0	18.0						
-13.5	18.5						
-14.0	19.0						
-14.5	19.5						

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.0	20.0				0.0-29.96 m Destructive Drilling, refer to Boring Log KB-102A for description.		
-15.5	20.5						
-16.0	21.0						
-16.5	21.5						
-17.0	22.0						
-17.5	22.5						
-18.0	23.0						
-18.5	23.5						
-19.0	24.0						
-19.5	24.5						

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-20.0	25.0				0.0-29.96 m Destructive Drilling, refer to Boring Log KB-102A for description.		
-20.5	25.5						
-21.0	26.0						
-21.5	26.5						
-22.0	27.0						
-22.5	27.5						
-23.0	28.0						
-23.5	28.5						
-24.0	29.0						
-24.5	29.5						

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-25.0		R-1					29.96 - 35.29 m, (Pliestocene) Oosterhout Fm.
		R-1	100%		29.96-30.35 m Well graded sand with gravel, (sw), 85% sand, medium to coarse, subangular, flat and elongated, soft hardness; 15% gravel, fine, angular, flat and elongated, soft hardness; dark greenish gray (5GY 4/1) and dark gray (N3), moist, strong HCl reaction, and shell fragments, sand is approximately 50% shell fragments and 50% quartz, gravel is all shell fragments, quartz is subrounded, shells are angular (Littoral).	sw	
-25.5	30.5					sw	
-26.0	31.0	R-2	100%		30.35-30.89 m Well graded sand, (sw), 95% sand, medium to coarse, subrounded, spherical, medium hardness; 5% gravel, fine, angular, flat and elongated, soft hardness; dark greenish gray (5GY 4/1) and dark gray (N3), moist, strong HCl reaction, some shell fragments, sand is approximately 25% shell fragments and 75% quartz, gravel is all shell fragments, quartz is subrounded, shells are angular (Littoral).		
-26.5	31.5	R-3	100%		30.89-35.29 m POORLY GRADED SAND, (SP), 100% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish gray (5GY 6/1) and dark greenish gray (5GY 4/1), moist, strong HCl reaction, homogeneous, little shell fragments, little glauconite, trace gravel, (shell fragments), sand is 20% shell fragments 70% quartz and 10% glauconite, quartz is subrounded, shells are angular, glauconite is rounded (Littoral).		
-27.0	32.0	R-4	100%				
-27.5	32.5						
-28.0	33.0	R-5	100%			SP	
-28.5	33.5						At 33.59 m on 27 June 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-29.0	34.0	R-6	97%				
-29.5	34.5	R-7	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-30.0						SP	Contact between gray sand and green sand is sharp.
		R-7	100%				
-30.5	35.5				35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		35.29 - 74.73 m, (Miocene) Breda Fm.
-31.0	36.0	R-8	100%				Extra recovery usually present in glauconitic sand runs because of some sloughing and heave. usually between 5 and 10 cm extra.
-31.5	36.5						
-32.0	37.0	R-9	100%				
-32.5	37.5					sp	
-33.0	38.0	R-10	100%				
-33.5	38.5						
-34.0	39.0	R-11	98%				
-34.5	39.5						
		R-12	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-35.0					35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		
	40.5	R-12	100%				
-35.5							
	41.0	R-13	100%				
-36.0							
	41.5						
-36.5							
	42.0	R-14	100%				
-37.0							
	42.5					sp	
-37.5							
	43.0	R-15	100%				
-38.0							
	43.5						
-38.5							
	44.0	R-16	100%				
-39.0							
	44.5						
-39.5		R-17	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-40.0					35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		
	45.5	R-17	100%				
-40.5							
	46.0	R-18	100%				
-41.0							
	46.5						
-41.5							
	47.0	R-19	100%				
-42.0							
	47.5					sp	No dolomite fragments appear after Run-19.
-42.5							
	48.0	R-20	100%				
-43.0							
	48.5						
-43.5							
	49.0	R-21	100%				
-44.0							
	49.5						
-44.5		R-22	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-45.0		R-22	100%		35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		
-45.5	50.5						
-46.0	51.0	R-23	100%				
-46.5	51.5						
-47.0	52.0	R-24	100%				51.88 - 51.97 m, Silty sand layer, dusky yellow green (5 GY 5/2) to greenish black (5GY 2/1)
-47.5	52.5					sp	
-48.0	53.0	R-25	98%				
-48.5	53.5						
-49.0	54.0	R-26	100%				
-49.5	54.5						
		R-27	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-50.0		R-27	100%		35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		At 55.37 m on 28 June 2011; Field geologist: DAR/KDR, Driller: Bart Caers
-50.5	55.5						
-51.0		R-28	100%				
	56.0						
-51.5	56.5						
-52.0		R-29	100%				
	57.0						
-52.5	57.5					sp	
-53.0		R-30	100%				
	58.0						
-53.5	58.5						
-54.0		R-31	100%				
	59.0						
-54.5	59.5						59.39 - 60.36 m, R-32 lab classification SP-SM 59.6 - 64.80 m, Occasional fine gravel sized shell fragment present
		R-32	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-55.0		R-32	100%		35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		
-55.5	60.5	ST-1	100%				
-56.0	61.0	R-33	100%				
-56.5	61.5						
-57.0	62.0	R-34	100%				
-57.5	62.5					sp	62.5 - 66.4 m, Occasional light olive gray (5 Y 5/2) mottle of clayey fine sand. every 10-20 cm
-58.0	63.0	R-35	100%				
-58.5	63.5						
-59.0	64.0	R-36	100%				
-59.5	64.5						
		R-37	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-60.0					35.29-66.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dusky green (5G 3/2) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, color mottling within greenish black matrix, 1 cm diameter spots of light olive gray sand, no change in grains, also fragments of sandy dolomite, 1-2 cm diameter, light olive gray, soft to medium hard, 20 to >100 cm spacing, sand is approximately 50% quartz and 50% glauconite (Marine).		
-60.5	65.5	R-37	100%			sp	
-61.0	66.0	R-38	100%				
-61.5	66.5				66.5-74.73 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, sand is approximately 65% glauconite & 35% quartz, minor carbonate, gradual transition from above lithology (Marine).		
-62.0	67.0	R-39	100%				
-62.5	67.5						
-63.0	68.0	R-40	100%			sp	
-63.5	68.5						
-64.0	69.0	R-41	100%				
-64.5	69.5						
		R-42	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-65.0					66.5-74.73 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; greenish black (5G 2/1) to greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, sand is approximately 65% glauconite & 35% quartz, minor carbonate, gradual transition from above lithology (Marine).		
-65.5	70.5	R-42	100%				
-66.0	71.0	R-43	100%				
-66.5	71.5						
-67.0	72.0	R-44	100%				
-67.5	72.5					sp	
-68.0	73.0	R-45	100%				
-68.5	73.5						
-69.0	74.0	R-46	100%				
-69.5	74.5						
		R-47	100%			ch	

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-70.0					74.73-77.4 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, little mica, (Marine).		74.73 - 83.26 m, (Oligocene) Rupel Fm. (Boom Clay) Subvertical fracture from 75.26-75.52
	75.5	R-47	100%				
-70.5							
	76.0	ST-2	100%			ch	
-71.0							
	76.5	ST-3	100%				
-71.5							
	77.0						
-72.0		R-48	100%				
	77.5				77.4-77.75 m Silty clayey sand, (sc-sm), 60% sand, fine, rounded, spherical, medium hardness; 40% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, weak cementation, little mica, (Marine).	sc-sm	
-72.5						ch	
	78.0				77.75-77.98 m Sandy fat clay, (ch), 70% fines, medium plasticity, low toughness; 30% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, weak cementation, little mica, gradual transition with adjacent lithologies (Marine).		
-73.0		R-49	100%				
	78.5				77.98-80.04 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, little mica, gradual transition to adjacent lithologies (Marine).		
-73.5							
	79.0	ST-4	100%			ch	
-74.0							
	79.5	ST-5	100%				
-74.5							
		R-50	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
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FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35° C; 28 June 2011: clear, hot, thunderstorms, 20-35° C; 29 June 2011: partly cloudy, rain, 10-20° C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-75.0					80.04-80.4 m Silty clayey sand, (sc-sm), 60% sand, fine, rounded, spherical, medium hardness; 40% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, weak cementation, little mica, gradual transition to adjacent lithologies (Marine).	sc-sm	At 80.8 m on 28 June 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-75.5	80.5	R-50	100%				
-76.0	81.0				80.4-81.13 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, little mica, gradual transition to adjacent lithologies (Marine).	ch	
-76.5	81.5	R-51	43%		81.13-83.26 m Fat clay with sand, (ch), 75% fines, medium plasticity; 25% sand, fine to medium, subrounded, spherical; dark gray (N3) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, moderate cementation, trace mica.	ch	
-77.0	82.0	R-52	100%				
-77.5	82.5						
-78.0	83.0	R-53	100%				
-78.5	83.5				83.26-97.79 m Silty clayey sand, (sc-sm), 85% sand, fine to medium, subrounded, spherical; 15% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace glauconite, trace, large > 2 cm shell fragments.	sc-sm	Similar in structure and appearance to Breda sand, except a few shades lighter and with a higher fines constituent. 83.26 - 83.40 m, Sand stringer approaching 100% sand,dusky yellow green (5 GY 5/2) to greenish gray (5GY 6/1) 83.26 - 97.79 m, (L. Eocene - E. Oligocene) Zelzate Member of the Tongeren Fm. (Ruisbroek Sand)
-79.0	84.0	R-54	100%				
-79.5	84.5						
		R-55	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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ENGINEERS/CONSULTANTS/CM

Paul C. Rizzo Associates, Inc
500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-80.0					83.26-97.79 m Silty clayey sand, (sc-sm), 85% sand, fine to medium, subrounded, spherical; 15% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace glauconite, trace, large > 2 cm shell fragments.		
-80.5	85.5	R-55	100%				85.47 - 85.49 m, Large 2x4 cm shell, soft, very light gray, lying flat, strong reaction with hcl.
-81.0	86.0	R-56	100%				
-81.5	86.5						
-82.0	87.0	R-57	100%				
-82.5	87.5					sc-sm	
-83.0	88.0	R-58	100%				
-83.5	88.5						
-84.0	89.0	R-59	90%				
-84.5	89.5	R-60	95%				89.41 - 89.45 m, Large 6x4 cm phosphorite/sandstone pebble. very hard. conical, hollow, thick walled. could not saw through. grayish black

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-85.0					83.26-97.79 m Silty clayey sand, (sc-sm), 85% sand, fine to medium, subrounded, spherical; 15% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace glauconite, trace, large > 2 cm shell fragments.		N2. no reaction to HCL.
-85.5	90.5	R-60	95%				
-86.0	91.0	R-61	100%				90.61 m, Sand has become saturated, clay not far below. also, there is a lot of extra recovery, approx 20 cm due to sand heave. saturated and flowing.
-86.5	91.5						
-87.0	92.0	R-62	100%				
-87.5	92.5	R-63	100%			sc-sm	
-88.0	93.0						
-88.5	93.5	R-64	100%				
-89.0	94.0						
-89.5	94.5	R-65	100%				

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-90.0		R-65	100%		83.26-97.79 m Silty clayey sand, (sc-sm), 85% sand, fine to medium, subrounded, spherical; 15% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace glauconite, trace, large > 2 cm shell fragments.	sc-sm	97.79 - 101.84 m, (L. Eocene - E. Oligocene) Zelzate Member of the Tongeren Fm. (Watervliet Clay)
-90.5	95.5						
		R-66	100%				
-91.0	96.0						
-91.5	96.5						
		R-67	100%				
-92.0	97.0						
-92.5	97.5						
		R-68	100%		97.79-101.84 m Sandy fat clay, (ch), 70% fines, medium plasticity, medium dry strength, medium toughness; 30% sand, fine to medium, subrounded, spherical; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, 5 to 10 mm thick stringers of sand throughout core.	ch	
-93.0	98.0						
-93.5	98.5	ST-6	100%				
-94.0	99.0						
		R-69	100%				
-94.5	99.5						
		R-70					

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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REV 0 Boring KB-102

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384916.35 m E. 39046.45 m
GROUND SURFACE ELEVATION: 5.09 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-95.0			0%		97.79-101.84 m Sandy fat clay, (ch), 70% fines, medium plasticity, medium dry strength, medium toughness; 30% sand, fine to medium, subrounded, spherical; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), dry, weak HCl reaction, very stiff consistency, weak cementation, trace mica, 5 to 10 mm thick stringers of sand throughout core.	ch	99.89 m, Zero recovery prompted one more run below the planned termination deph.
	100.5	R-70	0%				
-95.5							
	101.0						
-96.0		R-71	100%				101.5 m - Bottom of boring, Sand content increasing, color changing to dark greenish grey (5GY 4/1), retains cohesion
	101.5						Borehole closure completed using Mikolit bentonite pellets for full depth. 5.92 cubic meters of pellets used.
-96.5					---- Bottom of Boring at 101.84 m.----		

DATE/TIME STARTED: 27 June 2011 / 13:00
DATE/TIME FINISHED: 29 June 2011 / 10:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 27 June 2011: clear, light wind, 20-35º C; 28 June 2011: clear, hot, thunderstorms, 20-35º C; 29 June 2011: partly cloudy, rain, 10-20º C.

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REV 0 Boring KB-102A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384913.70 m E. 39049.31 m
GROUND SURFACE ELEVATION: 5.10 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
5.0					0.0-1.5 m Hand auger.		At 0 m; Field geologist: Gillian Krezoski, Driller: Christof Sanean
4.5	0.5						
4.0	1.0						
3.5	1.5				1.5-1.6 m Drilled to install casing.		
3.0	2.0	S-1	2-5-7-9 (12) 88%		1.6-14.8 m Poorly graded sand, (sp), 100% sand, fine to medium, subangular; light olive gray (5Y 5/2), dry to wet, strong HCl reaction, loose to medium dense consistency, trace organics, trace to 5% angular shell fragments.		
2.5	2.5	S-2	4-8-13-11 (21) 58%				
2.0	3.0	S-3	5-8-8-9 (16) 68%			sp	
1.5	3.5	S-4	5-6-4-4 (10) 40%		3.54 m ~2 cm layer of rock fragments, chert, limestone, fragments do not appear natural.		
1.0	4.0	S-5	2-3-10-16 (13) 57%		4.0 m ~10 cm horizon of siltier sand (up to 10%) with cm-scale laminations an some iron oxide staining.		
0.5	4.5	S-6	6-11-16-19 (27) 68%				

DATE/TIME STARTED: 03 July 2011 / 10:57
DATE/TIME FINISHED: 05 July 2011 / 10:05
FIELD GEOLOGIST: Gillian Krezoski
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: Christof Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 3 July 2011: sunny, light wind, 18° C; 4 July 2011: partly cloudy, 15-20° C; 5 July 2011: partly cloudy, 15-25° C.

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REV 0 Boring KB-102A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384913.70 m E. 39049.31 m
GROUND SURFACE ELEVATION: 5.10 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
0.0		S-6			1.6-14.8 m Poorly graded sand, (sp), 100% sand, fine to medium, subangular; light olive gray (5Y 5/2), dry to wet, strong HCl reaction, loose to medium dense consistency, trace organics, trace to 5% angular shell fragments.		
-0.5	5.5	S-7	1-7-12-12 (19) 48%				
-1.0	6.0	S-8	1-6-10-16 (16) 52%				
-1.5	6.5	S-9	5-11-15-18 (26) 70%				
-2.0	7.0	S-10	2-9-13-14 (22) 55%				
-2.5	7.5	S-11	4-11-15-19 (26) 58%			sp	
-3.0	8.0				8.2 m Dark greenish gray (5GY 4/1).		
-3.5	8.5	S-12	1-6-13-14 (19) 50%				
-4.0	9.0	S-13	4-11-16-17 (27) 0%				
-4.5	9.5	S-14	4-8-11-17 (19) 33%				

DATE/TIME STARTED: 03 July 2011 / 10:57
DATE/TIME FINISHED: 05 July 2011 / 10:05
FIELD GEOLOGIST: Gillian Krezoski
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: Christof Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 3 July 2011: sunny, light wind, 18° C; 4 July 2011: partly cloudy, 15-20° C; 5 July 2011: partly cloudy, 15-25° C.

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CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384913.70 m E. 39049.31 m
GROUND SURFACE ELEVATION: 5.10 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-5.0					1.6-14.8 m Poorly graded sand, (sp), 100% sand, fine to medium, subangular; light olive gray (5Y 5/2), dry to wet, strong HCl reaction, loose to medium dense consistency, trace organics, trace to 5% angular shell fragments.		
	10.5	S-15	5-13-14-14 (27) 0%				
-5.5							
		S-16	2-3-4-9 (7) 22%				
	11.0						
-6.0							
		S-17	2-7-10-11 (17) 35%				
	11.5						
-6.5							
		S-18	4-8-12-14 (20) 37%				
	12.0						
-7.0							
		S-19	7-16-20-24 (36) 0%			sp	
	12.5						
-7.5							
		S-20	1-7-10-10 (17) 35%		13.2-13.8 m Dark gray (N3), slighly laminated sand with silt (sp-sm).		
	13.0						
-8.0							
		S-21	3-8-10-12 (18) 60%				13.60 - 14.20 m, S-21 lab classification SP-SM At 13.6 m; Field geologist: Sam Donadio, Driller: Christof Sanean
	13.5						
-8.5							
	14.0						
-9.0							
		S-22	1-3-4-5 (7) 50%		14.25 m Medium dark gray (N4), roughly 2-6 mm laminations of elastic silty clay.		
	14.5						
-9.5							
		S-23	1-1-4-5 (5) 92%			cl-ml	

DATE/TIME STARTED: 03 July 2011 / 10:57
DATE/TIME FINISHED: 05 July 2011 / 10:05
FIELD GEOLOGIST: Gillian Krezoski, Sam Donadio
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: Christof Sanean, Christof Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 3 July 2011: sunny, light wind, 18° C; 4 July 2011: partly cloudy, 15-20° C; 5 July 2011: partly cloudy, 15-25° C.

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REV 0 Boring KB-102A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384913.70 m E. 39049.31 m
GROUND SURFACE ELEVATION: 5.10 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-10.0		S-23	1-1-4-5 (5) 92%		14.8-16.0 m Sandy silty clay, (cl-ml), 70% fines, medium plasticity, medium dry strength, low toughness; 30% sand; medium light gray (N6), moist, strong HCl reaction, medium stiff consistency, elastic silty clay inter bedded with fine sand.	cl-ml	
-10.5	15.5	ST-1	100%				
-11.0	16.0	S-24	0-1-1-4 (2) 52%		16.0-26.2 m Poorly graded sand, (sp), 95% sand, fine, subrounded; 5% fines; medium gray (N5), weak HCl reaction, very loose to medium dense consistency, 1-2 mm shell fragments present throughout, 5-30 mm dark grey to black clayey silt lenses throughout, material becomes more saturated and less fines noted at approximately 18.45 m.	sp	0 = WOH
-11.5	16.5	S-25	0-3-3-3 (6) 65%				0 = WOH
-12.0	17.0	S-26	0-2-5-7 (7) 55%				0 = WOH
-12.5	17.5	S-27	0-4-7-10 (11) 55%				0 = WOH
-13.0	18.0	S-28	4-14-14-17 (28) 62%				
-13.5	18.5	S-29	2-9-11-13 (20) 42%		19.0 m Medium dark gray (N4), 2-4 mm silt laminations.		
-14.0	19.0	S-30	2-7-13-15 (20) 60%				19.60 - 20.20 m, S-30 lab classification SP-SM
-14.5	19.5						

DATE/TIME STARTED: 03 July 2011 / 10:57
DATE/TIME FINISHED: 05 July 2011 / 10:05
FIELD GEOLOGIST: Sam Donadio
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: Christof Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 3 July 2011: sunny, light wind, 18° C; 4 July 2011: partly cloudy, 15-20° C; 5 July 2011: partly cloudy, 15-25° C.

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REV 0 Boring KB-102A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384913.70 m E. 39049.31 m
GROUND SURFACE ELEVATION: 5.10 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.0		S-30			16.0-26.2 m Poorly graded sand, (sp), 95% sand, fine, subrounded; 5% fines; medium gray (N5), weak HCl reaction, very loose to medium dense consistency, 1-2 mm shell fragments present throughout, 5-30 mm dark grey to black clayey silt lenses throughout, material becomes more saturated and less fines noted at approximately 18.45 m.		0 = WOH
-15.5	20.5	S-31	0-5-11-11 (16) 50%				
-16.0	21.0	S-32	2-7-11-12 (18) 38%				
-16.5	21.5	S-33	3-7-10-10 (17) 30%		21.4-21.5 m Black organic material in clayey silt.		
-17.0	22.0	S-34	1-6-14-17 (20) 0%				~Significant water circulation loss from approximately 20 m.
-17.5	22.5	S-35	2-10-18-23 (28) 28%			sp	
-18.0	23.0	S-36	1-3-9-15 (12) 0%				
-18.5	23.5	S-37	3-8-13-20 (21) 67%				
-19.0	24.0	S-38	3-8-15-17 (23) 0%				
-19.5	24.5						

DATE/TIME STARTED: 03 July 2011 / 10:57
DATE/TIME FINISHED: 05 July 2011 / 10:05
FIELD GEOLOGIST: Sam Donadio
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: Christof Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 3 July 2011: sunny, light wind, 18° C; 4 July 2011: partly cloudy, 15-20° C; 5 July 2011: partly cloudy, 15-25° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-102A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384913.70 m E. 39049.31 m
GROUND SURFACE ELEVATION: 5.10 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-20.0					16.0-26.2 m Poorly graded sand, (sp), 95% sand, fine, subrounded; 5% fines; medium gray (N5), weak HCl reaction, very loose to medium dense consistency, 1-2 mm shell fragments present throughout, 5-30 mm dark grey to black clayey silt lenses throughout, material becomes more saturated and less fines noted at approximately 18.45 m.		
	25.5	S-39	2-5-12-20 (17) 17%			sp	
-20.5							
		S-40	2-9-16-23 (25) 20%				
	26.0						
-21.0							
					26.2-26.45 m Well graded gravel with silt and sand, (gw-gm), 50% gravel, fine to coarse, subangular, cubic, medium hardness; 40% sand, fine to coarse, subangular, spherical, hard hardness; 10% fines; light olive gray (5Y 5/2) and light brown (5YR 6/4), moist, weak HCl reaction, medium dense consistency, trace glauconite, various types of gravel up to 30 mm (claystone fragments and shells) in a silty sand matrix, ~10% flat shell fragments up to 20 mm.	gw-gm	
	26.5	S-41	2-17-10-5 (27) 42%				
-21.5						cl	
					26.45-26.8 m Lean clay, (cl), olive gray (5Y 4/1), stiff consistency.		At 26.8 m; Field geologist: Erich Zorn, Driller: Nicholas Meeus
	27.0	S-42	3-5-12-17 (17) 95%				
-22.0					26.8-29.98 m Poorly graded sand with silt, (sp-sm), 85% sand, fine to coarse, subangular, spherical; 10% fines; 5% gravel, fine, angular, flat, medium hardness; pale yellowish brown (10YR 6/2) to light olive gray (5Y 5/2), moist, strong HCl reaction, medium dense to dense consistency, ~10% shell fragments up to 20 mm in size, gravel is shell fragments.		
	27.5	S-43	10-20-30-35 (50) 100%				Hammer energy measurements collected in S-42 and S-43, S-42 = 68.2 percent, S-43 = 71.0 percent
-22.5							
	28.0	ST-2	0%				
-23.0		S-44	14-32-49-50/12 75%			sp-sm	In S-44, S-45, and S-46, N-value was too high - results void
	28.5						
-23.5							
		S-45	25-38-50/13 93%				Borehole closure completed using 1.82 cubic meters of Mikolit bentonite pellets for full depth and sand cover at surface. Borehole continues in KB-102
	29.0						
-24.0							
	29.5						
-24.5		S-46	26-40-42-50/12 77%				

---- Bottom of Boring at 29.98 m.----

DATE/TIME STARTED: 03 July 2011 / 10:57
DATE/TIME FINISHED: 05 July 2011 / 10:05
FIELD GEOLOGIST: Erich Zorn, Sam Donadio
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: Nicholas Meeus, Christof Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 3 July 2011: sunny, light wind, 18° C; 4 July 2011: partly cloudy, 15-20° C; 5 July 2011: partly cloudy, 15-25° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
4.5	0.0				0.0-1.5 m Hand Auger.		
4.0	0.5						
3.5	1.0						
3.0	1.5				1.5-1.96 m Drill to 1.96 m depth to install casing.		
2.5	2.0	S-1	2-13-13 (26) 58%		1.96-4.5 m Poorly graded sand, (sp), 100% sand, medium, subrounded; dark yellowish brown (10YR 4/2), moist, weak HCl reaction, medium dense to very dense consistency, well sorted, some flat rounded shell fragments, 10 - 20% mafics.	sp	
2.0	2.5	S-2	3-9-8 (17) 44%				
1.5	3.0	S-3	1-4-12 (16) 80%		2.86 m Medium dark gray (N4), strong HCl reaction, small ~5 cm clay layer, 20% mafics.		
1.0	3.5	S-4	3-13-18 (31) 51%		3.37 m Light olive gray (5Y 5/2) and medium dark gray (N4), trace organics, some flat rounded shell fragments, 15% mafics.		
0.5	4.0	S-5	10-25-28 (53) 78%				
0.0	4.5	S-6	2-5-6 (11) 53%		4.5-4.72 m Fat clay, (ch), 100% fines, medium plasticity, medium dry strength, no dilatancy; medium dark gray (N4), organic odor, dry, weak HCl reaction, laminated, stiff consistency, trace organics.	ch	
		S-7	2-6-6 (12) 96%			sm	

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-0.5	5.5	S-7		4.72-5.62 m Silty sand, (sm), 70% sand, fine; 30% fines; dark greenish gray (5G 4/1), moist, weak HCl reaction, medium dense consistency.		
		S-8	5-6-15 (21) 69%		sm	
-1.0	6.0	S-9	14-15-29 (44) 51%	5.62-7.18 m Poorly graded sand, (sp), 100% sand, fine to medium; dark greenish gray (5G 4/1), moist, strong HCl reaction, medium dense to dense consistency, shell grain fragments increasing with depth.		
-1.5		S-10	3-7-10 (17) 0%		sp	
-2.0	6.5	S-11	1-5-10 (15) 22%			
-2.5	7.0	S-12	2-2-1 (3) 76%	7.18-7.3 m Elastic silt, (mh), 100% fines, medium plasticity, slow dilatancy; olive gray (5Y 4/1), organic odor, moist, no HCl reaction, laminated, very soft consistency, trace organics, peat lenses cm-scale.	mh	
-3.0	7.5	S-13	1-3-4 (7) 100%	7.3-8.5 m Peat, (pt), olive black (5Y 2/1), organic odor, moist, no HCl reaction, soft to medium stiff consistency, Peat.	pt	8.32 - 8.52 m, lab classification CH
-3.5	8.0	S-14	1-1-2 (3) 80%			
-4.0	8.5	ST-1	100%	8.5-11.85 m LEAN CLAY, (CL), 100% fines, medium plasticity, no dilatancy; dark greenish gray (5GY 4/1), organic odor, moist, weak HCl reaction, very soft consistency, trace peat, trace rock fragments, trace organics.		
-4.5	9.0	S-15	0-0-0 (0) 33%		CL	0 = WOH
-5.0	9.5	S-16	0-0-0-0 (0) 92%			0 = WOH

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-5.5		S-17	0-0-0-0 (0) 42%		8.5-11.85 m LEAN CLAY, (CL), 100% fines, medium plasticity, no dilatancy; dark greenish gray (5GY 4/1), organic odor, moist, weak HCl reaction, very soft consistency, trace peat, trace rock fragments, trace organics.		0 = WOH
	10.5	S-17					
-6.0		S-18	0-0-0-0 (0) 0%			CL	0 = WOH
	11.0						
-6.5		ST-2	0%				
	11.5						
-7.0		S-19	2-7-9-11 (16) 85%		11.85-11.95 m Peat, (pt), dusky yellowish brown (10YR 2/2), organic odor, no HCl reaction, Spongy consistency, Peat.	pt	
-7.5	12.0				11.95-12.9 m SILTY CLAY, (CL-ML), 100% fines, low plasticity, slow dilatancy; light olive gray (5Y 5/2), organic odor, moist, weak HCl reaction, laminated, very stiff consistency, trace peat.	CL-ML	
	12.5	ST-3	60%				
-8.0							
	13.0	S-20	4-9-10-12 (19) 45%		12.9-12.97 m SANDY SILTY CLAY, (CL-ML), 70% fines, non plastic, no dry strength, no dilatancy; 30% sand, fine; olive gray (5Y 4/1), organic odor, moist, strong HCl reaction, very stiff consistency.	CL-ML	
-8.5					12.97-14.17 m SILTY CLAY, (CL-ML), 100% fines, low plasticity, slow dilatancy; light olive gray (5Y 5/2), organic odor, moist, weak HCl reaction, laminated, medium stiff to very stiff consistency, trace peat.	CL-ML	
	13.5						
-9.0		S-21	0-3-5-18 (8) 28%				
	14.0						
-9.5		S-22	10-28-35-26 (63) 62%		14.17-14.77 m Silty sand, (sm), 70% sand, fine to medium, subangular; 30% fines; olive gray (5Y 4/1), moist, weak HCl reaction, very dense consistency.	sm	
	14.5						
-10.0		S-23	5-8-10-16 (18) 72%			ml	

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-10.5	15.5	S-23	5-8-10-16 (18) 72%	14.77-16.0 m Silt, (ml), 95% fines, low plasticity, slow dilatancy; 5% sand; light olive gray (5Y 5/2), organic odor, moist, weak HCl reaction, laminated, stiff to very stiff consistency, trace peat, trace organics, trace cm-scale glauconitic lamina.	ml	15.27 - 15.37 m, overlap occured Monday a.m. as a result of removal of pipes from borehole during the weekend
-11.0	16.0	S-24	3-5-8-11 (13) 87%	15.77 m Glauconitic lamina end, color becomes dusky yellowish brown (10 YR 2/2).		
-11.5	16.5	ST-4	100%	16.0-17.07 m Silty sand, (sm), 70% sand, fine; 30% fines; dark greenish gray (5G 4/1), dry to moist, strong HCl reaction, laminated, medium dense consistency.	sm	Upper contact depth estimated - occured in shelby tube.
-12.0	17.0	S-25	4-7-14-16 (21) 73%			
-12.5	17.5	S-26	3-11-17-22 (28) 43%	17.07-21.87 m Poorly graded sand with silt, (sp-sm), 80% sand, fine, subrounded; 10% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, laminated, loose to dense consistency, trace organics.		
-13.0	18.0	S-27	2-6-10-17 (16) 60%			
-13.5	18.5	S-28	1-2-9-17 (11) 70%		sp-sm	18.27 - 18.87 m, S-28 lab classification ML
-14.0	19.0	ST-5	57%			
-14.5	19.5	S-29	0-2-6-9 (8) 50%	19.47 m Grayish olive green (5GY 3/2).		0 = WOH
-15.0						

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.5		S-29			17.07-21.87 m Poorly graded sand with silt, (sp-sm), 80% sand, fine, subrounded; 10% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, laminated, loose to dense consistency, trace organics.		
	20.5	S-30	4-12-17-20 (29) 53%				
-16.0							
	21.0	S-31	2-6-12-15 (18) 62%			sp-sm	
-16.5							
	21.5	S-32	4-14-23-48 (37) 8%				
-17.0							
	22.0	S-33	9-31-48-50/13 0%		21.87-23.67 m Poorly graded sand, (sp), 95% sand, fine to coarse, subrounded; 5% gravel; dark greenish gray (5G 4/1), weak HCl reaction, dense to very dense consistency, large angular shell fragments up to 3 cm in scale.		
-17.5							
	22.5	S-34	4-15-21-31 (36) 0%			sp	
-18.0							
	23.0	S-35	5-17-19-26 (36) 0%				
-18.5							
	23.5						
-19.0					23.67-23.88 m Elastic silt, (mh), 100% fines, medium plasticity, low dry strength, no dilatancy; olive gray (5Y 4/1), moist, weak HCl reaction, laminated, medium stiff consistency.	mh	
	24.0	S-36	1-4-11-21 (15) 35%				
-19.5					23.88-25.47 m Poorly graded sand, (sp), 95% sand, fine to coarse, subrounded; 5% gravel; dark greenish gray (5G 4/1), moist, weak HCl reaction, medium dense consistency, large angular shell fragments up to 3 cm in scale, contains several cm-scale horizons of elastic silt described at 23.67 m.		
	24.5	S-37	5-10-14-15 (24) 3%			sp	
-20.0							
		S-38					

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-20.5		S-38	4-9-14-18 (23) 7%		sp	
	25.5			25.47-25.66 m Elastic silt, (mh), 100% fines, medium plasticity, low dry strength, no dilatancy; olive gray (5Y 4/1), moist, weak HCl reaction, laminated, medium stiff consistency.	mh	
-21.0		S-39	1-12-16-24 (28) 32%		sp	
	26.0			25.66-26.07 m Poorly graded sand, (sp), 95% sand, fine to coarse, subrounded; 5% gravel; dark greenish gray (5G 4/1), moist, weak HCl reaction, medium dense consistency, large angular shell fragments up to 3 cm in scale, contains several cm-scale horizons of elastic silt described at 23.67 m.		26.02 - 26.04 m, Silt (ml), 100% fines, medium dry strength; light olive gray (5Y 5/2), dry, weak HCl reaction
-21.5		S-40	4-7-13-14 (20) 82%		cl	
	26.5			26.07-26.67 m Lean clay, (cl), 100% fines, low plasticity, no dilatancy; olive gray (5Y 4/1), dry, weak HCl reaction, laminated, very stiff consistency, becomes siltier downunit.		
-22.0		ST-6	100%	26.67-27.7 m Lean clay with sand, (cl), 80% fines, medium plasticity, no dilatancy; 20% sand, fine, subangular; olive gray (5Y 4/1), dry, weak HCl reaction, laminated, very stiff consistency, becomes siltier towards 27.7 m.	cl	
-22.5	27.0					27.27 - 27.87 m, lab classification SC-SM
	27.5	S-41	3-9-9-14 (18) 90%			
-23.0				27.7-28.0 m Clayey sand, (sc), 80% sand, fine to coarse, subangular; 20% fines; olive gray (5Y 4/1), moist, weak HCl reaction, laminated, medium dense consistency.	sc	
	28.0	S-42	1-7-13-20 (20) 53%			
-23.5				28.0-29.0 m Poorly graded sand with clay, (sp-sc), 70% sand, fine to medium, subangular; 20% gravel; 10% fines; olive gray (5Y 4/1), moist, medium dense consistency, shell hash layers, shells horizontally oriented, 3-5 cm thick layers, 15-20% of grains.	sp-sc	
	28.5					
-24.0		S-43	6-21-19-21/7 83%			
	29.0					
				29.0-29.02 m Poorly graded sand, (sp), 90% sand; 10% fines; light olive gray (5Y 5/2), dry, weak HCl reaction, strong cementation, angular chunks of sandstone, refusal.	sp	Sandstone
-24.5		S-44	6-25-36-38 (61) 53%			
	29.5			29.02-30.27 m Poorly graded sand with silt, (sp-sm), 70% sand, fine to medium, subangular; 20% gravel; 10% fines; olive gray (5Y 4/1), moist, very dense consistency, trace organics, shell grains 15-20% of sample.	sp-sm	Borehole continues in KB-103A
-25.0		S-45	10-31-38-43 (69) 47%			

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384744.41 m E. 39211.28 m
GROUND SURFACE ELEVATION: 4.74 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-25.5		S-45	10-31-38-43 (69) 47%		---- Bottom of Boring at 30.27 m.----	sp-sm	Borehole closure completed using 1.82 cubic meters of Mikolit bentonite pellets for full depth and sand cover at surface.

DATE/TIME STARTED: 23 June 2011 / 14:30
DATE/TIME FINISHED: 28 June 2011 / 16:20
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid: Brackish Local Groundwater

WEATHER: 23 June 2011: partly cloudy, showers, 15-20° C; 24 June 2011: scattered showers, 15-20° C; 25 June 2011: rainy, windy, 15-20° C; 27 June 2011: sunny, hot, 20-30° C; 28 June 2011: cloudy, rain, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
4.5	0.5				0.0-29.98 m Destructive drilling, refer to KB-103 for description.		At 0 m on 29 June 2011; Field geologist: DAR/KDR, Driller: Bart Caers
4.0	1.0						
3.5	1.5						
3.0	2.0						
2.5	2.5						
2.0	3.0						
1.5	3.5						
1.0	4.0						
0.5	4.5						
0.0	5.0						
-0.5	5.5						
-1.0	6.0						
-1.5	6.5						
-2.0							

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	USCS SYMBOL	REMARKS

COORDINATES

N. 384743.07 m E. 39212.26 m

GROUND SURFACE ELEVATION: 4.76 m

HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

DESCRIPTION

0.0-29.98 m Destructive drilling, refer to KB-103 for description.

-2.5 7.5
-3.0 8.0
-3.5 8.5
-4.0 9.0
-4.5 9.5
-5.0 10.0
-5.5 10.5
-6.0 11.0
-6.5 11.5
-7.0 12.0
-7.5 12.5
-8.0 13.0
-8.5 13.5
-9.0

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
-9.5	14.5				**N. 384743.07 m E. 39212.26 m** **GROUND SURFACE ELEVATION: 4.76 m** HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP 0.0-29.98 m Destructive drilling, refer to KB-103 for description.		
-10.0	15.0						
-10.5	15.5						
-11.0	16.0						
-11.5	16.5						
-12.0	17.0						
-12.5	17.5						
-13.0	18.0						
-13.5	18.5						
-14.0	19.0						
-14.5	19.5						
-15.0	20.0						
-15.5	20.5						
-16.0							

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
-16.5	21.5				**N. 384743.07 m E. 39212.26 m** **GROUND SURFACE ELEVATION: 4.76 m** HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP 0.0-29.98 m Destructive drilling, refer to KB-103 for description.		
-17.0	22.0						
-17.5	22.5						
-18.0	23.0						
-18.5	23.5						
-19.0	24.0						
-19.5	24.5						
-20.0	25.0						
-20.5	25.5						
-21.0	26.0						
-21.5	26.5						
-22.0	27.0						
-22.5	27.5						
-23.0							

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-23.5	28.5				0.0-29.98 m Destructive drilling, refer to KB-103 for description.		
-24.0	29.0						
-24.5	29.5						
-25.0	30.0						
-25.5	30.5	R-1	100%		29.98-35.73 m Poorly graded sand with gravel, (sp), 75% sand, fine to medium, subangular, spherical; 20% gravel, fine, angular, flat, medium hardness; 5% fines; medium dark gray (N4) to dark greenish gray (5G 4/1), moist, strong HCl reaction, trace Glauconite grains, little Shell fragments [gravel], shell fragments up to 4 cm long in concentrations spaced 20-100 cm apart, 5-10 cm thick.		At 29.98 m on 29 June 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus 29.98 m, Extra recovery in coreruns due to collapse and heave into casing. pictures will show more material than run length.
-26.0	31.0						
-26.5	31.5	R-2	100%				
-27.0	32.0	ST-1	100%				
-27.5	32.5	R-3	100%			sp	
-28.0	33.0						
-28.5	33.5	R-4	100%				
-29.0	34.0						
-29.5	34.5	R-5	100%				
-30.0							

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-30.5	35.5	R-6	100%			sp	
-31.0					35.73-70.48 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines, medium plasticity; dusky green (5G 3/2) to greenish black (5GY 2/1), moist to wet, weak HCl reaction, mottled, some Glauconite grains, high % of black glauconite grains give sand its green/black coloring, mottling with brown streaks is result of concentrated fines, sand is also mottled pale olive (10Y 6/2) (Marine).		35.73 - 70.48 m, (Miocene) Breda Fm.
-31.5	36.0						
-32.0	36.5	R-7	100%				
-32.5	37.0						
-33.0	37.5	R-8	100%				
-33.5	38.0						
-34.0	38.5	R-9	100%				
-34.5	39.0					sp	
-35.0	39.5	R-10	100%				
-35.5	40.0						
-36.0	40.5	R-11	100%				
-36.5	41.0						
-37.0	41.5	R-12	100%				
		R-13	100%				

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-37.5	42.5	R-13	100%		35.73-70.48 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines, medium plasticity; dusky green (5G 3/2) to greenish black (5GY 2/1), moist to wet, weak HCl reaction, mottled, some Glauconite grains, high % of black glauconite grains give sand its green/black coloring, mottling with brown streaks is result of concentrated fines, sand is also mottled pale olive (10Y 6/2) (Marine).	sp	41.82 m, Runs less than a meter are a result of not being able to push any further. material is coming up into the casing, evidence by full sample tubes and up to 20 cm extra recovery.
-38.0	43.0	R-14	100%				
-38.5	43.5						
-39.0	44.0	R-15	100%				
-39.5	44.5						
-40.0	45.0	R-16	100%				
-40.5	45.5						
-41.0	46.0	R-17	100%				
-41.5	46.5						
-42.0	47.0	R-18	100%				
-42.5	47.5						
-43.0	48.0	R-19	100%				
-43.5	48.5						
-44.0		R-20	100%				

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-44.5	49.5	R-20	100%		35.73-70.48 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines, medium plasticity; dusky green (5G 3/2) to greenish black (5GY 2/1), moist to wet, weak HCl reaction, mottled, some Glauconite grains, high % of black glauconite grains give sand its green/black coloring, mottling with brown streaks is result of concentrated fines, sand is also mottled pale olive (10Y 6/2) (Marine).	sp	At 54.92 m on 30 June 2011; Field geologist: DAR/KDR, Driller: Bart Caers 55.00 m, Sand is approximately 50% glauconite and 50%
-45.0	50.0	R-21	100%				
-45.5	50.5	R-22	100%				
-46.0	51.0						
-46.5	51.5	R-23	100%				
-47.0	52.0						
-47.5	52.5	R-24	100%				
-48.0	53.0						
-48.5	53.5	R-25	100%				
-49.0	54.0						
-49.5	54.5	R-26	100%				
-50.0	55.0						
-50.5	55.5	R-27	100%				
-51.0		R-28					

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-51.5	56.5	R-28	100%		35.73-70.48 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines, medium plasticity; dusky green (5G 3/2) to greenish black (5GY 2/1), moist to wet, weak HCl reaction, mottled, some Glauconite grains, high % of black glauconite grains give sand its green/black coloring, mottling with brown streaks is result of concentrated fines, sand is also mottled pale olive (10Y 6/2) (Marine).		quartz.
-52.0	57.0						
-52.5	57.5	R-29	100%				
-53.0	58.0						
-53.5	58.5	R-30	100%				
-54.0	59.0						
-54.5	59.5	R-31	100%			sp	
-55.0	60.0						
-55.5	60.5	R-32	100%				
-56.0	61.0						
-56.5	61.5	R-33	100%				
-57.0	62.0						62.00 - 64.5 m, Shell fragments and large shells up to 5 cm present. Large shell at 62.23, 62.35, 62.67, 63.23, 63.48, and 64.45 m.
-57.5	62.5	R-34	100%				
-58.0		R-35					

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-58.5	63.5	R-35	100%		35.73-70.48 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines, medium plasticity; dusky green (5G 3/2) to greenish black (5GY 2/1), moist to wet, weak HCl reaction, mottled, some Glauconite grains, high % of black glauconite grains give sand its green/black coloring, mottling with brown streaks is result of concentrated fines, sand is also mottled pale olive (10Y 6/2) (Marine).	sp	65.00 m, Below approximately 65.0 m glauconite makes up 65-75% of sand.
-59.0	64.0						
-59.5	64.5	R-36	100%				65.80 - 66.80 m, R-38 lab classification SM
-60.0	65.0						
-60.5	65.5	R-37	100%				
-61.0	66.0						
-61.5	66.5	R-38	100%				
-62.0	67.0						
-62.5	67.5	R-39	100%				67.75 m, Sand becomes very dense and compact from 67.75-69.7 m, requires many more pushes than previous samples.
-63.0	68.0						
-63.5	68.5	R-40	100%				
-64.0	69.0						
-64.5	69.5	R-41	100%				69.4 m, Bottom meter of unit above boom clay is very wet.
-65.0		R-42	100%				

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-65.5	70.5	R-42	100%			sp	
-66.0	71.0	R-43	100%		70.48-72.0 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, upper 30 cm is a mix of clay and overlying black sand (Marine).	ch	70.48 - 88.0 m, (Oligocene) Rupel Fm. (Boom Clay) 70.75 m, Sand content greater from 70.75-71.00 m, up to 25%.
-66.5	71.5						
-67.0	72.0	ST-2	100%				
-67.5	72.5	ST-3	100%		72.0-72.5 m Sandy fat clay, (ch), 70% fines, medium plasticity, slow dilatancy, medium toughness; 30% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, gradual transition with adjacent lithologies (Marine).	ch	72.00 m, Lithologic change estimated, occured in shelby tube.
-68.0	73.0	R-44	100%		72.5-73.55 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, (Marine).	ch	
-68.5	73.5						
-69.0	74.0	R-45	100%		73.55-74.58 m Fat clay with sand, (ch), 75% fines, medium plasticity, slow dilatancy, medium toughness; 25% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, gradual transition with adjacent lithologies (Marine).	ch	
-69.5	74.5						
-70.0	75.0	ST-4	100%		74.58-75.0 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, trace glauconite, gradual transition to adjacent lithologies (Marine).	ch	75.00 m, lithologic change estimated, occured in shelby tube.
-70.5	75.5	ST-5	100%		75.0-76.0 m Fat clay with sand, (ch), 85% fines, high plasticity, slow dilatancy, medium toughness; 15% sand, fine, rounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, little glauconite, gradual transition with adjacent lithologies, sand content varies from 10-25% (Marine).	ch	
-71.0	76.0					ch	
-71.5	76.5	R-46	100%		76.0-76.33 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, little glauconite, (Marine).	sc-sm	
-72.0						ch	

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-72.5	77.5	R-46		76.33-76.78 m Silty clayey sand, (sc-sm), 60% sand, fine, rounded, spherical, medium hardness; 40% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), moist, weak HCl reaction, weak cementation, little mica, some glauconite, gradual transition to adjacet lithologies (Marine).	ch / sc-sm	
-73.0	78.0	R-47	100%	76.78-77.19 m Fat clay, (ch), 90% fines, high plasticity, no dilatancy, high toughness; 10% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, some glauconite, (Marine).	ch	
-73.5	78.5	ST-6	100%			
-74.0	79.0	ST-7	100%	77.19-77.87 m Silty clayey sand, (sc-sm), 60% sand, fine, rounded, spherical, medium hardness; 40% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1), moist, weak HCl reaction, weak cementation, little mica, some glauconite, gradual transition to underlying lithology (Marine).	sc-sm	
-74.5	79.5	R-48	100%	77.87-80.6 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, trace glauconite, (Marine).	ch	
-75.0	80.0					
-75.5	80.5	R-49	100%	80.6-80.83 m Silty clayey sand, (sc-sm), 70% sand; 30% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, weak cementation, little mica, little glauconite, gradual transition to underlying lithology (Marine).	sc-sm	
-76.0	81.0					
-76.5	81.5	R-50	100%	80.83-82.58 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, trace glauconite, (Marine).	ch	
-77.0	82.0					
-77.5	82.5	R-51	100%	82.58-82.75 m Silty clayey sand, (sc-sm), 70% sand, fine, rounded, spherical, medium hardness; 30% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, weak cementation, little mica, little glauconite, gradual transition to underlying lithology (Marine).	sc-sm / ch	
-78.0	83.0					
-78.5	83.5	R-52	100%	82.75-83.25 m Fat clay with sand, (ch), 85% fines, high plasticity, no dilatancy, high toughness; 15% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1),	sc-sm / ch	
-79.0						

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-79.5	84.5	R-52	100%	dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, trace glauconite, gradual transition to adjacent lithologies (Marine).	ch	
-80.0		ST-8	100%	83.25-83.83 m Silty clayey sand, (sc-sm), 70% sand, fine, rounded, spherical, medium hardness; 30% fines, medium plasticity, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, weak cementation, little mica, little glauconite, gradual transition to underlying lithology, some pockets of 100% sand (Marine).		84.5 m, lithology change estimated, occured in shelby tube.
-80.5	85.0	ST-9	100%			
-81.0	85.5	R-53	100%	83.83-84.5 m Fat clay with sand, (ch), 85% fines, high plasticity, no dilatancy, high toughness; 15% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) to dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, trace glauconite, gradual transition to adjacent lithologies (Marine).		At 85.31 m on 30 June 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-81.5	86.0			84.5-88.0 m Silty clayey sand, (sc-sm), 70% sand, fine to medium, subrounded, spherical; 30% fines, medium plasticity; grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace Glauconite grains, becoming sandier with depth, 80/20 to 90/10, sand with clay.	sc-sm	
-82.0	86.5	R-54	100%			
-82.5	87.0					
-83.0	87.5	R-55	100%			87.47 m, Large 2x4 cm shell fragment, could not cut with hand saw.
-83.5	88.0			88.0-97.43 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace Glauconite grains, trace mica, fines content increasing with depth, to SP-SC.	sp	87.72 m, 2 pieces of phosphorite/sandstone gravel, similar to KB102. approximately 3 x 2 cm in size, hard, black/brown color. 88.00 m, Extra recovery in sample tubes and less than 1m runs is consistent due to flowing/heaving of saturated sand. 88.0-97.43 m, (L. Eocene - E. Oligocene) Zelzate Member of the Tongeren Fm. (Ruisbroek Sand) 89.15 m, Dark phosphorite/sandstone pebble 1 x 5 cm.
-84.0	88.5	R-56	100%			
-84.5	89.0					
-85.0	89.5	R-57	100%			
-85.5	90.0					
-86.0	90.5	R-58	100%			

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Bart Caers, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-86.5	91.5	R-59	100%		88.0-97.43 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical; 5% fines; dark greenish gray (5GY 4/1) to grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, trace Glauconite grains, trace mica, fines content increasing with depth, to SP-SC.		
-87.0	92.0						
-87.5	92.5	R-60	100%				
-88.0	93.0						
-88.5	93.5	R-61	100%				
-89.0	94.0	ST-10	100%				93.73 - 94.14 m, lab classification SM
-89.5	94.5					sp	
-90.0	95.0	R-62	100%				
-90.5	95.5						95.21 m, Tooth approximately 1cm long x 3mm wide at root, sharp point.
-91.0	96.0	R-63	100%				
-91.5	96.5						
-92.0	97.0	R-64	0%				
-92.5	97.5						97.43 - 100.68 m, (L. Eocene - E. Oligocene) Zelzate Member of the Tongeren Fm. (Watervliet Clay)
-93.0		R-65	100%			ch	

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-103A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384743.07 m E. 39212.26 m
GROUND SURFACE ELEVATION: 4.76 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-93.5	98.5	R-65	100%		97.43-100.68 m Sandy fat clay, (ch), 60% fines, medium plasticity, low toughness; 40% sand, fine to medium, subrounded, spherical; grayish olive green (5GY 3/2) to dark greenish gray (5GY 4/1), dry, no HCl reaction, lensed, very stiff consistency, trace mica, sandy clay has lenses of very fine sand and the fines/sand ratio varies throughout the layer.	ch	97.43 m, Could not cut with hand saw and remains in solid core with no confinement.
-94.0	99.0	ST-11	100%				98.77 m, KB102 had a zero recovery run at approximately the same interval.
-94.5	99.5	R-66	0%				Borehole closure completed using Mikolit bentonite pellets for full depth.
-95.0	100.0	R-67	100%				
-95.5	100.5				---- Bottom of Boring at 100.68 m.----		

DATE/TIME STARTED: 29 June 2011 / 18:15
DATE/TIME FINISHED: 01 July 2011 / 06:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 29 June 2011: partly cloudy, 10-20° C; 30 June 2011: partly cloudy, 10-20° C; 1 July 2011: partly cloudy, 10-20° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
4.5	0.5				0.0-5.0 m Surface casing to 5 m depth..		At 0 m on 23 June 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
4.0	1.0						
3.5	1.5						
3.0	2.0						
2.5	2.5						
2.0	3.0						
1.5	3.5						
1.0	4.0						
0.5	4.5						
0.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-0.5	5.5				5.0-29.9 m Destructive drilling to 29.90 m depth, refer to KB-104A for description.		
-1.0	6.0						
-1.5	6.5						
-2.0	7.0						
-2.5	7.5						
-3.0	8.0						
-3.5	8.5						
-4.0	9.0						
-4.5	9.5						
-5.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
					N. 384596.32 m E. 39364.80 m **GROUND SURFACE ELEVATION: 4.93 m** HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP 5.0-29.9 m Destructive drilling to 29.90 m depth, refer to KB-104A for description.		
-5.5	10.5						
-6.0	11.0						
-6.5	11.5						
-7.0	12.0						
-7.5	12.5						
-8.0	13.0						
-8.5	13.5						
-9.0	14.0						
-9.5	14.5						
-10.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-10.5	15.5				5.0-29.9 m Destructive drilling to 29.90 m depth, refer to KB-104A for description.		
-11.0	16.0						
-11.5	16.5						
-12.0	17.0						
-12.5	17.5						
-13.0	18.0						
-13.5	18.5						
-14.0	19.0						
-14.5	19.5						
-15.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.5	20.5				5.0-29.9 m Destructive drilling to 29.90 m depth, refer to KB-104A for description.		
-16.0	21.0						
-16.5	21.5						
-17.0	22.0						
-17.5	22.5						
-18.0	23.0						
-18.5	23.5						
-19.0	24.0						
-19.5	24.5						
-20.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-20.5	25.5				5.0-29.9 m Destructive drilling to 29.90 m depth, refer to KB-104A for description.		
-21.0	26.0						
-21.5	26.5						
-22.0	27.0						
-22.5	27.5						
-23.0	28.0						
-23.5	28.5						
-24.0	29.0						
-24.5	29.5						
-25.0						sp	

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-25.5	30.5	R-1	100%		29.9-35.02 m Poorly graded sand, (sp), 90% sand, fine to medium, subangular, spherical, medium hardness; 5% gravel, fine, angular, flat, medium hardness; 5% fines, no dry strength; medium dark gray (N4) to dark greenish gray (5G 4/1), moist, weak HCl reaction, homogeneous, with fine gravel size shell fragment, trace glauconite.		Extra recovery indicates some sand heave at bottom of boring, maybe 10-20 cm in between runs.
-26.0	31.0	R-2	100%				29.90 - 35.02 m, (Pliestocene) Oosterhout Fm.
-26.5	31.5						30.80 - 31.55 m, R-2 lab classification SP-SM
-27.0	32.0	R-3	100%				
-27.5	32.5	ST-1	100%			sp	
-28.0	33.0	R-4	100%				32.96 m, 50% shell fragments
-28.5	33.5						33.26 m, Fine gravel size shell fragments up to 50% concentration
-29.0	34.0	R-5	97%				33.5 m, Up to 50% shell fragments, fine gravel size.
-29.5	34.5						34.0 m, Greater than 50% shell fragments, fine to coarse gravel size.
-30.0		R-6	100%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-30.5	35.5	R-6	100%		35.02-43.54 m Poorly graded sand, (sp), 90% sand, fine to medium, subrounded, spherical, medium hardness; 5% gravel, fine, angular, flat, medium hardness; 5% fines; dusky yellowish green (10GY 3/2) to dusky green (5G 3/2), moist, weak HCl reaction, mottled, some glauconite, little Fine gravel size shell fragment, maximum grain size = 20 mm, gravel occurs concentrated in lenses, not evenly throughout the soil.		35.02 - 74.41 m, (Miocene) Breda Fm.
-31.0	36.0						
-31.5	36.5	R-7	99%				36.21 m, Small lenses of up to 50% shell fragments, fine gravel size. lenses 1-2 cm thick. Lenses below 36.21m, 20 to 50 cm spacing.
-32.0	37.0						
-32.5	37.5	R-8	92%			sp	
-33.0	38.0						
-33.5	38.5	R-9	90%				
-34.0	39.0						
-34.5	39.5	R-10	100%				
-35.0		R-11	100%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-35.5	40.5	R-11	100%		35.02-43.54 m Poorly graded sand, (sp), 90% sand, fine to medium, subrounded, spherical, medium hardness; 5% gravel, fine, angular, flat, medium hardness; 5% fines; dusky yellowish green (10GY 3/2) to dusky green (5G 3/2), moist, weak HCl reaction, mottled, some glauconite, little Fine gravel size shell fragment, maximum grain size = 20 mm, gravel occurs concentrated in lenses, not evenly throughout the soil.	sp	
-36.0	41.0	R-12	100%				
-36.5	41.5						
-37.0	42.0	R-13	91%				
-37.5	42.5						
-38.0	43.0	R-14	100%				
-38.5	43.5				43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).	sp	At 43.54 m on 23 June 2011; Field geologist: DAR/KDR, Driller: Hugo Janssens Weather conditions: mostly clear, windy, 10-15 degrees C
-39.0	44.0	R-15	100%				
-39.5	44.5						
-40.0		R-16	100%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-40.5	45.5	R-16	100%		43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).	sp	46.30-46.48 m, Light olive gray (5Y 5/2) vertical clay seam
-41.0	46.0	R-17	100%				
-41.5	46.5	R-18	100%				
-42.0	47.0						
-42.5	47.5	R-19	100%				
-43.0	48.0						
-43.5	48.5	R-20	100%				
-44.0	49.0						
-44.5	49.5	R-21	100%				
-45.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-45.5	50.5	R-22	100%		43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).	sp	51.88 - 52.46 m, Shelby tube stuck in boring. Tube and sample destroyed during retrieval with fishing tools.
-46.0	51.0						
-46.5	51.5	R-23	100%				
-47.0	52.0						
-47.5	52.5						
-48.0	53.0	R-24	100%				
-48.5	53.5						
-49.0	54.0	R-25	100%				
-49.5	54.5	ST-2	100%				
-50.0		R-26	95%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-50.5	55.5	R-26	95%		43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).	sp	
-51.0	56.0	R-27	100%				
-51.5	56.5						
-52.0	57.0	R-28	95%				
-52.5	57.5						
-53.0	58.0	R-29	100%				
-53.5	58.5						
-54.0	59.0	R-30	100%				
-54.5	59.5						
-55.0		R-31	100%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-55.5	60.5	R-31			43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).	sp	At 61.06 m on 24 June 2011; Field geologist: EVZ/JML, Driller: Nicholas Meeus
-56.0	61.0	R-32	100%				
-56.5	61.5	R-33	100%				
-57.0	62.0	R-34	100%				
-57.5	62.5						
-58.0	63.0	R-35	100%				Weather conditions: windy, partly cloudy, 20 degrees C
-58.5	63.5						
-59.0	64.0	R-36	100%				
-59.5	64.5						
-60.0		R-37	100%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-60.5	65.5	R-37	100%		43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).	sp	
-61.0	66.0	R-38	100%				
-61.5	66.5						
-62.0	67.0	R-39	100%				
-62.5	67.5						
-63.0	68.0	R-40	100%				
-63.5	68.5						
-64.0	69.0	R-41	100%				
-64.5	69.5						
-65.0		R-42	100%				

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-65.5	70.5	R-42	100%		43.54-74.71 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; greenish black (5GY 2/1) to greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, with glauconite, sand is 60-70% glauconite, 25-35% quartz and up to 5% carbonate, and smears of light, olive gray (5Y 5/2) due to higher quarttz and clay content, becoming more saturated with depth closer to boom clay (Marine).		70.28 - 70.38 m, Silty, up to 50%, has a 'shine' when cut.
-66.0	71.0	R-43	100%				
-66.5	71.5						
-67.0	72.0	R-44	100%				
-67.5	72.5					sp	
-68.0	73.0	R-45	100%				
-68.5	73.5						
-69.0	74.0	R-46	100%				74.0 m, Contact is wavy and undulating with inclusions of clay within sand and sand within clay. sharp and defined change.
-69.5	74.5	R-47	98%				74.71 - 83.9 m, (Oigocene) Rupel Fm. (Boom Clay)
-70.0						ch	

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-70.5	75.5	R-47	98%		74.71-76.81 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, subrounded, spherical; dark gray (N3) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, mottled, very stiff consistency, weak cementation.		
		ST-3	100%			ch	ST-4 Not Used
-71.0	76.0						
-71.5	76.5	R-48	100%				
-72.0	77.0				76.81-77.91 m Fat clay with sand, (ch), 80% fines, high plasticity, no dilatancy, high toughness; 20% sand, fine, subrounded, spherical; dark gray (N3) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation.	ch	
-72.5	77.5	R-49	100%				
-73.0	78.0				77.91-79.7 m Fat clay, (ch), 95% fines, high plasticity, high dry strength, no dilatancy, high toughness; 5% sand, fine, subrounded, spherical; dark gray (N3) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, mottled, very stiff consistency, weak cementation.	ch	
-73.5	78.5	R-50	100%				
-74.0	79.0						
		ST-5	100%				
-74.5	79.5						
		ST-6	100%			ch	lithology change is estimated, change occured in shelby tube ST-6.
-75.0		R-51					

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-75.5	80.5	R-51	63%		79.7-80.92 m Fat clay with sand, (ch), 85% fines, high plasticity, high dry strength, no dilatancy, high toughness; 15% sand, fine, subrounded, spherical, medium hardness; dark greenish gray (5G 4/1) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, (Marine).	ch	At 79.93 m on 24 June 2011; Field geologist: DAR/KDR, Driller: Nicholas Meeus
-76.0	81.0				80.92-81.7 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, subrounded, spherical, medium hardness; dark greenish gray (5G 4/1) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, mottled, very stiff consistency, weak cementation, trace mica, (Marine).	ch	
-76.5	81.5	R-52	95%				
-77.0	82.0				81.7-82.52 m Sandy fat clay, (ch), 70% fines, high plasticity, no dilatancy, high toughness; 30% sand, fine to medium, subrounded, spherical, medium hardness; dark greenish gray (5G 4/1) to dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, weak cementation, little mica, gradual transition to adjacent lithologies (Marine).	ch	
-77.5	82.5	R-53	100%		82.52-83.28 m Silty clayey sand, (sc-sm), 75% sand, fine to medium, subrounded, spherical, medium hardness; 25% fines, low plasticity, slow dilatancy, low toughness; dark greenish gray (5G 4/1), moist, weak HCl reaction, homogeneous, with glauconite, (Marine).	sc-sm	
-78.0	83.0				83.28-83.58 m Fat clay with sand, (ch), 75% fines, high plasticity, no dilatancy, high toughness; 25% sand, fine, subrounded, spherical, medium hardness; dark greenish gray (5GY 4/1), dry, strong HCl reaction, very stiff consistency, weak cementation, little mica, gradual transition to adjacent lithologies (Marine).	ch	
-78.5	83.5	R-54	100%			sc-sm	
-79.0	84.0				83.58-83.9 m Silty clayey sand, (sc-sm), 75% sand, fine to medium, subrounded, spherical, medium hardness; 25% fines, low plasticity, slow dilatancy, low toughness; dark greenish gray (5G 4/1), moist, weak HCl reaction, homogeneous, very stiff consistency, with glauconite, (Marine).		83.9 - 98.0 m, (L. Eocene - E. Oligocene) Zelzate Member of the Tongeren Fm. (Ruisbroek Sand)
-79.5	84.5	R-55	100%		83.9-85.35 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; dark greenish gray (5GY 4/1) and greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, glauconite is fine grained sand making up 20-25% of sand, remainder is quartz with minor carbonate (Marine).	sp	
-80.0		R-56					

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
					sp	
-80.5	85.5	R-56	100%	85.35-85.52 m Fat clay with sand, (ch), 75% fines, high plasticity, no dilatancy, high toughness; 25% sand, fine to medium, subrounded, spherical, medium hardness; dark greenish gray (5G 4/1) to dark greenish gray (5GY 4/1), moist, strong HCl reaction, very stiff consistency, weak cementation, little mica, gradual transition to adjacent lithologies, glauconite is 30-40% of sand grains (Marine).	ch	
-81.0	86.0	R-57	100%	85.52-86.45 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; dark greenish gray (5GY 4/1) and greenish black (5GY 2/1), moist, weak HCl reaction, homogeneous, with glauconite, glauconite is fine grained sand making up 20-25% of sand, remainder is quartz with minor carbonate (Marine).	sp	
-81.5	86.5			86.45-86.88 m Fat clay with sand, (ch), 75% fines, high plasticity, no dilatancy, high toughness; 25% sand, fine to medium, subrounded, spherical, medium hardness; dark greenish gray (5G 4/1) to dark greenish gray (5GY 4/1), moist, strong HCl reaction, very stiff consistency, weak cementation, little mica, gradual transition to adjacent lithologies, glauconite is 30-40% of sand grains (Marine).	ch	
-82.0	87.0	R-.58	88%			86.88 m, Lithology change estimated due to recovery loss.
-82.5	87.5			86.88-91.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, weak HCl reaction, homogeneous, with glauconite, glauconite is fine grained sand making up 20-25% of sand, remainder is quartz with minor carbonate (Marine).		
-83.0	88.0	R-59	97%			
-83.5	88.5	ST-7	100%		sp	
-84.0	89.0					
-84.5	89.5	R-60	100%			
-85.0		R-61	100%			

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-85.5	90.5	R-61	100%		86.88-91.5 m Poorly graded sand, (sp), 95% sand, fine to medium, subrounded, spherical, medium hardness; 5% fines; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, weak HCl reaction, homogeneous, with glauconite, glauconite is fine grained sand making up 20-25% of sand, remainder is quartz with minor carbonate (Marine).	sp	90.03 m, Yellowish gray (5Y 8/1) medium sand size shell fragments present.
-86.0	91.0	R-62	100%				
-86.5	91.5	R-63	100%		91.5-98.0 m Poorly graded sand, (sp), 100% sand, fine to medium, subrounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, some glauconite, trace fines, little mica, mostly quartz sand, glauconite is fine grained sand making up 10-15% of sand (Marine).	sp	
-87.0	92.0						
-87.5	92.5	R-64	100%				
-88.0	93.0						
-88.5	93.5	R-65	100%				
-89.0	94.0						
-89.5	94.5	R-66	100%				
-90.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

Paul C. Rizzo Associates, Inc.
ENGINEERS/CONSULTANTS/CM

Paul C. Rizzo Associates, Inc
500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
www.rizzoassoc.com

REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-90.5	95.5	R-66			91.5-98.0 m Poorly graded sand, (sp), 100% sand, fine to medium, subrounded, spherical, medium hardness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), moist, weak HCl reaction, homogeneous, some glauconite, trace fines, little mica, mostly quartz sand, glauconite is fine grained sand making up 10-15% of sand (Marine).		
		R-67	100%				
-91.0	96.0						
-91.5	96.5	R-68	96%			sp	96.5 - 98.0 m, Clay content begins to increase.
-92.0	97.0						
-92.5	97.5	R-69	100%				
-93.0	98.0				98.0-99.4 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, subrounded, spherical; dark greenish gray (5G 4/1), dry, weak HCl reaction, mottled, very stiff consistency, weak cementation, little mica, trace glauconite, (Marine).	ch	98.0 m, Lithology contact estimated, occured in shelby tube. 98.0 - 100.4 m, (L. Eocene - E. Oligocene) Zelzate Member of the Tongeren Fm,. (Watervliet Clay)
		ST-8	100%				
-93.5	98.5						
-94.0	99.0	R-70	100%				
-94.5	99.5				99.4-100.42 m Silty clayey sand, (sc-sm), 60% sand, fine to medium, subrounded, spherical, medium hardness; 40% fines, low plasticity, slow dilatancy, low toughness; dark greenish gray (5G 4/1), moist, strong HCl reaction, homogeneous, with glauconite, little mica, fine sand sized glauconite make up to 50% of sand, quartz is other 50% (Marine).	sc-sm	
		R-71	100%				
-95.0							

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384596.32 m E. 39364.80 m
GROUND SURFACE ELEVATION: 4.93 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-71	100%			sc-sm	
					---- Bottom of Boring at 100.42 m.----		Borehole closure completed using Mikolit bentonite pellets for full depth. 5.92 cubic meters used.

DATE/TIME STARTED: 23 June 2011 / 08:00
DATE/TIME FINISHED: 25 June 2011 / 00:00
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 23 June 2011: partly cloudy, windy, 20° C; 24 June 2011: windy, partly cloudy, 10-20° C, 25 June 2011: partly cloudy, rain, 10-15° C

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384595.78 m E. 39367.07 m
GROUND SURFACE ELEVATION: 4.94 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
4.5	0.5				0.0-1.5 m Hand Augering.		
4.0	1.0						
3.5	1.5				1.5-1.8 m Drilled to install casing.		
3.0	2.0	S-1	1-1-6-10 (7) 58%		1.8-4.85 m Poorly graded sand, (sp), 90% sand, fine to medium, subangular; 5% gravel; 5% fines; medium dark gray (N4) and light olive gray (5Y 5/2), organic odor, moist, weak HCl reaction, laminated, very loose to medium dense consistency, trace organics, trace roots, shell fragments (5%) up to 1 cm in size.		
2.5	2.5	S-2	4-10-10-9 (20) 62%				
2.0	3.0	S-3	3-8-11-12 (19) 75%			sp	3.10 - 3.18 m, Silty layer containing 1.0 cm scale oxide stained clay rip-up clasts, strong HCL reaction in layer.
1.5	3.5						
1.0	4.0	S-4	1-1-2-4 (3) 48%				
0.5	4.5	ST-1	50%				
0.0		S-5	3-7-8-11 (15) 73%			SM	

DATE/TIME STARTED: 29 June 2011 / 15:00
DATE/TIME FINISHED: 01 July 2011 / 13:50
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid= Brackish Loocal Groundwater

WEATHER: 29 June 2011: cool, overcast, 15° C; 30 June 2011: cool, windy, 15-20° C; 1 July 2011: sunny, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-104A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384595.78 m E. 39367.07 m
GROUND SURFACE ELEVATION: 4.94 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-0.5	5.5	S-5	3-7-8-11 (15) 73%	4.85-6.0 m SILTY SAND, (SM), 80% sand, fine, subangular; 20% fines; dark greenish gray (5G 4/1) and black (N1), moist, weak HCl reaction, very loose to medium dense consistency, trace organics, trace iron oxide staining.	SM	5.40 - 5.42 m, Organic rich
		S-6	2-3-2-2 (5) 53%			
-1.0	6.0	S-7	1-1-1-2 (2) 45%	6.0-6.6 m Elastic silt, (mh), 100% fines, medium plasticity, no dilatancy; dark greenish gray (5G 4/1), dry, weak HCl reaction, mottled, soft consistency, trace organics.	mh	
-1.5	6.5					
-2.0	7.0	ST-2	100%	6.6-6.8 m Silty sand, (sm), 80% sand, fine, subangular; 20% fines; dark greenish gray (5G 4/1) and black (N1), moist, weak HCl reaction, very loose to medium dense consistency, trace organics, trace iron oxide staining.	sm	Change in lithology depth estimated as change occurred in shelby tube
-2.5	7.5	S-8	0-0-0-2 (0) 73%	6.8-8.3 m Peat, (pt), brownish black (5YR 2/1), organic odor, moist, Spongy to very loose consistency.	pt	0 = WOH 0 = WOH
-3.0	8.0	S-9	0-1-2-3 (3) 100%			
-3.5	8.5	S-10	0-0-0-0 (0) 100%	8.3-10.8 m LEAN CLAY, (CL), 100% fines, medium plasticity, low toughness; dark greenish gray (5G 4/1), organic odor, weak HCl reaction, lensed, very soft consistency, trace peat, laminated.	CL	0 = WOH
-4.0	9.0	ST-3	100%			
-4.5	9.5	S-11	0-0-0-0 (0) 100%			0 = WOH
-5.0						

DATE/TIME STARTED: 29 June 2011 / 15:00
DATE/TIME FINISHED: 01 July 2011 / 13:50
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid= Brackish Loocal Groundwater

WEATHER: 29 June 2011: cool, overcast, 15° C; 30 June 2011: cool, windy, 15-20° C; 1 July 2011: sunny, 15° C.

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REV 0 Boring KB-104A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384595.78 m E. 39367.07 m
GROUND SURFACE ELEVATION: 4.94 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		S-11			8.3-10.8 m LEAN CLAY, (CL), 100% fines, medium plasticity, low toughness; dark greenish gray (5G 4/1), organic odor, weak HCl reaction, lensed, very soft consistency, trace peat, laminated.	CL	0 = WOH
-5.5	10.5	S-12	0-0-0-3 (0) 100%				
-6.0	11.0	S-13	6-10-13-12 (23) 65%		10.8-12.0 m Poorly graded sand with silt, (sp-sm), 90% sand, fine to medium, subangular; 10% fines; dark greenish gray (5GY 4/1), strong HCl reaction, medium dense consistency, trace peat.	sp-sm	
-6.5	11.5	S-14	2-6-7-8 (13) 77%				
-7.0	12.0	S-15	0-2-3-5 (5) 73%		12.0-13.78 m SILTY CLAY, (CL-ML), 100% fines; olive gray (5Y 4/1) and grayish brown (5YR 3/2), organic odor, moist, weak HCl reaction, laminated, medium stiff to stiff consistency, trace organics.	CL-ML	0 = WOH
-7.5	12.5	S-16	0-2-6-12 (8) 75%				0 = WOH
-8.0	13.0	S-17	1-4-6-8 (10) 80%				
-8.5	13.5				13.78-13.8 m Peat, (pt), brownish black (5YR 2/1), organic odor, moist.	pt	
-9.0	14.0	ST-4	78%		13.8-14.3 m SILTY CLAY, (CL-ML), 100% fines; olive gray (5Y 4/1) and grayish brown (5YR 3/2), organic odor, moist, weak HCl reaction, laminated, medium stiff to stiff consistency, trace organics.	CL-ML	
-9.5	14.5	S-18	2-10-17-17 (27) 65%		14.3-15.0 m Poorly graded sand, (sp), 100% sand, fine to medium, subrounded; dark greenish gray (5GY 4/1), organic odor, moist, weak HCl reaction, medium dense consistency.	sp	Depth at upper contact estimated due to change occurring in shelby tube.
-10.0							

DATE/TIME STARTED: 29 June 2011 / 15:00
DATE/TIME FINISHED: 01 July 2011 / 13:50
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid= Brackish Loocal Groundwater

WEATHER: 29 June 2011: cool, overcast, 15° C; 30 June 2011: cool, windy, 15-20° C; 1 July 2011: sunny, 15° C.

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REV 0 Boring KB-104A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384595.78 m E. 39367.07 m
GROUND SURFACE ELEVATION: 4.94 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-10.5	15.5	S-19	2-3-8-10 (11) 67%	15.0-15.7 m Silt, (ml), fine to medium; 100% fines, non plastic; olive gray (5Y 4/1), organic odor, moist, weak HCl reaction, laminated, stiff consistency, trace organics, trace peat.	ml	0 = WOH
-11.0	16.0	S-20	0-3-9-16 (12) 58%	15.7-16.0 m Sandy organic soil, (ol/oh), silty to sandy peat.	ol/oh	
				16.0-16.42 m Poorly graded sand, (sp), 100% sand, fine, subrounded; olive gray (5Y 4/1), organic odor, moist, weak HCl reaction, laminated, medium dense consistency, trace peat.	sp	
-11.5	16.5	S-21	1-7-7-10 (14) 70%	16.42-17.4 m Elastic silt, (mh), 90% fines, low plasticity, rapid dilatancy; 10% sand, fine; dark greenish gray (5GY 4/1), moist, strong HCl reaction, laminated, stiff consistency, trace organics, glauconitic laminations, cm-scale, grades into a sp sand.	mh	0 = WOH
-12.0	17.0	S-22	0-4-9-11 (13) 73%			
-12.5	17.5	S-23	2-9-11-13 (20) 62%	17.4-21.75 m Poorly graded sand with silt, (sp-sm), 90% sand, fine to medium, subangular; 10% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, laminated, loose to medium dense consistency, trace organics.	sp-sm	
-13.0	18.0	S-24	1-2-6-11 (8) 62%			
-13.5	18.5	S-25	3-13-7-11 (20) 43%			
-14.0	19.0	S-26	4-10-16-20 (26) 48%			19.10 - 19.20 m, 30% silt, 70% sand
-14.5	19.5	S-27	1-3-4-5 (7) 73%			
-15.0						

DATE/TIME STARTED: 29 June 2011 / 15:00
DATE/TIME FINISHED: 01 July 2011 / 13:50
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid= Brackish Loocal Groundwater

WEATHER: 29 June 2011: cool, overcast, 15° C; 30 June 2011: cool, windy, 15-20° C; 1 July 2011: sunny, 15° C.

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REV 0 Boring KB-104A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384595.78 m E. 39367.07 m
GROUND SURFACE ELEVATION: 4.94 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.5	20.5	S-27	1-3-4-5 (7) 73%		17.4-21.75 m Poorly graded sand with silt, (sp-sm), 90% sand, fine to medium, subangular; 10% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, laminated, loose to medium dense consistency, trace organics.		
		ST-5	70%			sp-sm	21.00 - 21.60 m, S-28 lab classification SM
-16.0	21.0	S-28	1-2-3-5 (5) 78%				
-16.5	21.5	S-29	1-6-18-35 (24) 25%		21.75-23.4 m Poorly graded sand, (sp), 100% sand, medium, subangular; dark greenish gray (5GY 4/1), weak HCl reaction, medium dense to dense consistency, trace organics, some rock fragments, trace glauconite, 5% shells, fine to 1 cm, angular.		
-17.0	22.0	S-30	1-17-20-22 (37) 0%			sp	
-17.5	22.5	S-31	1-6-9-12 (15) 25%				
-18.0	23.0	S-32	1-3-6-17 (9) 53%		23.4-23.72 m Lean clay, (cl), 100% fines, high plasticity, medium dry strength, no dilatancy; olive gray (5Y 4/1), weak HCl reaction, laminated, stiff consistency.	cl	
-18.5	23.5				23.72-25.9 m Poorly graded sand, (sp), 100% sand, medium, subangular; dark greenish gray (5GY 4/1), weak HCl reaction, medium dense consistency, trace organics, some rock fragments, trace glauconite, 5% shells, fine to 1 cm, angular, contains lenses of lean clay (1-2 cm) as described at 23.40 m.		
-19.0	24.0	S-33	1-5-13-15 (18) 8%			sp	
-19.5	24.5	S-34	1-6-17-38 (23) 33%				24.75 - 24.80 m, Silty S-34 contains a partially fossilized seed, resembles an acorn, 1.5 cm in diameter
-20.0							

DATE/TIME STARTED: 29 June 2011 / 15:00
DATE/TIME FINISHED: 01 July 2011 / 13:50
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid= Brackish Loocal Groundwater

WEATHER: 29 June 2011: cool, overcast, 15° C; 30 June 2011: cool, windy, 15-20° C; 1 July 2011: sunny, 15° C.

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REV 0 Boring KB-104A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384595.78 m E. 39367.07 m
GROUND SURFACE ELEVATION: 4.94 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-20.5	25.5	S-34			23.72-25.9 m Poorly graded sand, (sp), 100% sand, medium, subangular; dark greenish gray (5GY 4/1), weak HCl reaction, medium dense consistency, trace organics, some rock fragments, trace glauconite, 5% shells, fine to 1 cm, angular, contains lenses of lean clay (1-2 cm) as described at 23.40 m.	sp	
		S-35	1-13-14-16 (27) 50%				
-21.0	26.0	S-36	2-15-14-18 (29) 83%		25.9-26.4 m Lean clay, (cl), 100% fines, low plasticity, low dry strength, no dilatancy; olive gray (5Y 4/1), dry, weak HCl reaction, very stiff consistency.	cl	25.95 - 26.0 m, Well graded sand with silt (sw-sm), 90% sand, fine, subangular; 10% fines' moist, weak HCl reaction
-21.5	26.5	S-37	1-12-18-21 (30) 72%		26.4-30.0 m Silty sand, (sm), 70% sand, fine to coarse, subangular; 20% fines; 10% gravel; olive gray (5Y 4/1), weak HCl reaction, laminated, medium dense to very dense consistency, trace glauconite, fine to coarse (1-3 cm) full shells and fragments of shells - up to 10-20%, 1-2 cm horizons of lean clay as described in previous unit.		1 cm silt horizon at 26.25 m, hard, dry, 5Y 7/2
-22.0	27.0	ST-6	100%				
-22.5	27.5	S-38	3-10-24-27 (34) 100%			sm	
-23.0	28.0	S-39	1-10-18-14 (28) 70%				
-23.5	28.5	S-40	16-20-25-19 (45) 77%				Borehole closure completed using Mikolit bentonite pellets for full depth and sand cover at surface, approximately 1.82 cubic meters used Borehole continues on KB-104
-24.0	29.0	S-41	3-22-34-30 (56) 78%				
-24.5	29.5						
-25.0							

---- Bottom of Boring at 30.00 m.----

DATE/TIME STARTED: 29 June 2011 / 15:00
DATE/TIME FINISHED: 01 July 2011 / 13:50
FIELD GEOLOGIST: GMK
CHECKED BY: Erich Zorn

DRILLING METHOD: Standard Penetration Testing (SPT) and Mud Rotary Drilling - 240 mm borehole, 35 mm SPT sample
DRILLING CO. BMNED/SMET DRILL RIG: Fraste MD/XL (GFR7) HAMMER ID: 14335

APPROVED BY: Mark Zatezalo

DRILLER: C. Sanean
HELPER(S): Kris Dijkmans

NOTES: PCR-GEO7, WOH = Weight of Hammer
Drilling Fluid= Brackish Loocal Groundwater

WEATHER: 29 June 2011: cool, overcast, 15° C; 30 June 2011: cool, windy, 15-20° C; 1 July 2011: sunny, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-105

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
5.0					0.0-1.5 m Hand Auger to 1.5 m. 0-10 ft R.D. = 30°, Strike = 45°, moderately spaced.		At 0 m on 14 June 2011; Field geologist: DAR, Driller: Nicholas Meeus
4.5	0.5						
4.0	1.0						
3.5	1.5	S-1	8-16-26 (42) 89%		1.5-4.14 m Well graded sand, (sw), 100% sand, fine to medium, subangular, spherical; dark greenish gray (5GY 4/1), organic odor, wet, weak HCl reaction, very loose to dense consistency, trace organics.	sw	
3.0	2.0	S-2	5-14-17 (31) 84%				
2.5	2.5	S-3	2-10-13 (23) 87%				
2.0	3.0	S-4	5-8-7 (15) 80%				
1.5	3.5	S-5	4-4-5 (9) 0%				
1.0	4.0	S-6	2-3-1 (4) 100%				
0.5	4.5	ST-1	100%		4.14-4.7 m Fat clay, (ch), 95% fines, high plasticity, medium dry strength, medium toughness; 5% sand, fine; dark greenish gray (5G 4/1), organic odor, moist, weak HCl reaction, homogeneous, soft consistency, little organics.	ch	
		S-7	2-9-7 (16) 80%			sw	

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: DAR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20° C; 15 June 2011: sunny, partly cloudy, 15-20° C; 16 June 2011: partly cloudy, rainly, 15° C; 17 June 2011: partly cloudy, windly, 15° C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-105

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
0.0		S-7		4.7-6.95 m Well graded sand, (sw), 95% sand, fine to medium, subangular, spherical; 5% fines; dark greenish gray (5GY 4/1) and greenish black (5GY 2/1), organic odor, moist, strong HCl reaction, homogeneous, very loose to medium dense consistency, little organics.		
	5.5	S-8	2-2-3 (5) 0%			
-0.5		S-9	4-12-16 (28) 71%			
	6.0				sw	
-1.0		S-10	2-6-11 (17) 73%			
	6.5					
-1.5		S-11	1-2-2 (4) 0%			
	7.0					0 = WOH
-2.0		S-12	0-1-2 (3) 89%	6.95-8.0 m Lean clay, (cl), 90% fines, medium plasticity, no dilatancy, low toughness; 10% sand, fine; dark greenish gray (5GY 4/1), organic odor, moist, strong HCl reaction, homogeneous, soft consistency, trace rock fragments.		
	7.5	ST-2	92%		cl	
-2.5						
	8.0					
-3.0		S-13	2-5-6 (11) 60%	8.0-8.55 m Peat, (pt), light brown (5YR 6/4) and dusky brown (5YR 2/2), organic odor, moist, no HCl reaction, Firm consistency, weak cementation.	pt	
	8.5					
-3.5		S-14	0-0-0 (0) 100%	8.55-9.53 m Elastic silt, (mh), 95% fines, high plasticity, low toughness; 5% sand, fine; dark greenish gray (5GY 4/1), organic odor, moist, weak HCl reaction, very soft consistency, trace organics.		0 = WOH At 8.55 m on 15 June 2011; Field geologist: EVZ/JML, Driller: Hugo Janssens
	9.0				mh	
-4.0		S-15	0-0-2 (2) 89%			0 = WOH
	9.5					
-4.5		S-16	4-7-11 (18) 82%	9.53-9.59 m Peat, (pt), greenish black (5GY 2/1), organic odor, moist.	pt sw	

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: DAR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Nicholas Meeus, Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

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REV 0 Boring KB-105

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	DESCRIPTION	USCS SYMBOL	REMARKS
-5.0				9.59-10.35 m Well graded sand, (sw), 95% sand, fine, subrounded, spherical; 5% fines; dark greenish gray (5GY 4/1), moist, weak HCl reaction, homogeneous, medium dense consistency.	sw	10.02 - 10.35 m, Overdilled, no sample recovery.
-5.5	10.5	ST-3	100%	10.35-11.52 m Silty sand, (sm), 80% sand, fine, subrounded, spherical; 20% fines; dark greenish gray (5GY 4/1), organic odor, moist, strong HCl reaction, homogeneous, medium dense consistency, trace organics.	sm	
-6.0	11.0	S-17	7-9-7 (16) 44%			
-6.5	11.5	S-18	1-2-5 (7) 73%	11.52-13.04 m SILTY CLAY WITH SAND, (CL-ML), 75% fines, medium plasticity, low dry strength, slow dilatancy, low toughness; 25% sand, fine; olive gray (5Y 4/1), organic odor, moist, strong HCl reaction, medium stiff to stiff consistency, trace organics.	CL-ML	
-7.0	12.0	S-19	2-4-10 (14) 89%			
-7.5	12.5	ST-4	89%			
-8.0	13.0	S-20	1-3-12 (15) 27%	13.04-13.55 m Silty sand, (sm), 80% sand, fine, subrounded, spherical; 20% fines; olive gray (5Y 4/1), organic odor, moist, strong HCl reaction, homogeneous, medium dense consistency, trace organics.	sm	
-8.5	13.5	S-21	10-26-27 (53) 76%	13.55-14.86 m Poorly graded sand, (sp), 95% sand, fine, subrounded, spherical; 5% fines; greenish gray (5GY 6/1) and dark greenish gray (5GY 4/1), organic odor, moist, strong HCl reaction, homogeneous, medium dense to very dense consistency, trace organics.	sp	
-9.0	14.0	S-22	2-14-36 (50) 71%			
-9.5	14.5	S-23	11-16-11 (27) 0%			
		S-24			ml	

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-10.0		S-24	2-4-6 (10) 76%		14.86-16.2 m Silt with sand, (ml), 75% fines, medium plasticity, low dry strength, slow dilatancy, low toughness; 25% sand, fine; olive gray (5Y 4/1) and grayish olive (10Y 4/2), organic odor, moist, strong HCl reaction, medium stiff to very stiff consistency, trace organics, becomes more sandy (fine grained) with depth, up to 45% (Alluvial).	ml	At 15.29 m on 15 June 2011; Field geologist: DAR/KDR, Driller: Nicholas Meeus 0 = WOH
-10.5	15.5	S-25	0-2-5 (7) 91%				
-11.0	16.0	S-26	2-6-16 (22) 93%				
		S-27	4-21-28 (49) 27%		16.2-19.5 m Poorly graded sand, (sp), 100% sand, medium, rounded, spherical, medium hardness; greenish gray (5GY 6/1) and dark greenish gray (5GY 4/1), organic odor, moist, strong HCl reaction, homogeneous, medium dense to dense consistency, trace organics, Silt, (Aeolian).	sp	
-11.5	16.5						
		S-28	1-8-18 (26) 0%				
-12.0	17.0						
		S-29	0-2-11 (13) 0%				
-12.5	17.5						
		S-30	5-14-27 (41) 0%				
-13.0	18.0						
		S-31	6-21-28 (49) 0%				
-13.5	18.5						
		S-32	1-2-11 (13) 0%				
-14.0	19.0						
		ST-7	100%				Change is estimated. occured in shelby tube.
-14.5	19.5						
		S-33	2-6-11 (17) 9%			sp	

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Hugo Janssens, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-15.0		S-33			19.5-21.05 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, medium hardness; 5% fines; dark greenish gray (5G 4/1) and dark greenish gray (5GY 4/1), organic odor, moist, strong HCl reaction, homogeneous, medium dense consistency, trace organics, 10% medium grained sand, 2-3 mm black organic rich lenses and stringers (Aeolian).	sp	
		S-34	5-12-16 (28) 71%				
-15.5	20.5						
		S-35	3-5-9 (14) 84%				
	21.0						
-16.0		S-36	0-1-4 (5) 78%		21.05-22.1 m Lean clay, (cl), 90% fines, medium plasticity, slow dilatancy, medium toughness; 10% sand, fine, well rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), organic odor, moist, strong HCl reaction, medium stiff consistency, (Marine).	cl	0 = WOH
	21.5						
-16.5		ST-8	100%				
	22.0						
-17.0		S-37	1-6-15 (21) 0%		22.1-23.5 m Poorly graded sand, (sp), 100% sand, medium, rounded, spherical, medium hardness; medium light gray (N6), wet, weak HCl reaction, homogeneous, loose to medium dense consistency, 15-20% shell fragments, Black particles of glauconite, (Littoral).	sp	At 22.43 m on 16 June 2011; Field geologist: EVZ/JML, Driller: Hugo Janssens See ST-9 for disturbed sample of S-38
	22.5						
-17.5		S-38	1-11-18 (29) 0%				
	23.0						
-18.0		S-39	1-2-8 (10) 0%				
	23.5						23.43 - 23.93 m, Grab 1 Sample
-18.5		S-40	8-20-22-24 (42) 0%		23.5-25.5 m Poorly graded sand with gravel, (sp), 50% gravel, fine, angular, flat, medium hardness; 50% sand, fine, subrounded, spherical; medium gray (N5) and brownish black (5YR 2/1), wet, weak HCl reaction, homogeneous, medium dense to dense consistency, little Glauconite to 5mm diam., gravel is shell fragments.		
	24.0						
-19.0		S-41	0-3-10-17 (13) 0%			sp	24.04 - 24.64 m, Grab 2 Sample 0 = WOH
	24.5						
-19.5		Grab3					24.64 - 25.14 m, Grab 3 Sample

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Nicholas Meeus, Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

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REV 0 Boring KB-105

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-20.0		Grab3				sp	0 = WOR
-20.5	25.5	S-42	0-7-11-12 (18) 50%				
					25.5-26.5 m CLAYEY SAND WITH GRAVEL, (SC), 40% gravel, fine, angular, flat, medium hardness; 40% sand, fine to medium, subrounded, spherical; 20% fines, medium plasticity; medium gray (N5), moist, weak HCl reaction, medium dense consistency, some 40 % shell fragments, trace fine glauconite particles.	SC	
-21.0	26.0	S-43	1-6-11-14 (17) 53%				
-21.5	26.5	S-44	1-6-12-16 (18) 70%				
					26.5-27.1 m Lean clay with sand, (cl), 85% fines, medium plasticity, medium dry strength, no dilatancy, medium toughness; 15% sand, fine to medium, subrounded, spherical; medium dark gray (N4), moist, weak HCl reaction, very stiff consistency, trace Glauconite particles.	cl	
-22.0	27.0	Grab4					26.94 - 27.44 m, Grab Sample 4
					27.1-30.3 m Poorly graded sand with clay, (sp-sc), 90% sand, fine to medium, subrounded, spherical, medium hardness; 10% fines; dark greenish gray (5GY 4/1) and grayish black (N2), moist, strong HCl reaction, homogeneous, very loose consistency, trace white Shell fragments, trace Glauconite grains, maximum grain size = 1 mm (Littoral).		
-22.5	27.5						0 = WOR
-23.0	28.0	S-45	0-0-3-17 (3) 43%				
-23.5	28.5	S-46	16-28-50/8 89%			sp-sc	HIgh blow counts on S-46 due to friction of rising sand and do not reflect density of material At 28.5 m, water lost to formation then ejected from top of casing At 28.61 m on 16 June 2011; Field geologist: DAR/KDR, Driller: Nicholas Meeus
-24.0	29.0	R1	95%				
-24.5	29.5	R2	100%				

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Hugo Janssens, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

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REV 0 Boring KB-105

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-25.0		R2	100%			sp-sc	
	30.5				30.3-30.56 m Poorly graded sand with gravel, (sp), 80% sand, medium to coarse, rounded, spherical, medium hardness; 20% gravel, fine to coarse, angular, flat and elongated, soft hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, maximum grain size = 30 mm, yellowish gray to medium gray shell fragments, abundance of shells varies with location (Littoral).	sp	
-25.5		R3	99%			gw	
	31.0				30.56-30.76 m Well graded gravel with sand, (gw), 55% gravel, fine to coarse, angular, flat and elongated, soft hardness; 45% sand, fine to coarse, rounded, spherical, medium hardness; light greenish gray (5G 8/1) and medium dark gray (N4), wet, strong HCl reaction, maximum grain size = 30 mm, gravel is shell fragments (Littoral).		
-26.0							
	31.5				30.76-33.17 m Well graded sand, (sw), 95% sand, fine to coarse, subangular, flat and elongated, medium hardness; 5% gravel, fine to medium, angular, flat and elongated, soft hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, maximum grain size = 30 mm, yellowish gray to medium gray shell fragments make most of sand grains, lenses and zones have gravel up to 30%, gravel is larger shell fragments (Littoral).		
-26.5		R4	100%			sw	
	32.0						
-27.0							
	32.5						
-27.5		R5	79%				
	33.0						
-28.0					33.17-39.87 m Poorly graded sand with silt, (sp-sm), 90% sand, fine to medium, well rounded, spherical, medium hardness; 10% fines, low plasticity; greenish black (5GY 2/1), no odor, moist, weak HCl reaction, homogeneous, trace Shell fragments, trace Fine gravel, (Marine).		33.17 m to termination depth, (Miocene) Breda Fm.
	33.5						
-28.5		R6	0%				
	34.0					sp-sm	
-29.0							34.19 - 35.19 m, No sample collected
	34.5						
-29.5							

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-105

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384394.58 m E. 38816.66 m
GROUND SURFACE ELEVATION: 5.11 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-30.0					33.17-39.87 m Poorly graded sand with silt, (sp-sm), 90% sand, fine to medium, well rounded, spherical, medium hardness; 10% fines, low plasticity; greenish black (5GY 2/1), no odor, moist, weak HCl reaction, homogeneous, trace Shell fragments, trace Fine gravel, (Marine).		
-30.5	35.5	R7	71%				
-31.0	36.0						36.19 - 36.54 m, Overdilled, no sample recovery.
-31.5	36.5						
-32.0	37.0	R8	0%				
-32.5	37.5	R9	100%			sp-sm	
-33.0	38.0						
-33.5	38.5	R10	100%				Borehole adandoned at 39.87 m depth due to caving/running sand, no control over borehole walls. Borehole closure completed using sand and Mikolit bentonite pellets, 4.73 cubic meters of material used.
-34.0	39.0						
-34.5	39.5	R11	0%		---- Bottom of Boring at 39.87 m.----		

DATE/TIME STARTED: 14 June 2011 / 22:00
DATE/TIME FINISHED: 17 June 2011 / 18:15
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: 14335

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: WOH = Weight of Hammer, WOR = Weight of Rods; Borehole was drilled with brackish local groundwater.

WEATHER: 14 June 2011: sunny, clear, 15-20º C; 15 June 2011: sunny, partly cloudy, 15-20º C; 16 June 2011: partly cloudy, rainly, 15º C; 17 June 2011: partly cloudy, windly, 15º C.

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:06 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
4.5	0.5				0.0-29.78 m Destructive drilling.		At 0 m on 20 June 2011; Field geologist: EVZ/JML, Driller: Hugo Janssens
4.0	1.0						See KB-105 Boring Log for 0.0 to 29.78 m soil description
3.5	1.5						
3.0	2.0						
2.5	2.5						
2.0	3.0						
1.5	3.5						
1.0	4.0						
0.5	4.5						

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
					0.0-29.78 m Destructive drilling.		
-0.5	5.5						
-1.0	6.0						
-1.5	6.5						
-2.0	7.0						
-2.5	7.5						
-3.0	8.0						
-3.5	8.5						
-4.0	9.0						
-4.5	9.5						

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:07 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
					0.0-29.78 m Destructive drilling.		
-5.5	10.5						
-6.0	11.0						
-6.5	11.5						
-7.0	12.0						
-7.5	12.5						
-8.0	13.0						
-8.5	13.5						
-9.0	14.0						
-9.5	14.5						

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	USCS SYMBOL	REMARKS

COORDINATES

N. 384398.32 m E. 38812.79 m

GROUND SURFACE ELEVATION: 5.02 m

HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

DESCRIPTION

0.0-29.78 m Destructive drilling.

-10.5 15.5
-11.0 16.0
-11.5 16.5
-12.0 17.0
-12.5 17.5
-13.0 18.0
-13.5 18.5
-14.0 19.0
-14.5 19.5

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20º C; 21 June 2011: partly cloudy, windy, 15º C; 22 June 2011: partly cloudy, windy, 10-15º C;

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
					0.0-29.78 m Destructive drilling.		
-15.5	20.5						
-16.0	21.0						
-16.5	21.5						
-17.0	22.0						
-17.5	22.5						
-18.0	23.0						
-18.5	23.5						
-19.0	24.0						
-19.5	24.5						

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
					0.0-29.78 m Destructive drilling.		
-20.5	25.5						
-21.0	26.0						
-21.5	26.5						
-22.0	27.0						
-22.5	27.5						
-23.0	28.0						
-23.5	28.5						
-24.0	29.0						
-24.5	29.5						
		R-1	100%			sp	

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20º C; 21 June 2011: partly cloudy, windy, 15º C; 22 June 2011: partly cloudy, windy, 10-15º C;

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-1	100%		29.78-33.2 m Poorly graded sand, (sp), 90% sand, fine to coarse, subangular, flat and elongated, medium hardness; 5% gravel, fine and coarse, angular, flat and elongated, soft hardness; 5% fines; olive gray (5Y 4/1) and dark greenish gray (5GY 4/1), moist, weak HCl reaction, homogeneous, maximum grain size = 40 mm, sand is up to 50% shell fragments, mostly medium grained, gravel is all shell fragments, 5% to 10% glauconite grains, quartz is rounded to subrounded, shell fragments are angular to subangular (Littoral).		29.78 - 33.33 m, (Pleistocene) Oosterhout Fm.
-25.5	30.5						
		R-2	100%				At 30.53 m on 20 June 2011; Field geologist: DAR/KDR, Driller: Nicholas Meeus
-26.0	31.0						
						sp	
-26.5	31.5	R-3	100%				
-27.0	32.0						
		R-4	100%				
-27.5	32.5						
						sp	
-28.0	33.0	R-5	97%		33.2-33.33 m Poorly graded sand, (sp), 100% sand, medium to coarse, angular, flat and elongated, medium hardness; greenish gray (5G 6/1), moist, strong HCl reaction, homogeneous, maximum grain size = 4 mm, sand is approximately 75% shell fragments. sand is 50% coarse grained, 5% to 10% glauconite grains, quartz is rounded to subrounded, shell fragments are angular to subangular (Marine).		33.33 - 68.45 m, (Miocene) Breda Fm.
-28.5	33.5						
					33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).	sp	
-29.0	34.0	ST-1	100%				
-29.5	34.5	R-6	100%				

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-6	100%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).		
-30.5	35.5	R-7	88%				
-31.0	36.0						
-31.5	36.5	R-8	100%				
-32.0	37.0						
-32.5	37.5	R-9	100%			sp	Light olive gray (5Y5/2) mottles present below 37.35 m due to higher quartz and clay content within mottle.
-33.0	38.0						
-33.5	38.5	R-10	94%				
-34.0	39.0						
-34.5	39.5	R-11	86%				
		R-12	100%				

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20º C; 21 June 2011: partly cloudy, windy, 15º C; 22 June 2011: partly cloudy, windy, 10-15º C;

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-35.5	40.5	R-12	100%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).	sp	At 43.9 m on 21 June 2011; Field geologist: EVZ/JML, Driller: Hugo Janssens
-36.0	41.0	R-13	100%				
-36.5	41.5	R-14	100%				
-37.0	42.0	R-15	100%				
-37.5	42.5	ST-2	100%				
-38.0	43.0	R-16	100%				
-38.5	43.5	R-17	100%				
-39.0	44.0	R-18	100%				
-39.5	44.5						

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: DAR/KDR, EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-18	100%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).		
-40.5	45.5	R-19	100%				
-41.0	46.0						
-41.5	46.5	R-20	100%				
-42.0	47.0						
-42.5	47.5	R-21	99%			sp	
-43.0	48.0						
-43.5	48.5	R-22	98%				
-44.0	49.0						
-44.5	49.5	R-23	96%				
		R-24					

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:07 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

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PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
			95%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).		
-45.5	50.5	R-24	95%				
-46.0	51.0						
		R-25	100%				
-46.5	51.5						
-47.0	52.0						
		R-26	100%				
-47.5	52.5					sp	
-48.0	53.0						
		R-27	100%				
-48.5	53.5						
-49.0	54.0						
		R-28	100%				
-49.5	54.5						
		R-29					

DATE/TIME STARTED: 20 June 2011 / 18:30
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FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

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CLIENT: DELTA ENERGY B.V.

COORDINATES
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GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-50.5	55.5	R-29	100%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).		
-51.0	56.0						
		R-30	96%				
-51.5	56.5						
-52.0	57.0						
		R-31	100%			sp	
-52.5	57.5						
-53.0	58.0						
		R-32	100%				
-53.5	58.5						
-54.0	59.0						
		R-33	100%				
-54.5	59.5						
		R-34					

DATE/TIME STARTED: 20 June 2011 / 18:30
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DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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PROJECT: 104472 KCB2
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COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-55.5	60.5	R-34	100% / 100%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).	sp	
-56.0	61.0						
-56.5	61.5	R-35	100%				
-57.0	62.0						
-57.5	62.5	R-36	100%				
-58.0	63.0						
-58.5	63.5	R-37	100%				
-59.0	64.0						
-59.5	64.5	R-38	100%				64.2 m, 2 cm clayey sand lense
		R-39					

DATE/TIME STARTED: 20 June 2011 / 18:30
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FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

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COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-60.5	65.5	R-39	100%		33.33-68.45 m Poorly graded sand, (sp), 95% sand, fine to medium, well rounded, spherical, medium hardness; 5% fines, low plasticity; dusky green (5G 3/2) and greenish black (5G 2/1), moist, weak HCl reaction, homogeneous, little 5 to 20 mm brown sand lenses, sand is about 50% quartz, 50% glauconite, less than 5% carbonate grains, soil has plasticity despite very low fines content (Marine).	sp	Large shell fragments at 65.05, 65.2, 65.34, 65.51, 66.10, 66.3, 66.6 m.
-61.0	66.0						
-61.5	66.5	R-40	100%				
-62.0	67.0						
-62.5	67.5	R-41	100%				At 67.9 m on 21 June 2011; Field geologist: DAR/KDR, Driller: Nicholas Meeus
-63.0	68.0						
-63.5	68.5	R-42	100%		68.45-72.67 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, little mica, (Marine).	ch	68.45 - 79.85 m, (Oligocene) Rupel Fm (Boom Clay) 69.69 - 68.77 m, 25 mm thick green sand layer (prior lithology) angled 55 degrees.
-64.0	69.0						
-64.5	69.5	R-43	100%				
		ST-3					

DATE/TIME STARTED: 20 June 2011 / 18:30
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FIELD GEOLOGIST: EVZ/JML, DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens, Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
			100%		68.45-72.67 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, little mica, (Marine).	ch	
		ST-3	100%				
-65.5	70.5						
		R-44	100%				
-66.0	71.0						
-66.5	71.5						
		R-45	100%				
-67.0	72.0						
-67.5	72.5				72.67-73.18 m Sandy fat clay, (ch), 50% sand, fine, rounded, spherical, soft hardness; 50% fines, medium plasticity, no dilatancy, medium toughness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, gradual transition to adjacent lithologies (Marine).	ch	
		R-46	100%		73.18-73.71 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, little mica, gradual transition to adjacent lithologies (Marine).	ch	
-68.0	73.0						
-68.5	73.5				73.71-74.28 m Sandy fat clay, (ch), 50% sand, fine, rounded, spherical, soft hardness; 50% fines, medium plasticity, no dilatancy, medium toughness; dark greenish gray (5GY 4/1), dry, weak HCl reaction, very stiff consistency, gradual transition to adjacent lithologies (Marine).	ch	
		R-47	100%		74.28-76.28 m Fat clay, (ch), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, little mica, trace sand, gradual transition to adjacent lithologies (Marine).	ch	
-69.0	74.0						
-69.5	74.5						
		R-48	100%				

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: DAR/KDR
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

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PROJECT: 104472 KCB2
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COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-70.5	75.5	R-48	100%		74.28-76.28 m Fat clay, (ch), 100% fines, high plasticity, no dilatancy, high toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, little mica, trace sand, gradual transition to adjacent lithologies (Marine).	ch	
-71.0	76.0	R-49	99%				
-71.5	76.5				76.28-77.16 m Silty clayey sand, (sc-sm), 75% sand, fine, rounded, spherical, soft hardness; 25% fines, medium plasticity, slow dilatancy, medium toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, homogeneous, gradual transition to adjacent lithologies (Marine).	sc-sm	
-72.0	77.0	R-50	91%				
-72.5	77.5	ST-4	100%		77.16-77.8 m Fat clay, (ch), 95% fines, high plasticity, no dilatancy, high toughness; 5% sand, fine, rounded, spherical, soft hardness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), dry, weak HCl reaction, very stiff consistency, little mica, gradual transition to adjacent lithologies (Marine).	ch	
-73.0	78.0	R-51	100%		77.8-78.89 m Poorly graded sand with silt, (sp-sm), 90% sand, fine, rounded, spherical, soft hardness; 10% fines, medium plasticity, slow dilatancy, low toughness; dark greenish gray (5GY 4/1) and dark greenish gray (5G 4/1), moist, strong HCl reaction, homogeneous, trace mica, and glauconite, (Marine).	sp-sm	Depth of change is estimated, occured in shelby tube.
-73.5	78.5						
-74.0	79.0	R-52	100%		78.89-79.65 m Sandy fat clay, (ch), 50% sand, fine, rounded, spherical, soft hardness; 50% fines, medium plasticity, no dilatancy, medium toughness; dark greenish gray (5GY 4/1), moist, weak HCl reaction, stiff consistency, little mica, percent of sand vs fines changes on cm scale, common glauconite sand grains (Marine).	ch	79.65 - 95.12 m, (L. Eocene to E. Oligocene) Zelzate Member of the Tongeren Fm. (Ruisbroek Sand)
-74.5	79.5	R-53	100%			sp	

DATE/TIME STARTED: 20 June 2011 / 18:30
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CHECKED BY: Erich Zorn

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DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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COORDINATES
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GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-53	100%		79.65-95.12 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, medium hardness; 5% fines, low plasticity, low dry strength, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), dry, weak HCl reaction, homogeneous, glauconite up to 30% of grain, glauconite grains are mostly fine sand size (Marine).		
-75.5	80.5						
		R-54	100%				
-76.0	81.0						
-76.5	81.5	R-55	100%				
-77.0	82.0						
-77.5	82.5	R-56	100%			sp	
-78.0	83.0						
		R-57	97%				
-78.5	83.5						
-79.0	84.0	R-58	97%				
-79.5	84.5						
		ST-5	100%				

DATE/TIME STARTED: 20 June 2011 / 18:30
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DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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GROUND SURFACE ELEVATION: 5.02 m
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ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		ST-5			79.65-95.12 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, medium hardness; 5% fines, low plasticity, low dry strength, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), dry, weak HCl reaction, homogeneous, glauconite up to 30% of grain, glauconite grains are mostly fine sand size (Marine).	sp	87.09 m, 8-15 mm thick seam of pure dolomite mineral, can be easily scratched with fingernail. weak reaction to 1 N HCl and strong reaction to 3 N HCl. At 87.81 m on 22 June 2011; Field geologist: EVZ/JML, Driller: Hugo Janssens
-80.5	85.5	R-59	100%				
-81.0	86.0						
-81.5	86.5	R-60	100%				
-82.0	87.0						
-82.5	87.5	R-61	100%				
-83.0	88.0						
-83.5	88.5	R-62	100%				
-84.0	89.0						
-84.5	89.5	R-63	100%				
		R-64	100%				

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APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Nicholas Meeus, Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

WEATHER: 20 June 2011: cloudy, rain, 15-20° C; 21 June 2011: partly cloudy, windy, 15° C; 22 June 2011: partly cloudy, windy, 10-15° C;

RIZZO KCB2 BORING LOG - RIZZO_GINT STD US_2010_03_31.GDT - 9/23/11 14:07 - P:\10-4472 DELTA NL\KCB2 BORING LOG FILES - GINT FILES\104472_GINT_PROJECT_FILE\104472_DRAFT FINAL.GPJ

Paul C. Rizzo Associates, Inc.
ENGINEERS/CONSULTANTS/CM

Paul C. Rizzo Associates, Inc
500 Penn Center Blvd. Suite 100, Pittsburgh, PA 15221
www.rizzoassoc.com

REV 0 Boring KB-105A

PROJECT: 104472 KCB2
CLIENT: DELTA ENERGY B.V.

COORDINATES
N. 384398.32 m E. 38812.79 m
GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
-85.5	90.5	R-64	100%		79.65-95.12 m Poorly graded sand, (sp), 95% sand, fine to medium, rounded, spherical, medium hardness; 5% fines, low plasticity, low dry strength, rapid dilatancy, low toughness; dark greenish gray (5GY 4/1) and grayish olive green (5GY 3/2), dry, weak HCl reaction, homogeneous, glauconite up to 30% of grain, glauconite grains are mostly fine sand size (Marine).	sp	93.56 - 93.66 m, 10 cm thick silty sand layer, contains approximately 20-30% fines
-86.0	91.0	R-65	100%				
-86.5	91.5						
-87.0	92.0	R-66	78%				
-87.5	92.5						
-88.0	93.0	R-67	100%				
-88.5	93.5						
-89.0	94.0	R-68	100%				
-89.5	94.5						
		R-69	100%				

DATE/TIME STARTED: 20 June 2011 / 18:30
DATE/TIME FINISHED: 22 June 2011 / 13:10
FIELD GEOLOGIST: EVZ/JML
CHECKED BY: Erich Zorn

APPROVED BY: Mark Zatezalo

DRILLING METHOD: SMET Soil Coring - 240 mm borehole, 100 mm core sample

DRILLING CO. BMNED/SMET DRILL RIG: Fraste FS300 (SMET ID: GFR2) HAMMER ID: N/A

DRILLER: Hugo Janssens
HELPER(S): Reginald Van Reeth, Bart Horemans, Joelle Guisand, Danny Driesen

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						sp	95.12 - 100.23 m, (L. Eocene to E. Oligocene) Zelzate Member of the Tongeren Fm (Watervliet Clay)
-90.5	95.5	R-69	100%		95.12-99.51 m Sandy fat clay, (ch), 50% sand, fine to medium, subrounded, spherical; 50% fines, medium plasticity, low dry strength, no dilatancy, low toughness; dark greenish gray (5GY 4/1) to dark gray (N3), no odor, dry, no HCl reaction, mottled, with glauconite, homogenous but mottled coloring.		
-91.0	96.0	ST-6	100%				
-91.5	96.5						
		R-70	100%				
-92.0	97.0						
-92.5	97.5					ch	
		R-71	100%				
-93.0	98.0						
-93.5	98.5						
		R-72	100%				
-94.0	99.0						
-94.5	99.5	R-73	100%			ch	

DATE/TIME STARTED: 20 June 2011 / 18:30
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NOTES: Drilling fluid was composed of local brackish groundwater, a viscosifier (Tunnel-Gel™ SW Viscosifier), and a modified natural cellulosic polymer (PAC™-L).

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COORDINATES
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GROUND SURFACE ELEVATION: 5.02 m
HORIZONTAL DATUM: RD New VERTICAL DATUM: NAP

ELEVATION (Meters)	DEPTH (Meters)	SAMPLE OR RUN NO.	BLOW/15cm & (N) OR %REC	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-73	100%		99.51-100.23 m Fat clay with sand, (ch), 80% fines, high plasticity, high dry strength, no dilatancy, high toughness; 20% sand, fine to medium, subrounded, spherical; greenish gray (5GY 6/1) to dark greenish gray (5GY 4/1), dry, strong HCl reaction, mottled, very stiff consistency, weak cementation, trace shell fragments.	ch	At 99.92 m, a 3 cm diameter inclusion of pale yellowish brown (10YR 6/2) clay with medium sand size shell particles
					---- Bottom of Boring at 100.23 m.----		Borehole closure completed using cement bentonite grout and tremie pipe.

DATE/TIME STARTED: 20 June 2011 / 18:30
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APPENDIX B

CPTu LOGS FROM MOS GROUNDMECHANICA B.V.

MOS GRONDMECHANICA

Subject	:	Factual report site investigation KCB2 CPT at BORSSELE
Commissioned by	:	Paul C. Rizzo Associates, Inc. T.a.v. Dhr. L. Dubinsky, 500 Penn Center Blvd., Suite 100 PA 15235 USA PITSSBURGH,
Author	:	ir. H.W. Thijssen (010 50 30 239)
File	:	R0041011-RH_1
Date	:	August 4, 2011

MOS GRONDMECHANICA B.V.

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Kalanderstraat 10a	P.O. Box	153	NL-7460 AD Rijssen	Tel. No.	+31 548 512363
Gyroscoopweg 120			NL-1042 AZ Amsterdam	Tel. No.	+31 20 7537984
Ds Martin Luther Kingweg 150			district Wanica Suriname	Tel. No.	+597-488188

MOS

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2.1 Magneto cone tests 3

2.2 Cone Penetration Tests (CPTu's) 3

2.3 Dissipation 3

2.4 CPM 4

2.5 Surveying 4

Annex A CPTu

Annex B Dissipation tests

Annex C Results CPM

MOS GRONDMECHANICA

1. INTRODUCTION

This report contains the results of a soil investigation program that is carried out at Borssele (project KCB2 CPT).

The in situ tests were carried out in June and July 2011.

The testing program has been determined by the principal.

2. SOIL INVESTIGATION

2.1 Magneto cone tests

Prior to the execution of the CPTu's a testing with a magneto cone has been performed. In real-time, during the test, the data has been evaluated. At none of the locations an anomaly has been detected which could indicate unexploded shells.

The locations are predrilled up to 1.5m.

2.2 Cone Penetration Tests (CPTu's)

In the period of June and July 2011 the CPTu's several CPTu's are carried out until 60 m below ground level (GL) or refusal.

The locations are predrilled up to 1.5m. Over this distance no cone resistances are available.

The CPTu's are carried out in accordance with the Dutch standard NEN 5140 and ASTM D5778-07 using an electrical cone and an electrical friction sleeve; the filter for the pore pressure is situated behind the cone (u_2). During the execution of the CPTU's the cone resistance, the local friction and the pore water pressure are recorded every 20 mm.

An overview of the CPTu's and the CPTu graphs are presented in annex A, including the measured and derived parameters. The graphs are constructed with the program CPTask.

2.3 Dissipation

During the CPTu's several dissipation tests have been performed. Most of the tests concern short tests to verify the correctness of the pore pressure meter. According to the quality system of Mos Grondmechanica one dissipation test per CPTu should be performed. These tests have also been performed as a reaction on the observed negative pore pressures (pressures below atmospheric pressure) encountered in the deeper layers. The tests confirm the good working order of the pore pressure meter; the phenomenon of negative pore pressures must be allocated to the soil. The negative pore pressures can be caused by dilatancy. Also possible is that at some point cavitation occurs after which the pore pressure meter is not anymore fully saturated.

Four dissipation tests are executed during a longer period. Two tests are suitable for the determination of the coefficient of consolidation and the coefficient of permeability. The results are given in the plots of these dissipation tests.

The dissipation tests are included in annex B.

2.4 CPM

At two locations (kcpt7 and kcpt17) a CPTu with the CPM apparatus behind the cone has been performed. In total 7 CPM tests are executed. The results are given in annex C. The parameters are derived with the program of Cambridge InSitu.

After the last test at kcpt17 the cone has been pushed several meters deeper into soil with a high cone resistance and sleeve friction; this has caused severe damage to the CPM apparatus so no further CPM tests at other locations has been performed.

With the parameters no reliable relative density could be derived.

2.5 Surveying

Surveying and levelling has not been commissioned to Mos Grondmechanica. Mos Grondmechanica has not received information about the positioning or levelling. All tests are therefore presented with reference to ground level.

ir. H.W. Thijssen (010 50 30 239)

Rhoon, August 4, 2011

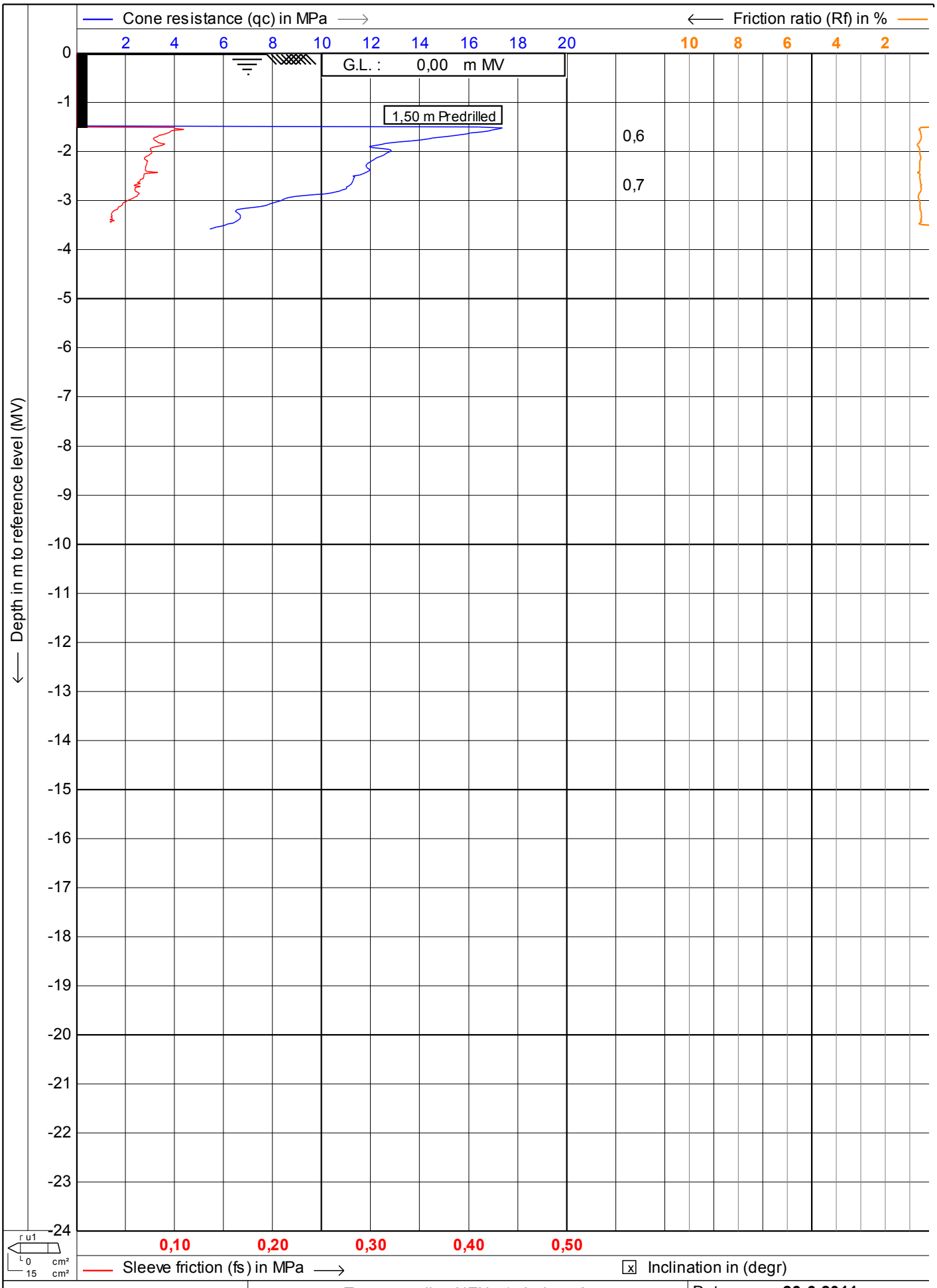
Mos Grondmechanica B.V.

Checked by : A.K.

Annex A
CPTu

CPTu

ProjectNo	order	SondeerNo	GL	Truck	Date	Time	depth m-GL	length m	Predrilled m	Cone
0041011	7	kcpt1a	0,00	11	22-06-2011	8:23:30	-3,58	3,58	1,50	S15CFIP481
0041011	8	kcpt1b	0,00	11	22-06-2011	8:45:33	-31,15	31,15	1,50	C10CFIP416
0041011	9	kcpt1c	0,00	11	22-06-2011	10:02:46	-60,13	60,13	1,50	S15CFIP481
0041011	10	kcpt2a	0,00	11	22-06-2011	12:58:27	-60,02	60,02	1,50	S15CFIP481
0041011	11	kcpt3a	0,00	11	21-06-2011	8:51:35	-39,15	39,15	1,50	S15CFIP.481
0041011	12	kcpt3b	0,00	11	21-06-2011	10:55:57	-60,81	60,81	1,50	S15CFIP.481
0041011	13	kcpt4a	0,00	11	21-06-2011	14:23:53	-60,21	60,21	1,50	S15CFIP.481
0041011	18	kpct5	0,00	11	24-06-2011	8:10:39	-60,01	60,01	1,50	S15CFIP481
0041011	14	kcpt6	0,00	11	08-07-2011	9:03:41	-36,18	36,18	1,50	S15CFIP481
0041011	15	kcpt7	0,00	11	06-07-2011	16:51:20	-31,27	31,27	1,50	C15CFIP.971
0041011	16	kcpt8a	0,00	11	27-06-2011	8:10:23	-60,01	60,01	1,50	S15CFIP481
0041011	1	kcpt10c	0,00	11	27-06-2011	13:34:37	-60,02	60,02	1,50	S15CFIP481
0041011	2	kcpt11	0,00	11	28-06-2011	12:54:59	-5,24	5,24	1,50	S15CFIP481
0041011	17	kctp11b	0,00	11	06-07-2011	7:56:37	-60,01	60,01	1,50	S15CFIP.481
0041011	3	kcpt12	0,00	11	05-07-2011	8:19:05	-37,00	37,00	1,50	S15CFIP481
0041011	4	kcpt12b	0,00	11	05-07-2011	11:27:27	-60,01	60,01	1,50	S15CFIP481
0041011	5	kcpt13	0,00	11	28-06-2011	8:12:36	-60,07	60,07	1,50	S15CFIP481
0041011	6	kcpt17	0,00	11	07-07-2011	10:48:58	-38,62	38,62	1,50	C15CFIP971



MOS GRONDMECHANICA

MOS
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3160 AA Rhoon
Tel: 010 - 50 30 200
Fax: 010 - 50 13 656
info@mosgeo.com
www.mosgeo.com

Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

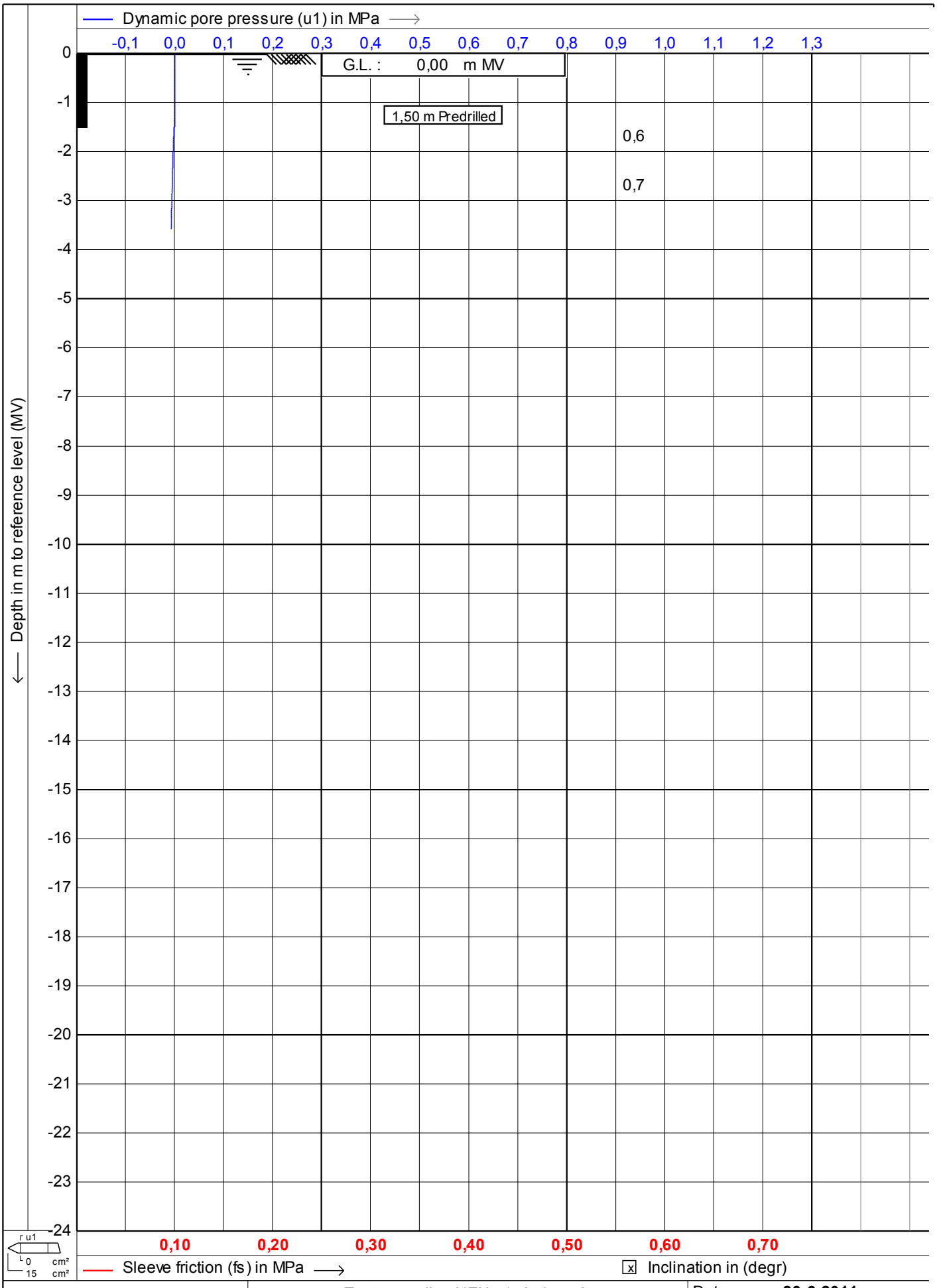
Date : **23-6-2011**

Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt1a** 1/4

CPTask V1.14



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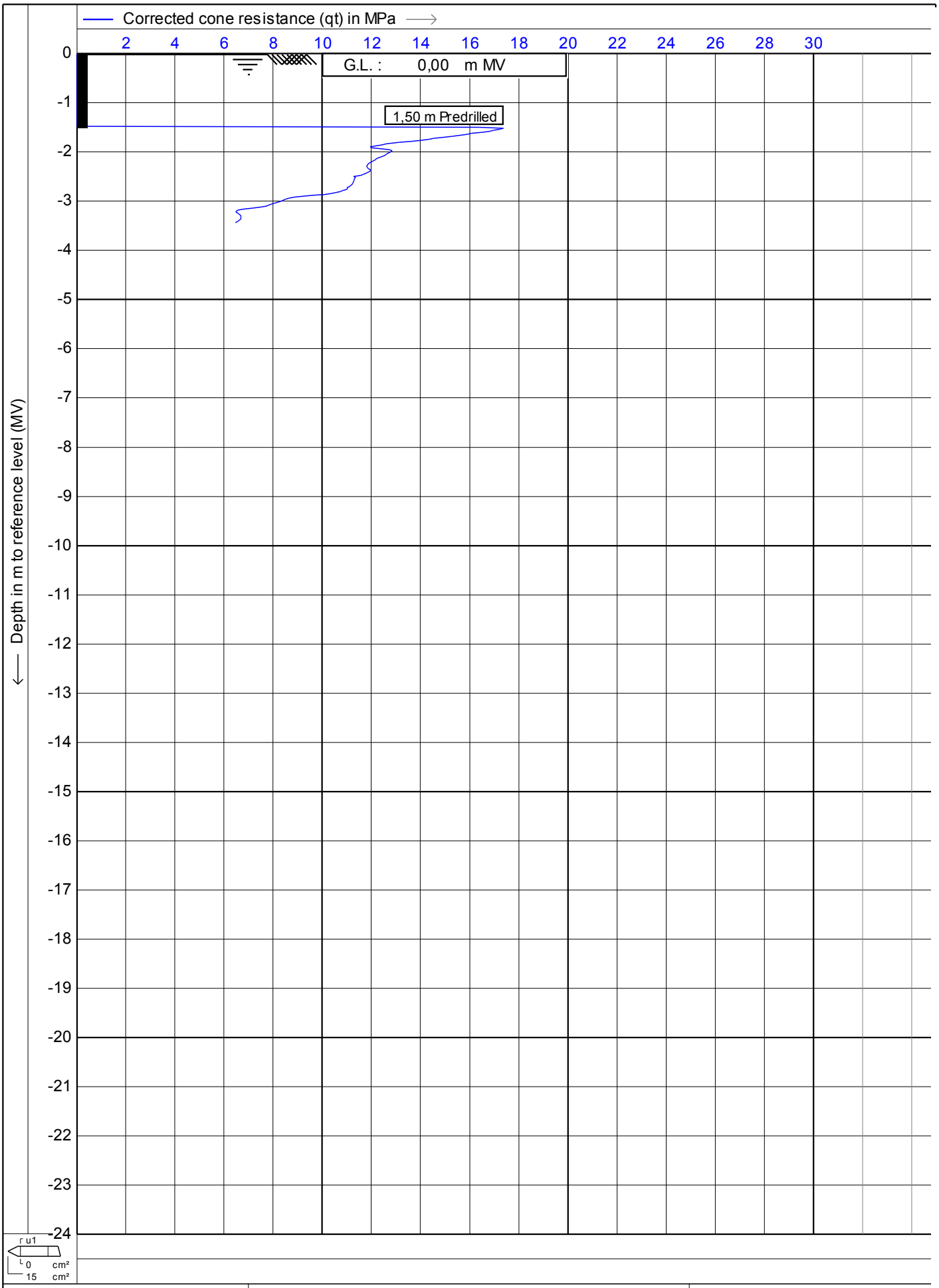

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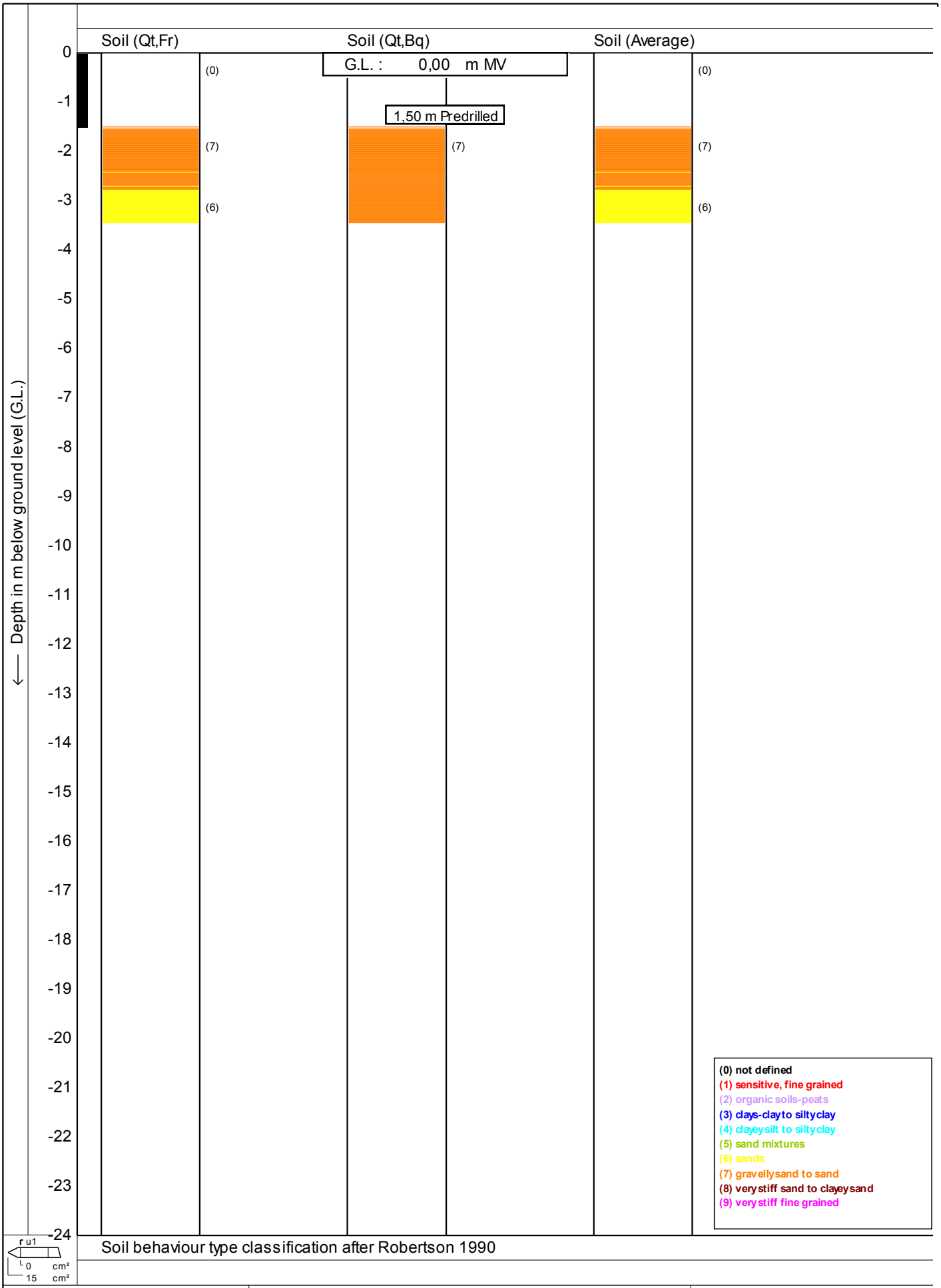

Soil behaviour type classification after Robertson 1990

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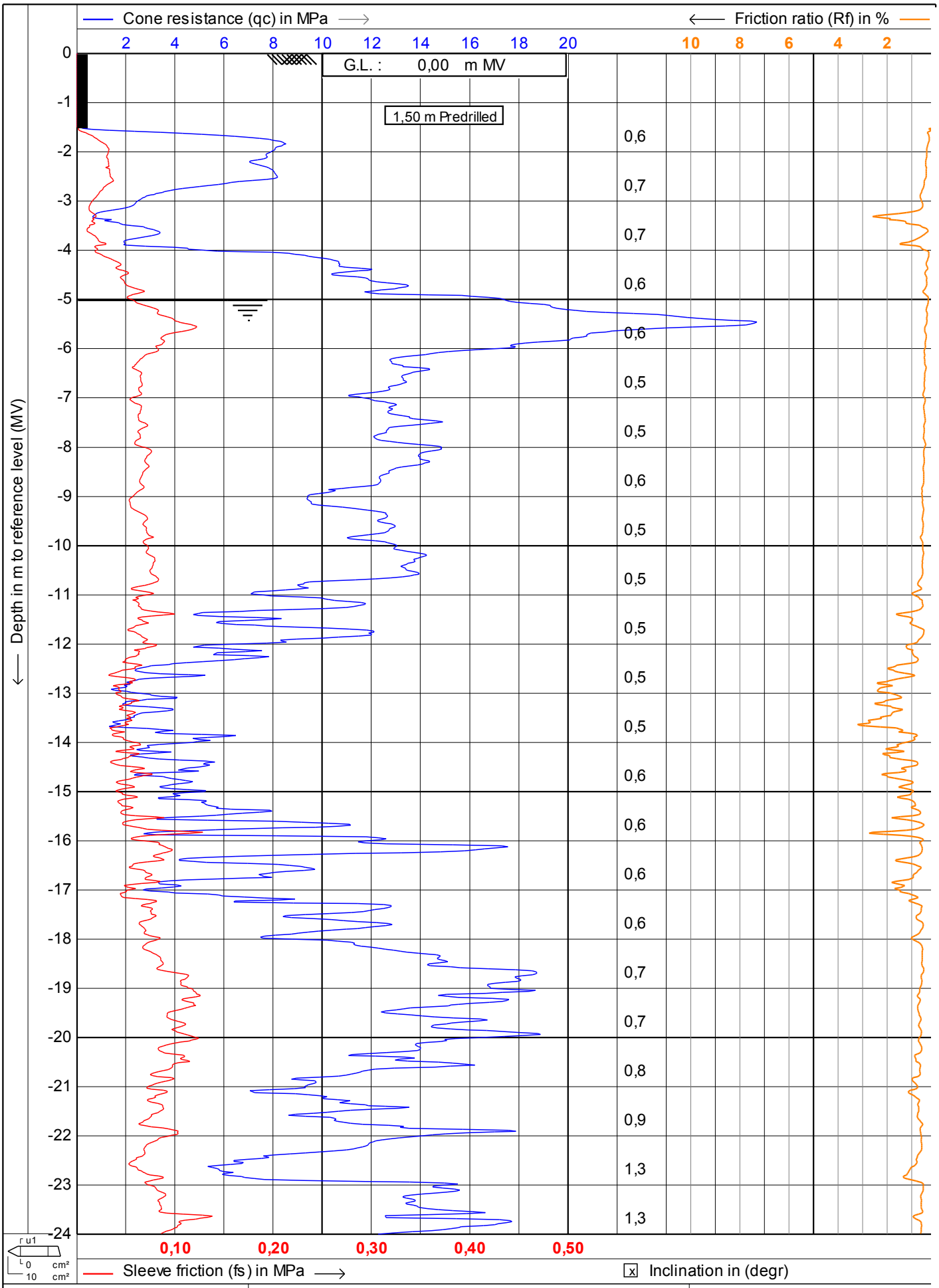

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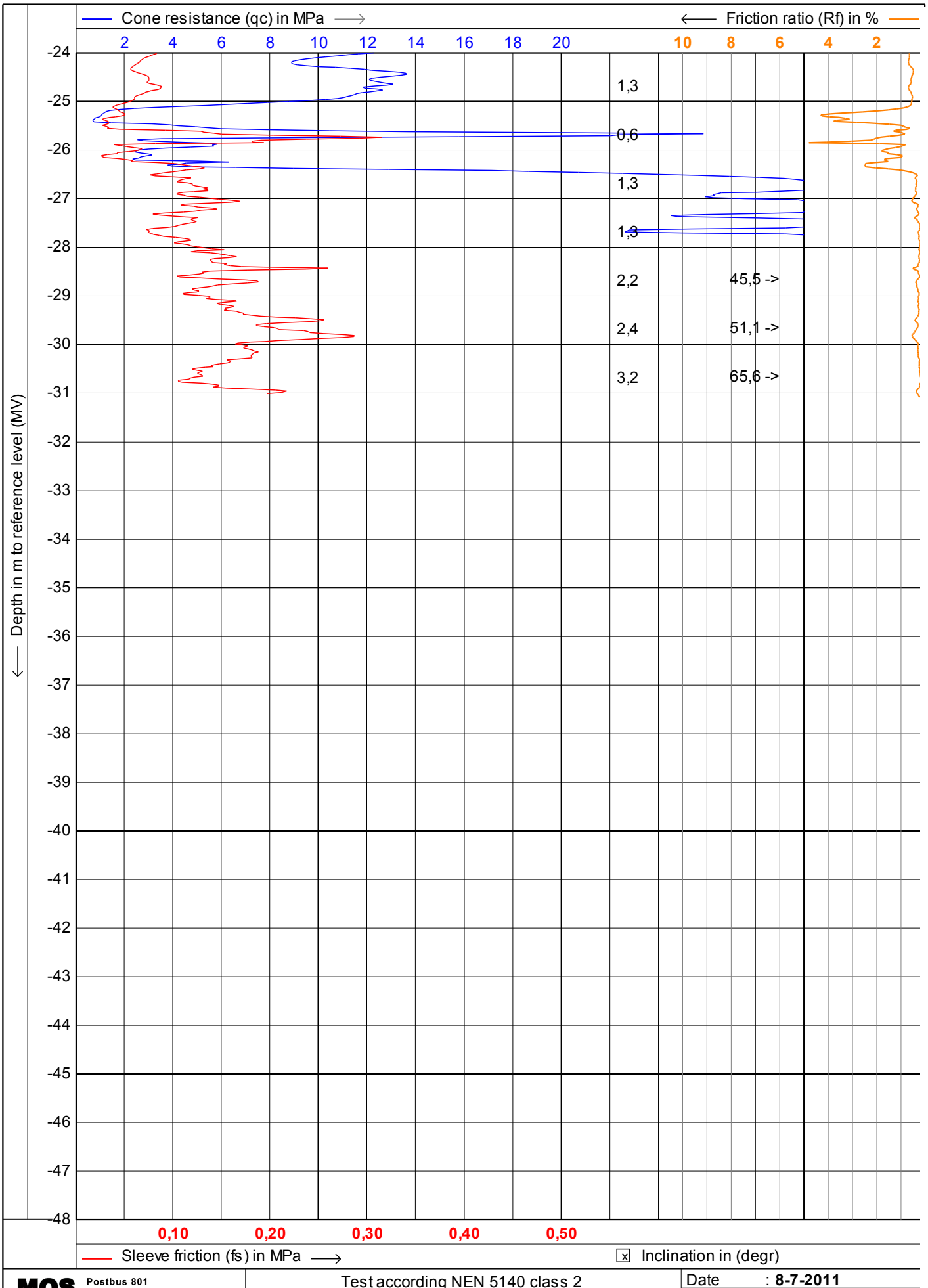
Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **C10CFIP416**
Project no. : **0041011**
CPT no. : **kcpt1b** 1/8

CPTask V1.14



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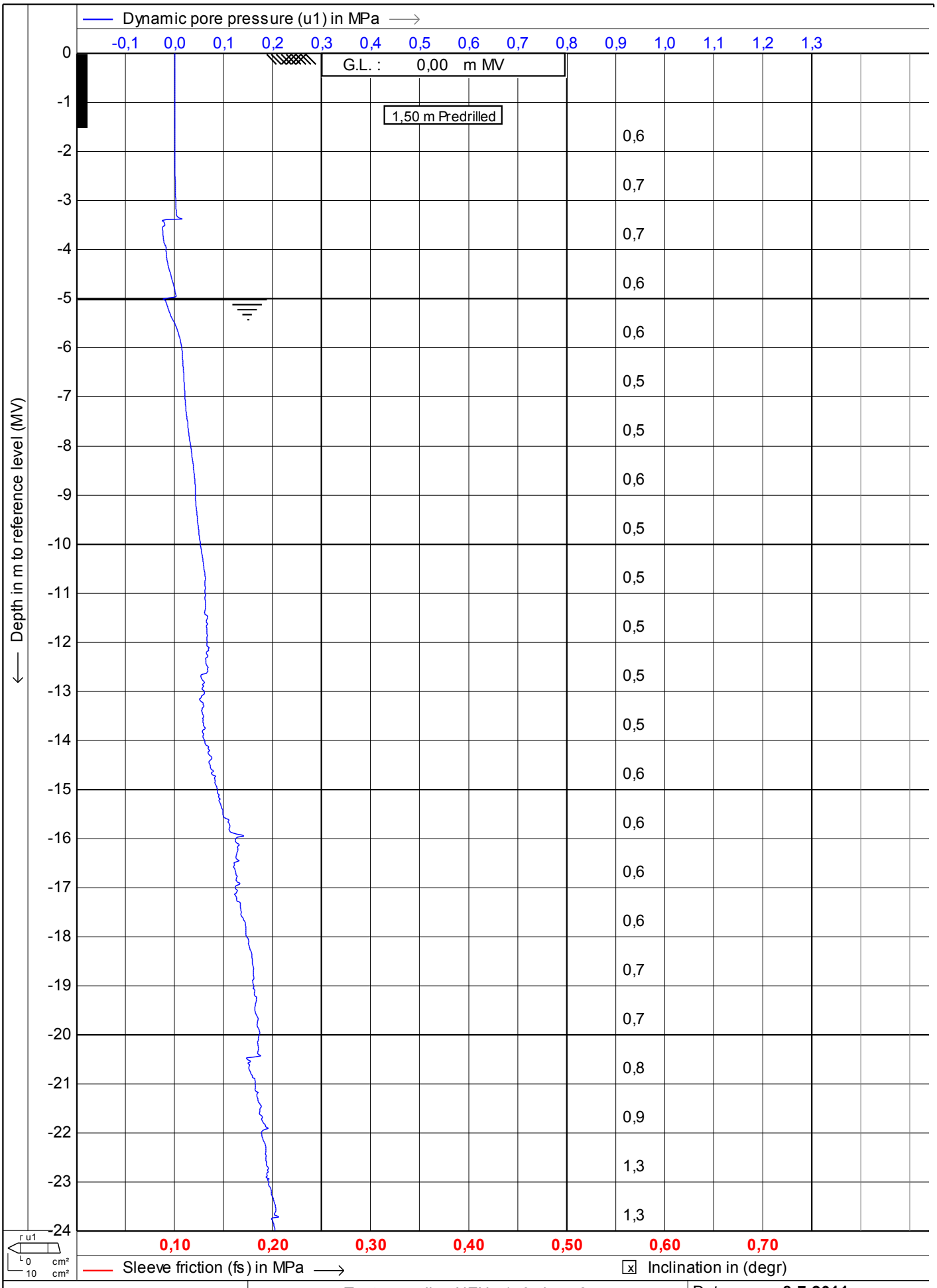

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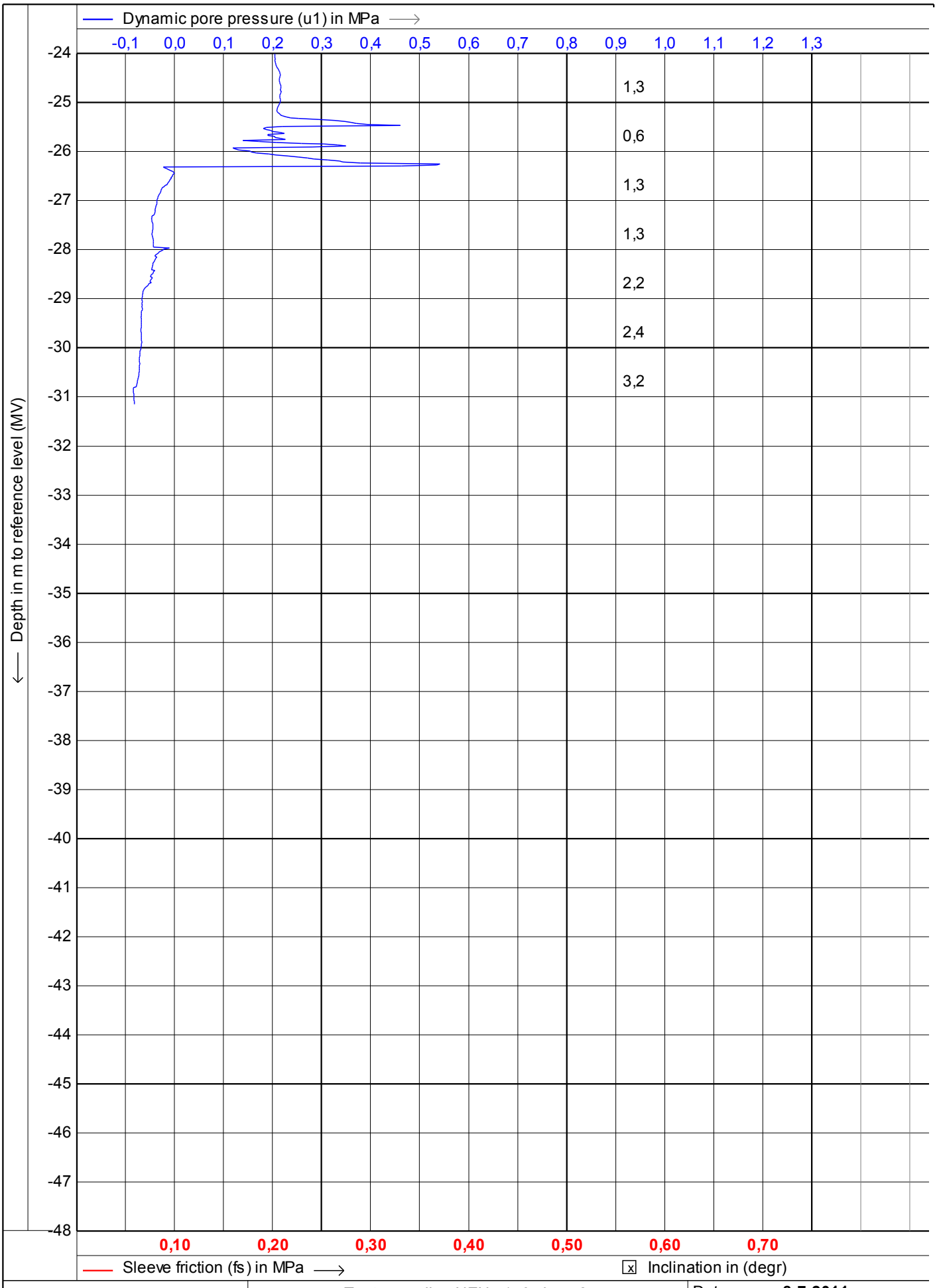

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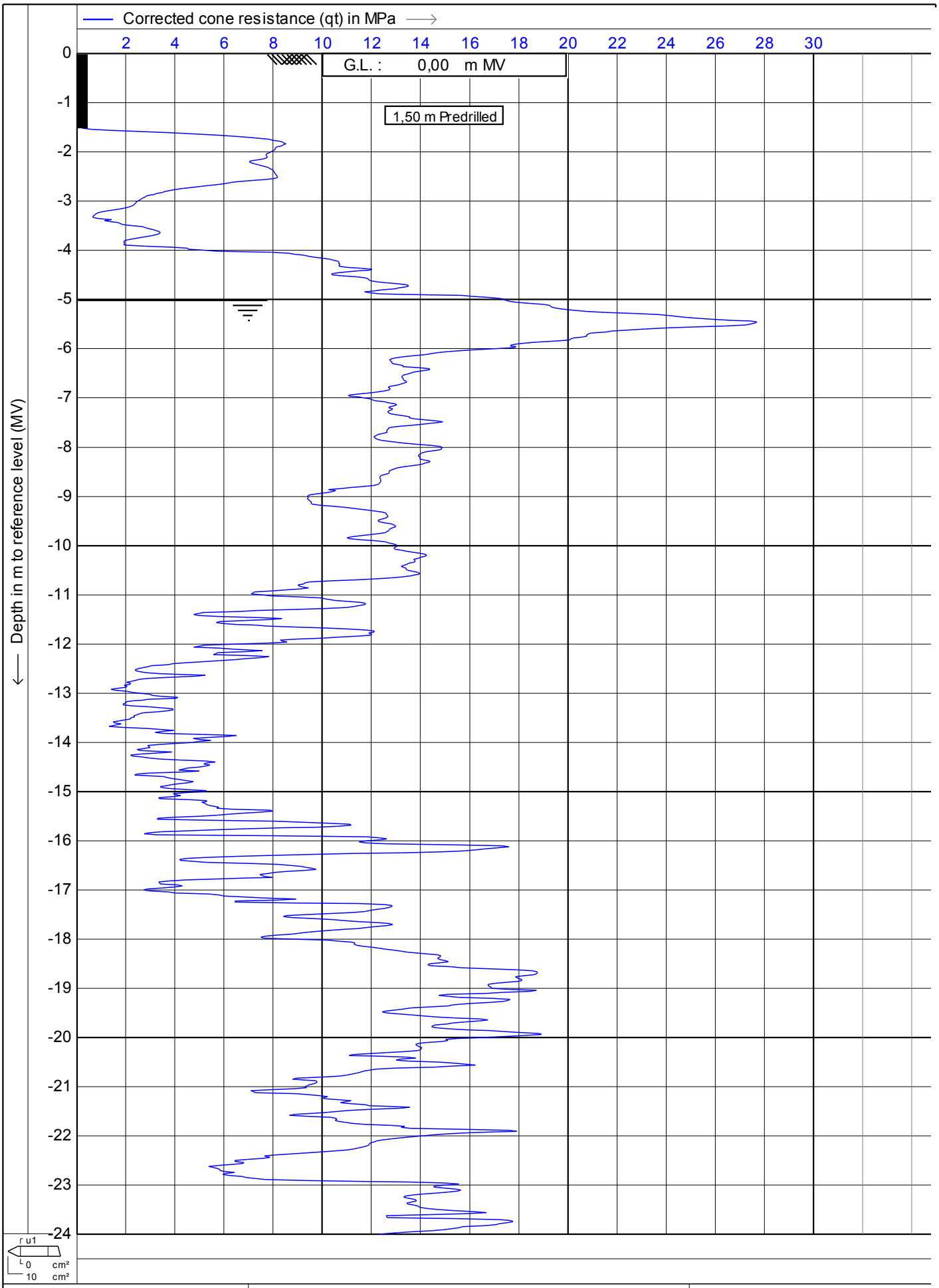

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CPTask V1.14

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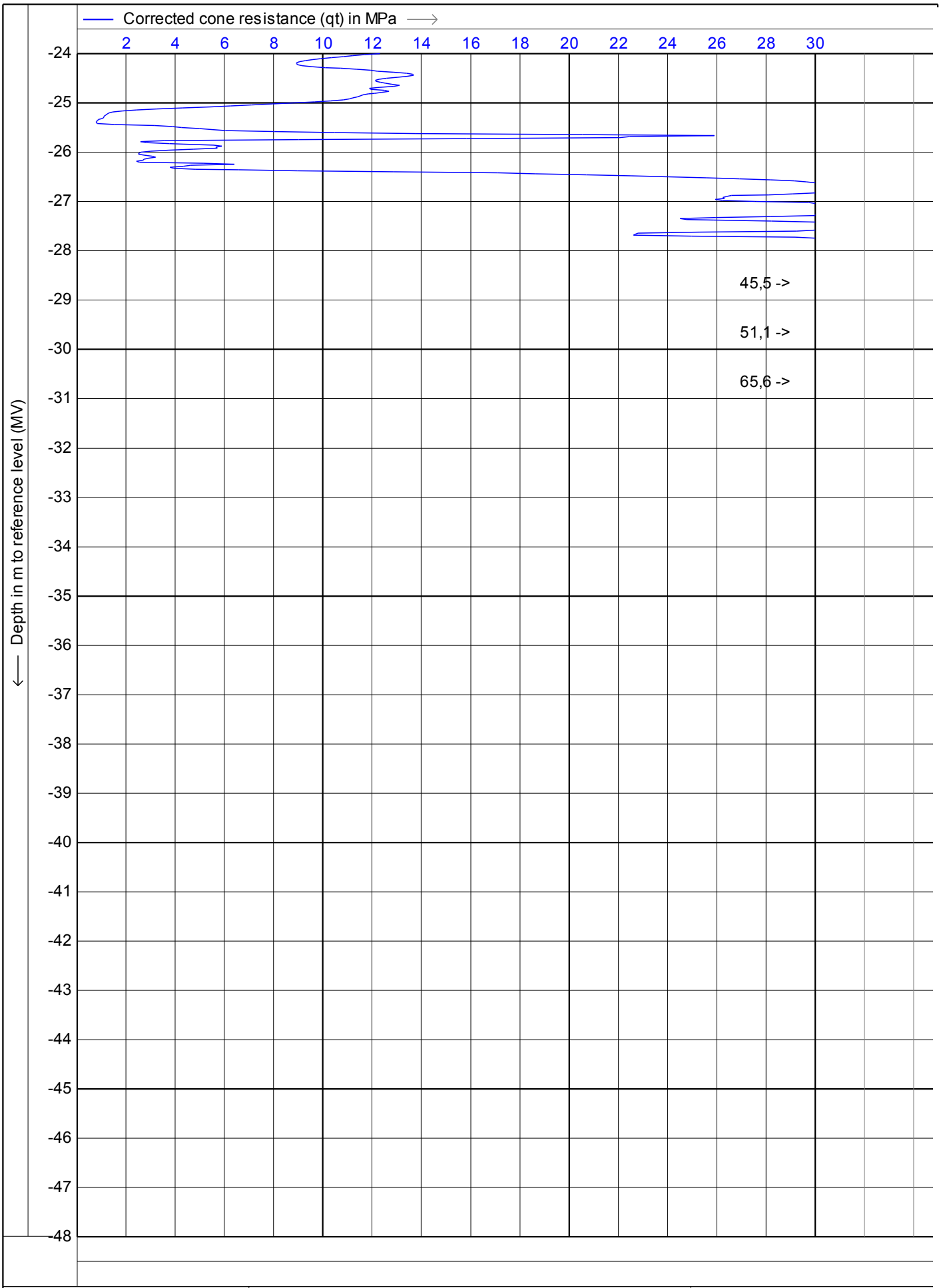

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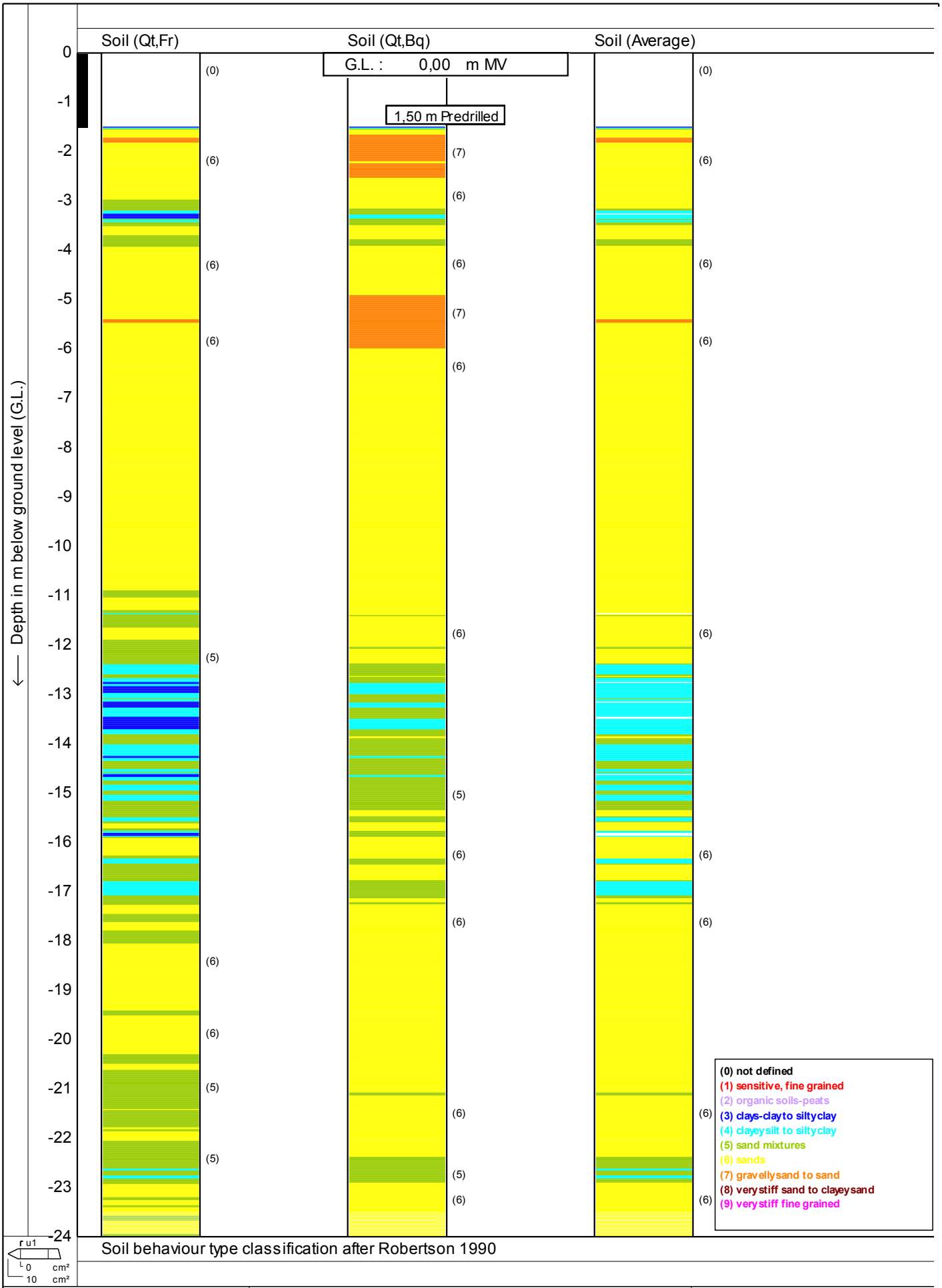

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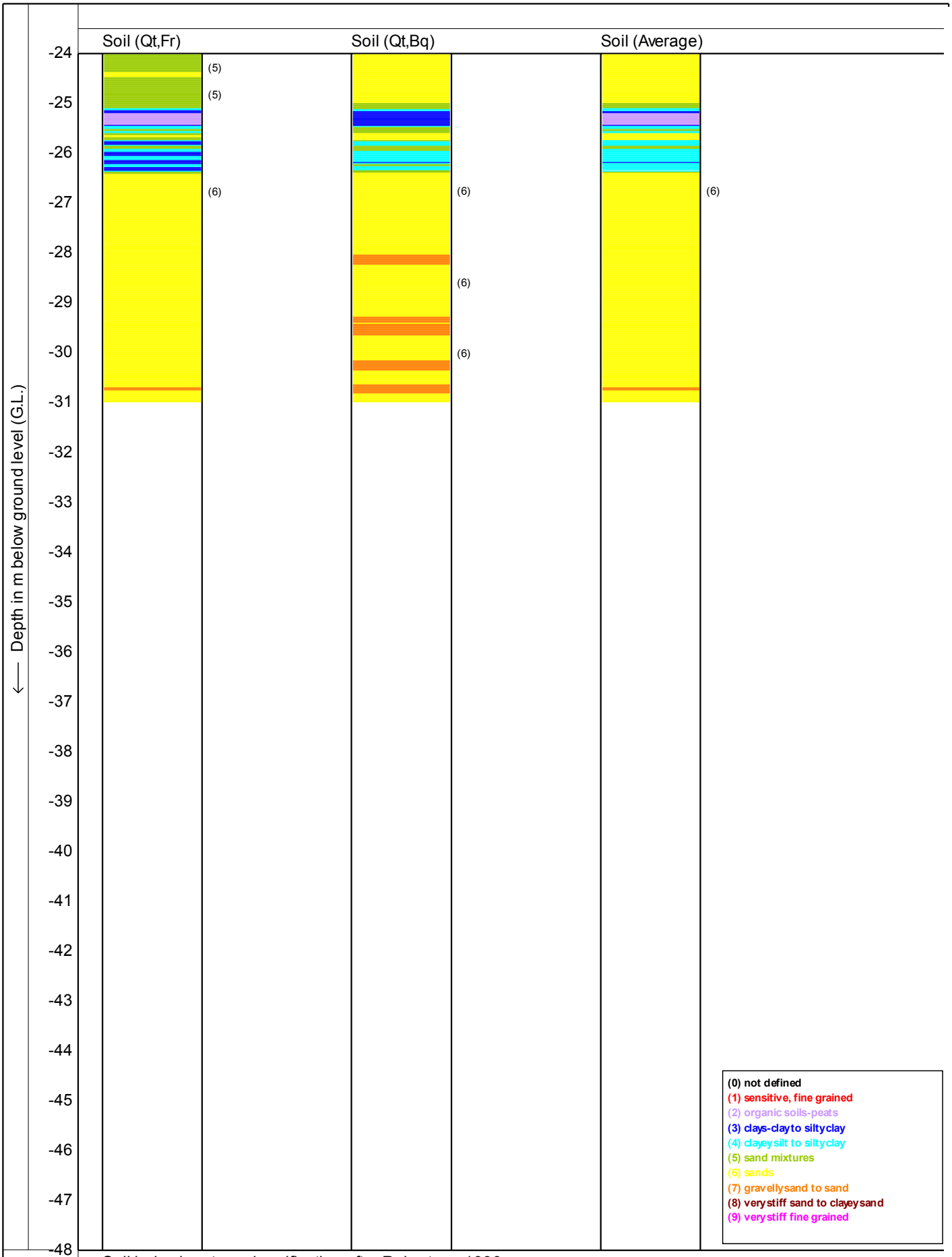
CPT no. : **kcpt1b** 7/8

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**

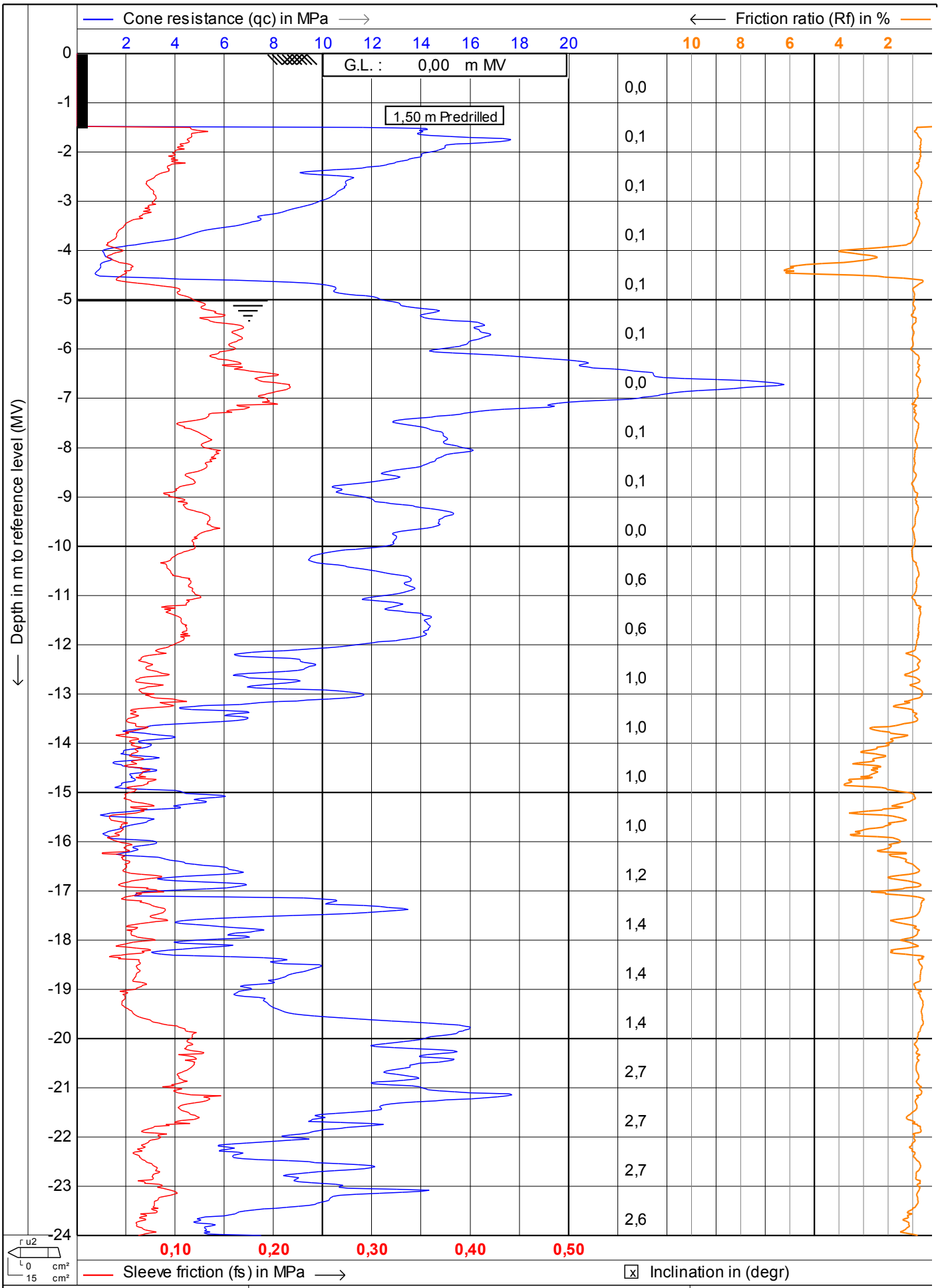
Cone no. : **C10CFIP416**

Project no. : **0041011**

CPT no. : **kcpt1b** **8/8**

CPTask V1.14

MOS GRONDMECHANICA



MOS GRONDMECHANICA

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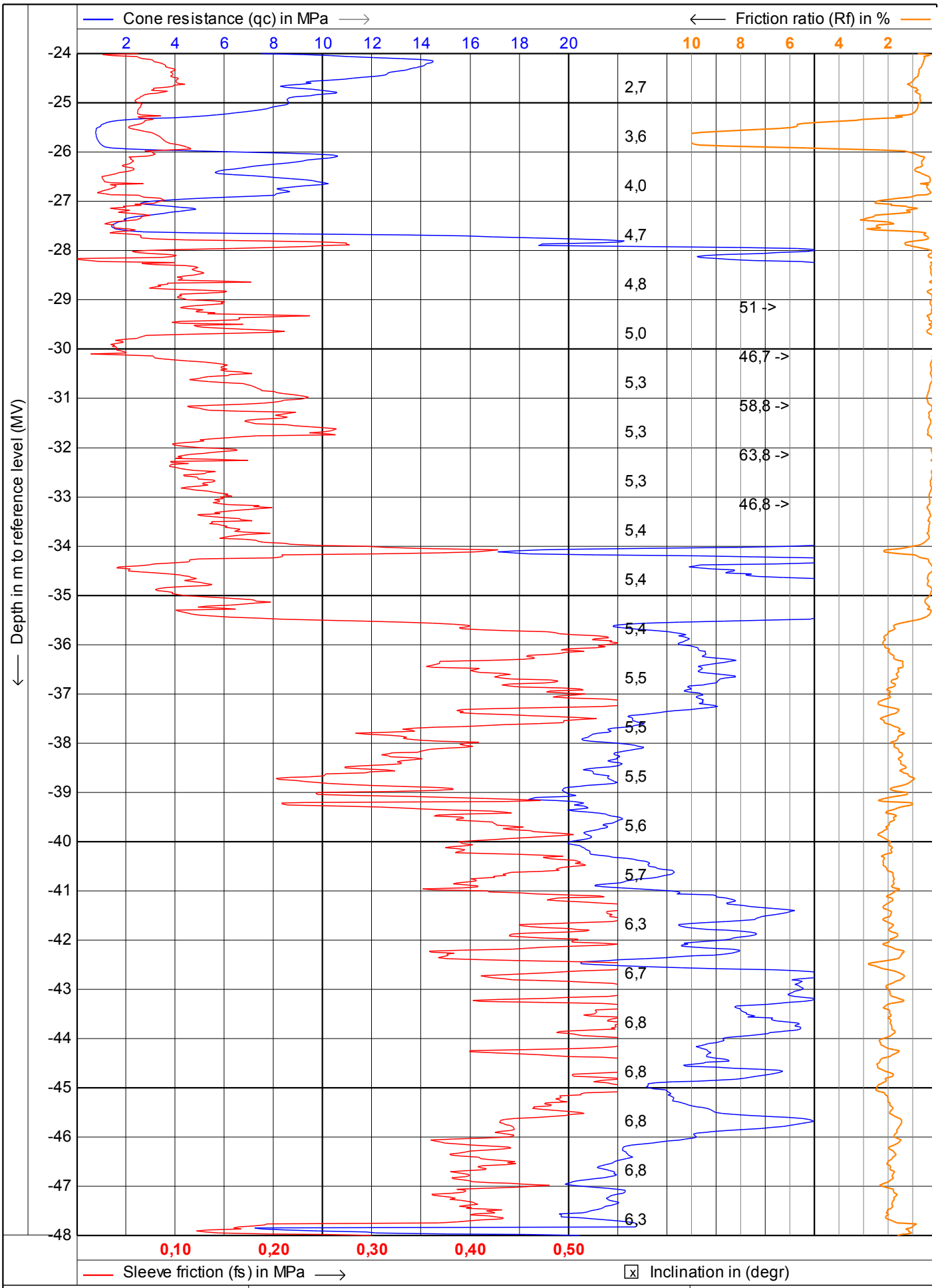
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt1c** 1/12

CPTask V1.14



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Test according NEN 5140 class 2

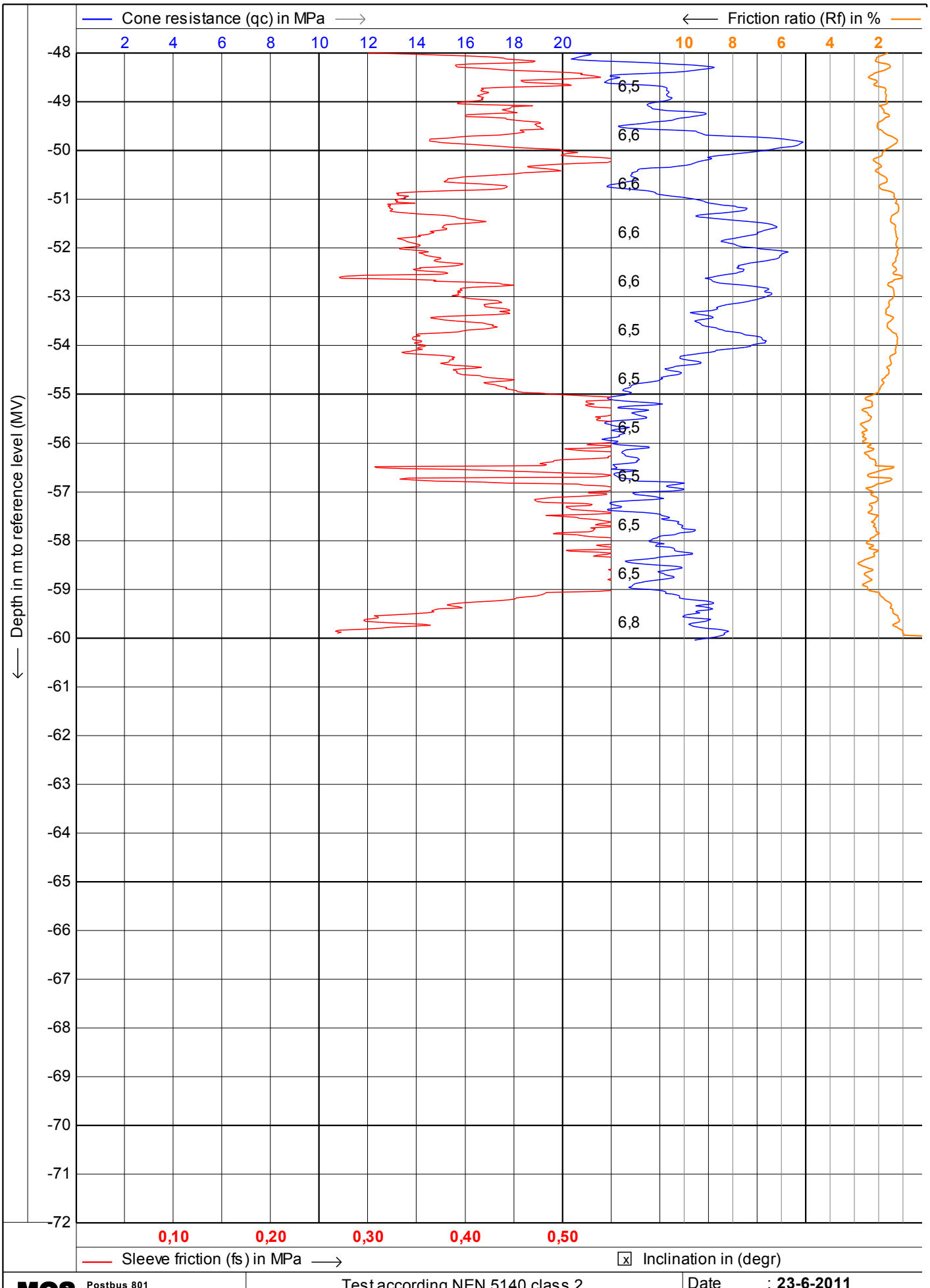
Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt1c** **2/12**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

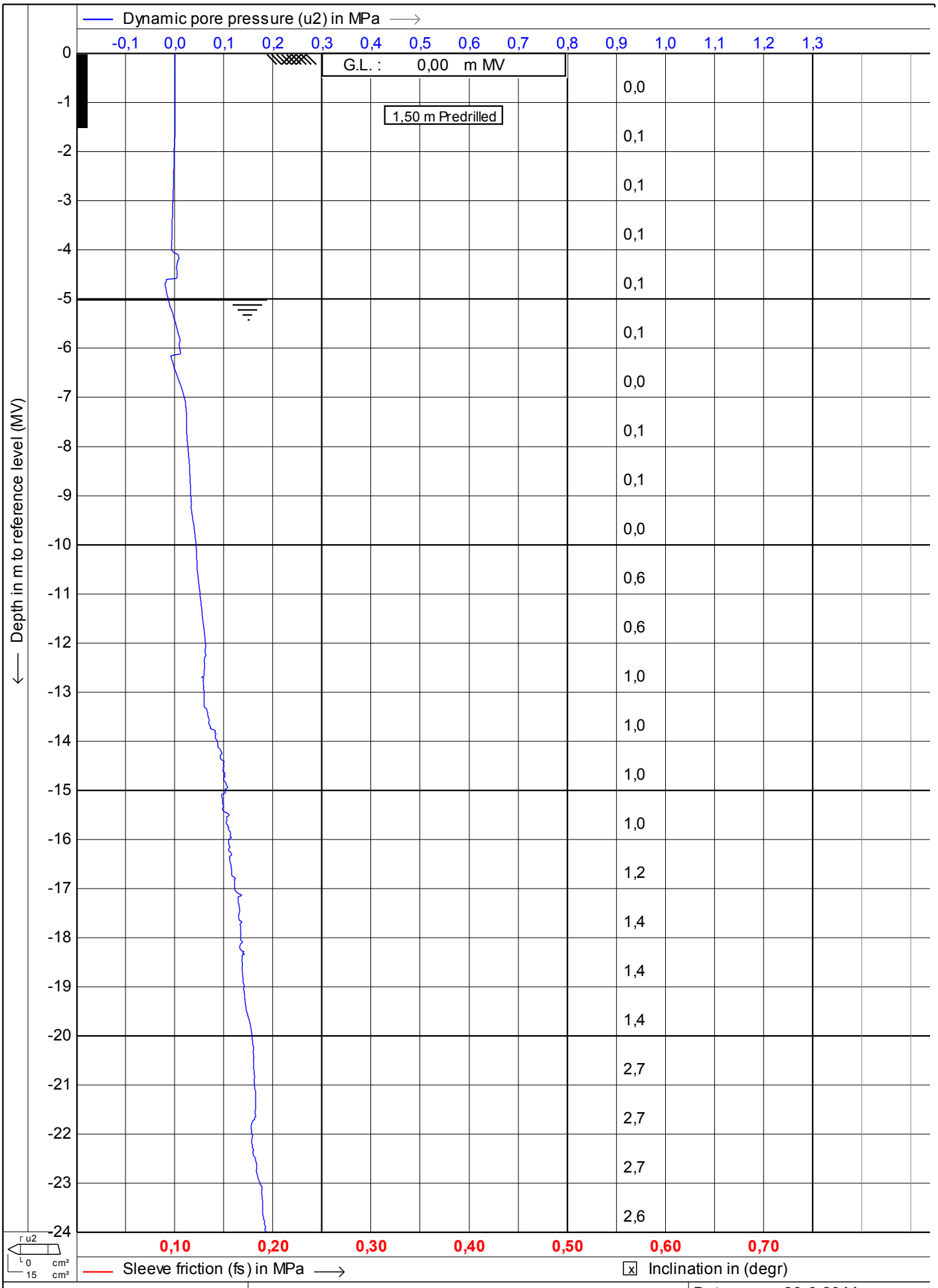
Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt1c** 3/12

CPTask V1.14

MOS



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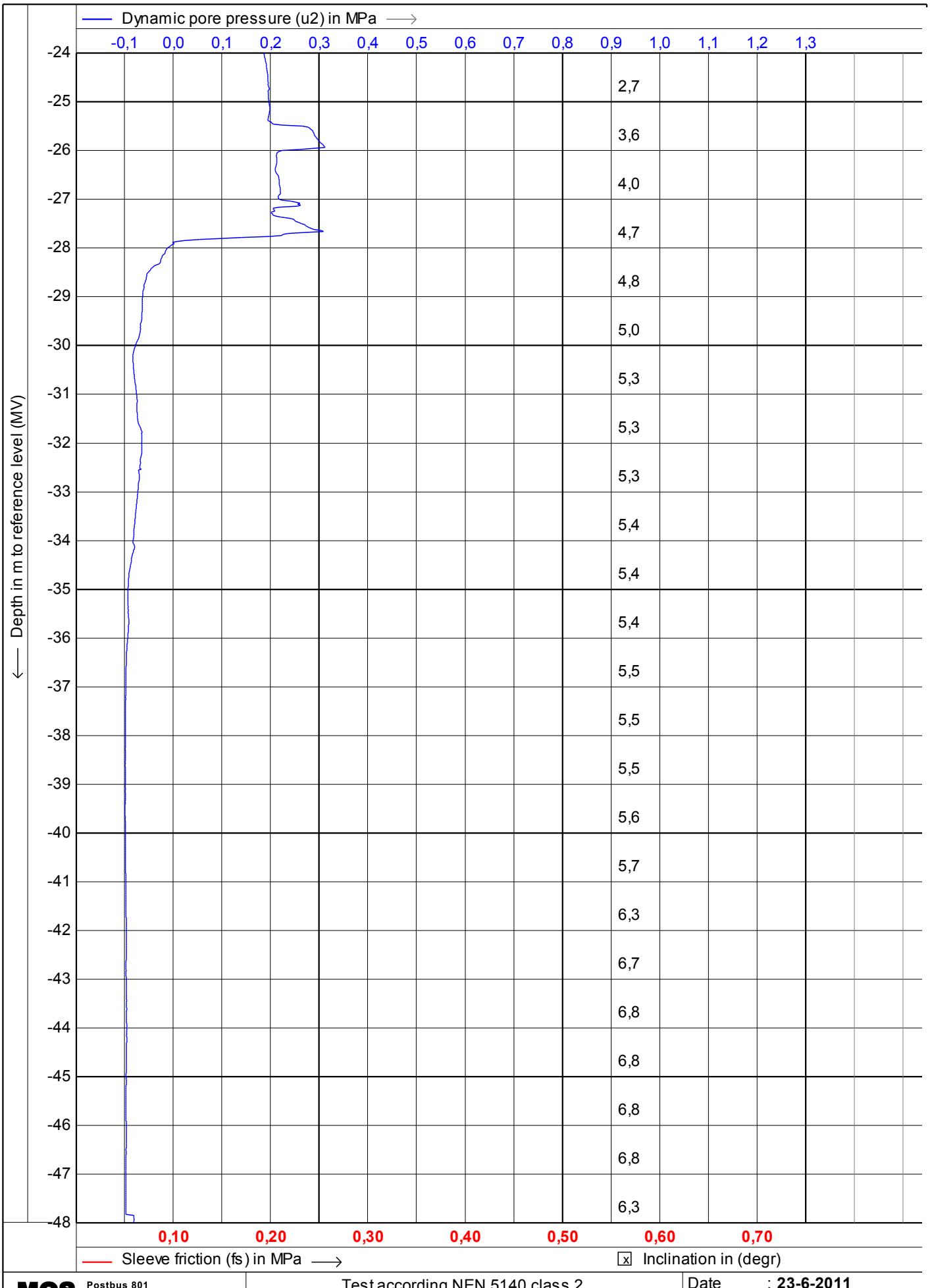
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt1c** 4/12

CPTask V1.14



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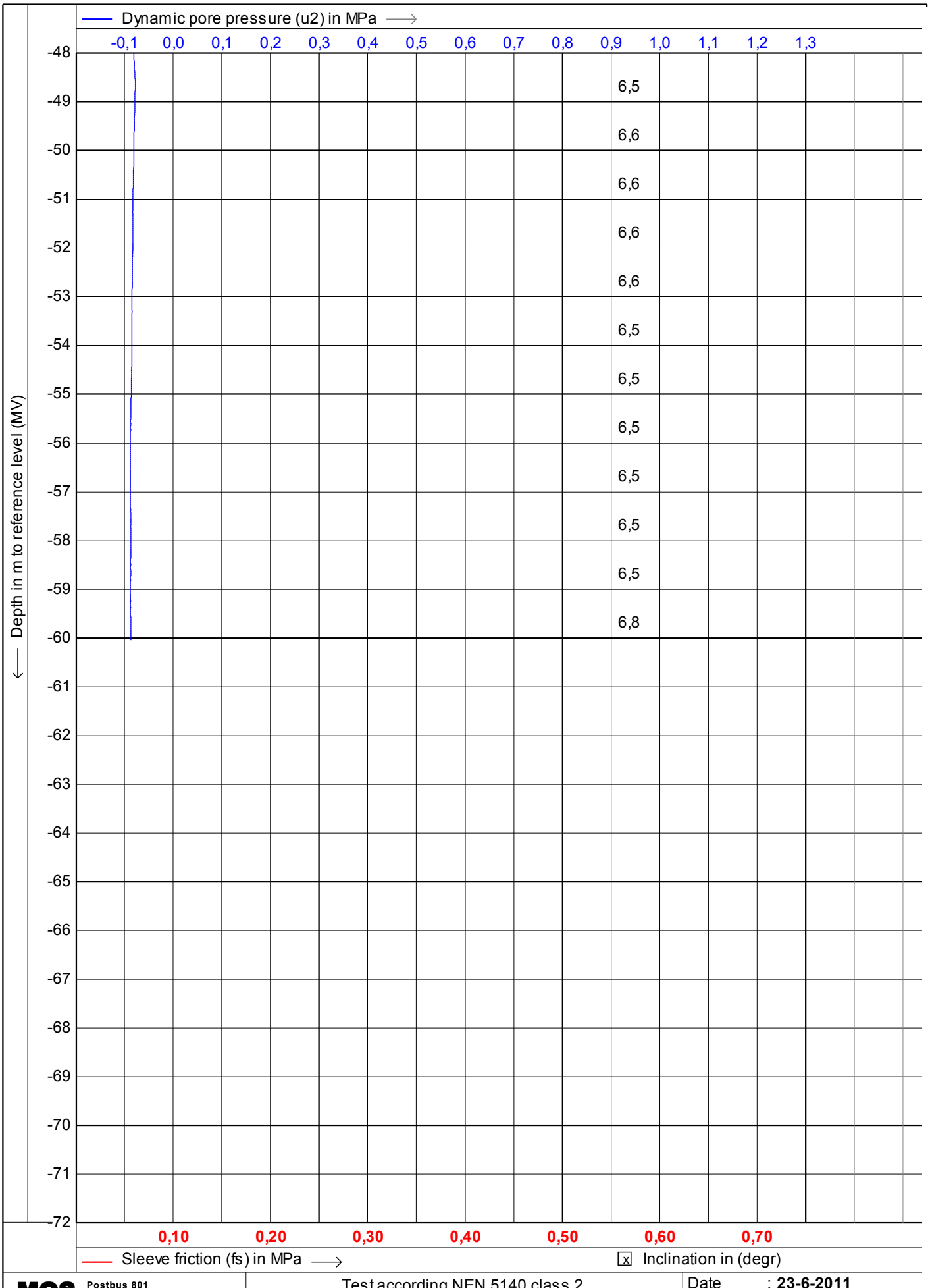
Project no.	: **0041011**
CPT no.	: **kcpt1c**

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

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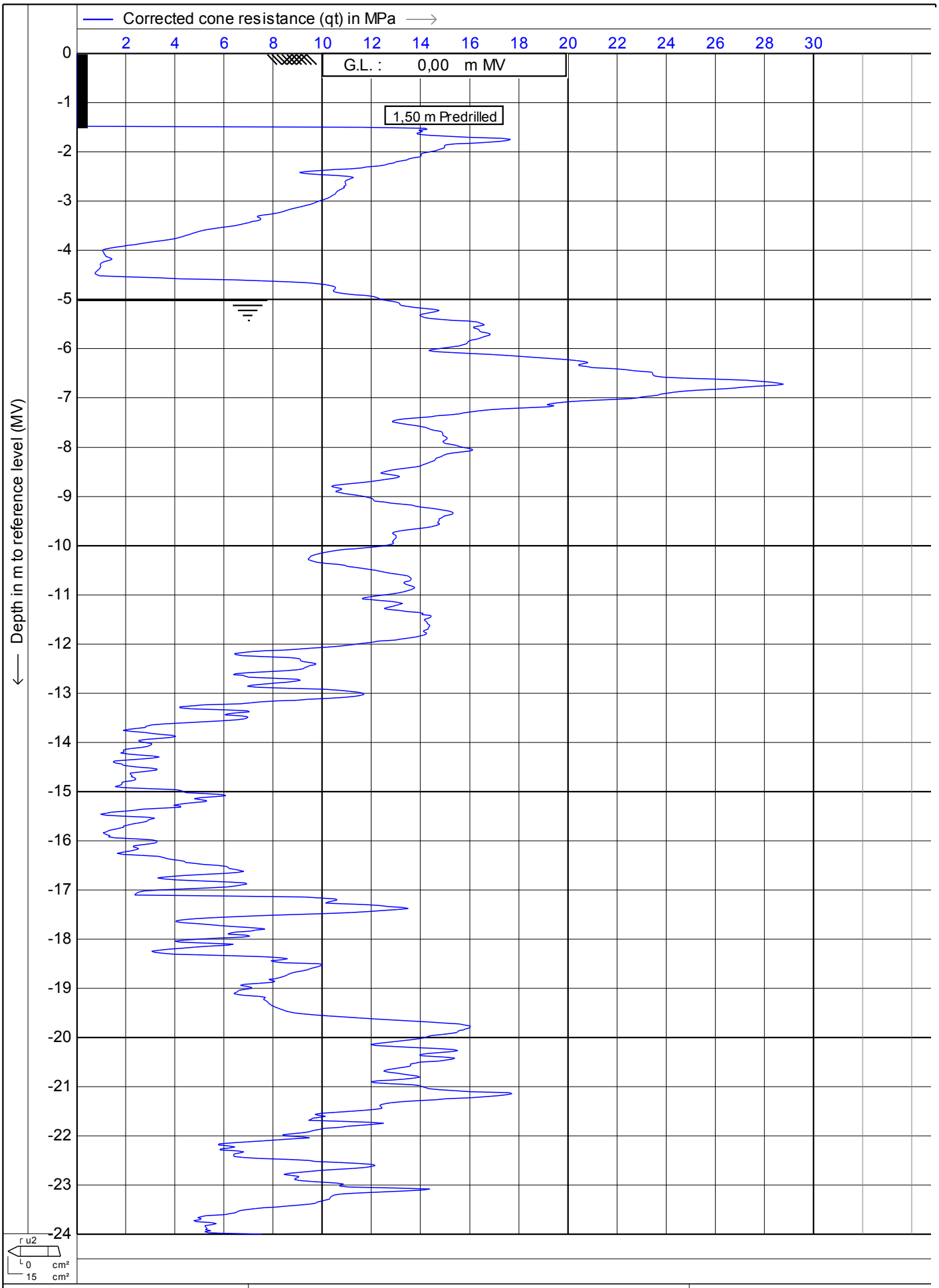
Project no.	: **0041011**
CPT no.	: **kcpt1c**

CPTask V1.14



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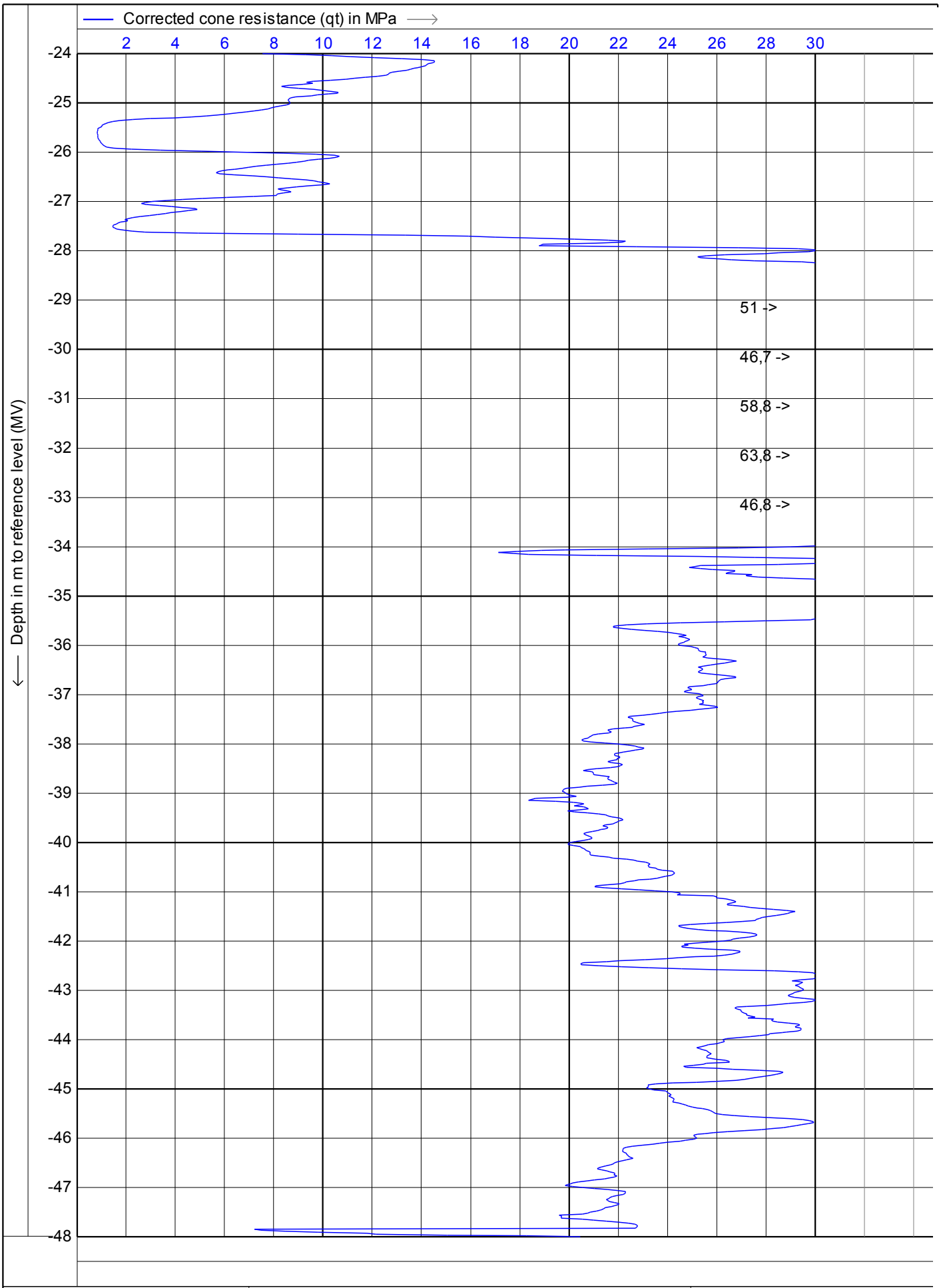
CPT no.	: **kcpt1c**

CPTask V1.14



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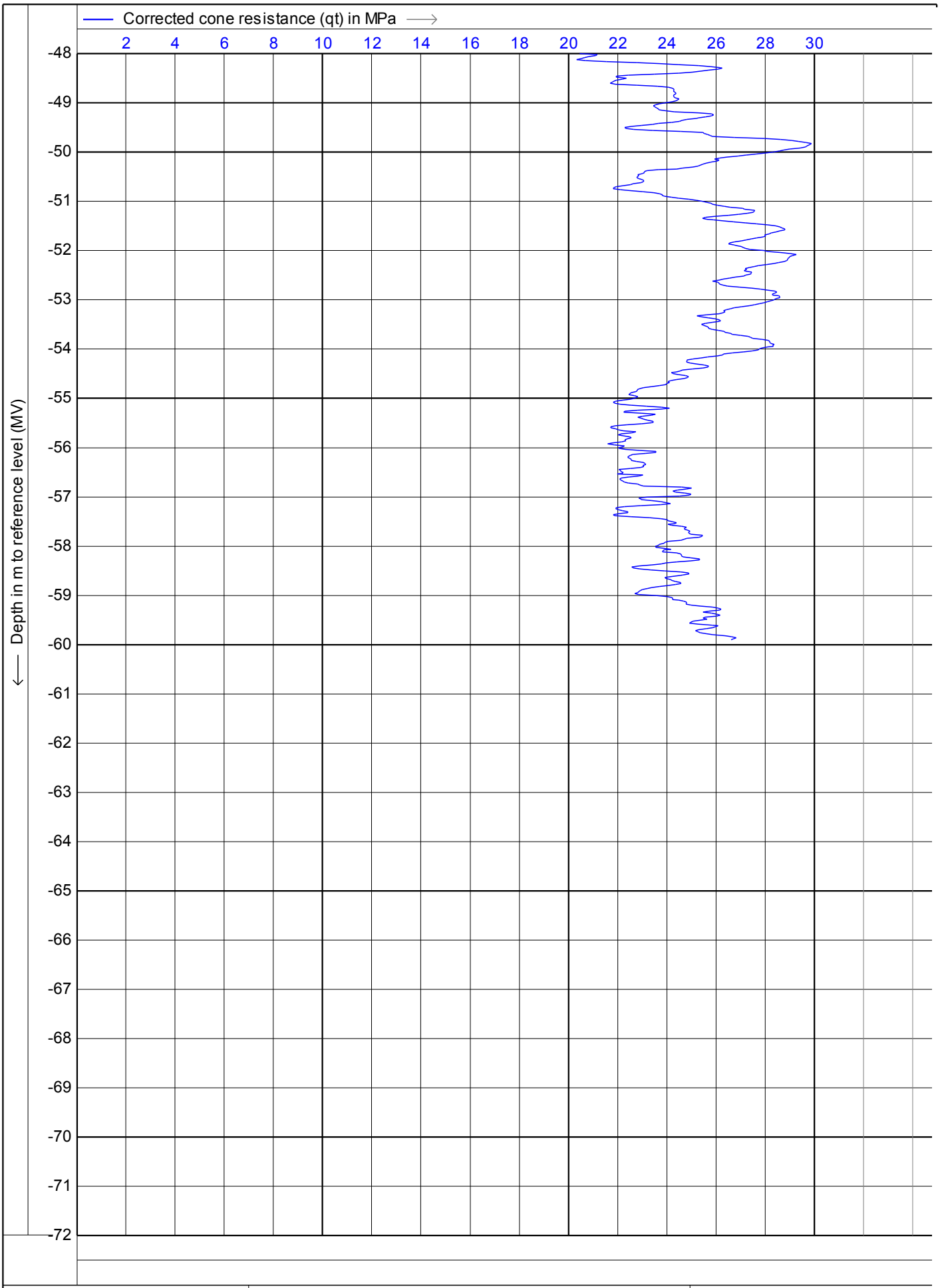
CPT no.	: **kcpt1c**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

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Location: **Borssele**

Date	: **23-6-2011**
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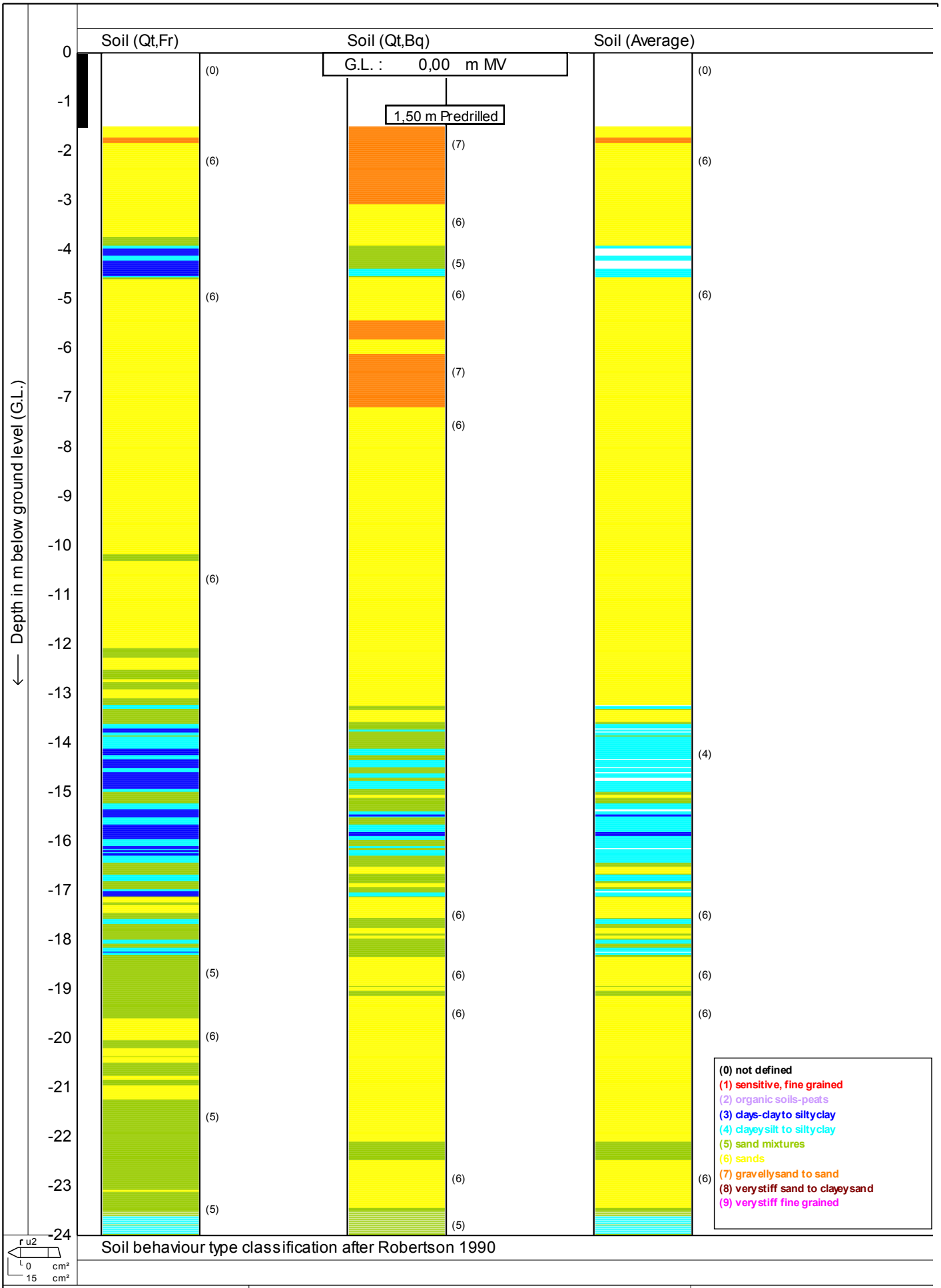
Project no.	: **0041011**
CPT no.	: **kcpt1c**

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**

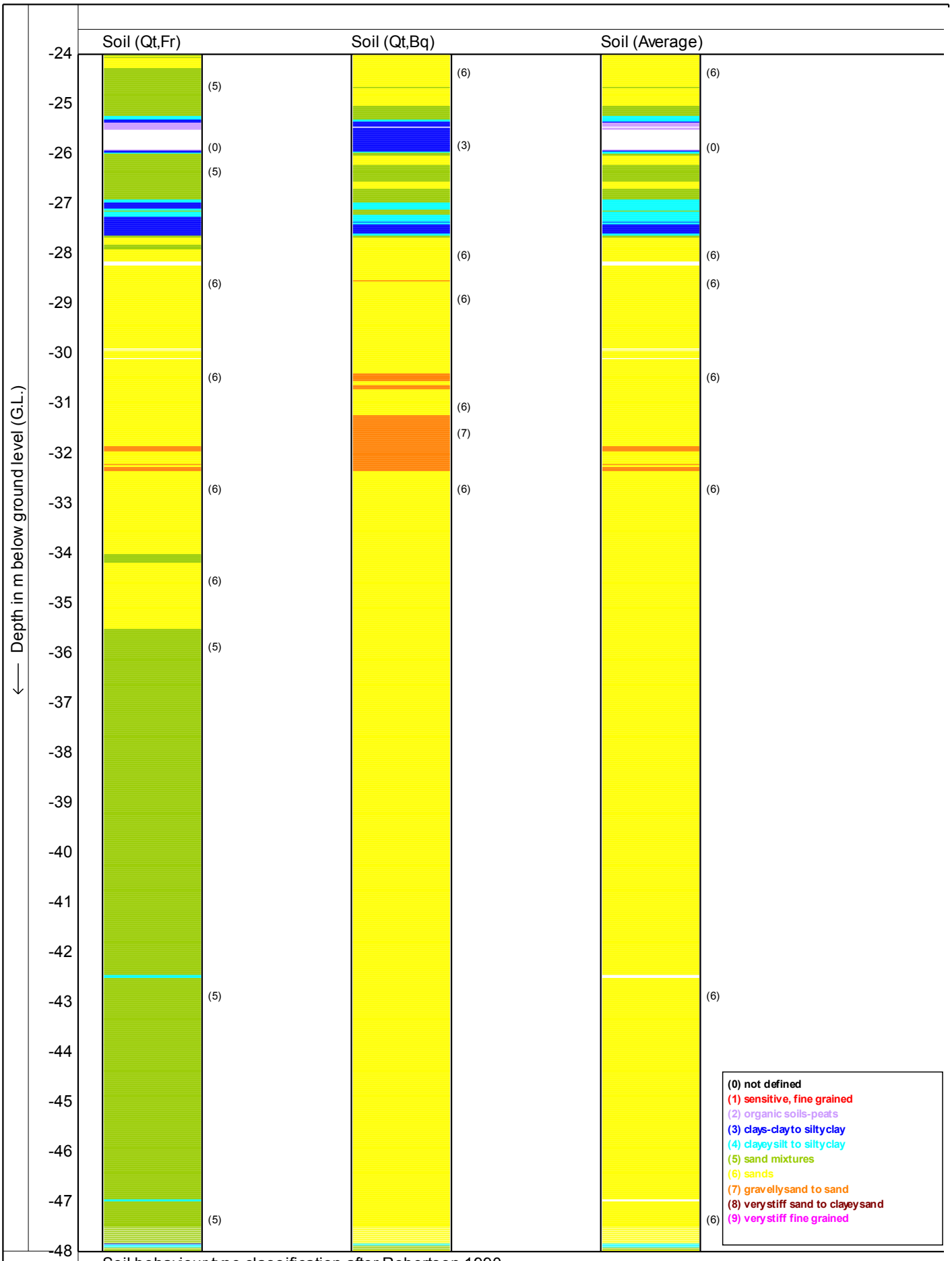
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt1c** 10/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

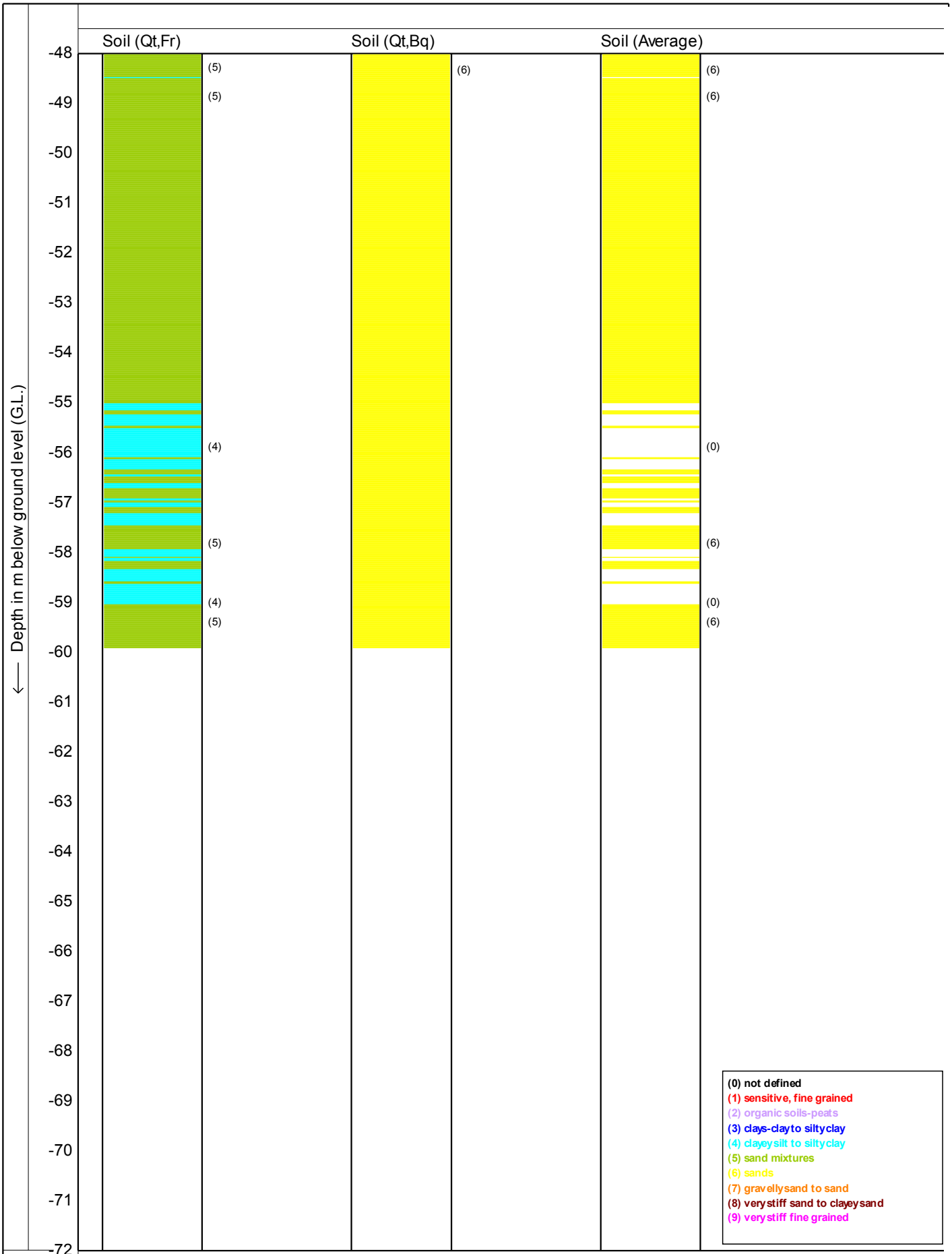
Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt1c** 11/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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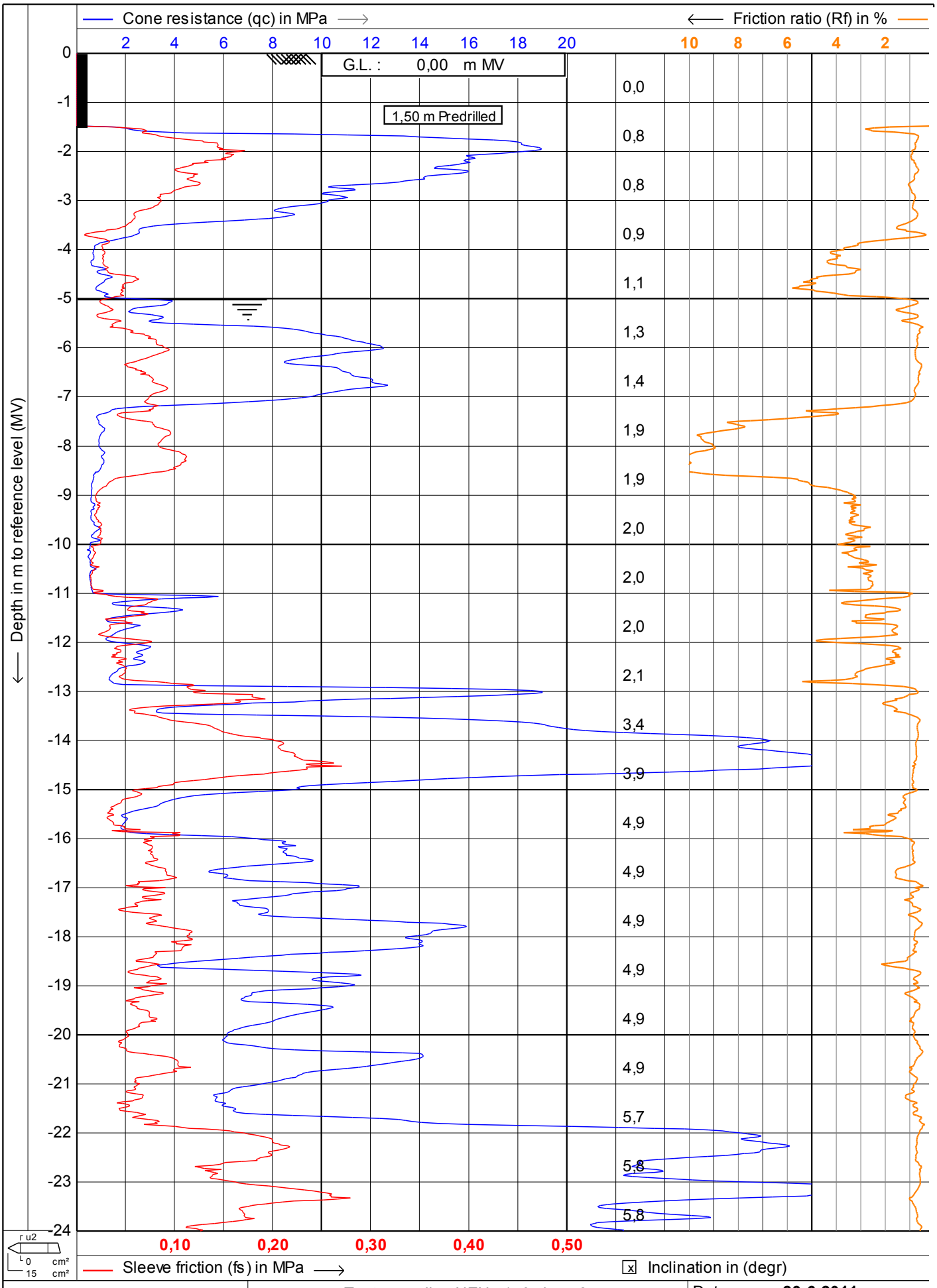
Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt1c** 12/12

MOS GRONDMECHANICA

CPTask V1.14



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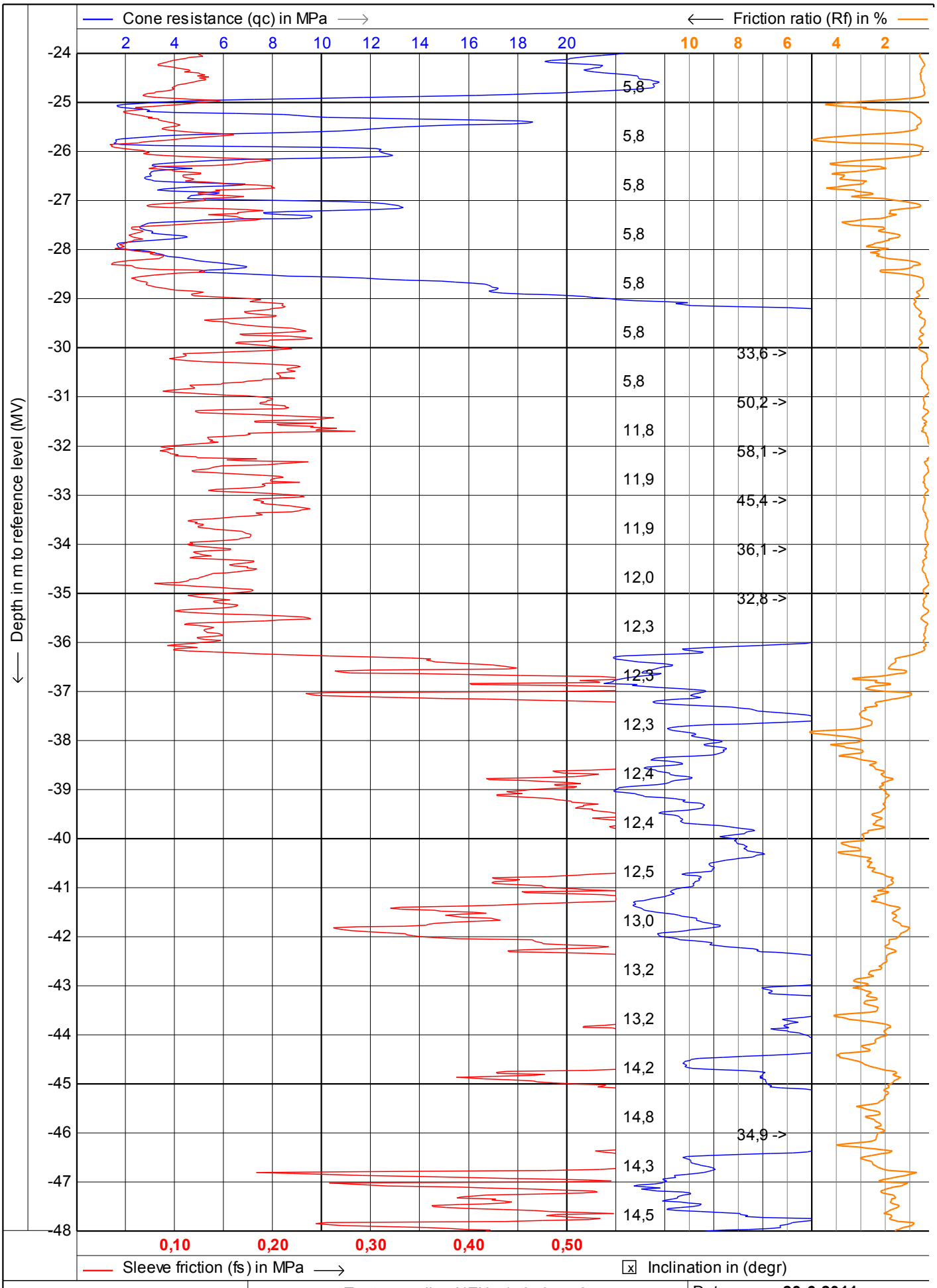
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt2a** 1/12

CPTask V1.14



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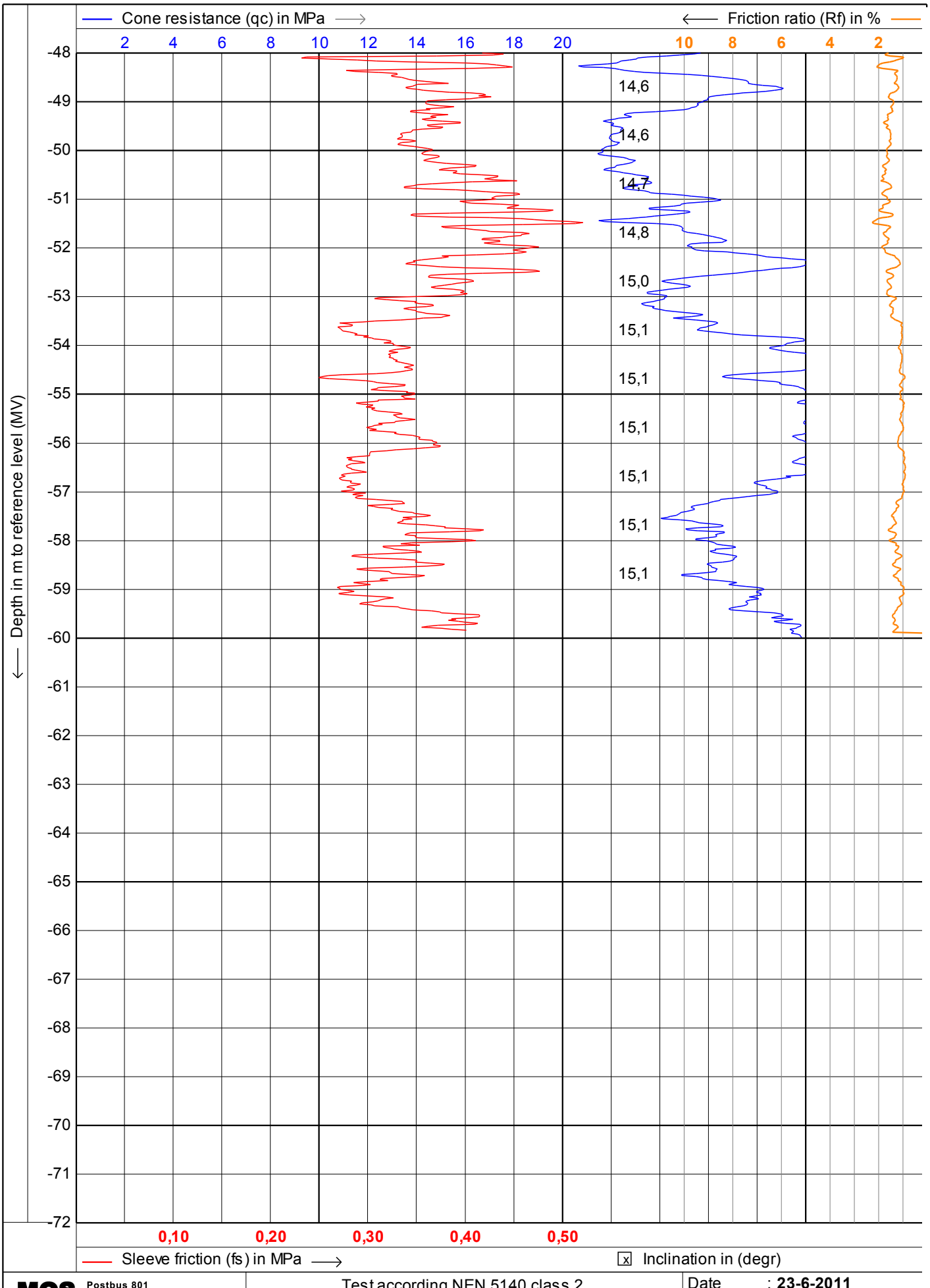
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt2a**

MOS GRONDMECHANICA
CPTask V1.14



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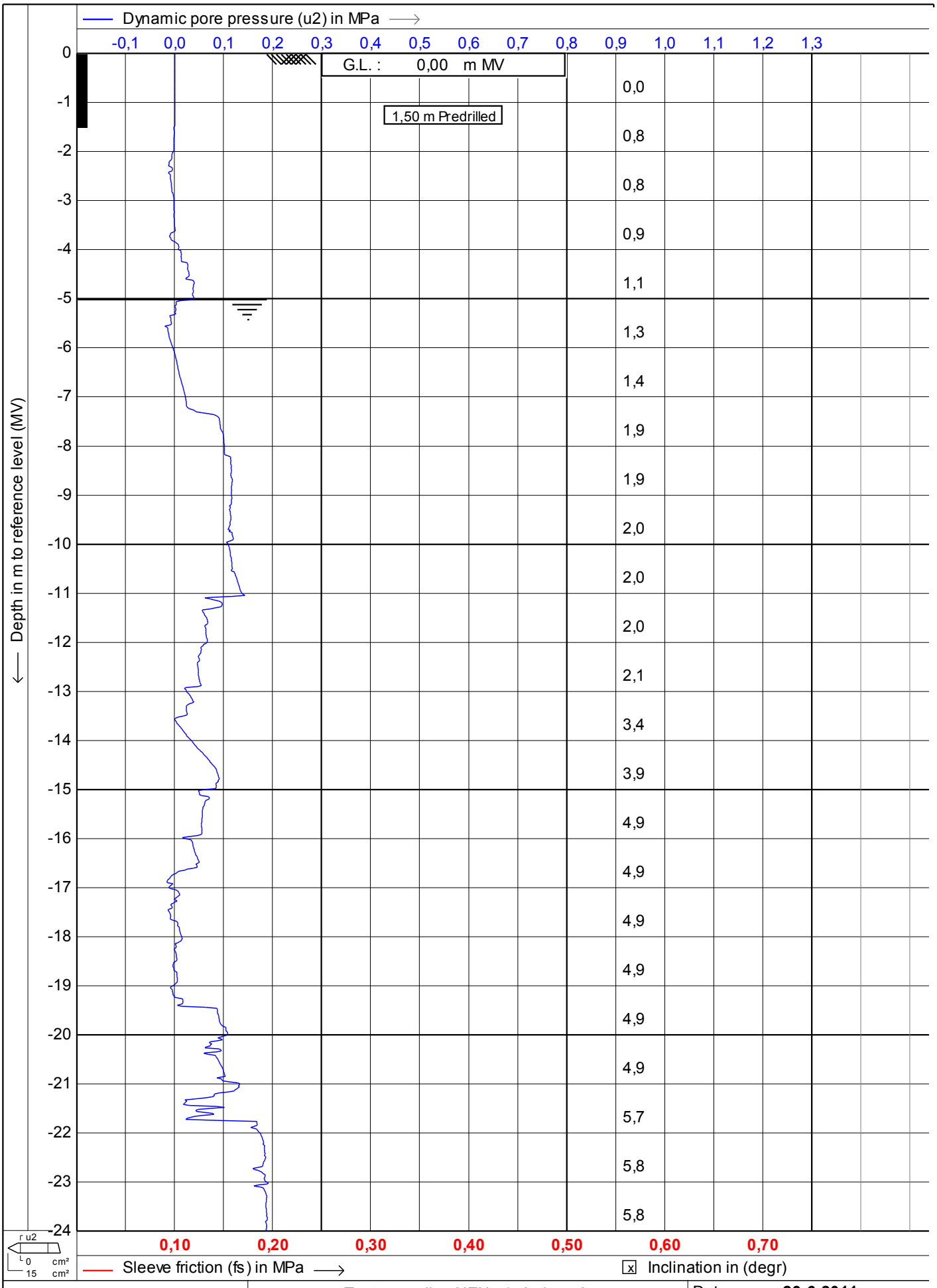
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt2a** 3/12

CPTask V1.14



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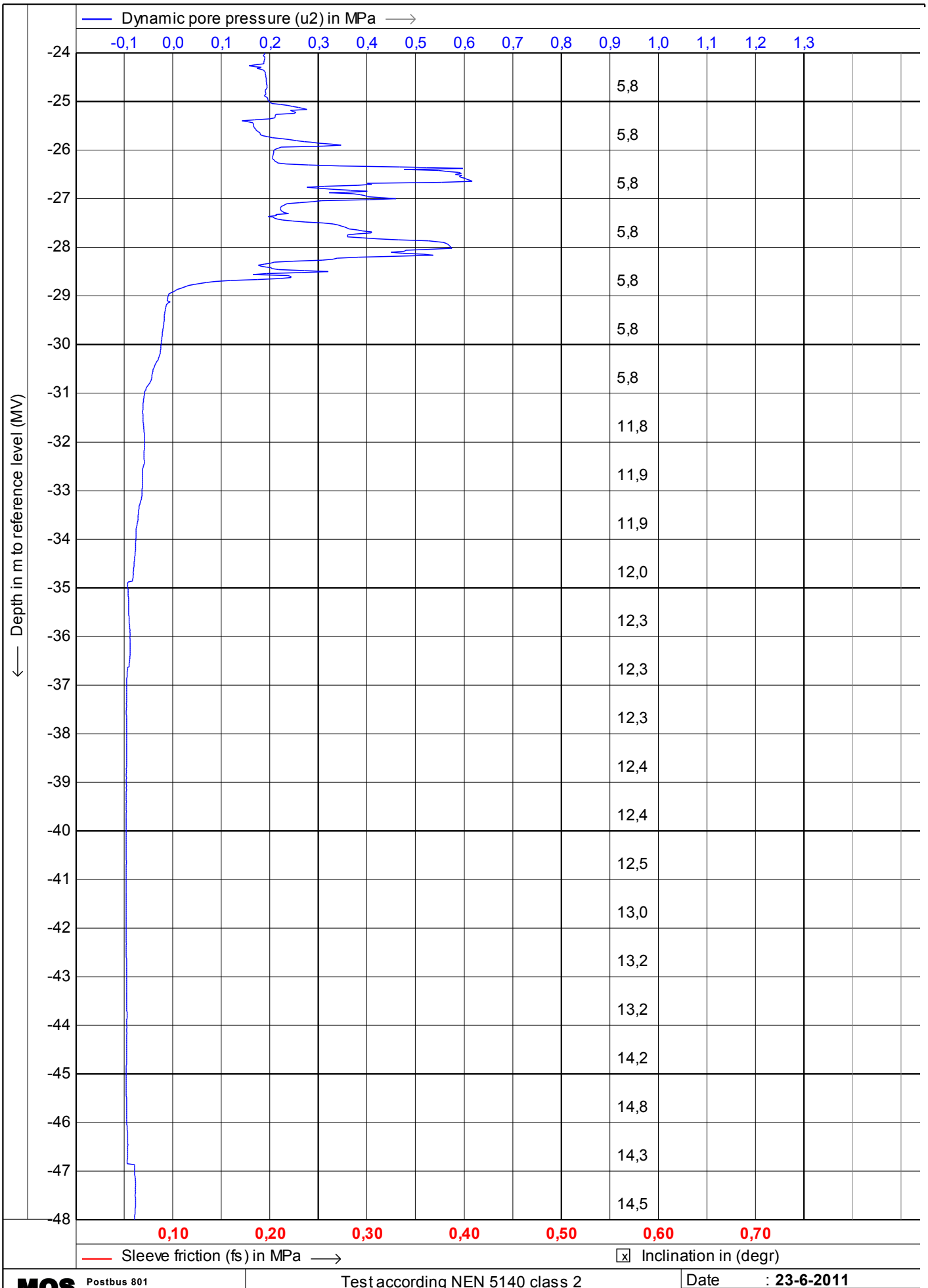
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt2a** 4/12

CPTask V1.14



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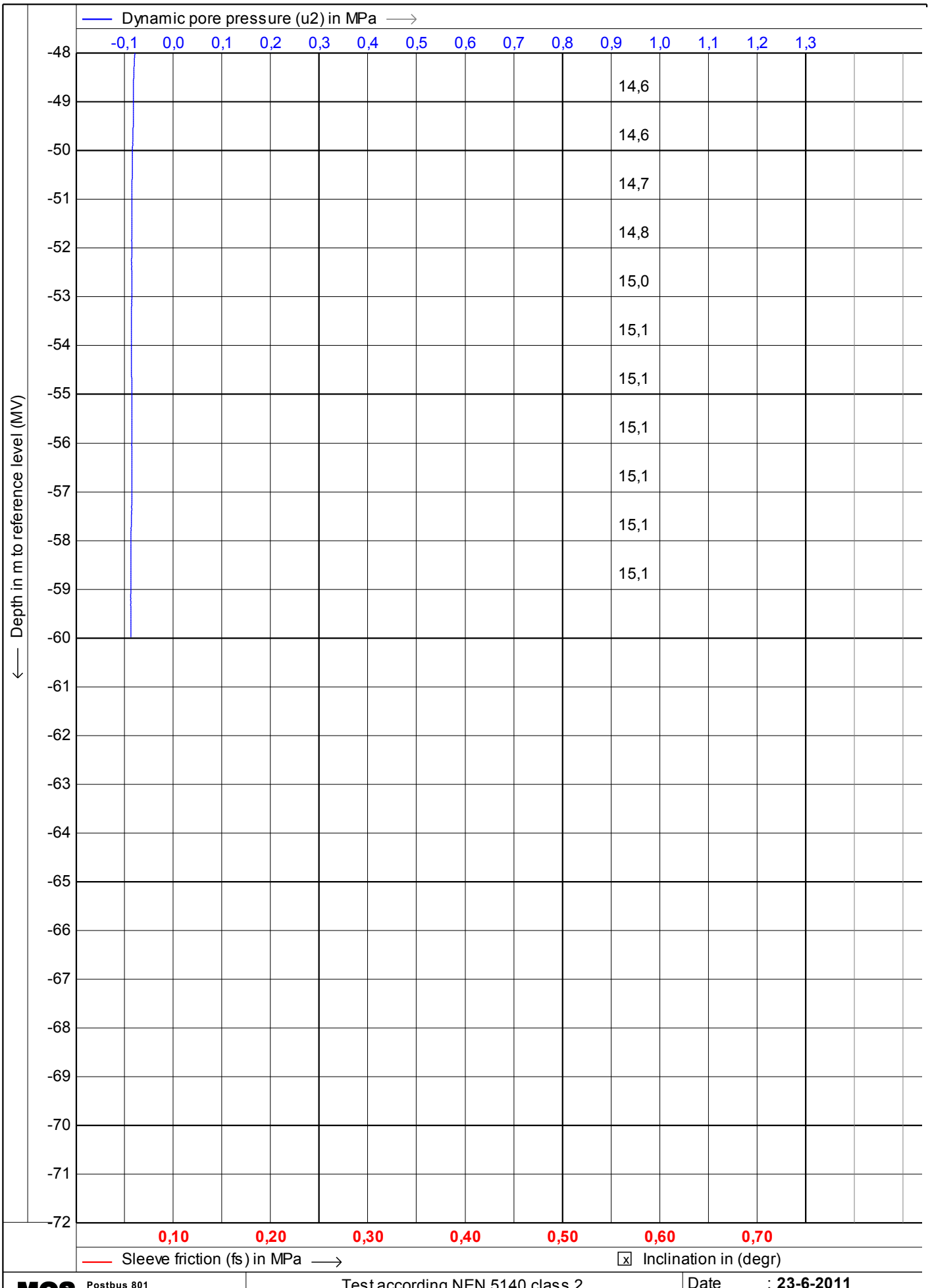
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt2a** **5/12**

CPTask V1.14



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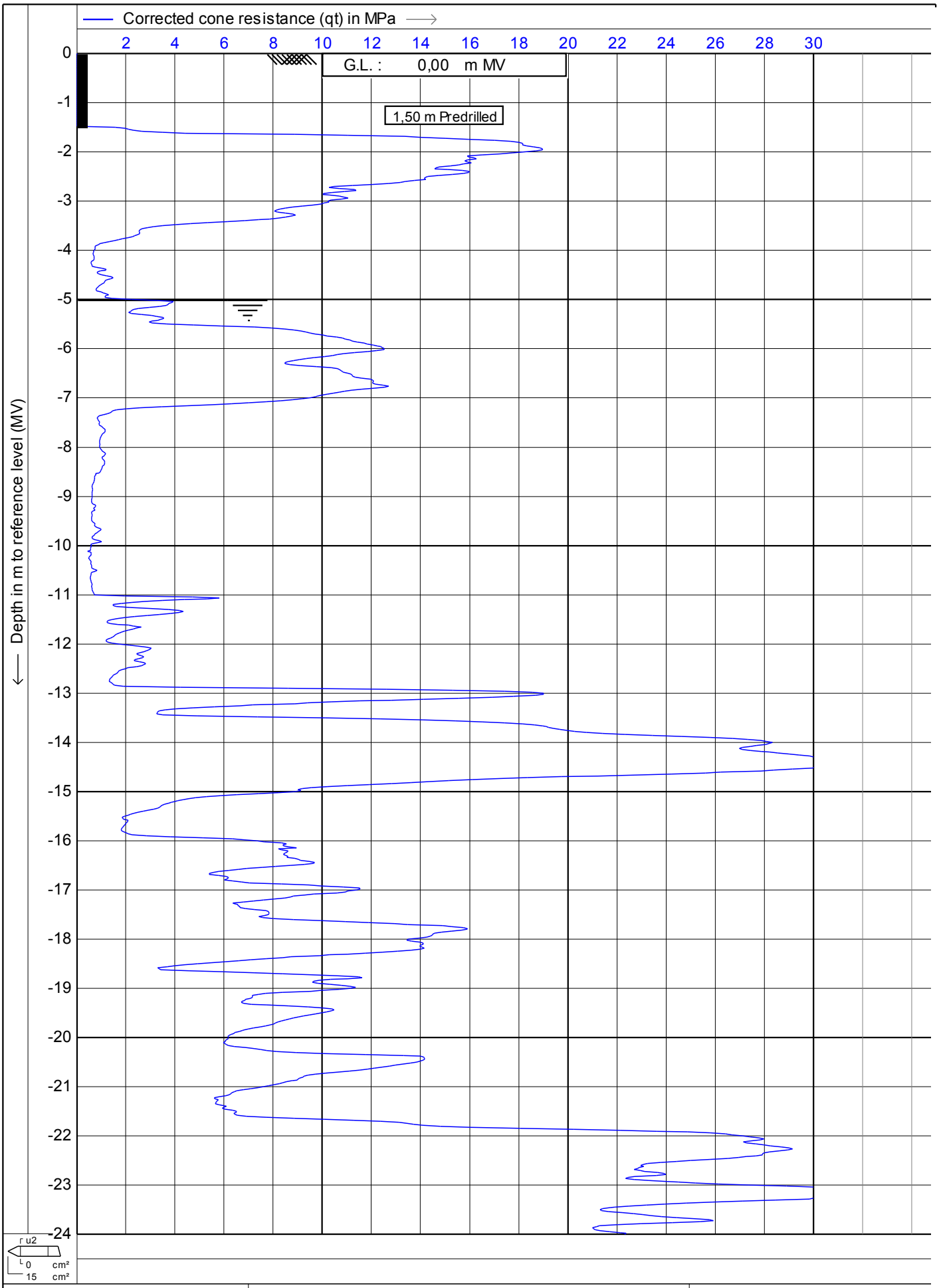
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **23-6-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt2a**

CPTask V1.14



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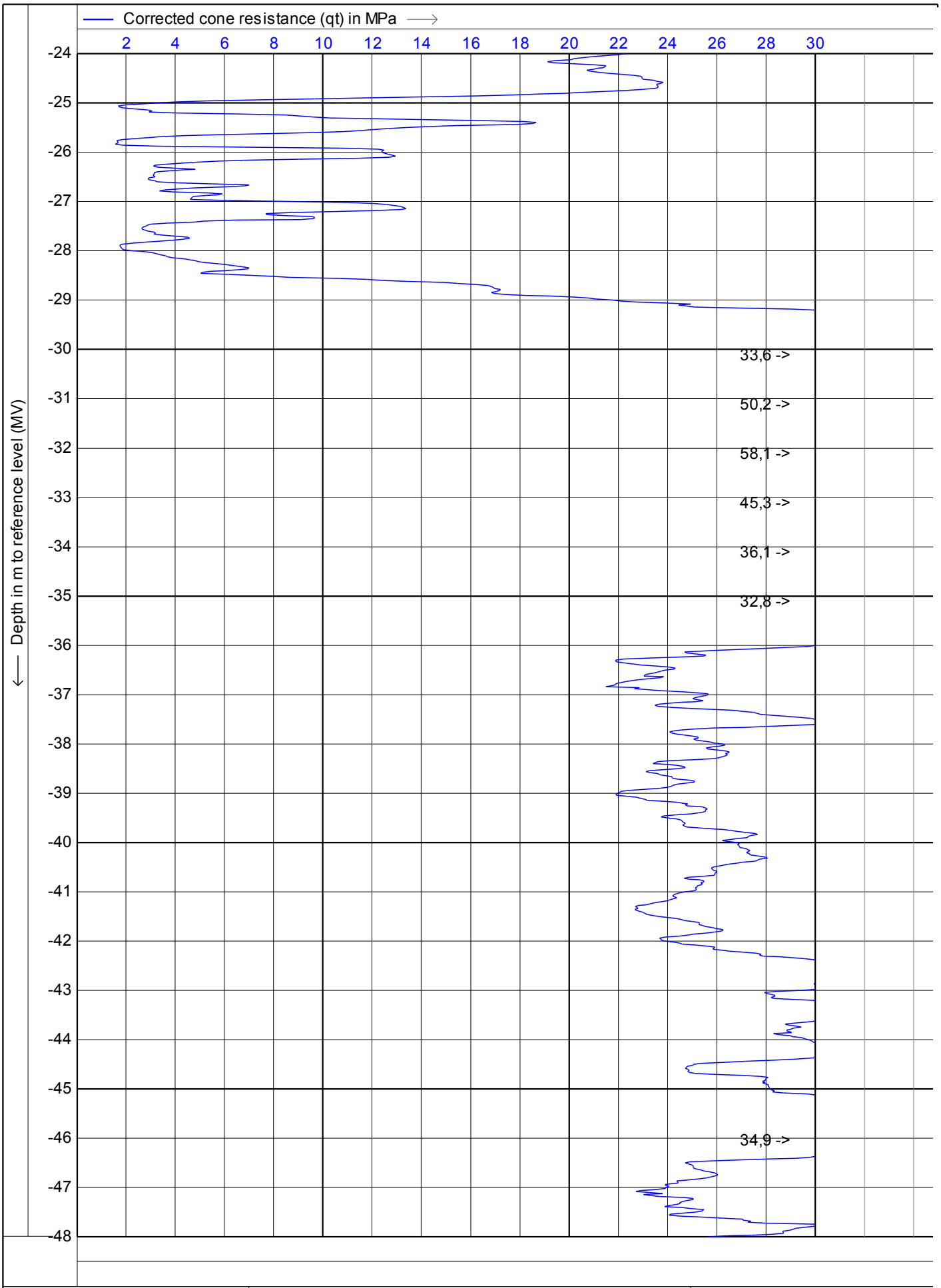
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **23-6-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt2a**

MOS GRONDMECHANICA
CPTask V1.14



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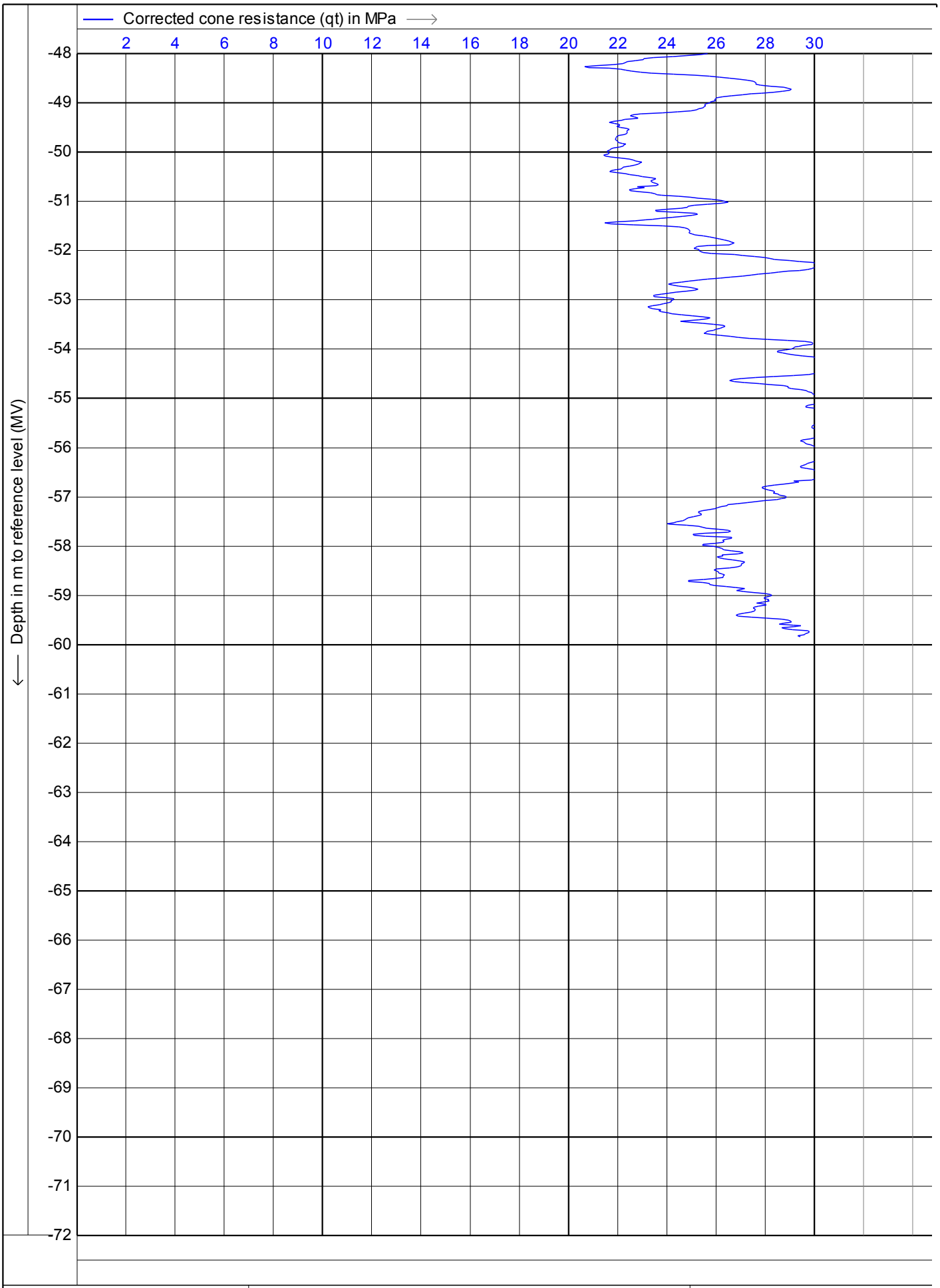
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **23-6-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt2a**

CPTask V1.14



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Project : **KCB2**

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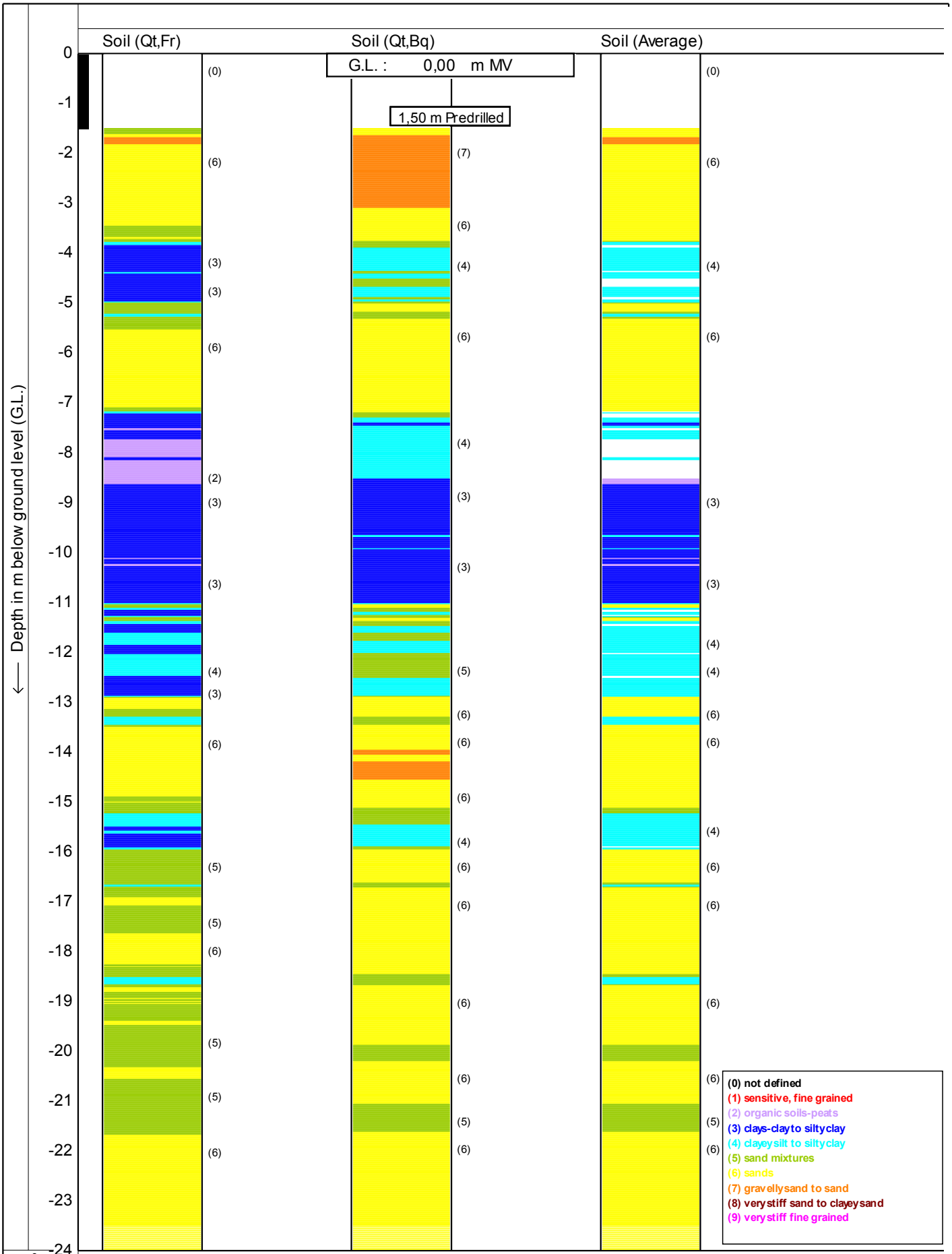
CPT no.	: **kcpt2a**

CPTask V1.14



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Project : **KCB2**

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Date : **23-6-2011**

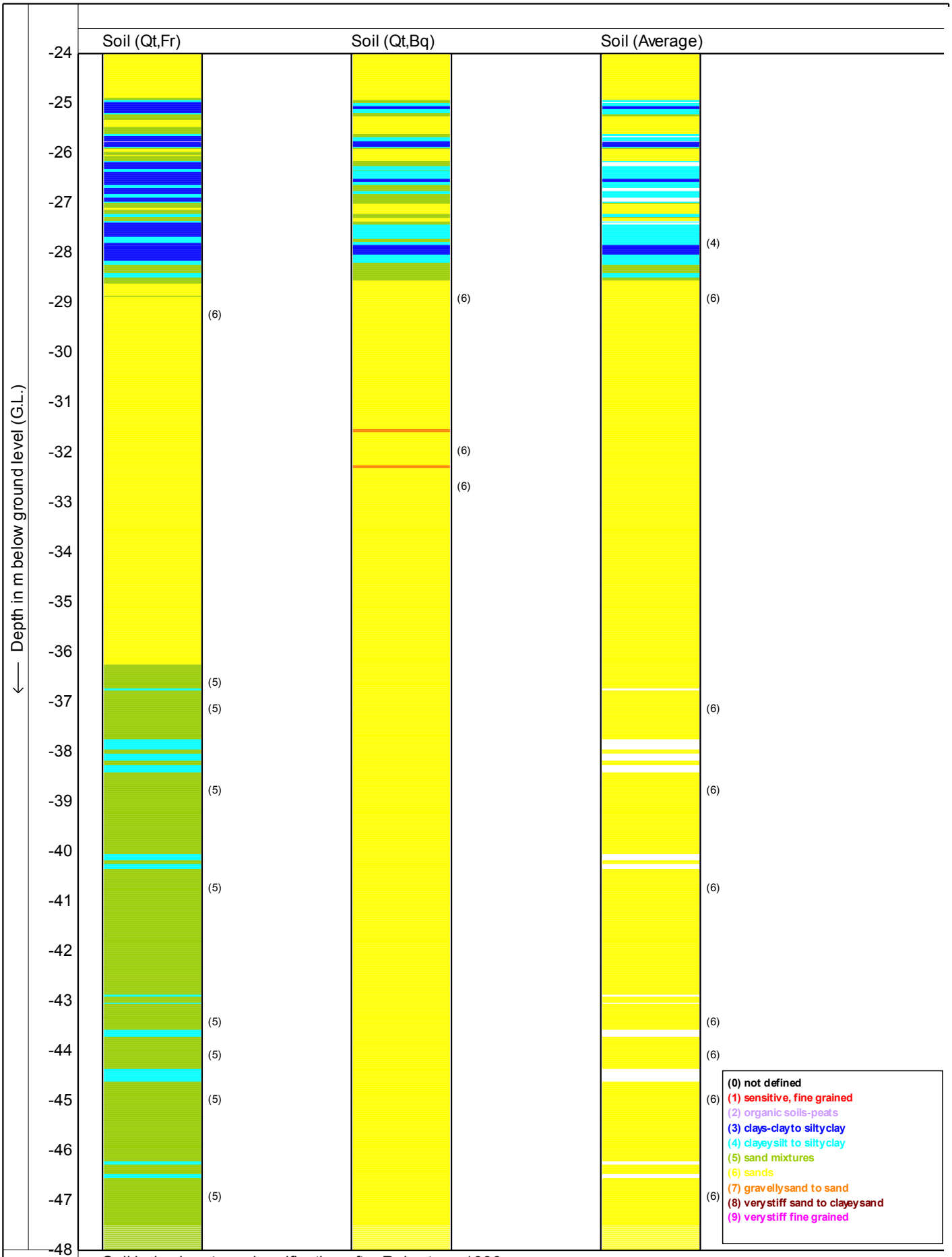
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt2a** 10/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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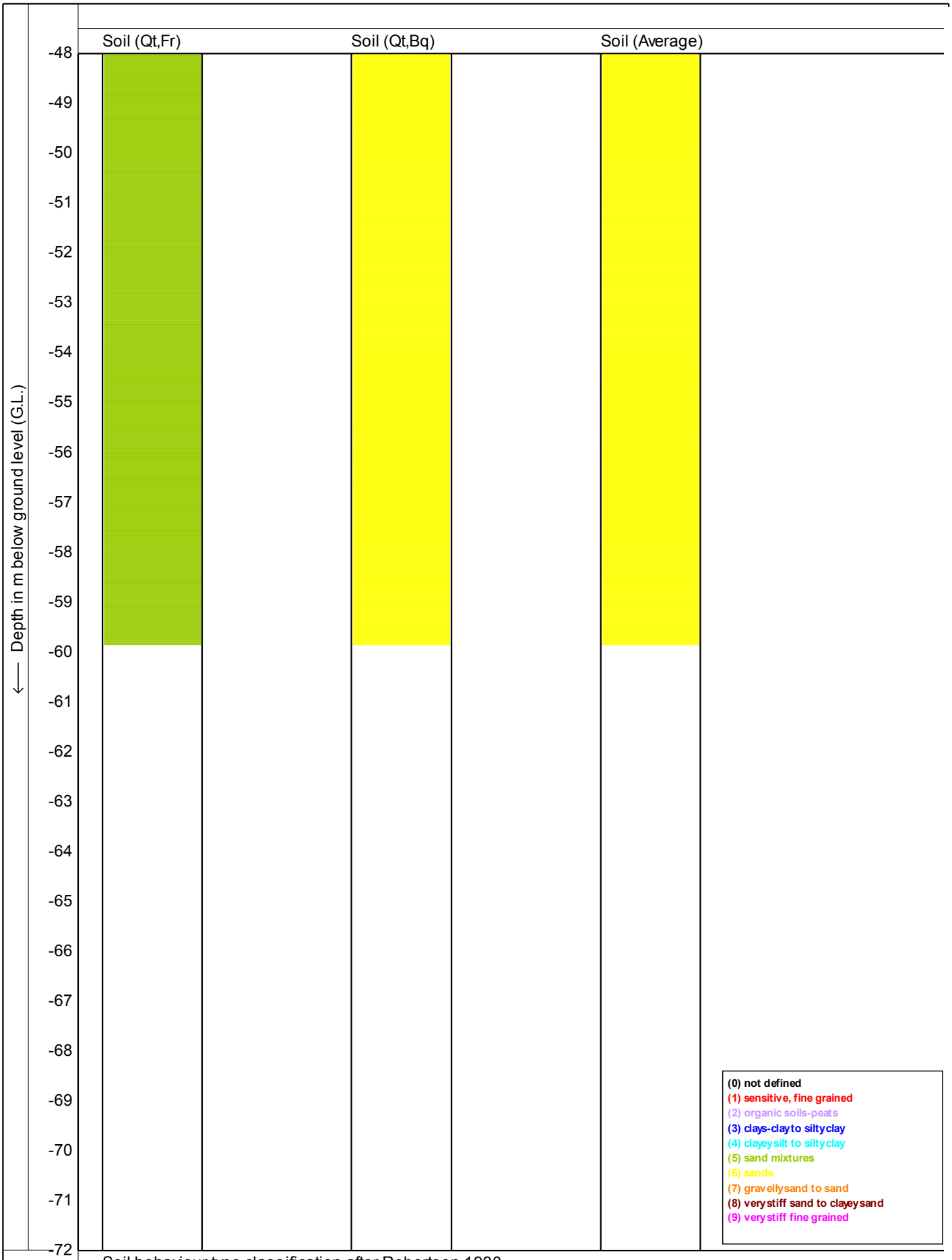
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt2a** 11/12

CPTask V1.14

MOS GRONDMECHANICA



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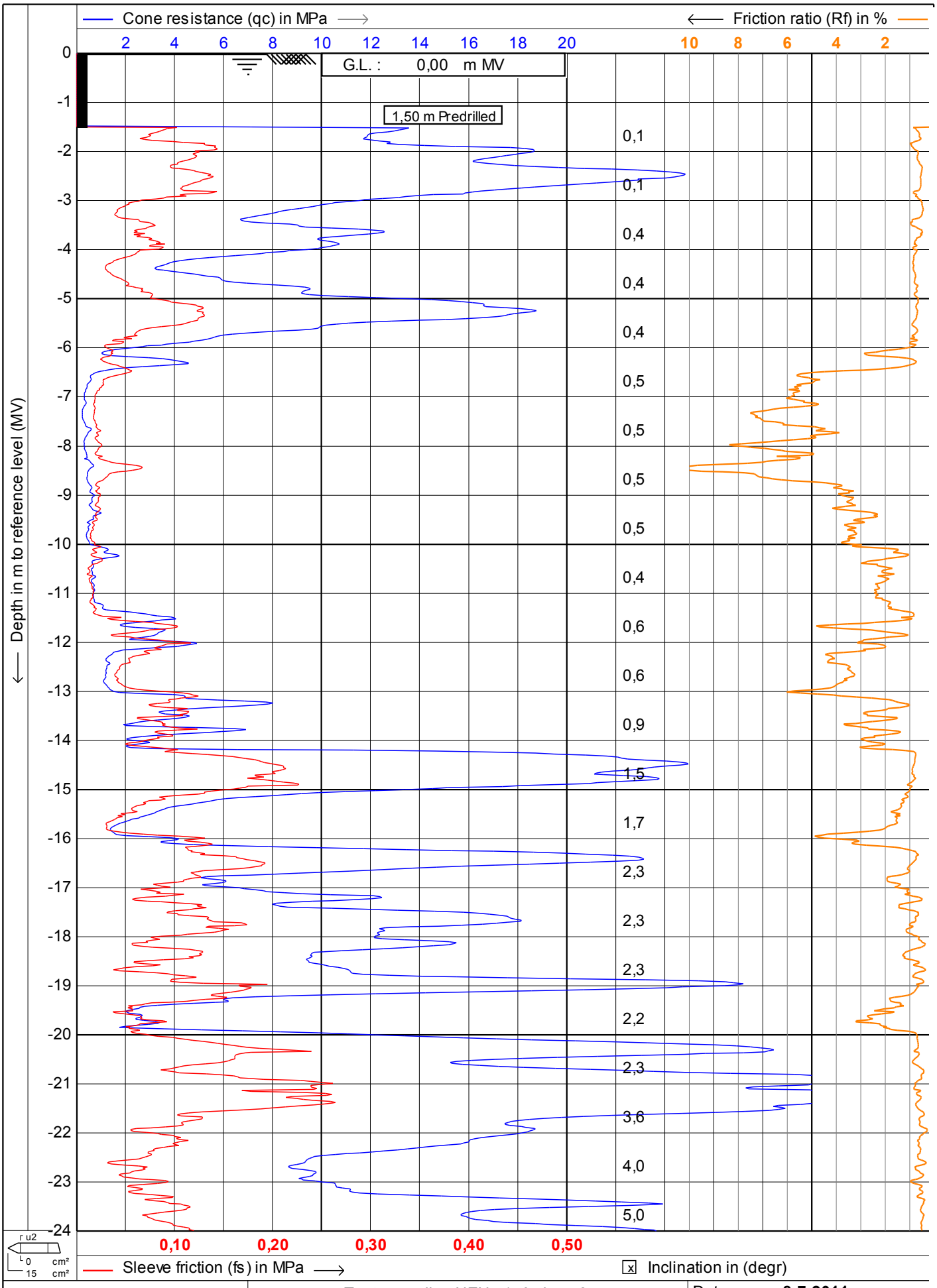
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt2a** 12/12

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**

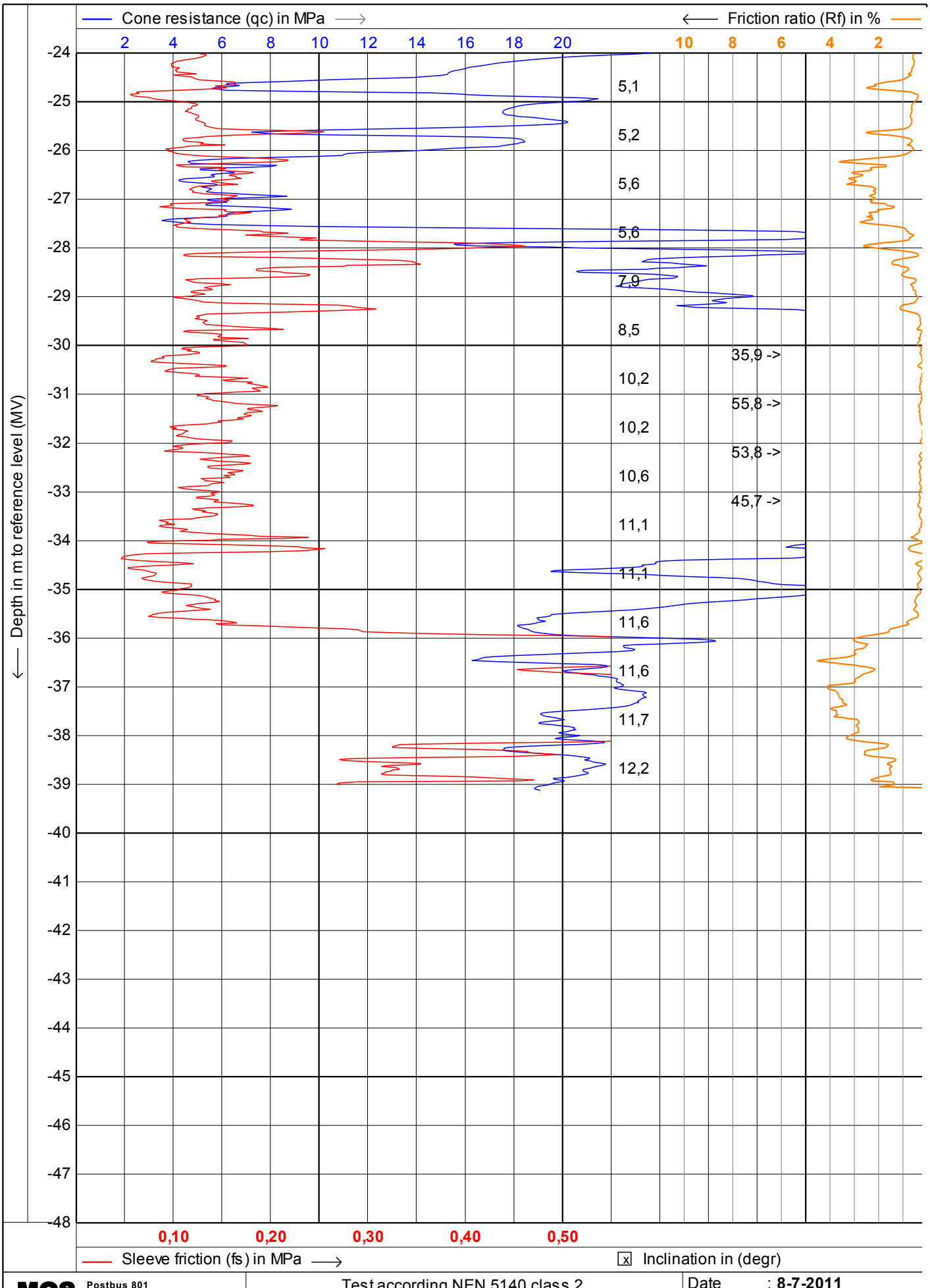
Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kcpt3a** 1/8

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

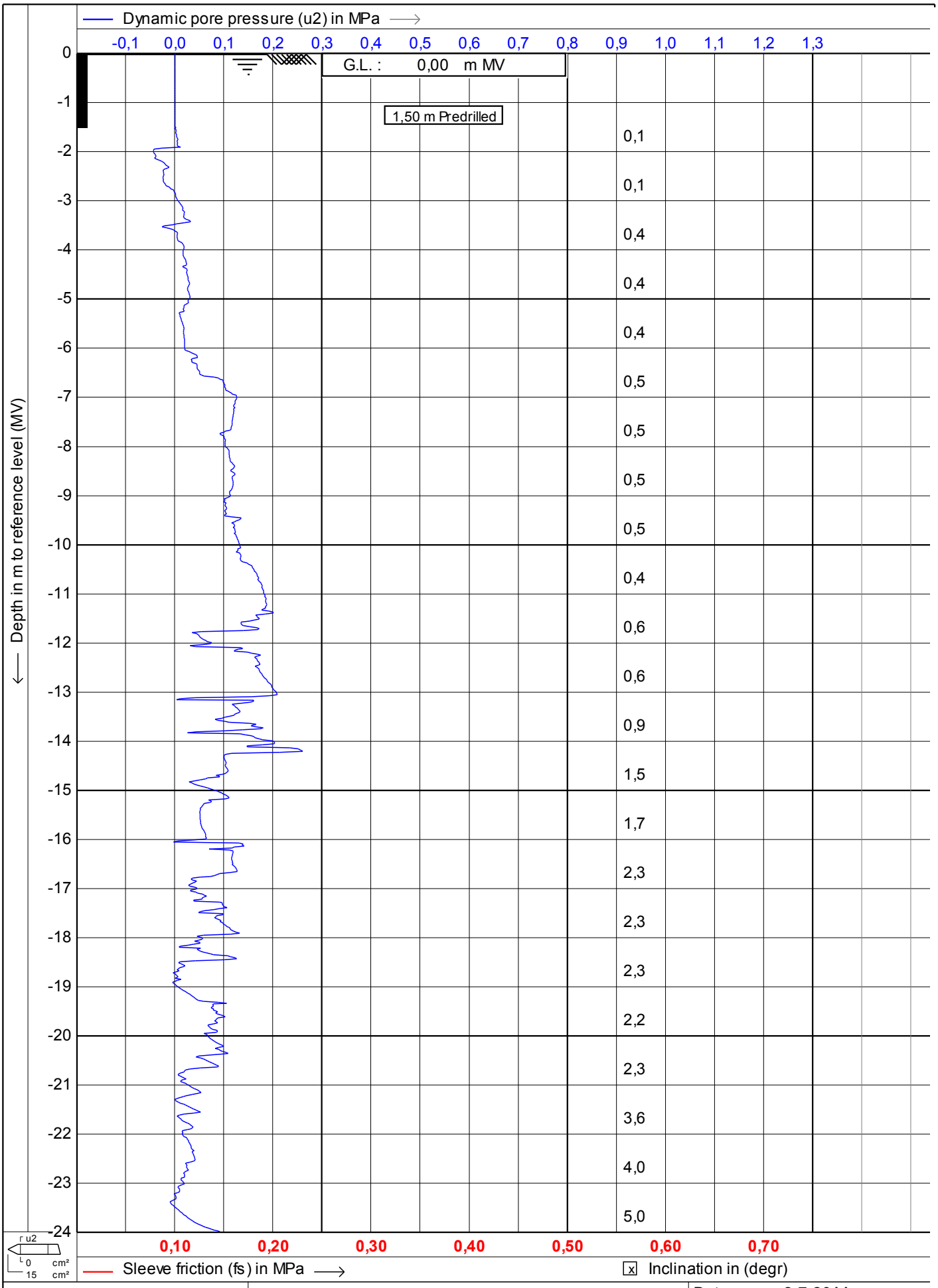
Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **S15CFIP.481**
Project no. : **0041011**
CPT no. : **kcpt3a** **2/8**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**

Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kcpt3a** 3/8

CPTask V1.14

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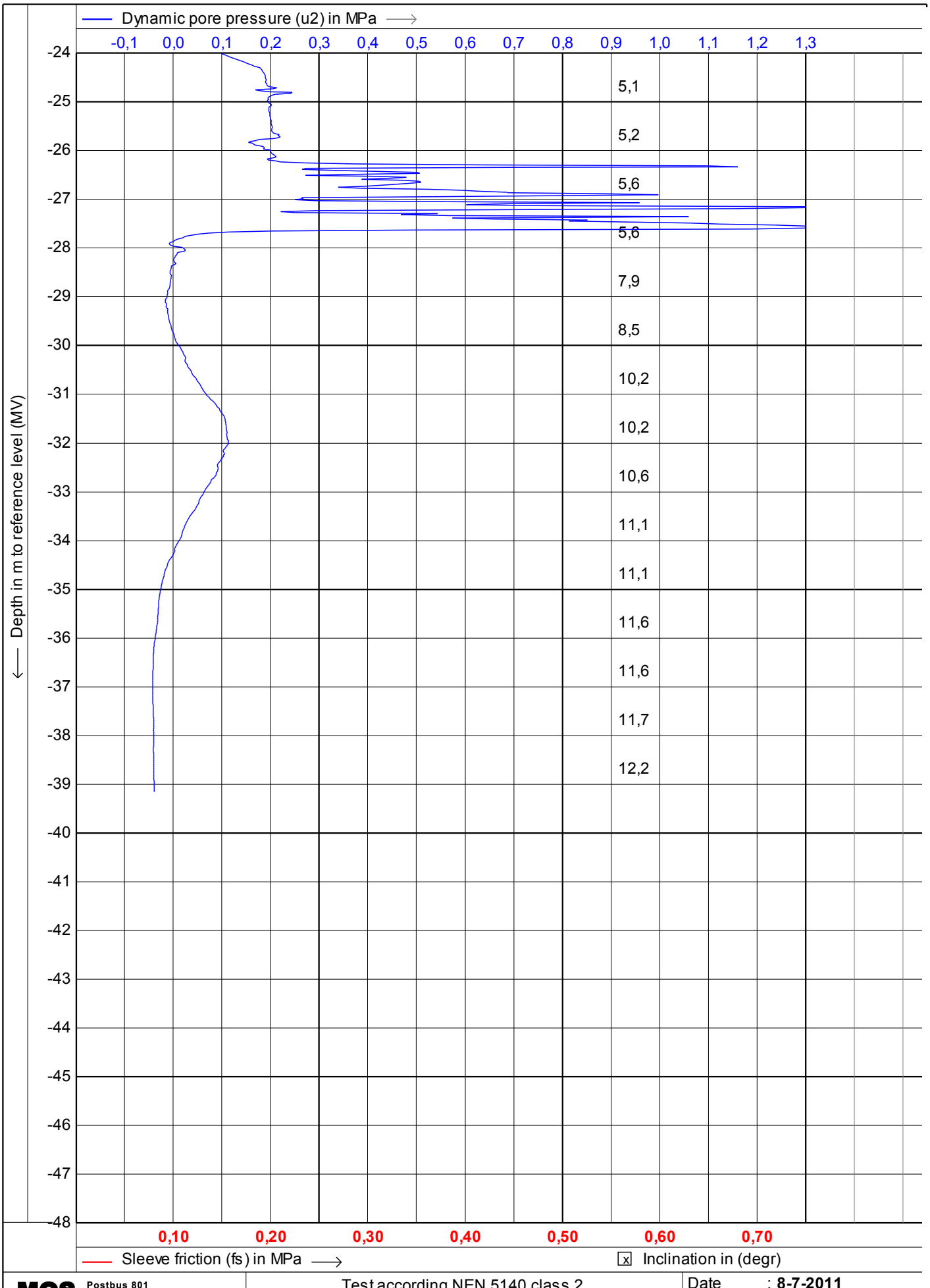

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

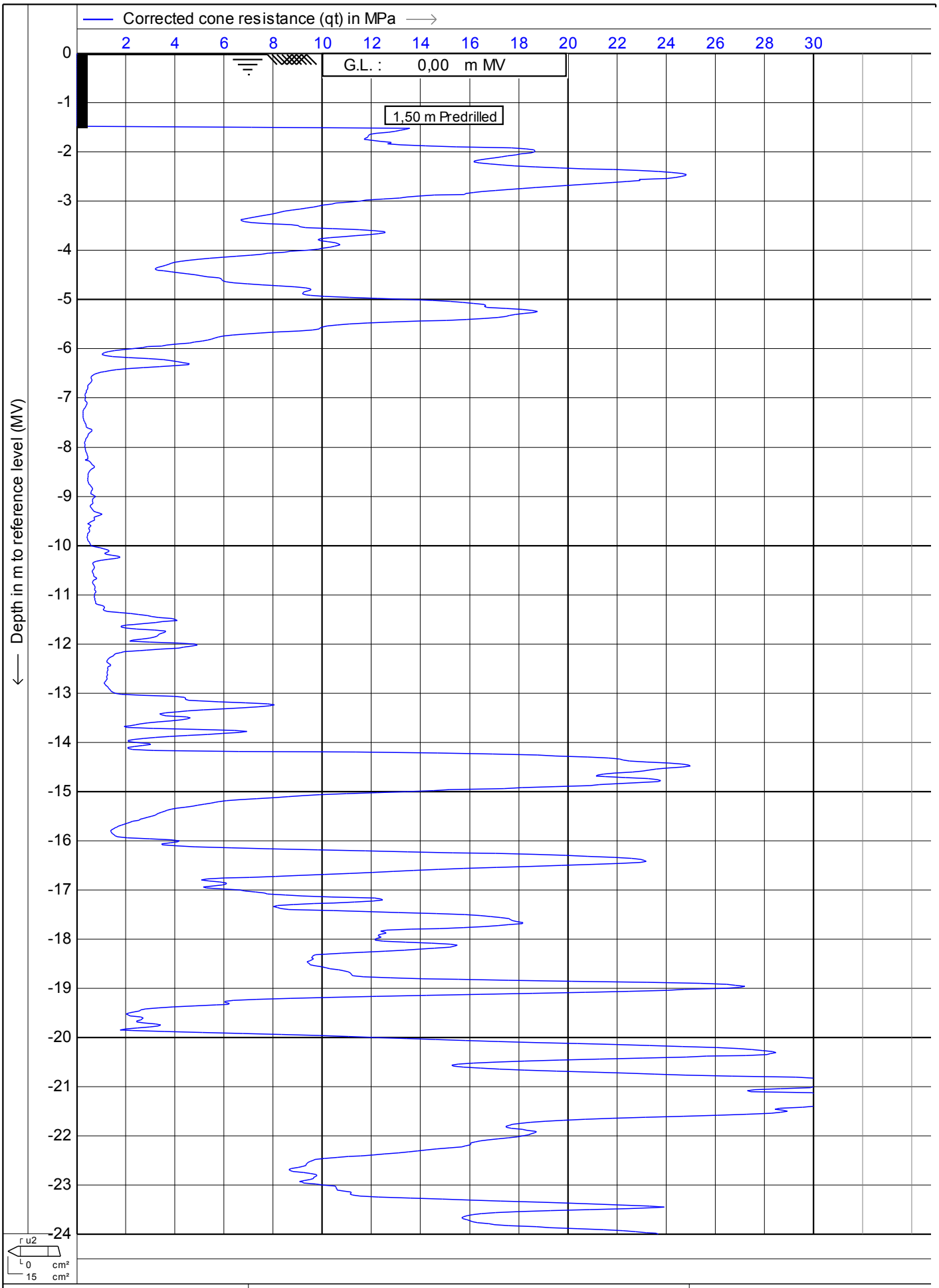
Date : **8-7-2011**

Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kcpt3a** 4/8

CPTask V1.14



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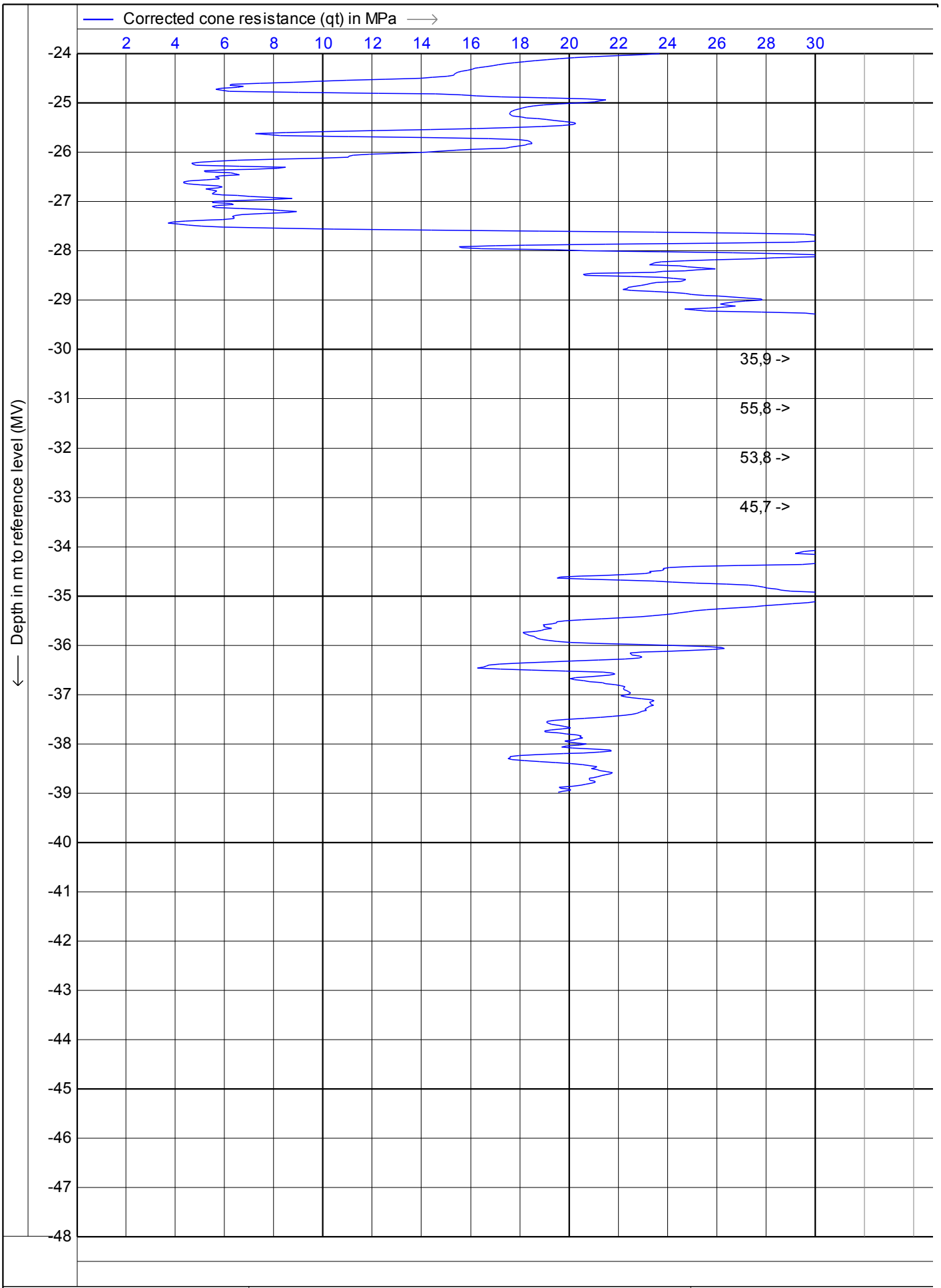
MOS GRONDMECHANICA
CPTask V1.14



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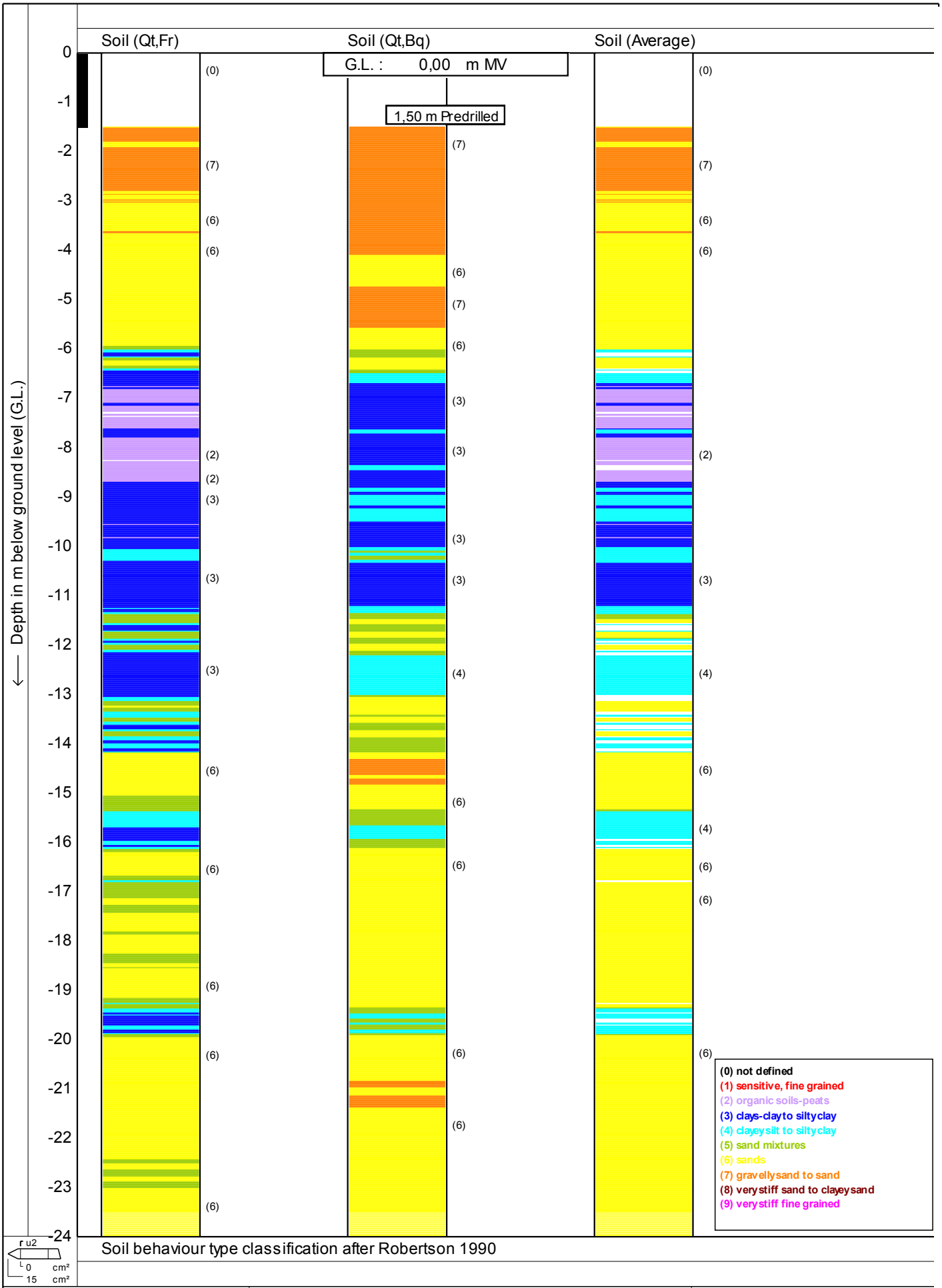
MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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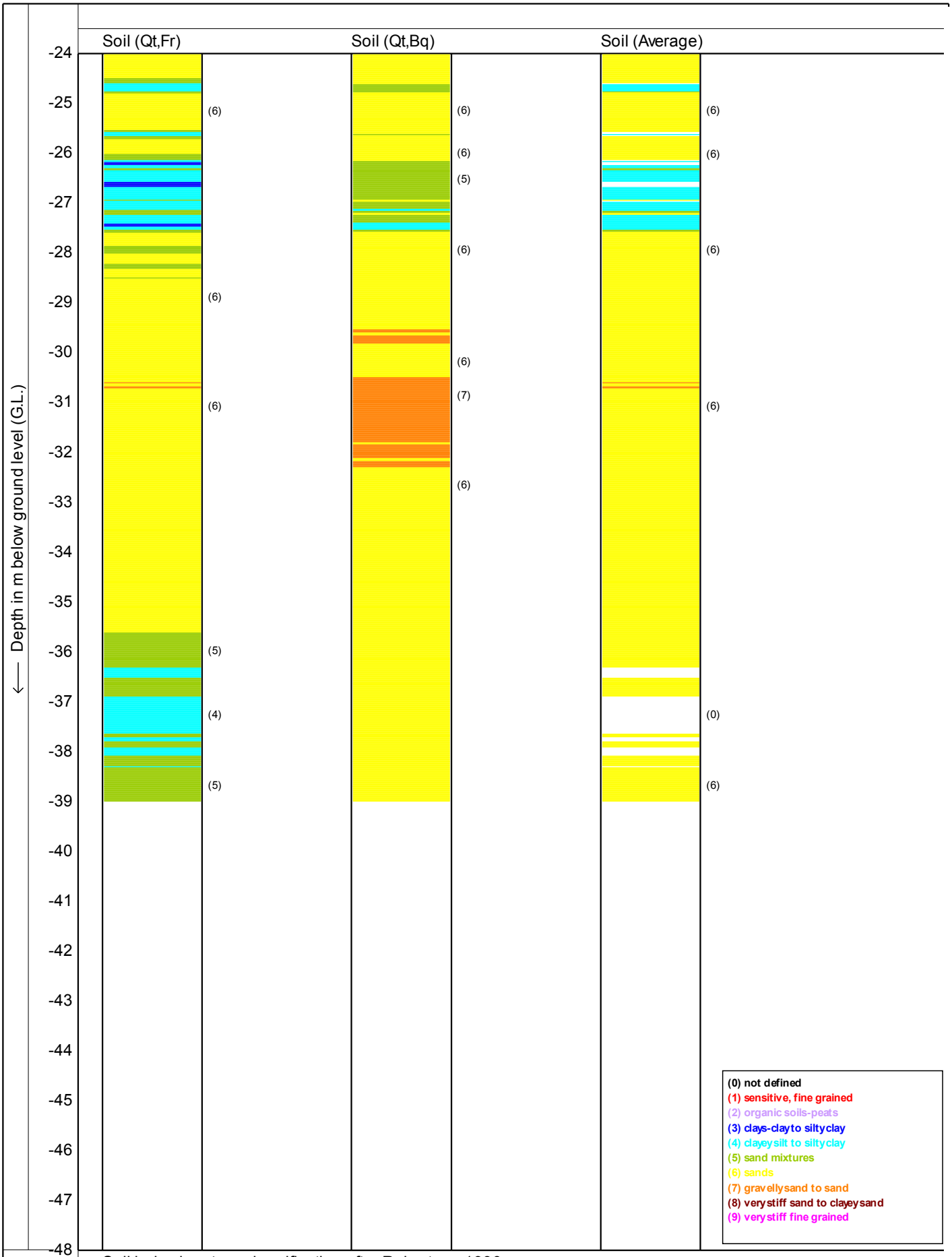
CPT no. : **kcpt3a** 7/8

MOS GRONDMECHANICA

CPTask V1.14



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CPT no. : **kcpt3a** 8/8

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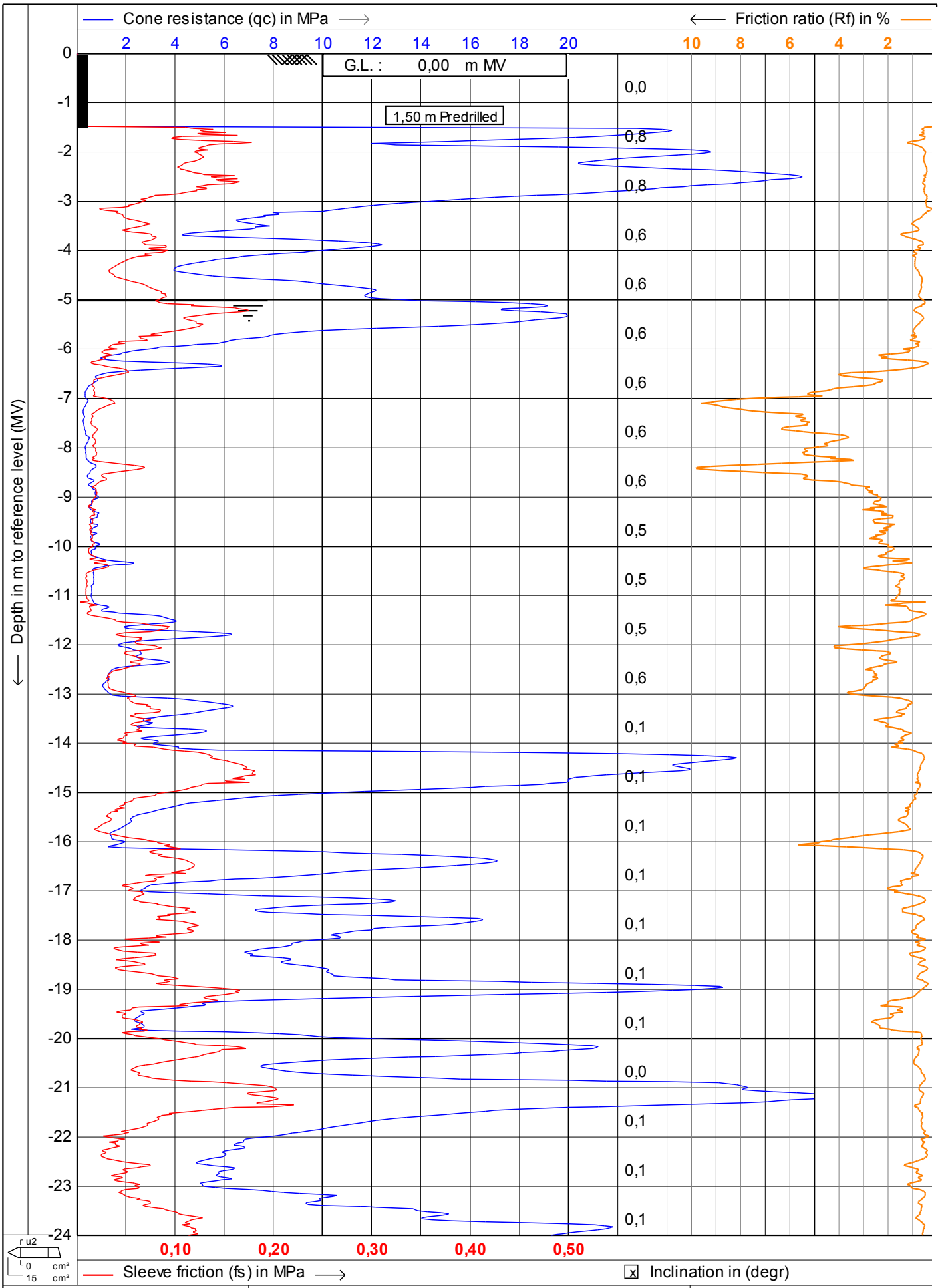
CPTask V1.14



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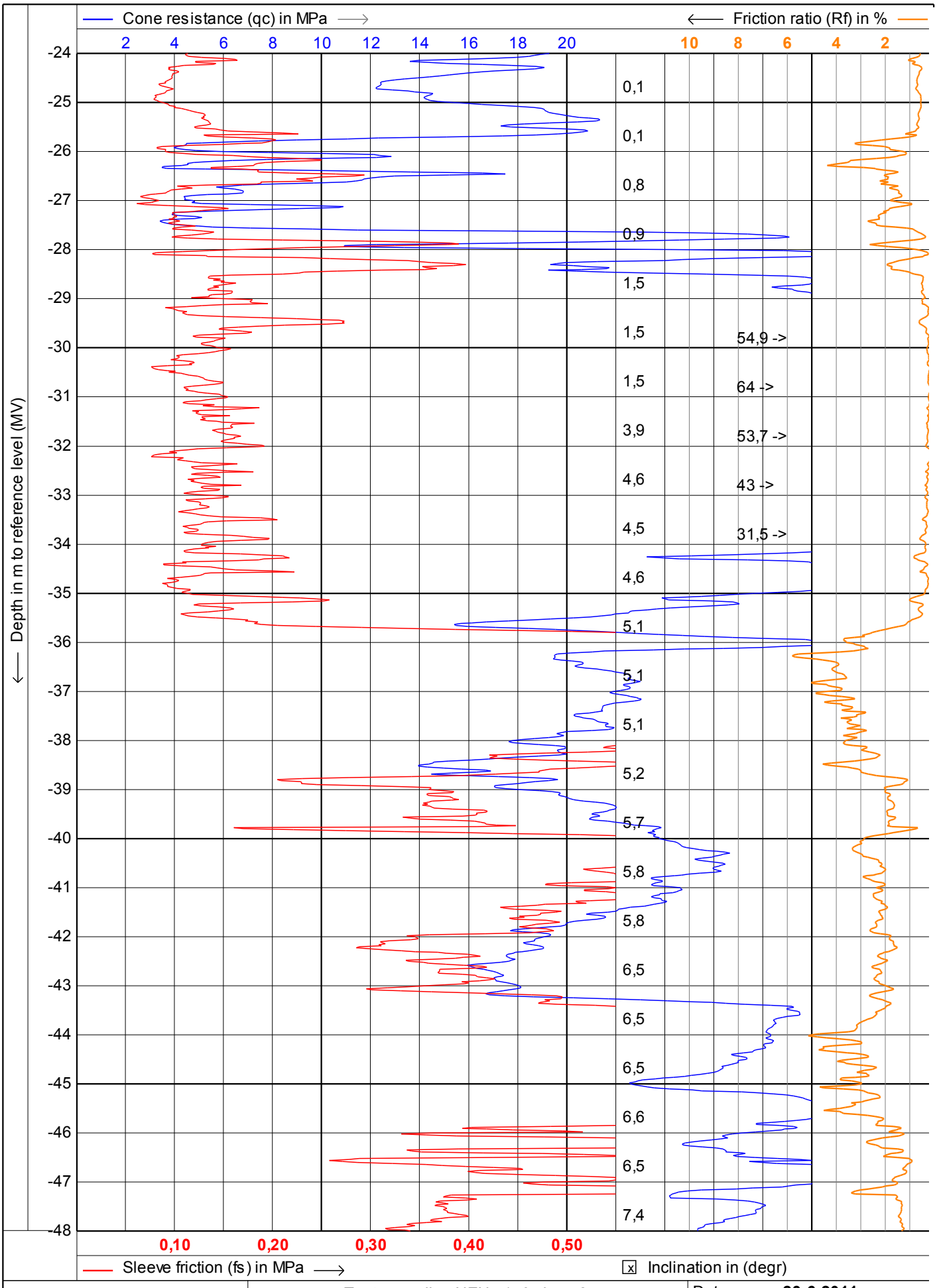
Project no. : **0041011**
CPT no. : **kcpt3b** 1/12

CPTask V1.14



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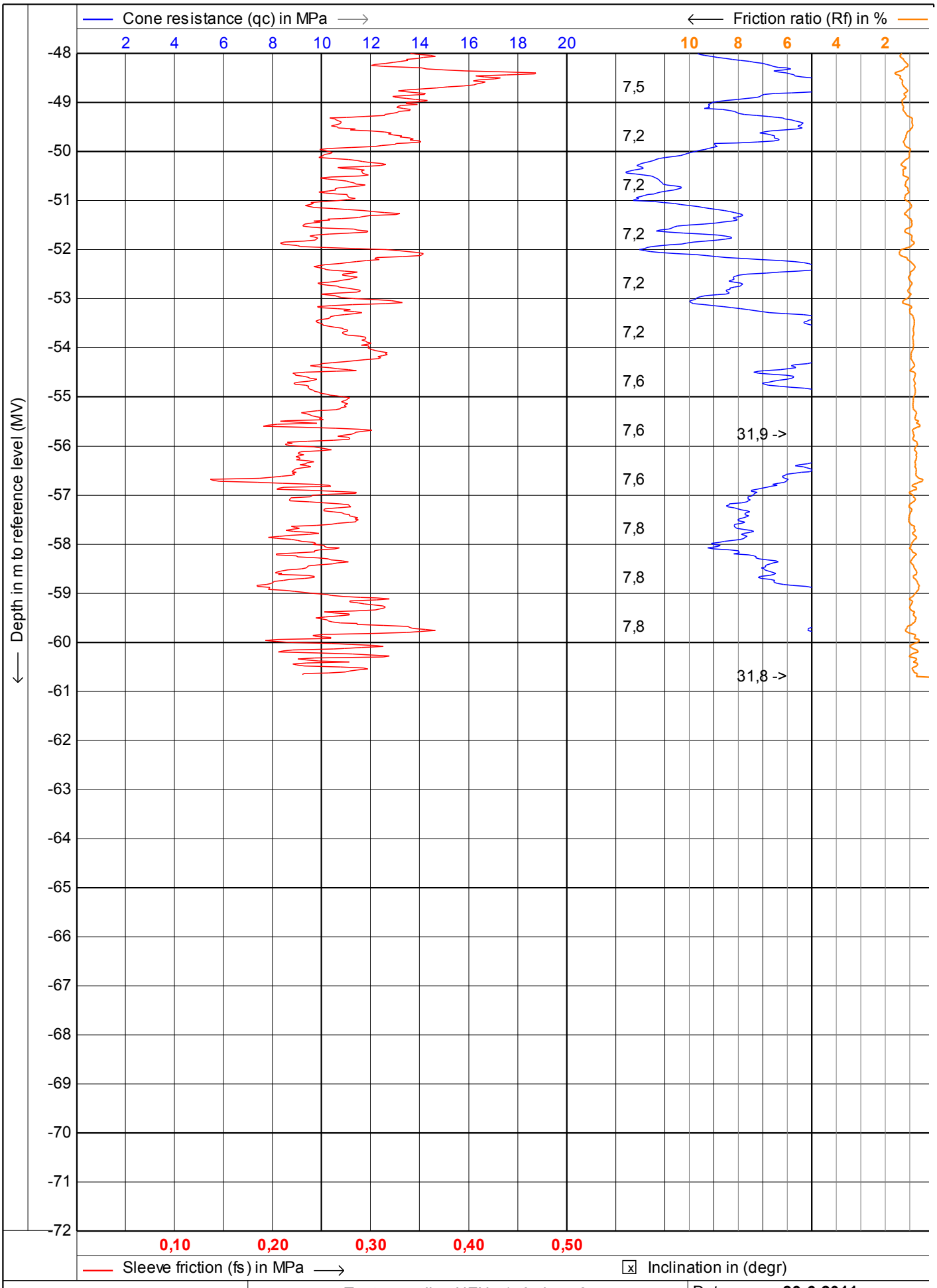
CPT no. : **kcpt3b** 2/12

CPTask V1.14



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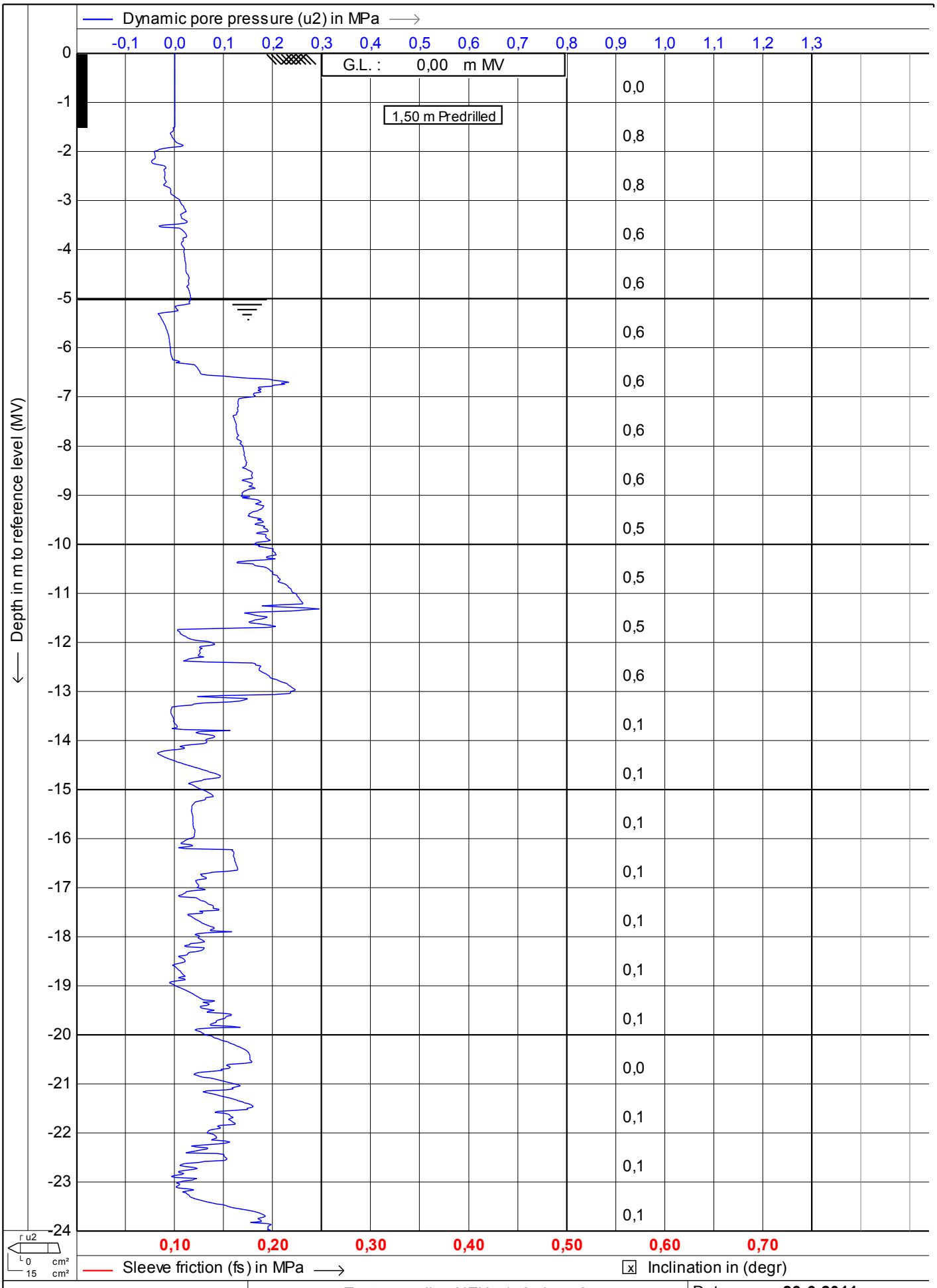
CPT no. : **kcpt3b** 3/12

MOS GRONDMECHANICA

CPTask V1.14



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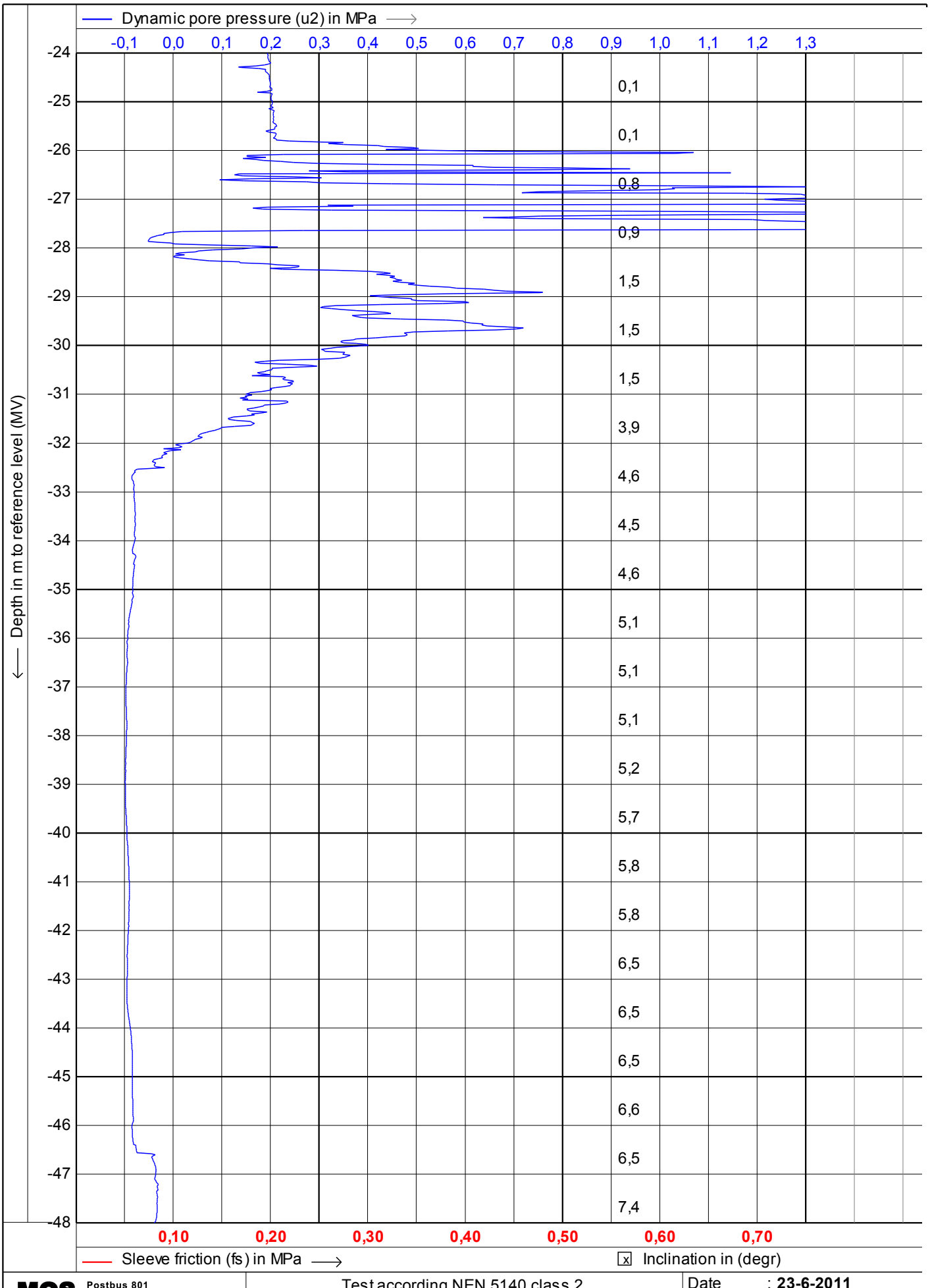
CPTask V1.14



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CPT no. : **kcpt3b** **5/12**

CPTask V1.14

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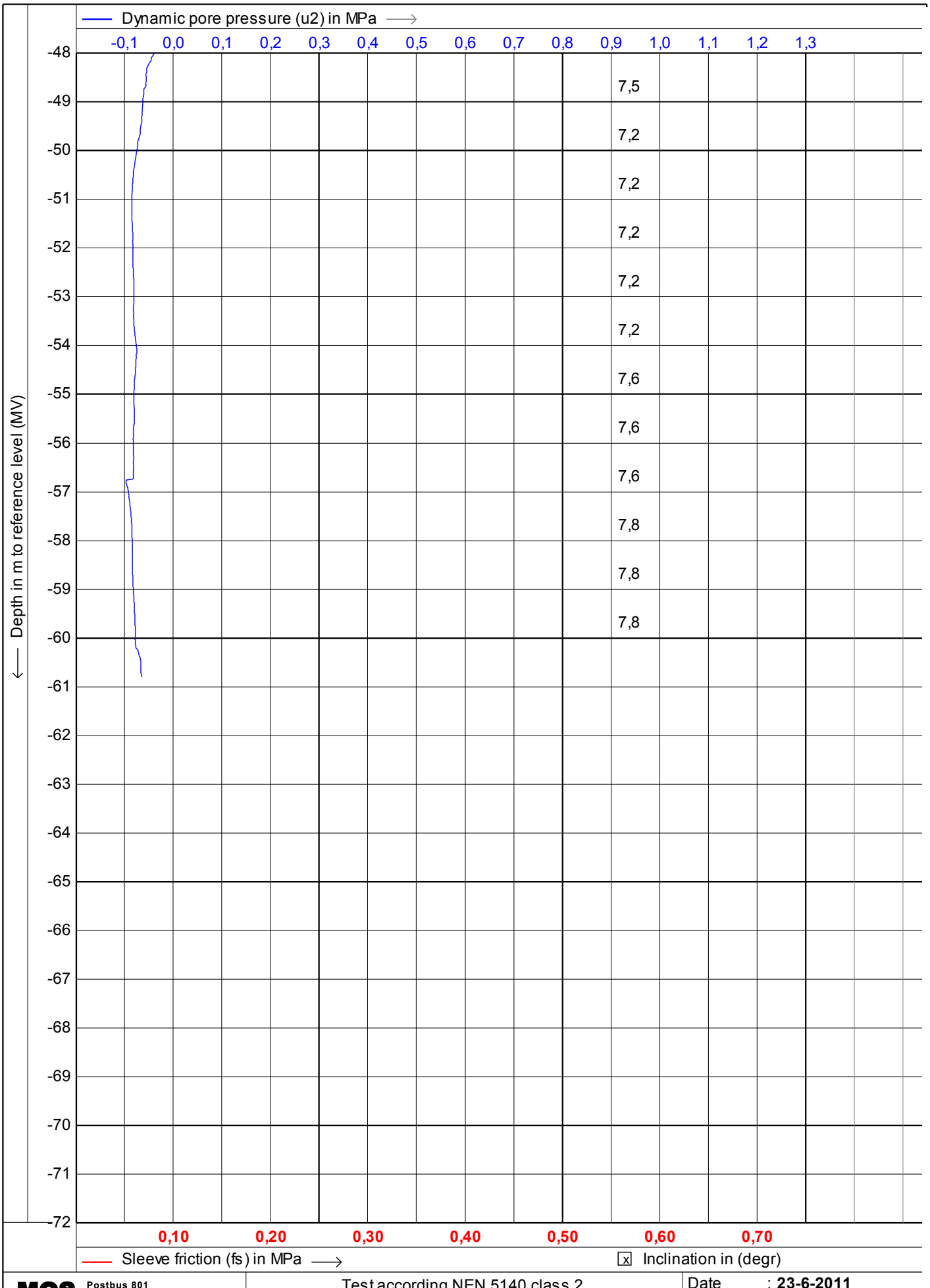

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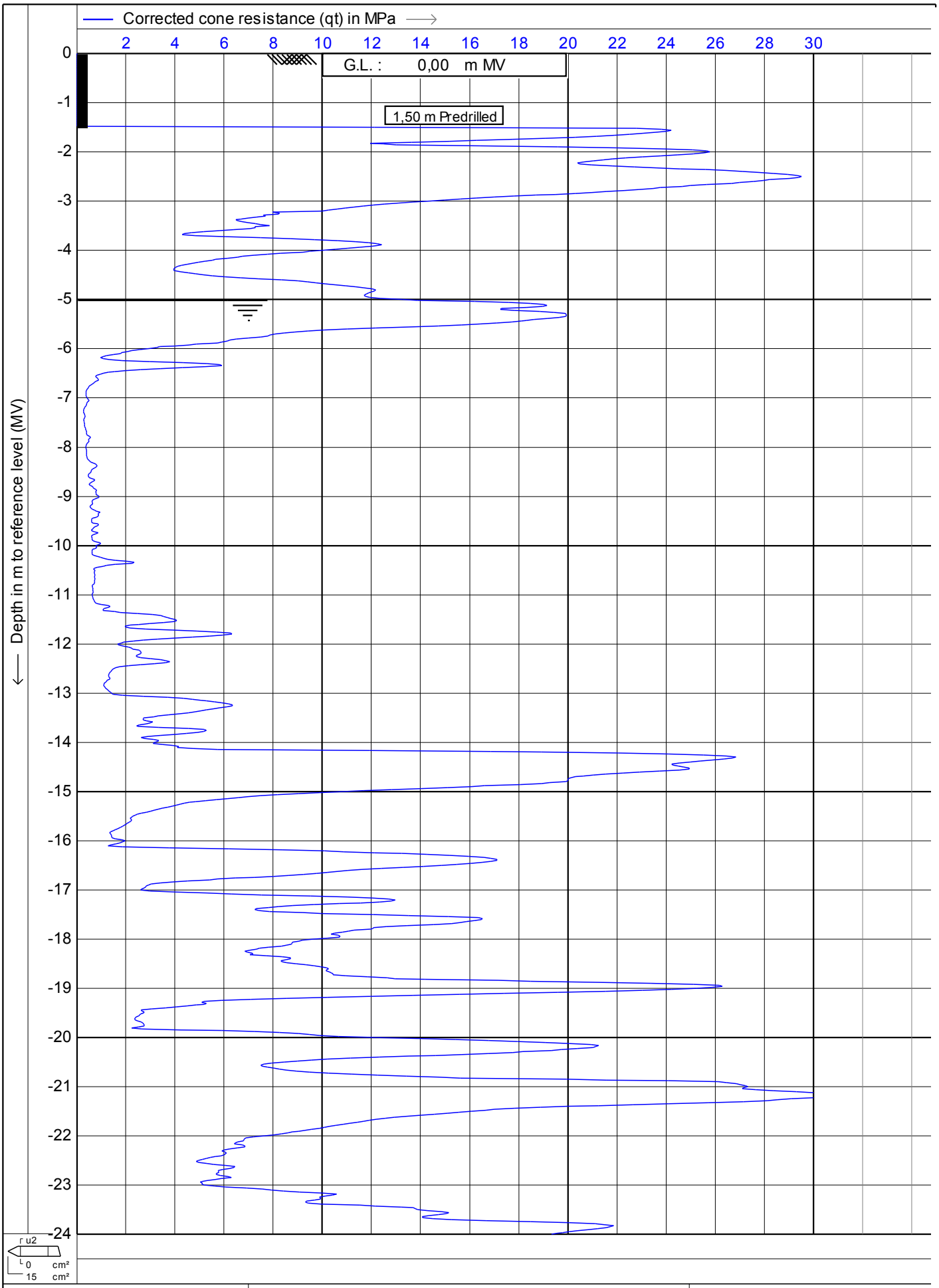
CPTask V1.14



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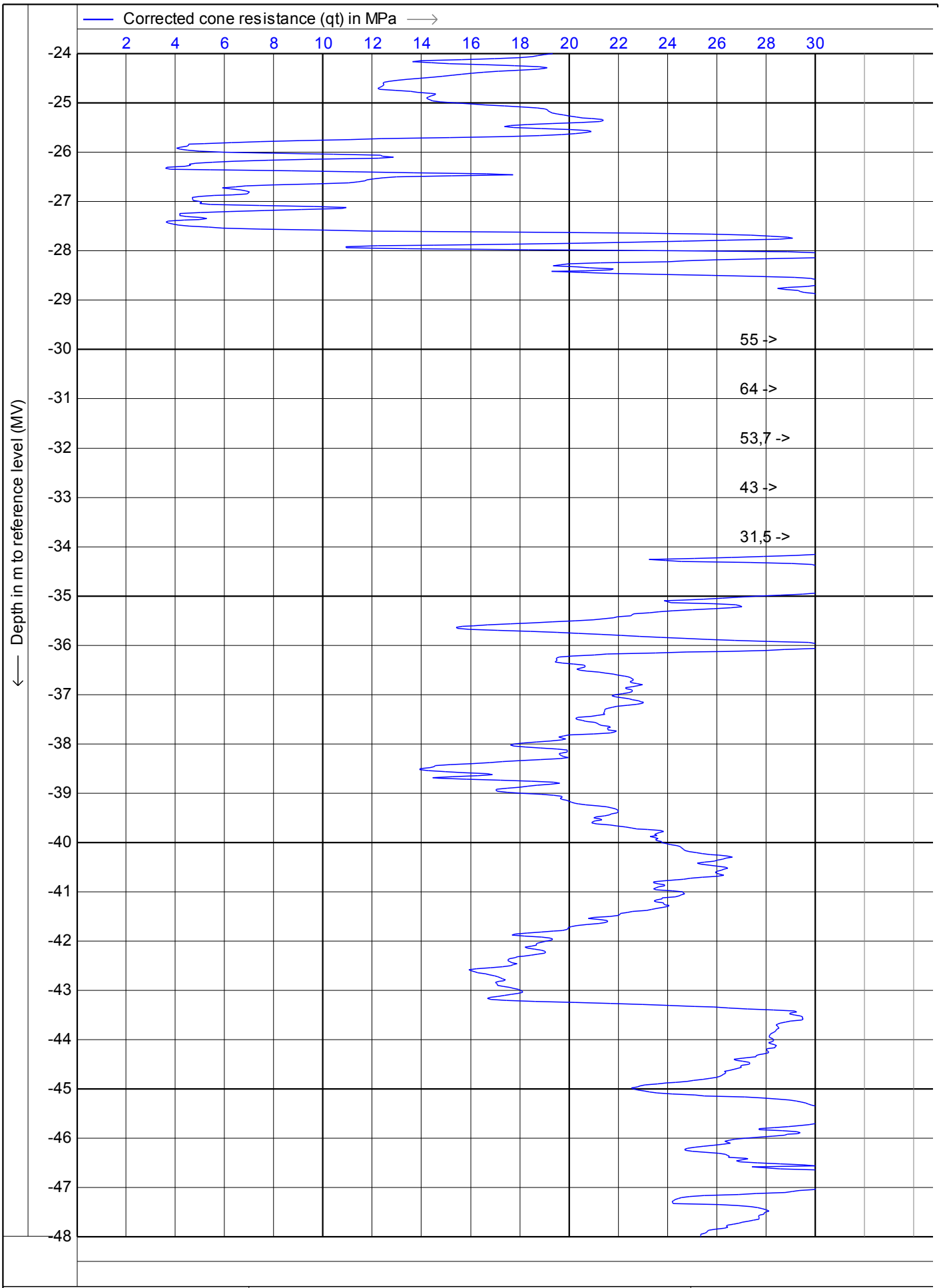
MOS GRONDMECHANICA
CPTask V1.14



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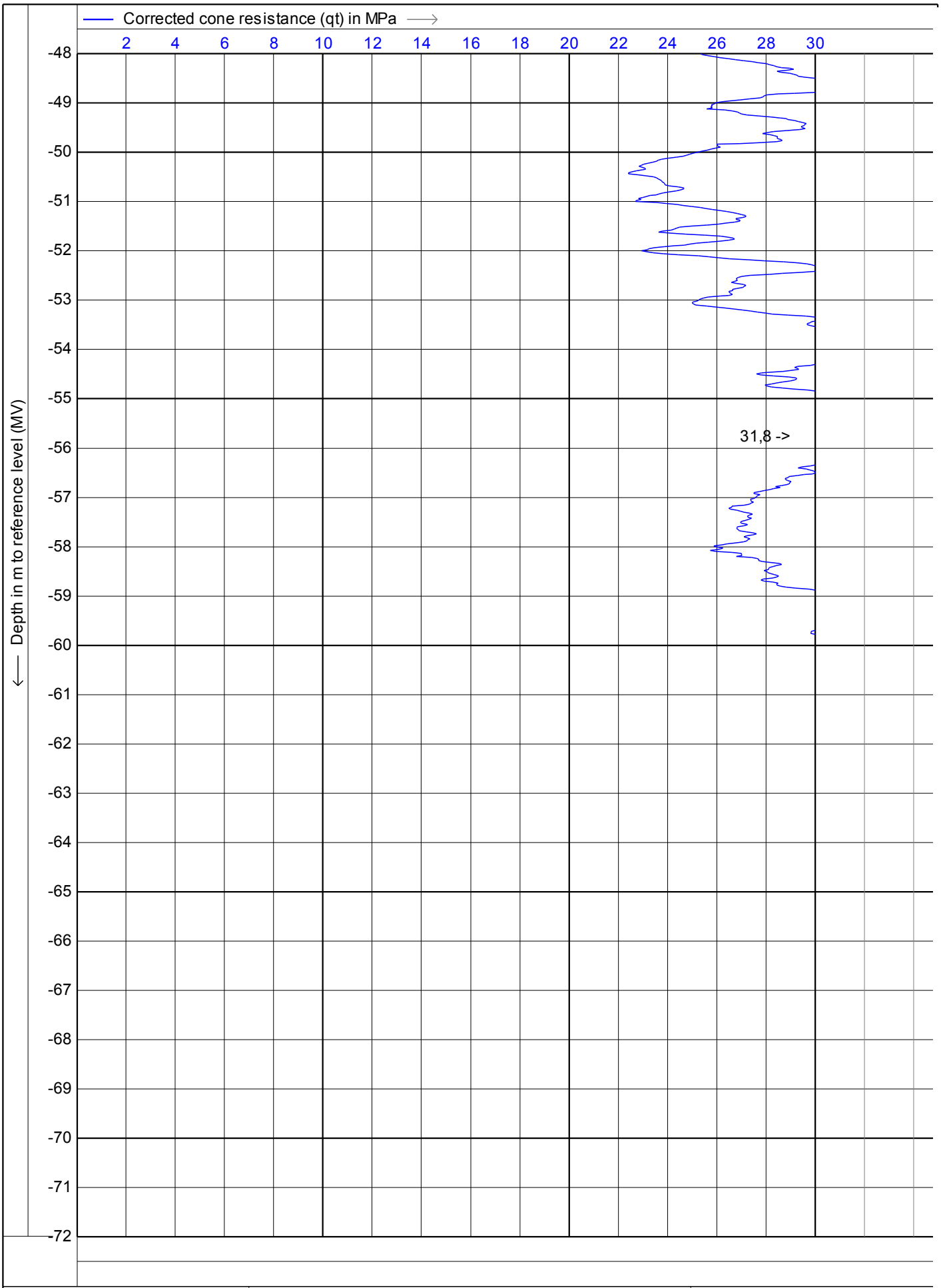
MOS GRONDMECHANICA

CPTask V1.14



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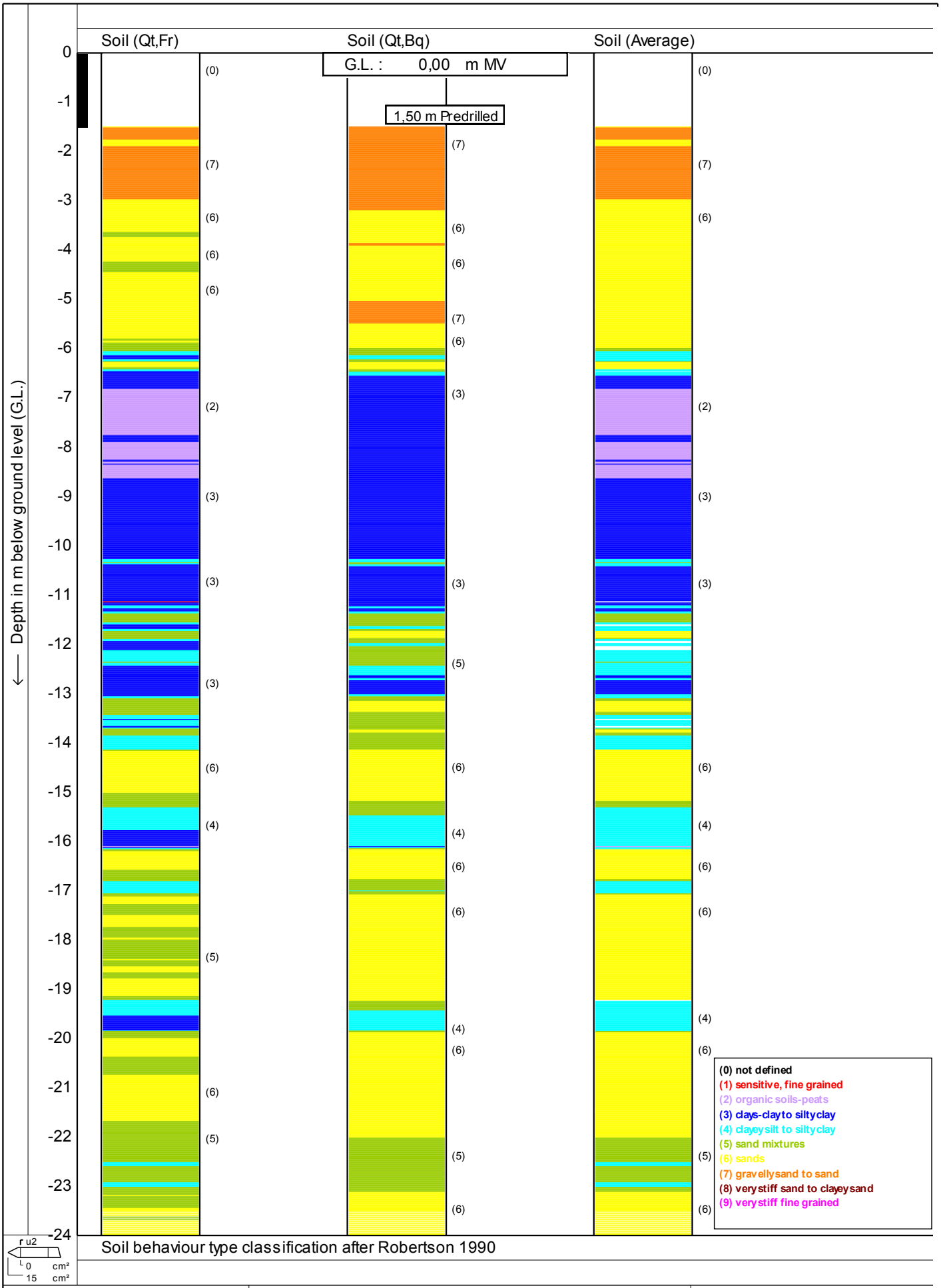
CPT no.	: **kcpt3b** **9/12**



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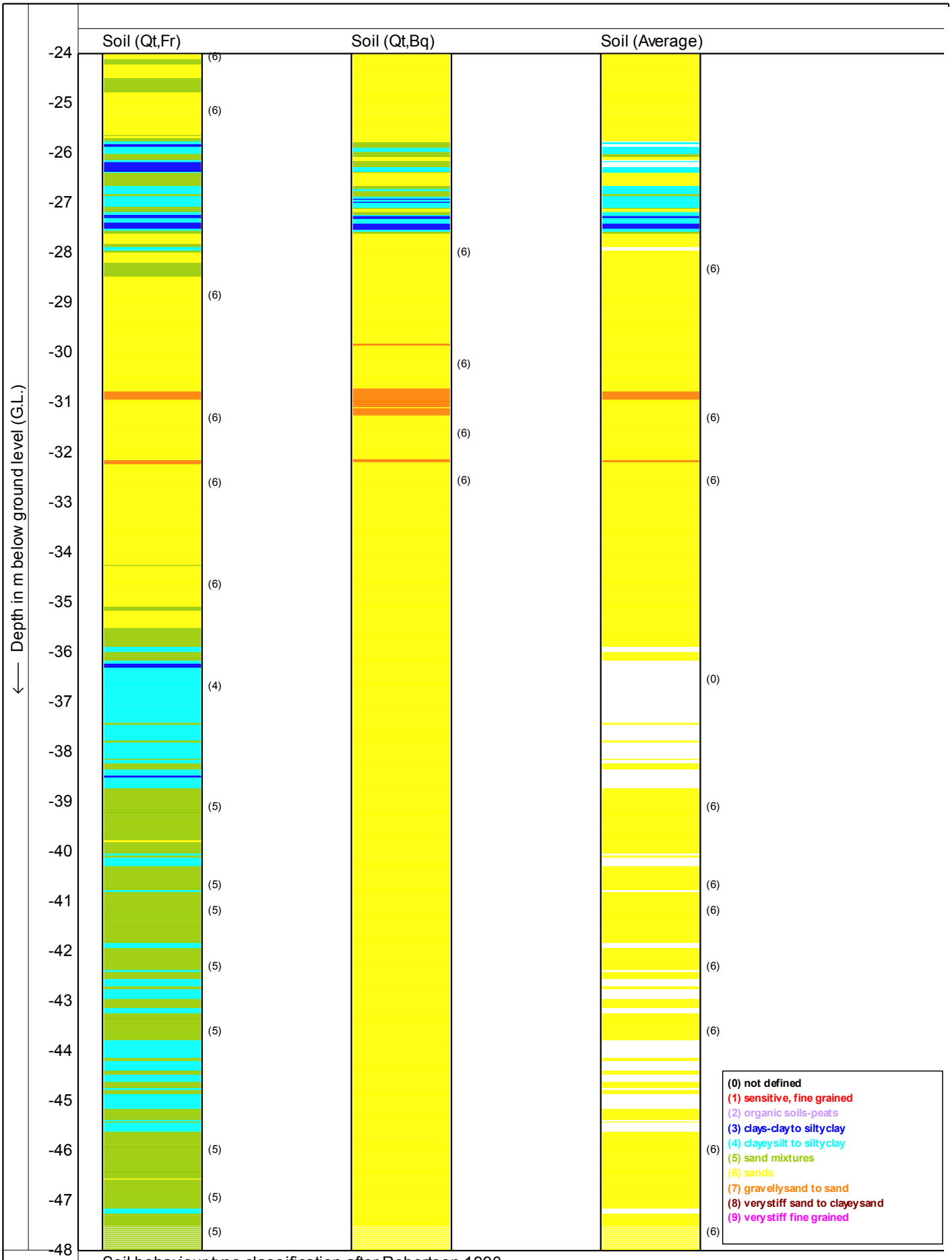
CPT no. : **kcpt3b** 10/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

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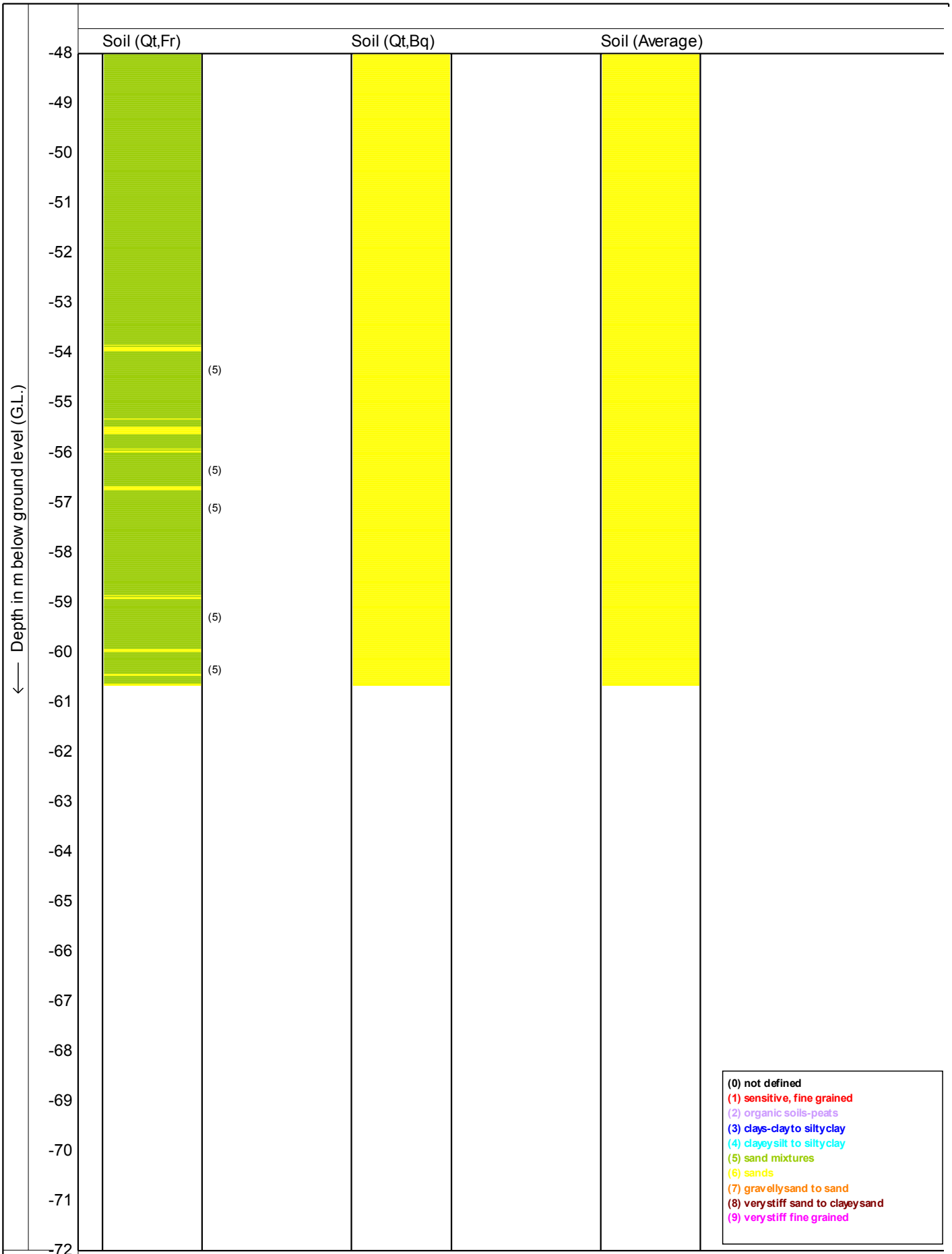
Cone no. : **S15CFIP.481**
Project no. : **0041011**
CPT no. : **kcpt3b** 11/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

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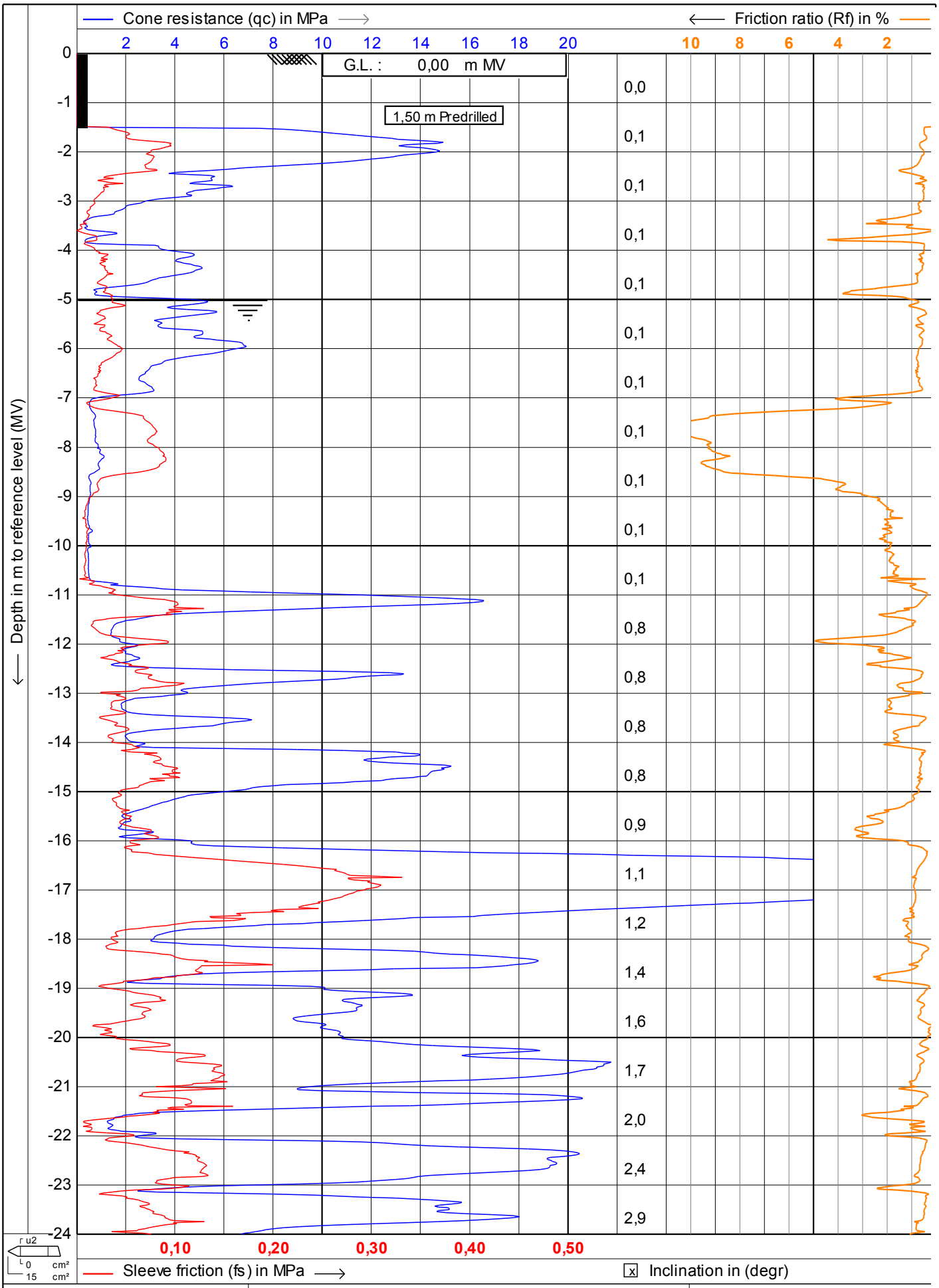
Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kcpt3b** 12/12

CPTask V1.14

MOS GRONDMECHANICA



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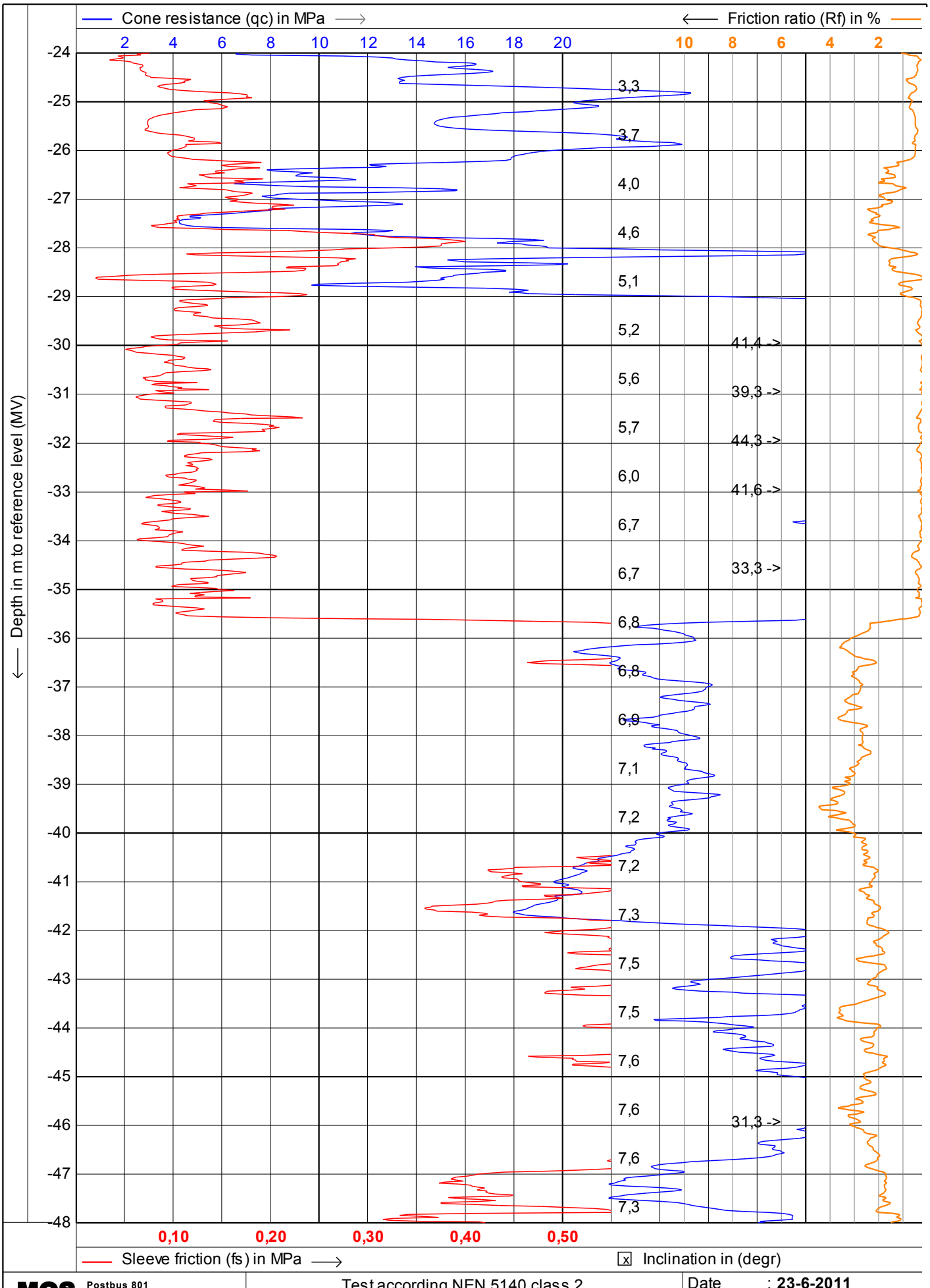
Date : **23-6-2011**

Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kcpt4a** 1/12

CPTask V1.14



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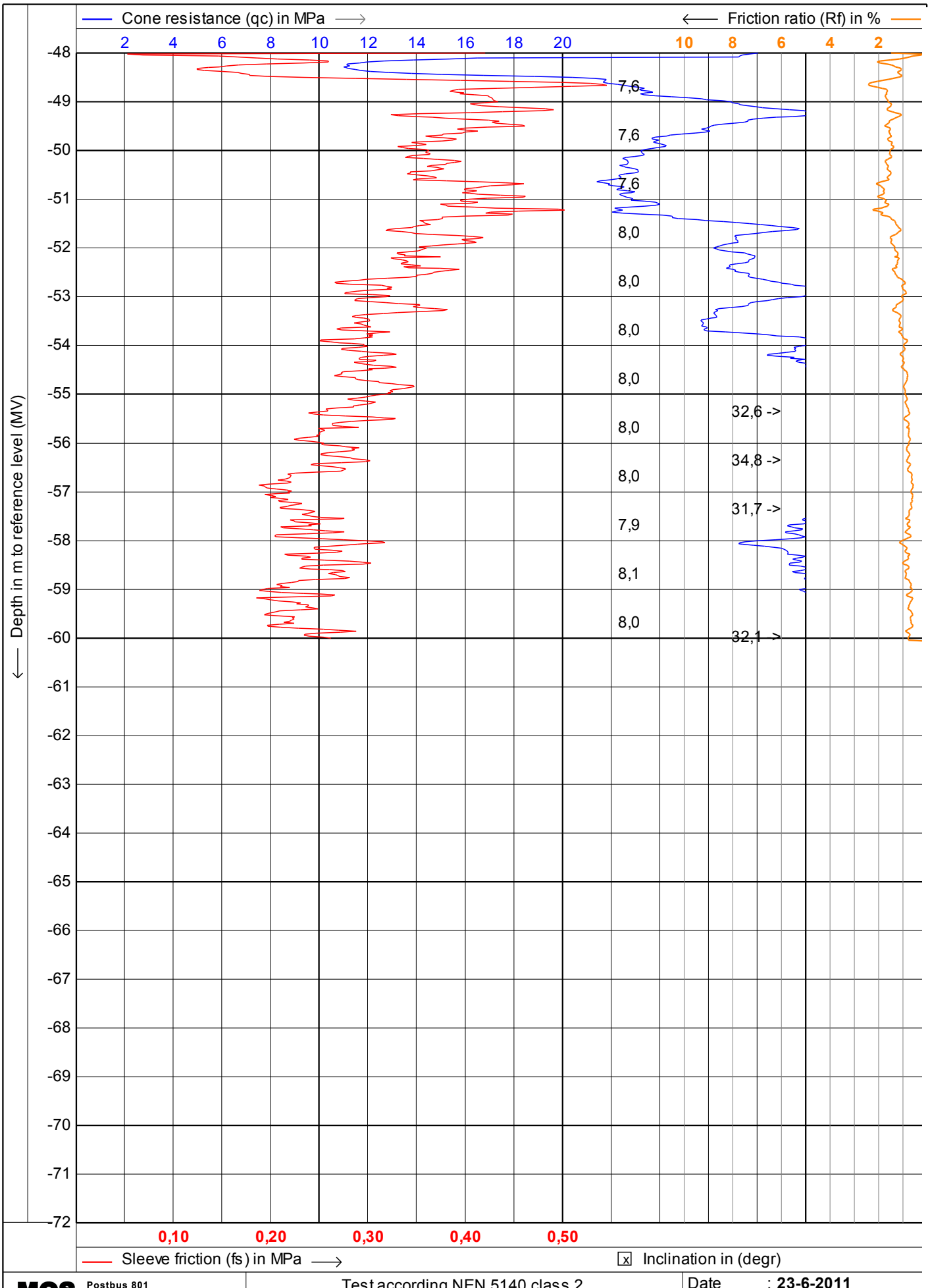
CPTask V1.14
MOS GRONDMECHANICA



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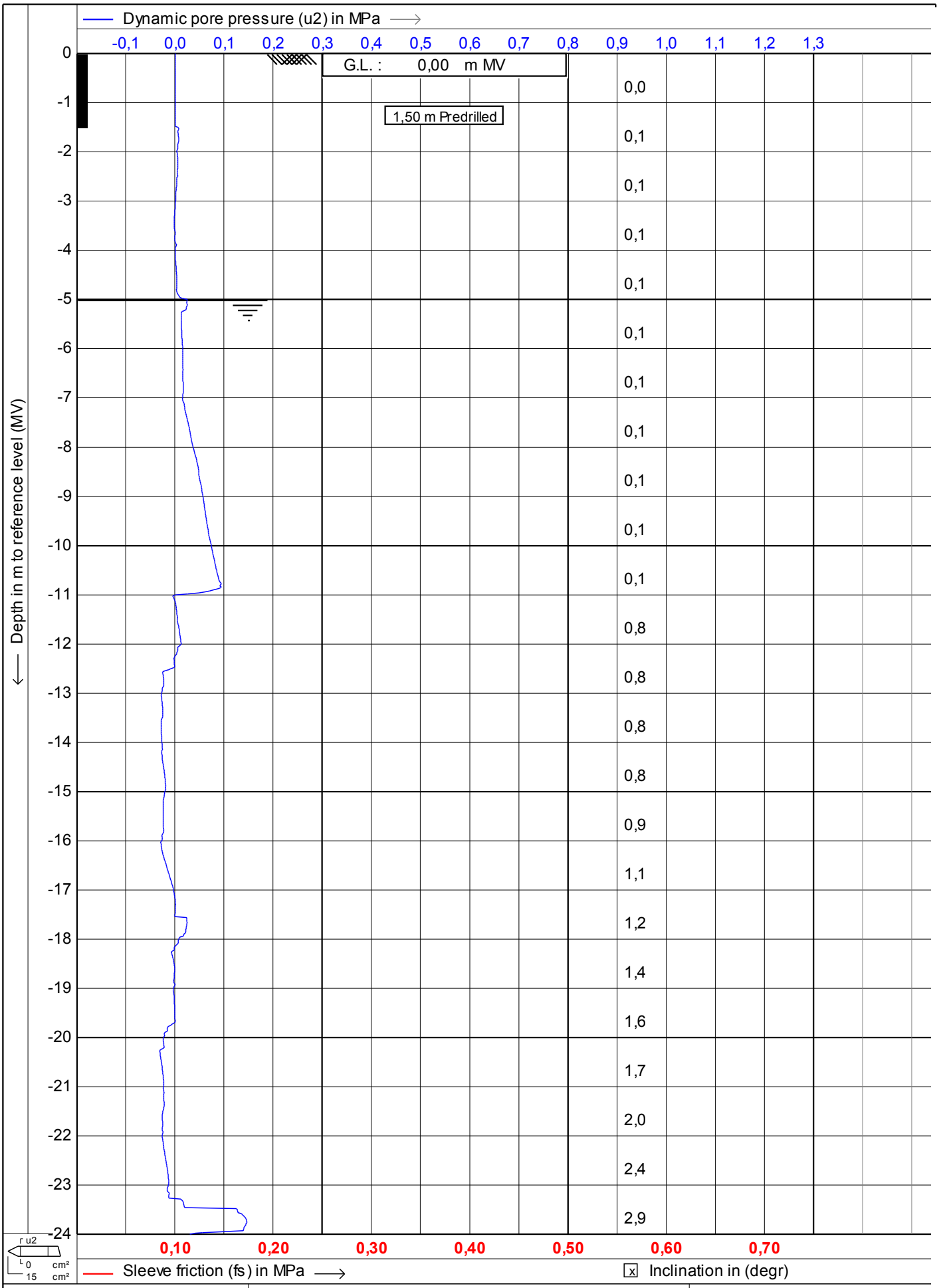
MOS GRONDMECHANICA

CPTask V1.14



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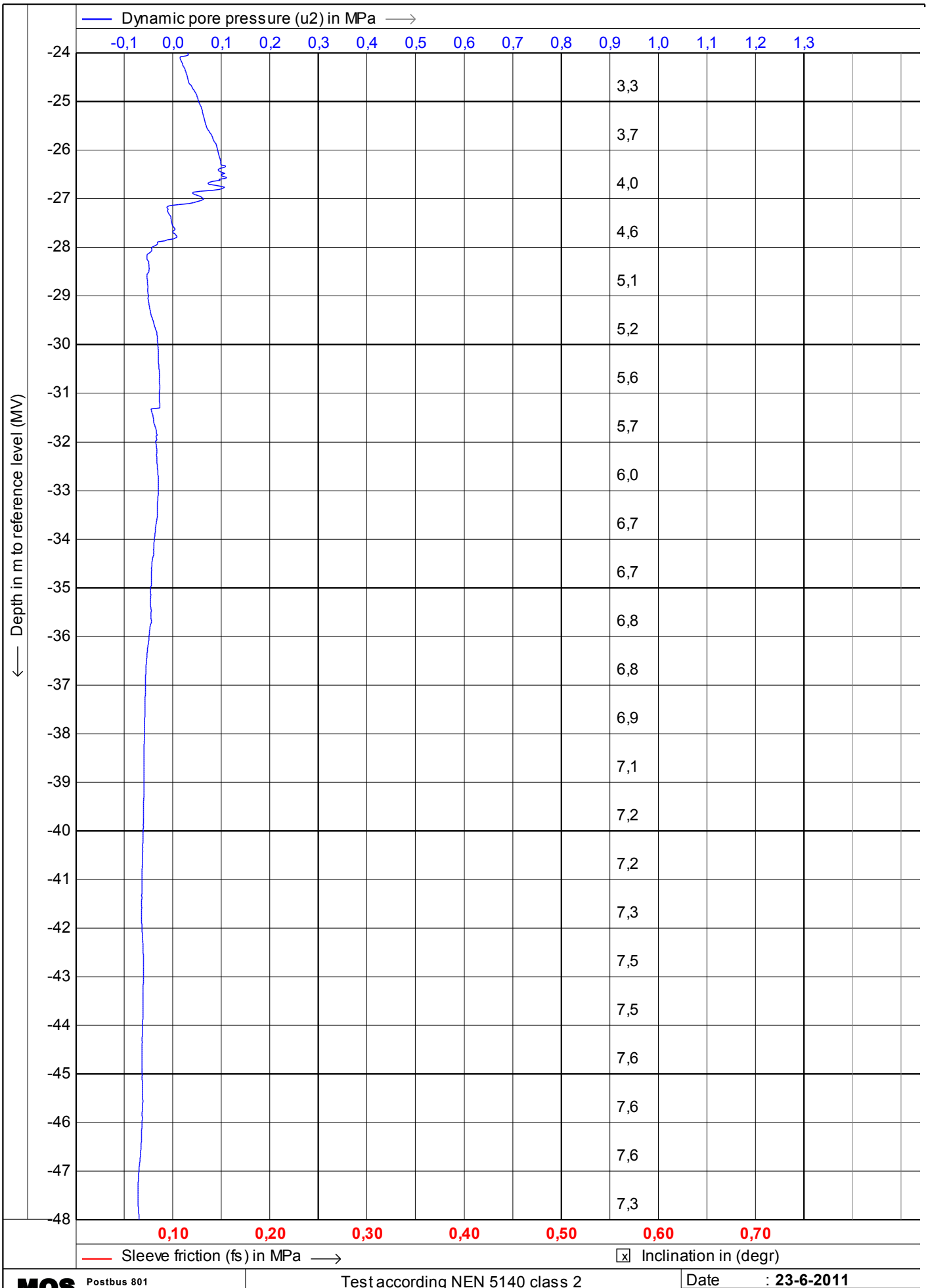
CPTask V1.14



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CPTask V1.14

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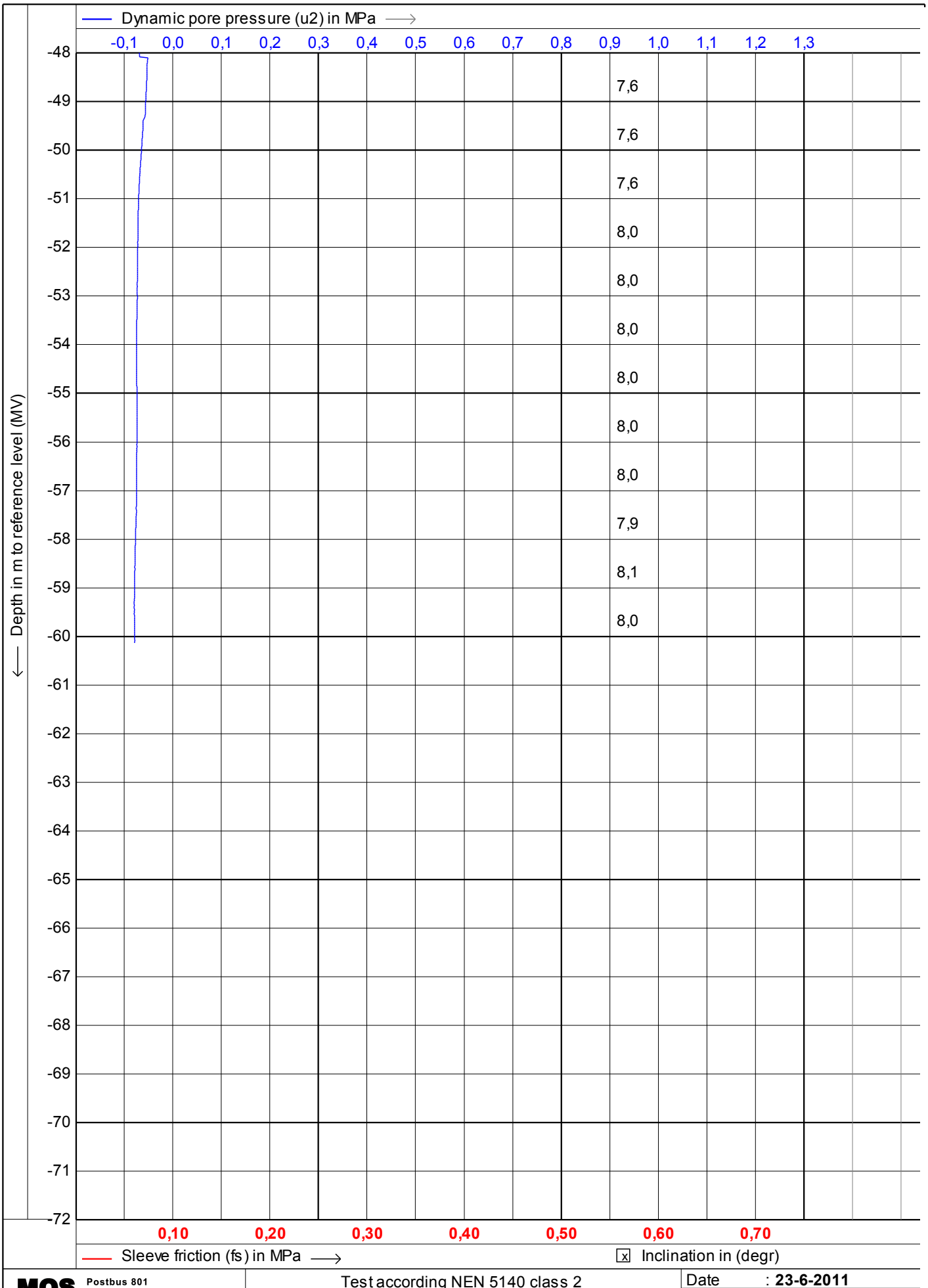

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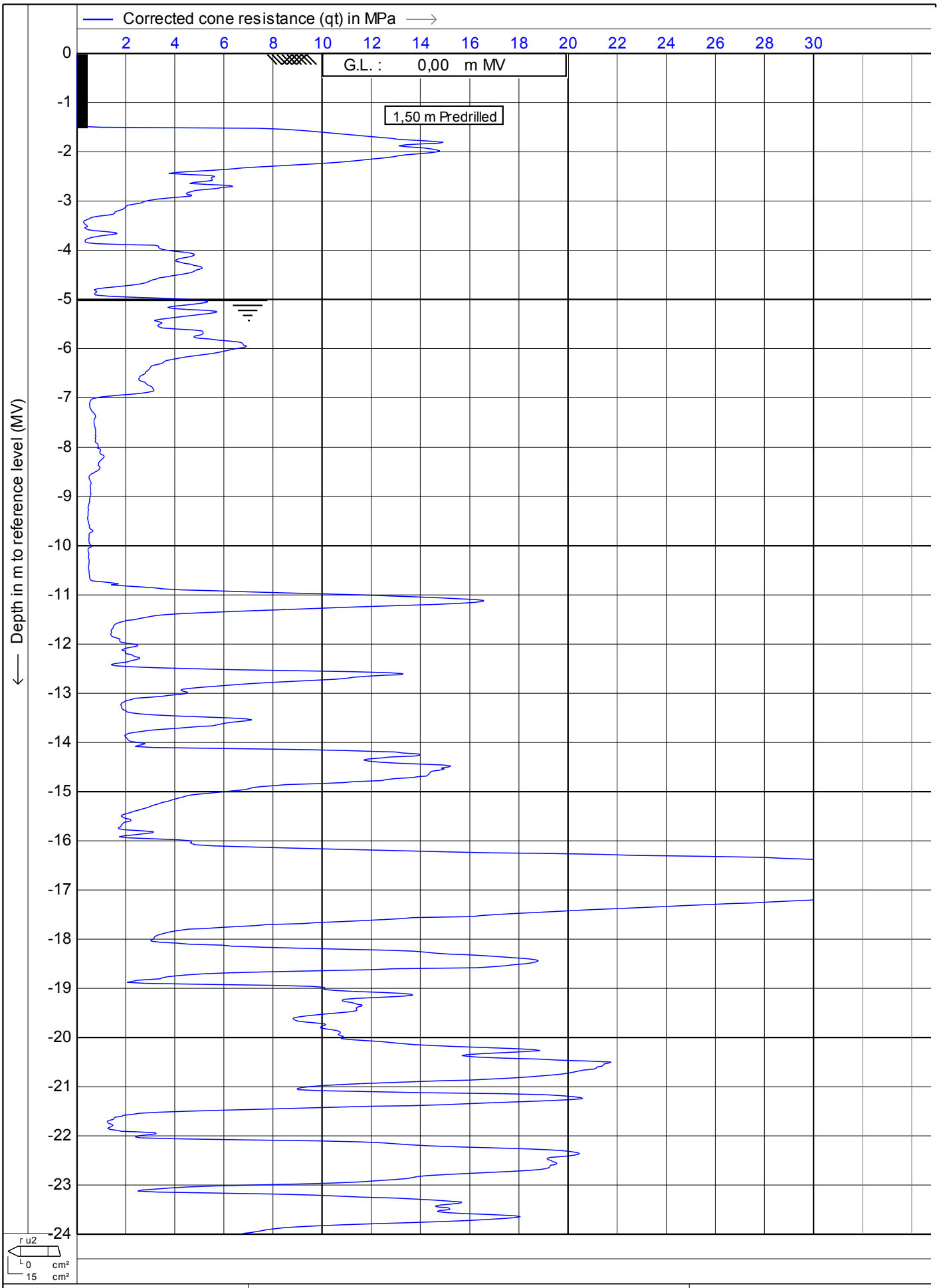
CPTask V1.14



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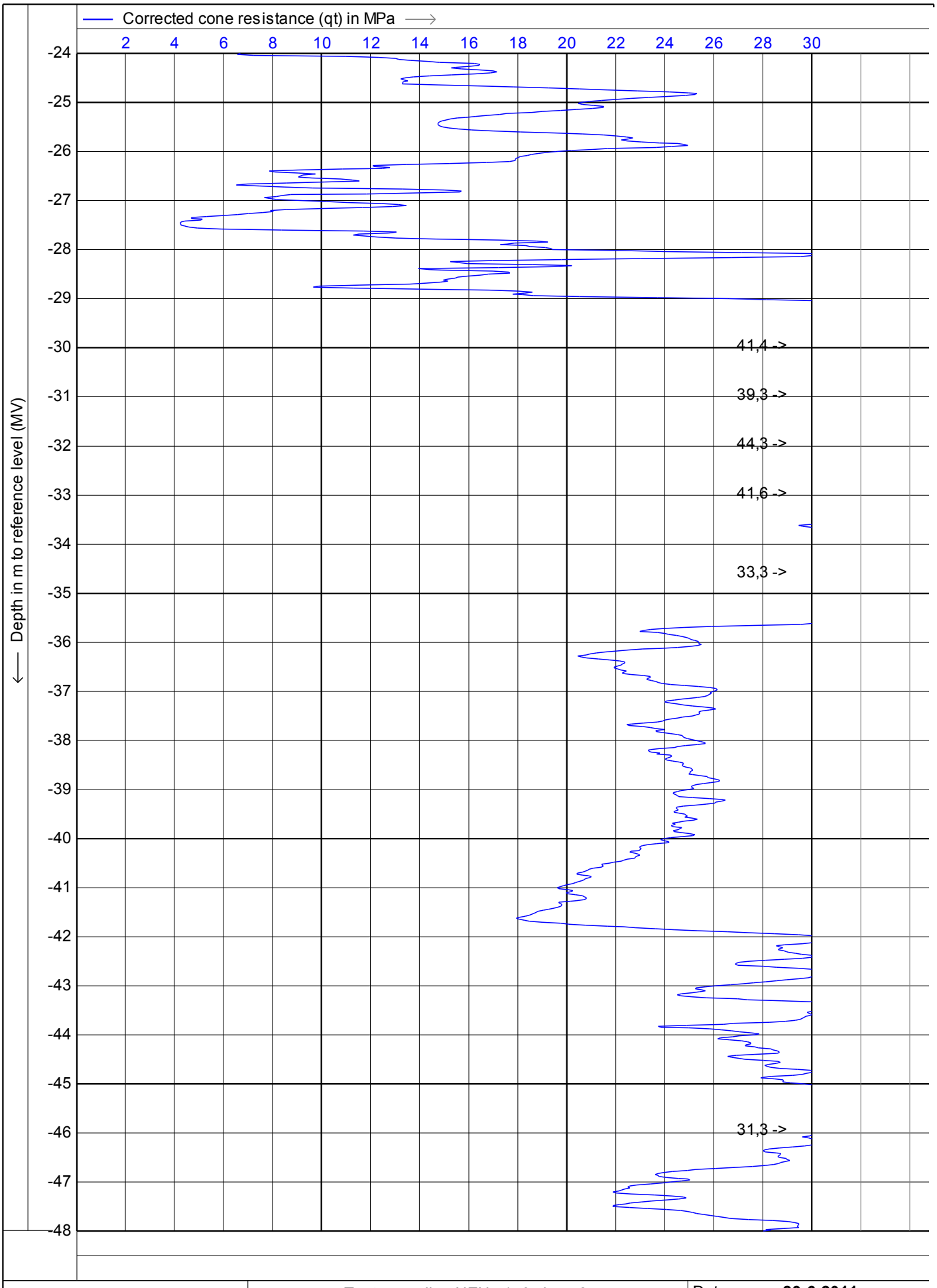

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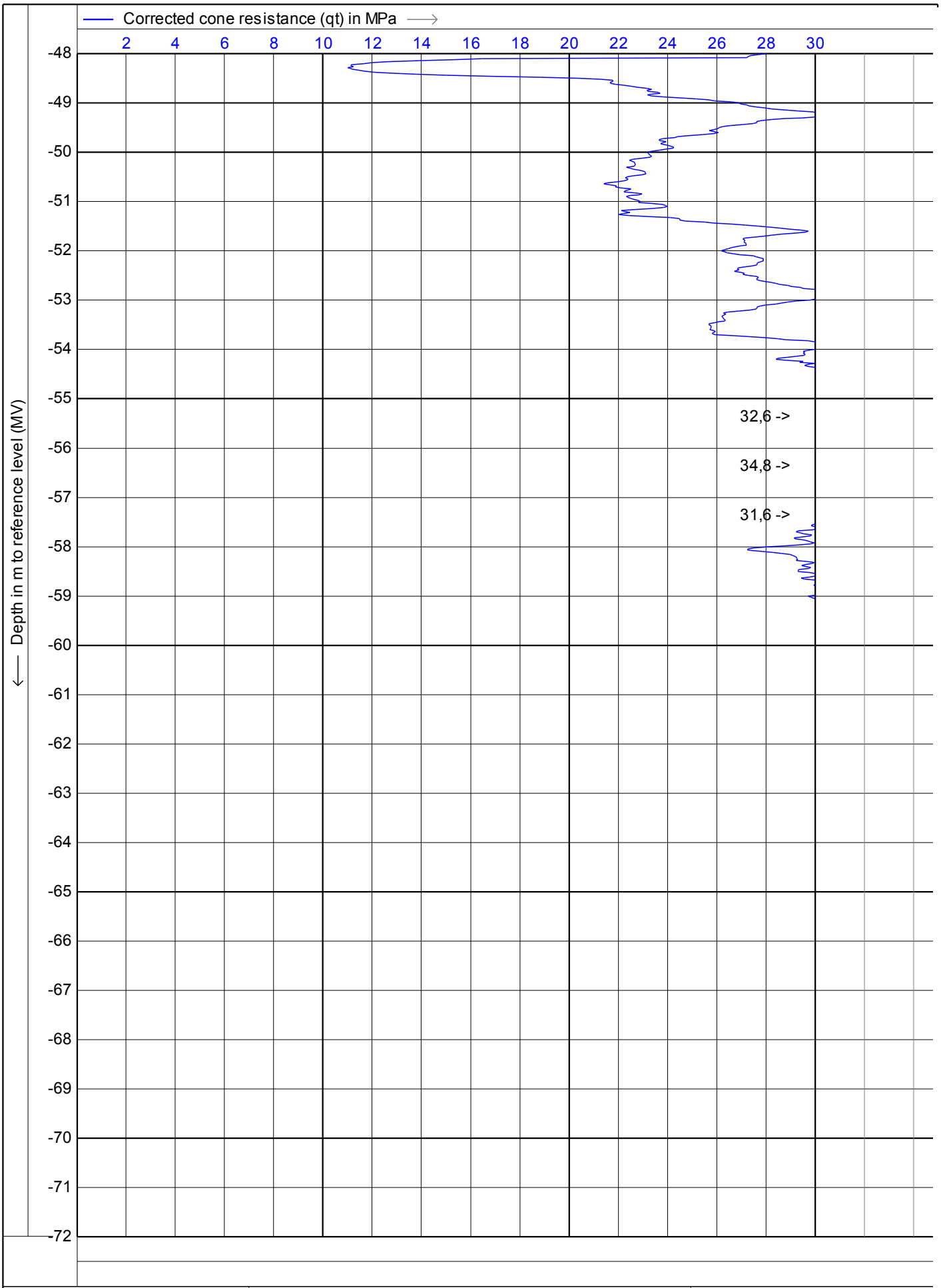
CPTask V1.14



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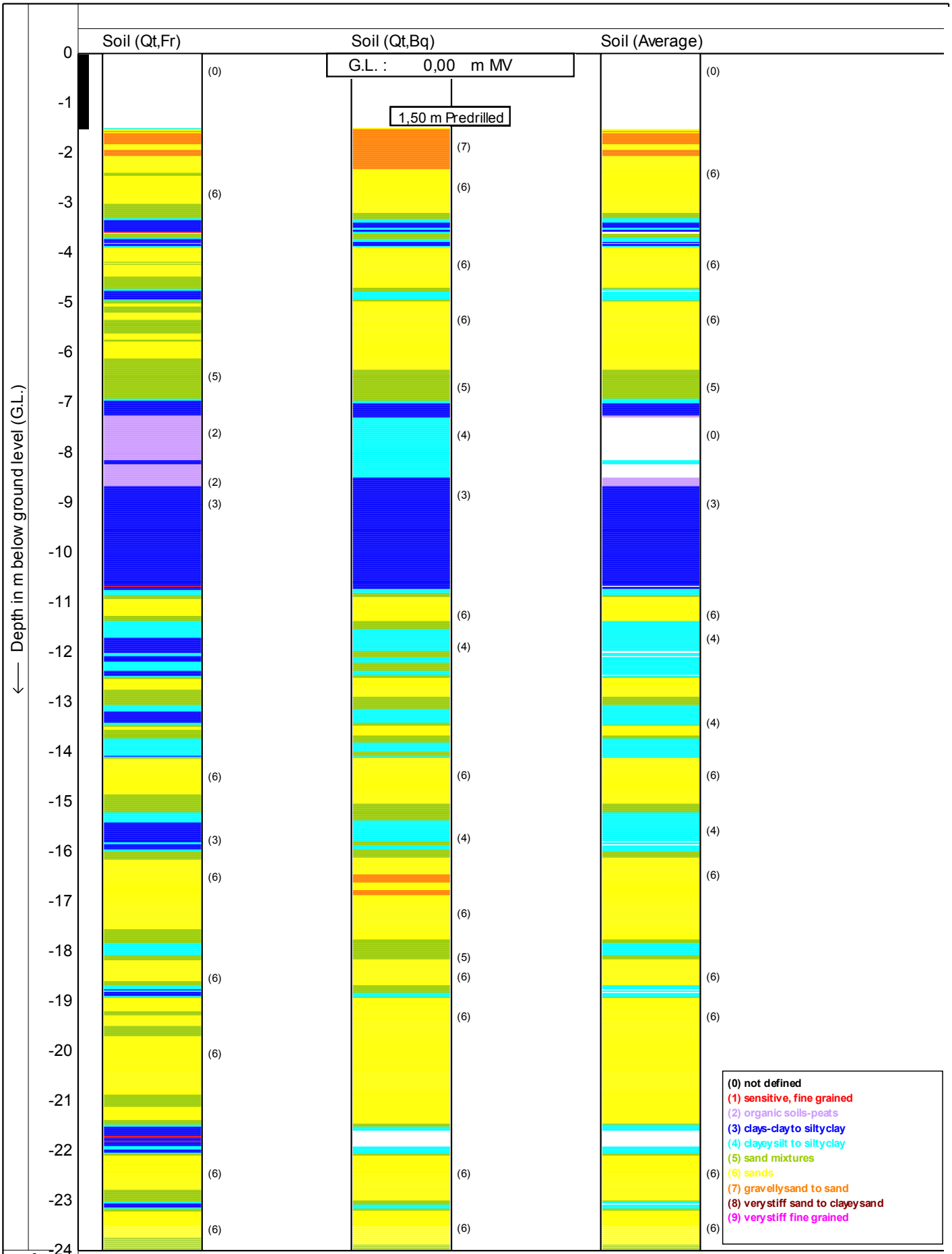

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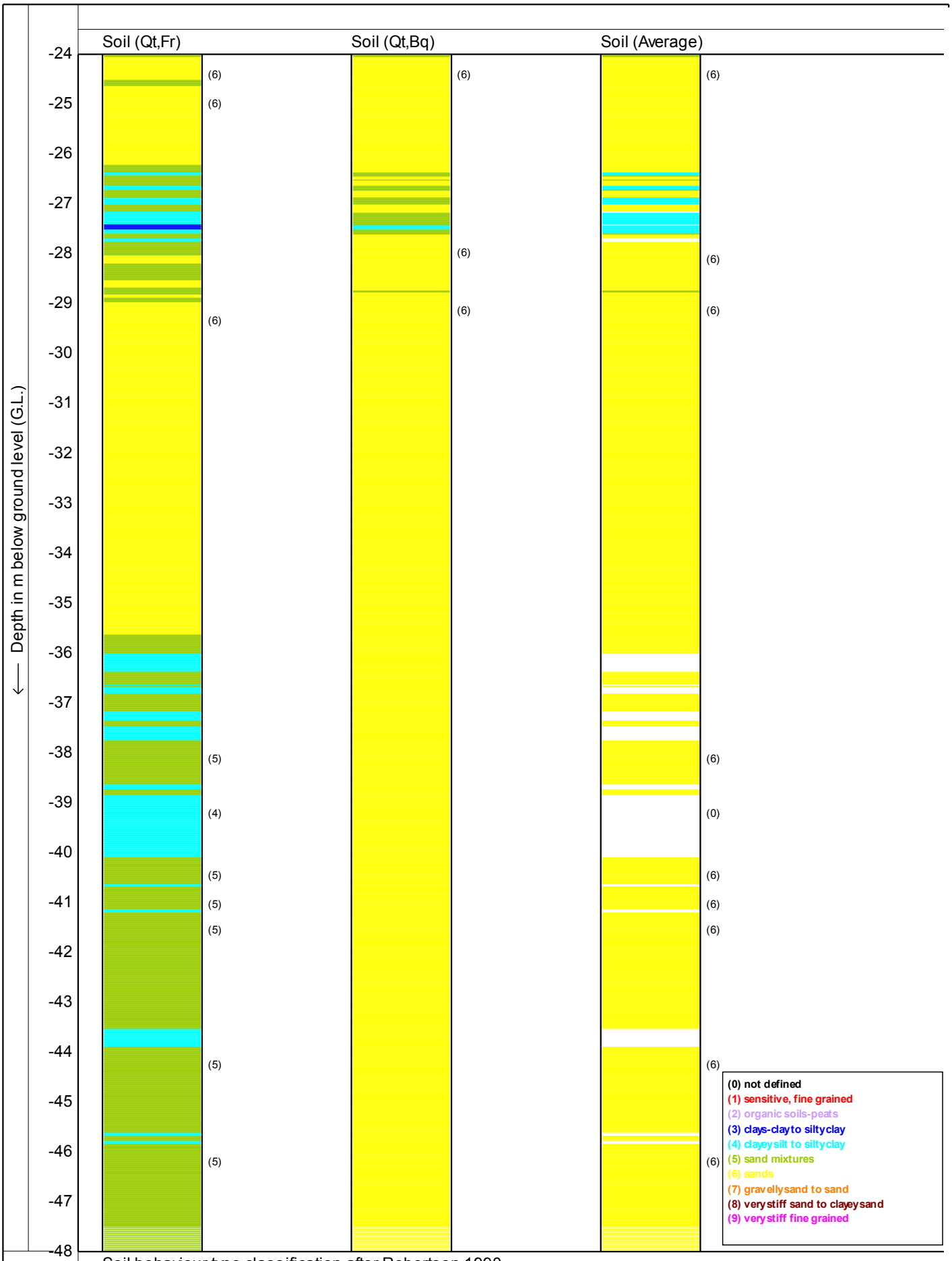
MOS GRONDMECHANICA

CPTask V1.14



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info@mosgeo.com
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Test according NEN 5140 class 2

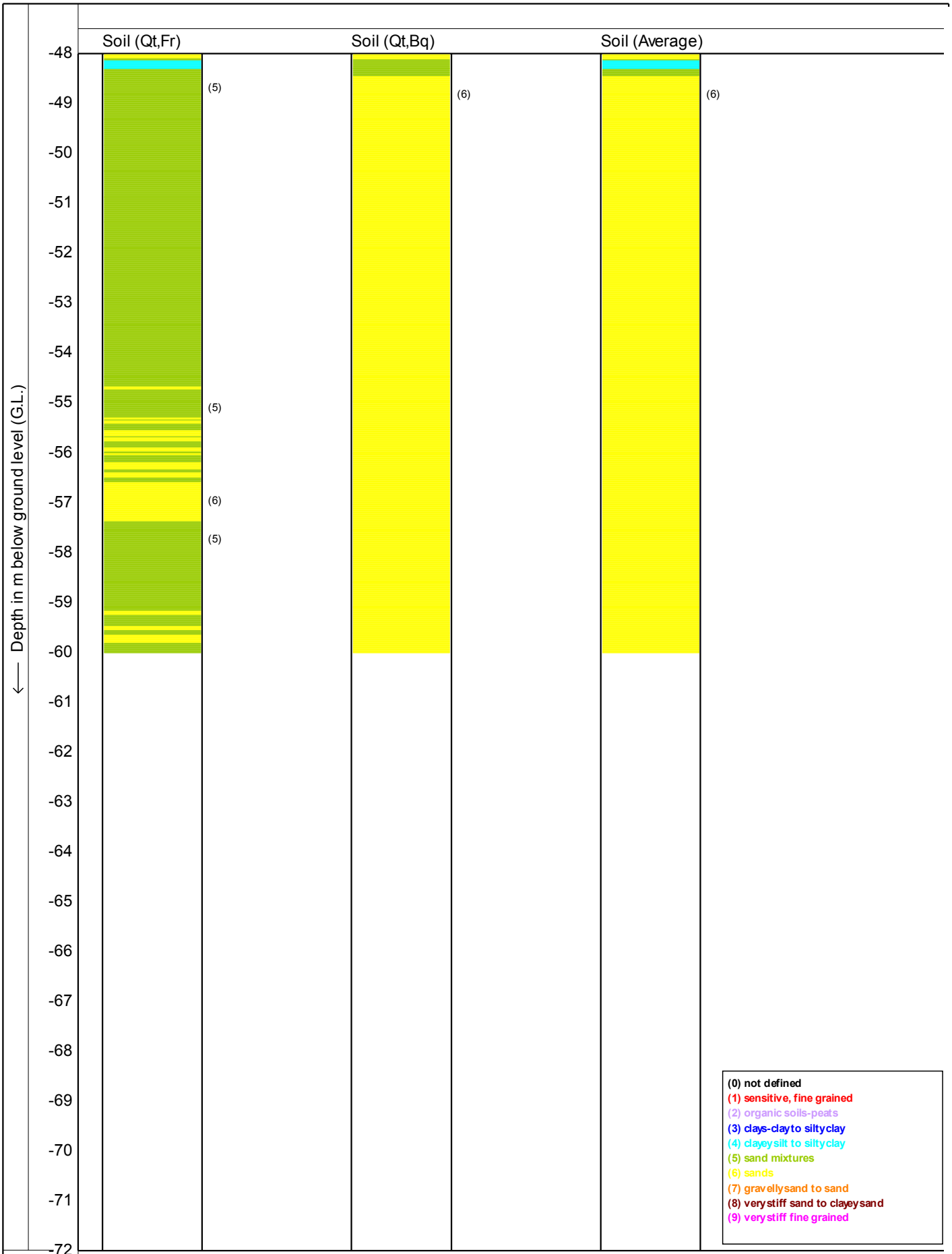
Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**
Cone no. : **S15CFIP.481**
Project no. : **0041011**
CPT no. : **kcpt4a** 11/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **23-6-2011**

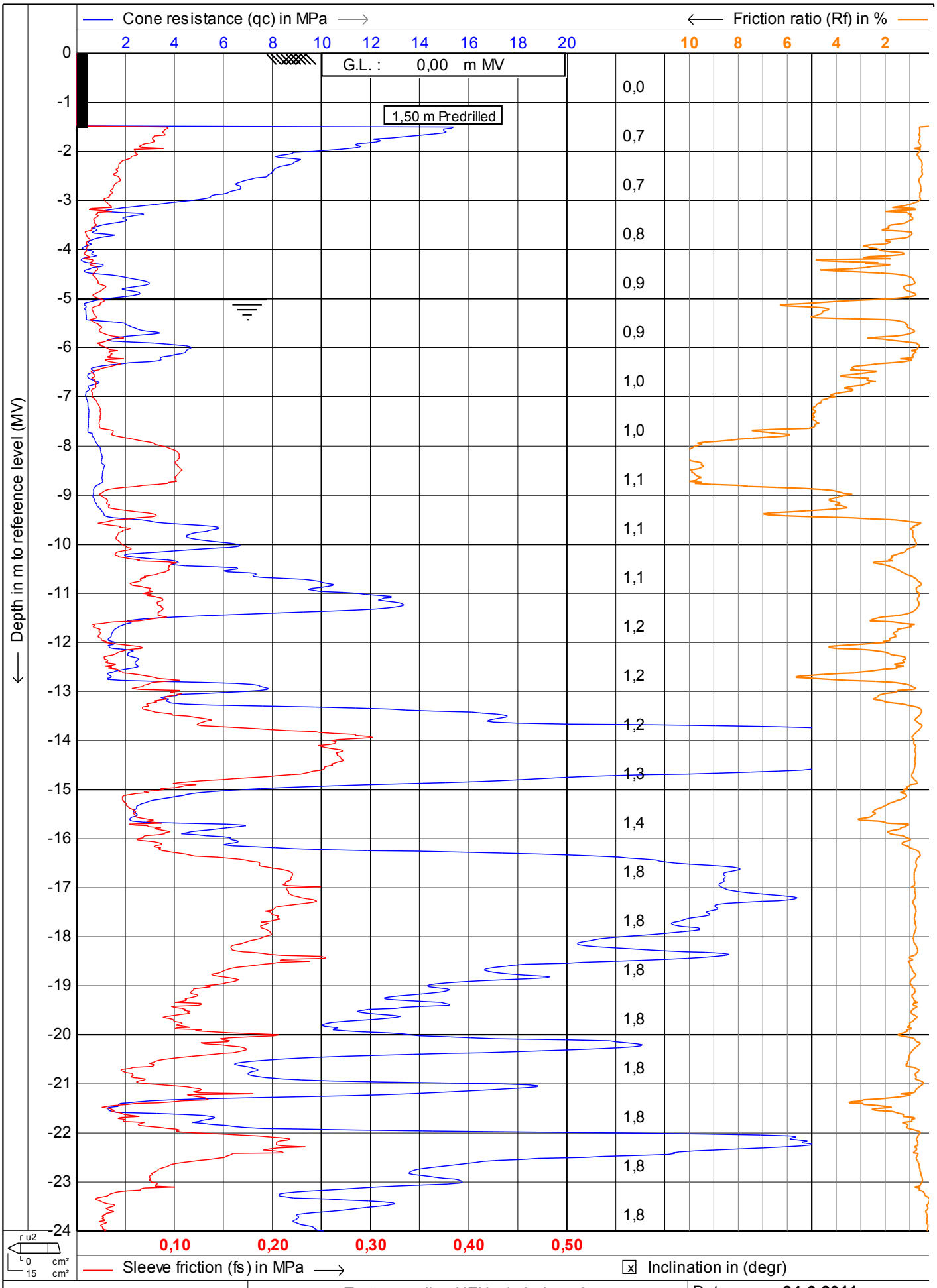
Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kcpt4a** 12/12

CPTask V1.14

MOS GRONDMECHANICA



MOS GRONDMECHANICA

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Fax: 010 - 50 13 656
info@mosgeo.com
www.mosgeo.com

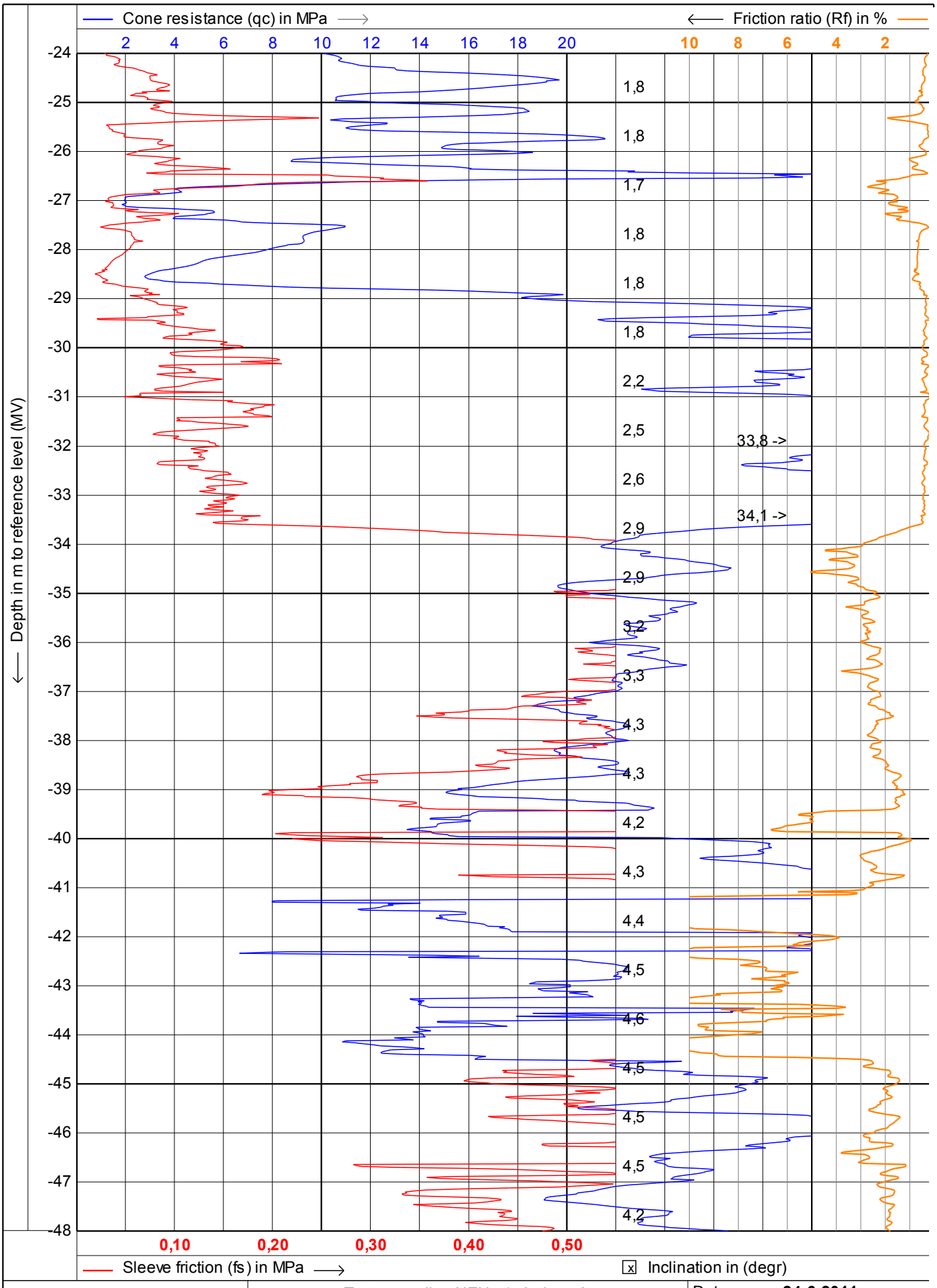
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **24-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kpct5**

CPTask V1.14



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www.mosgeo.com

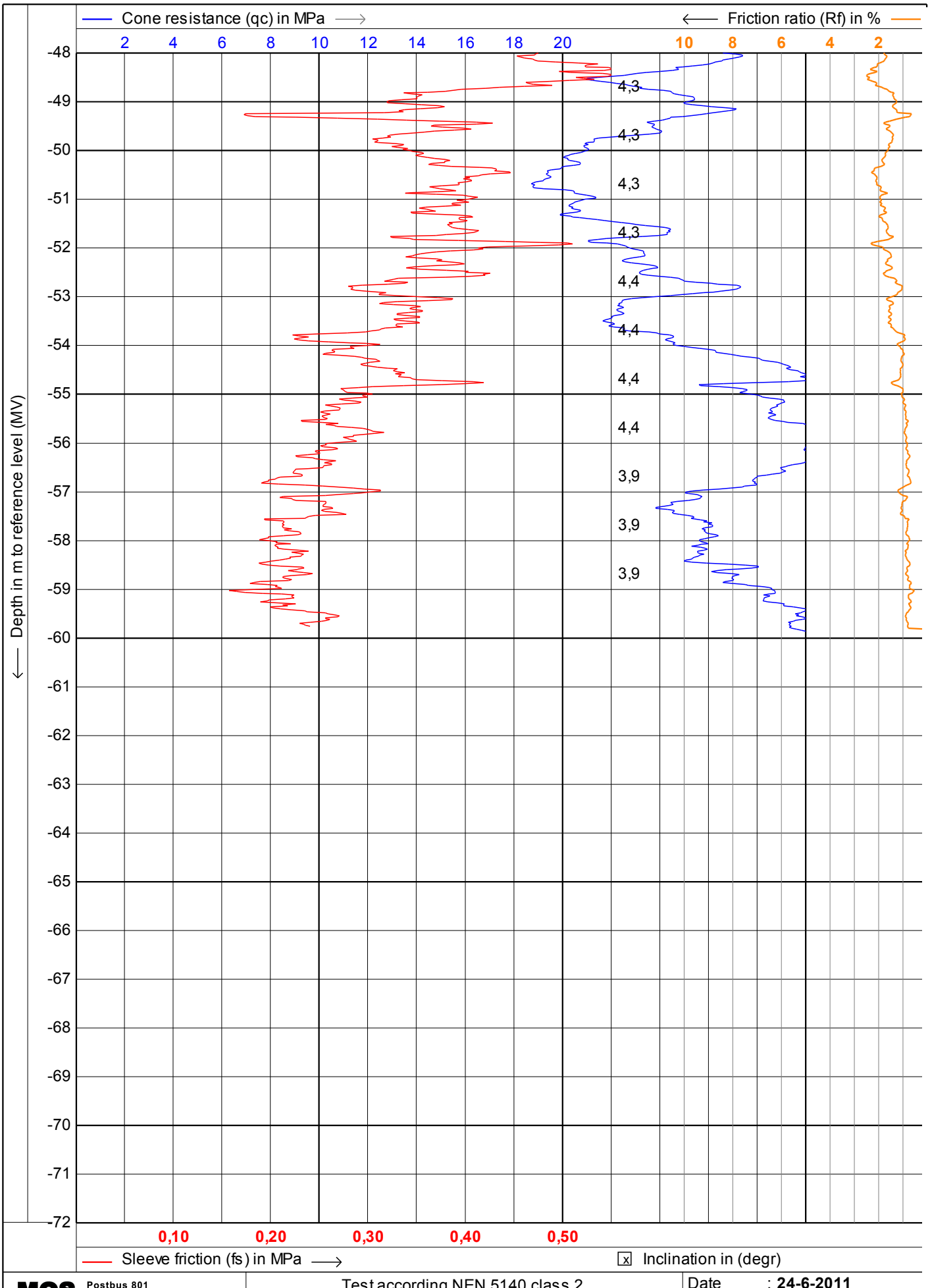
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **24-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kpct5** 2/12

CPTask V1.14



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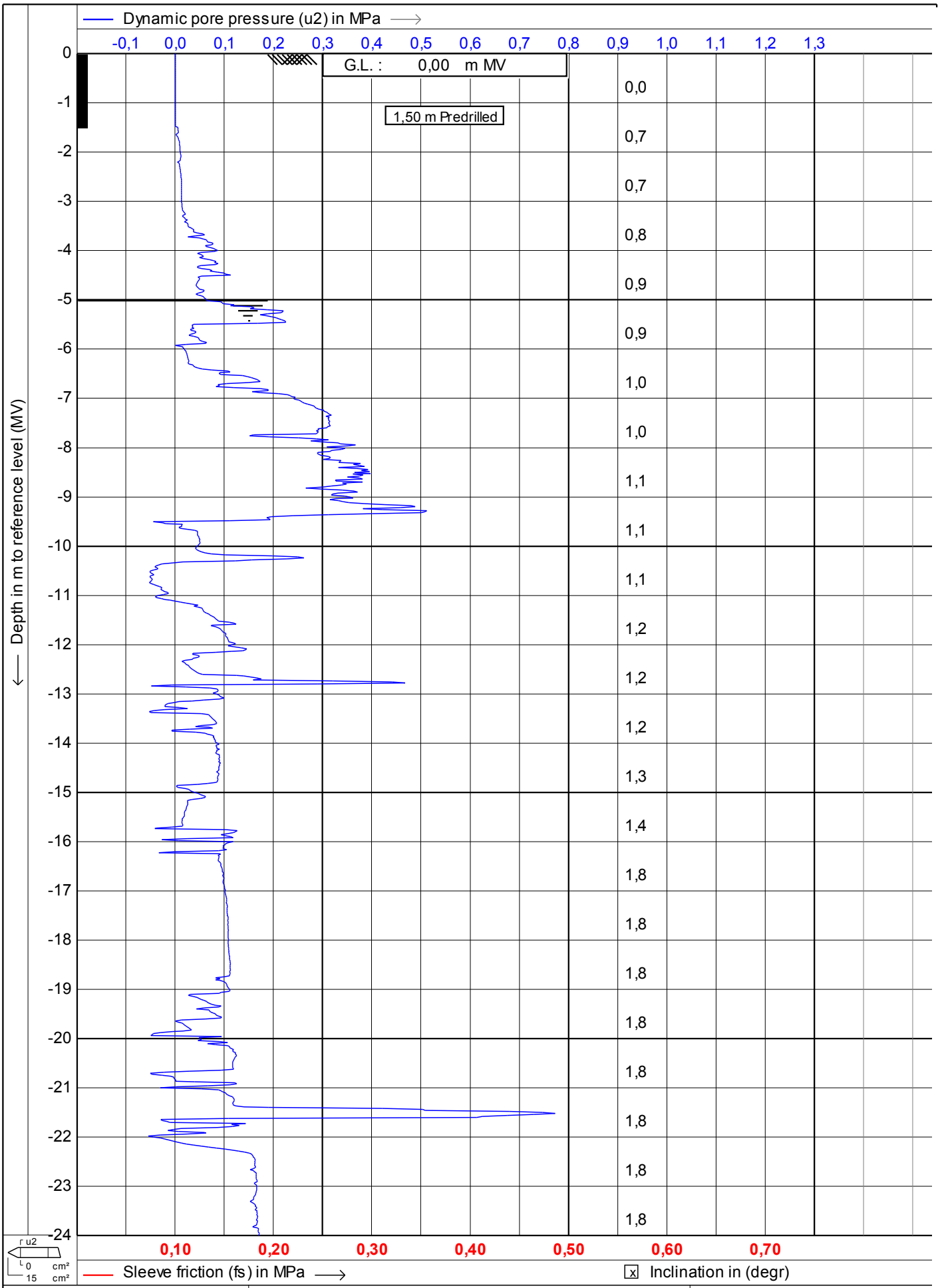
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **24-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kpct5** 3/12

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

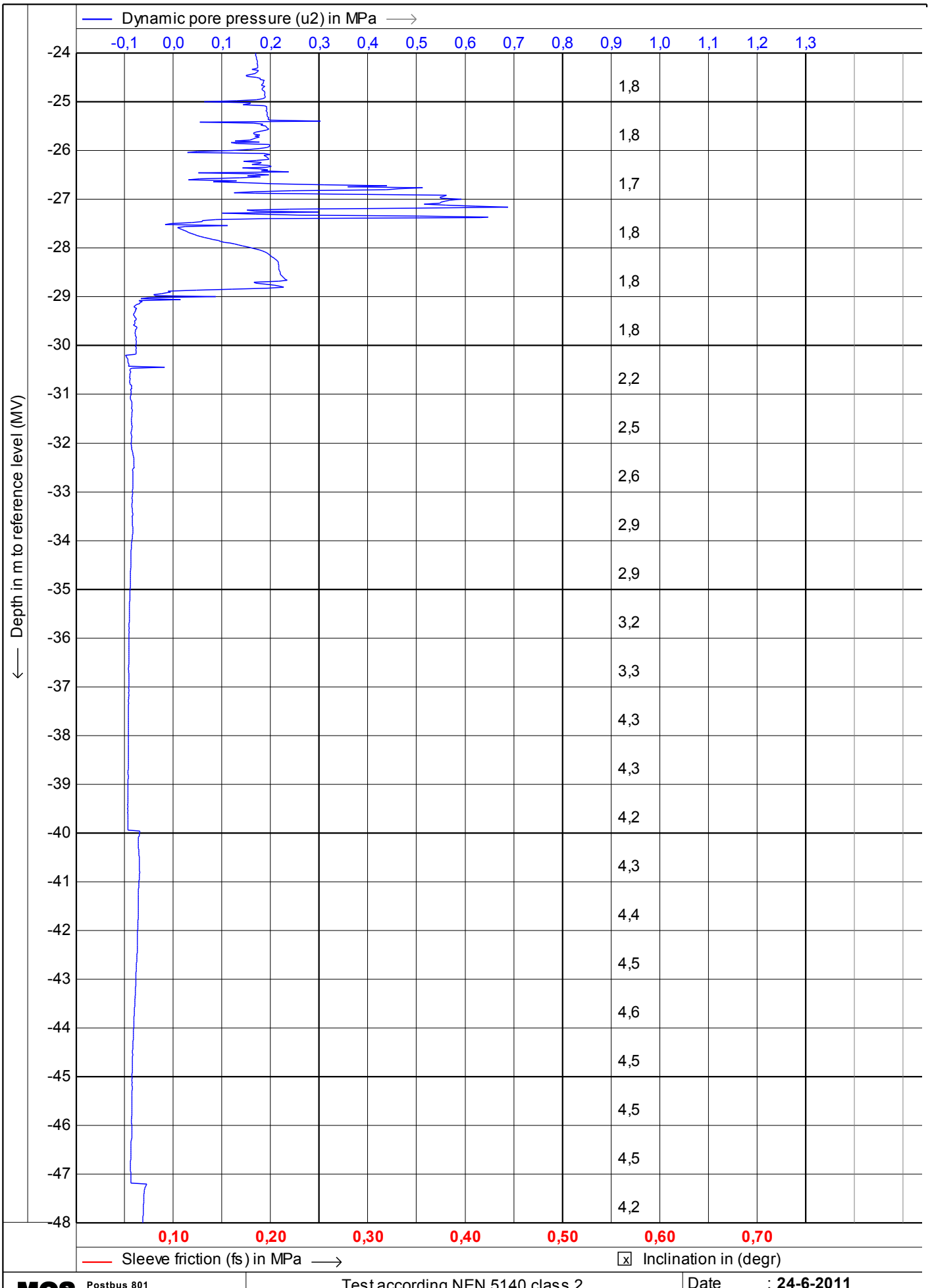
Date : **24-6-2011**

Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kpct5** 4/12

CPTask V1.14



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Test according NEN 5140 class 2

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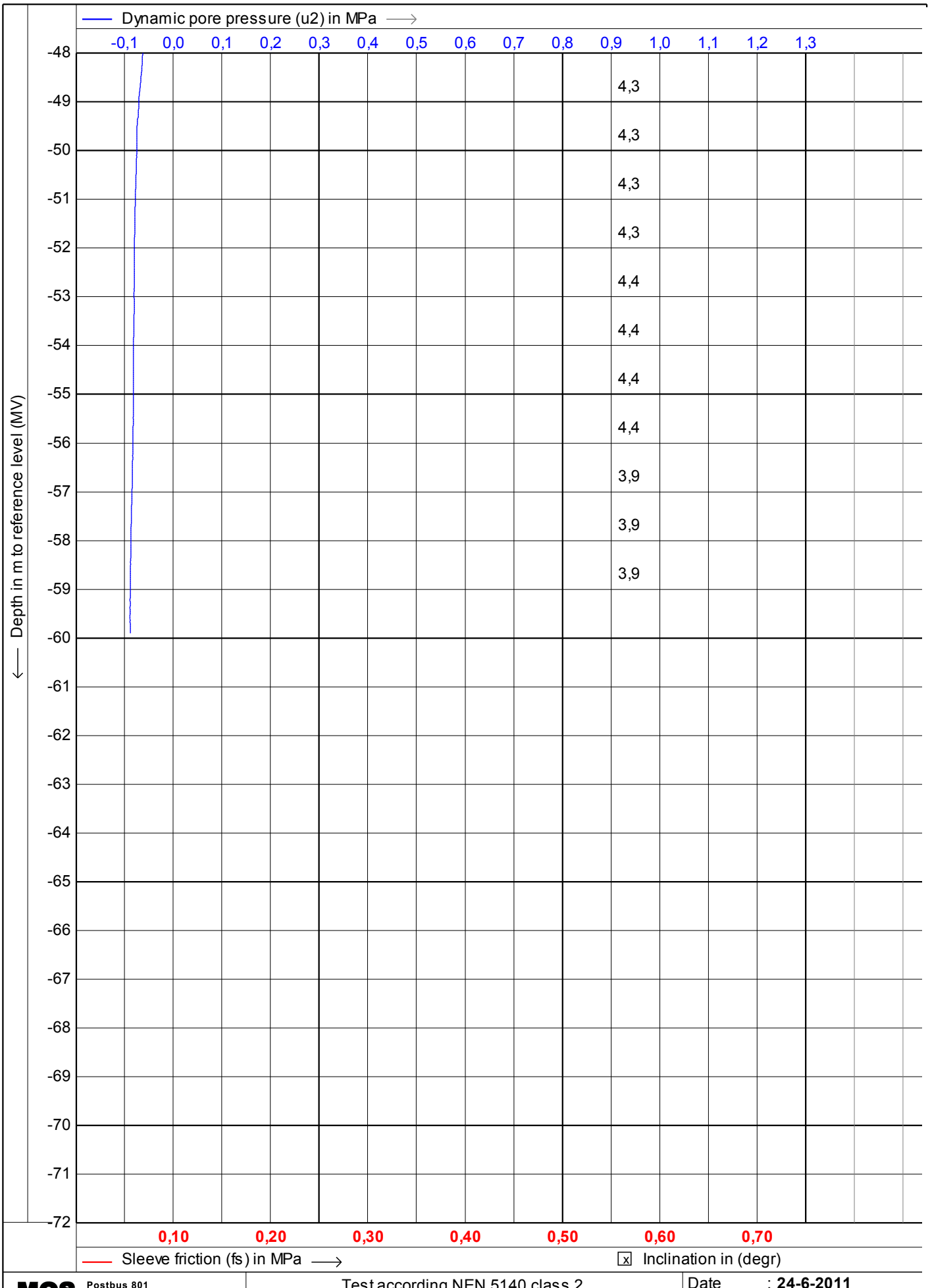
CPT no. : **kpct5**

CPTask V1.14



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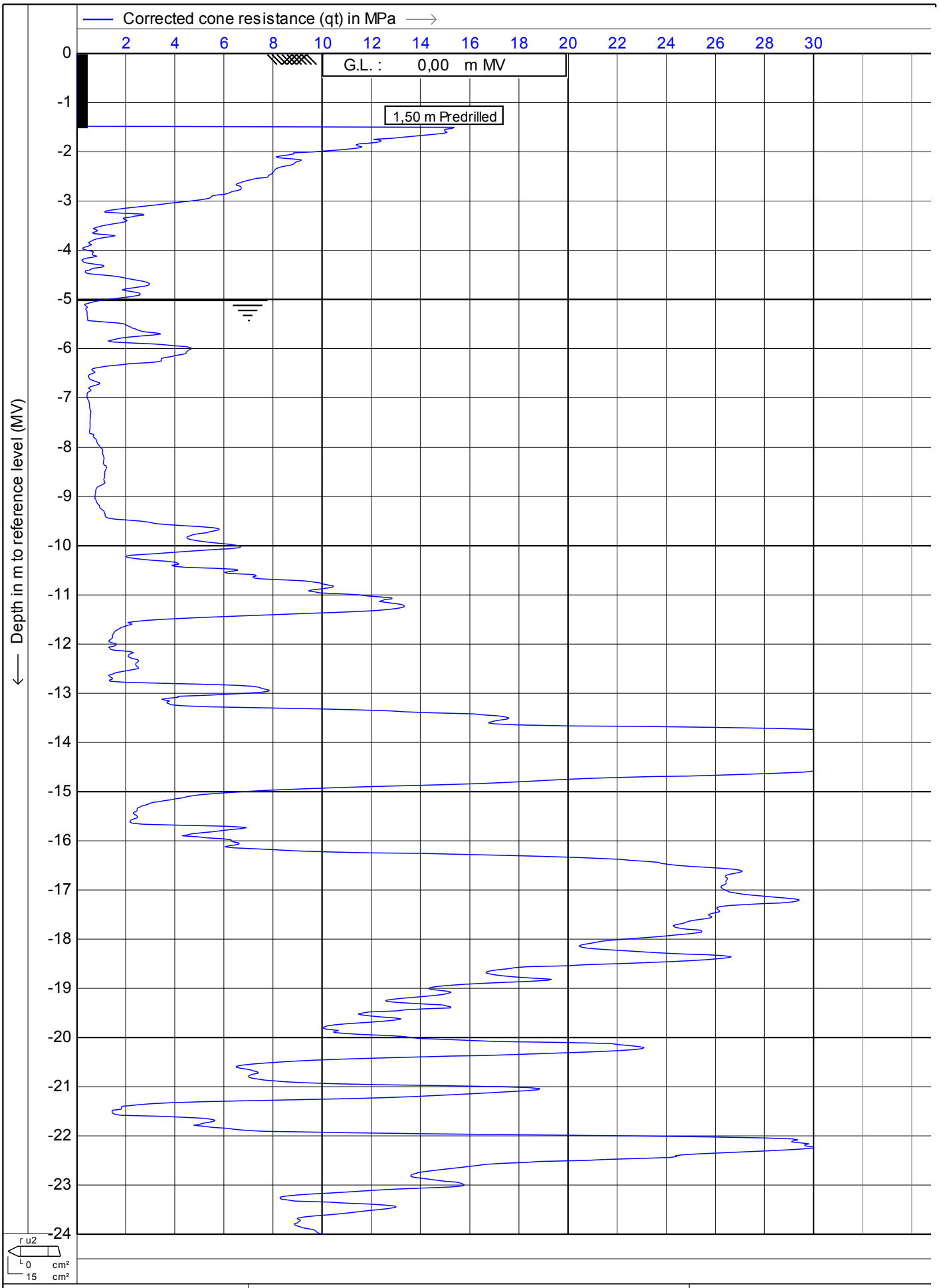
CPT no. : **kpct5**

CPTask V1.14



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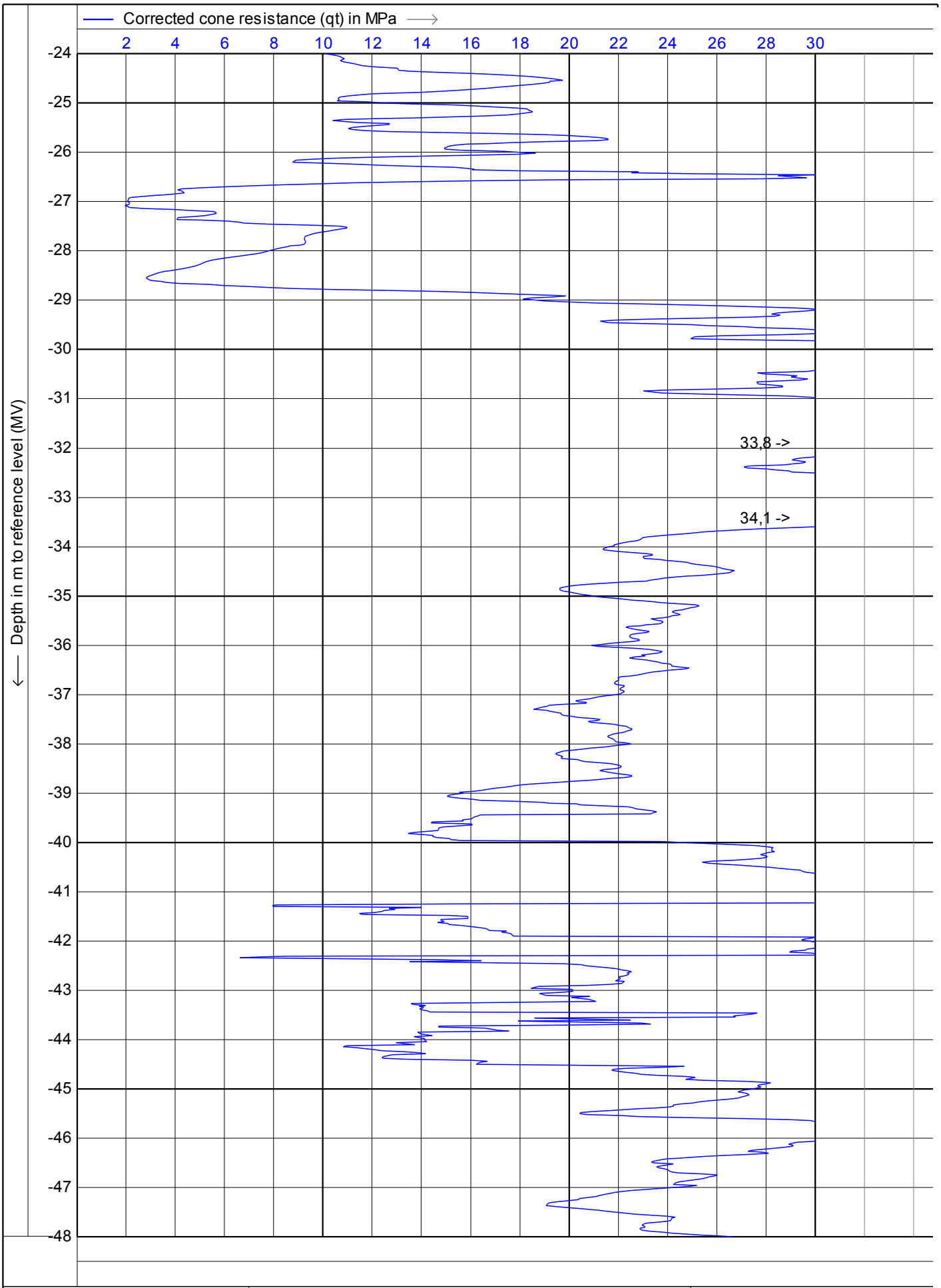
CPT no.	: **kpct5**

MOS GRONDMECHANICA
CPTask V1.14



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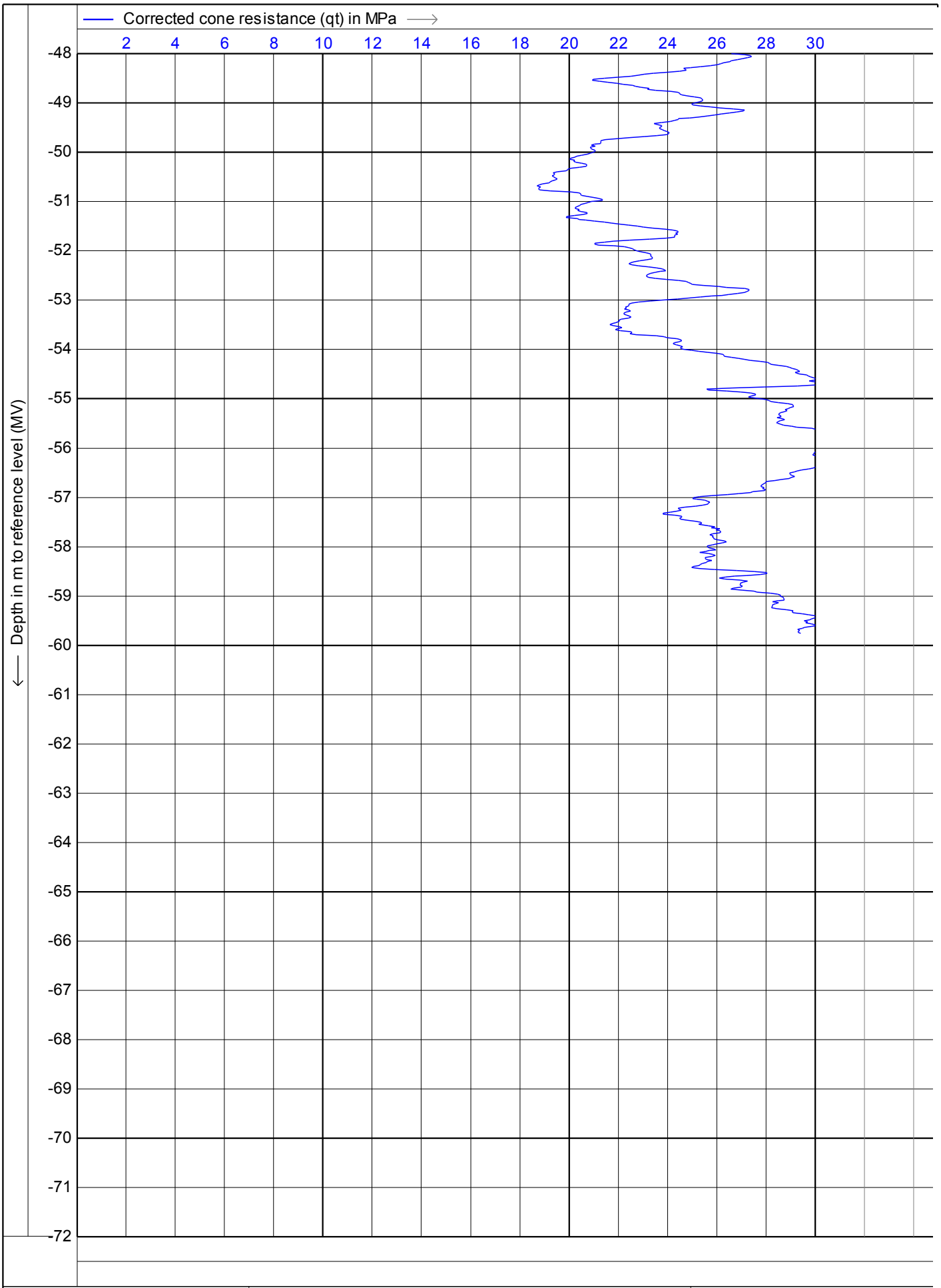
MOS GRONDMECHANICA

CPTask V1.14



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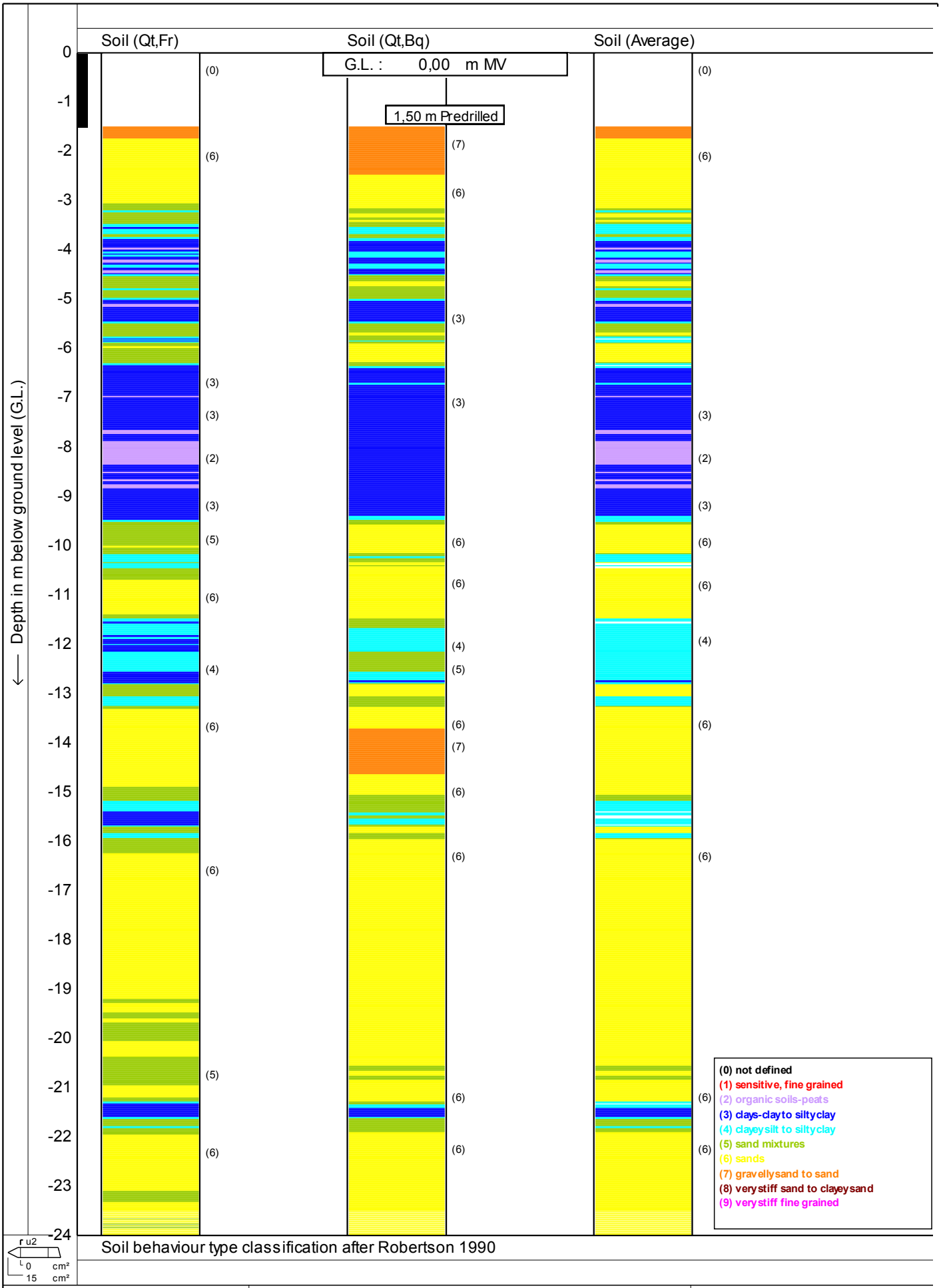
CPT no.	: **kpct5**

CPTask V1.14



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Date : **24-6-2011**

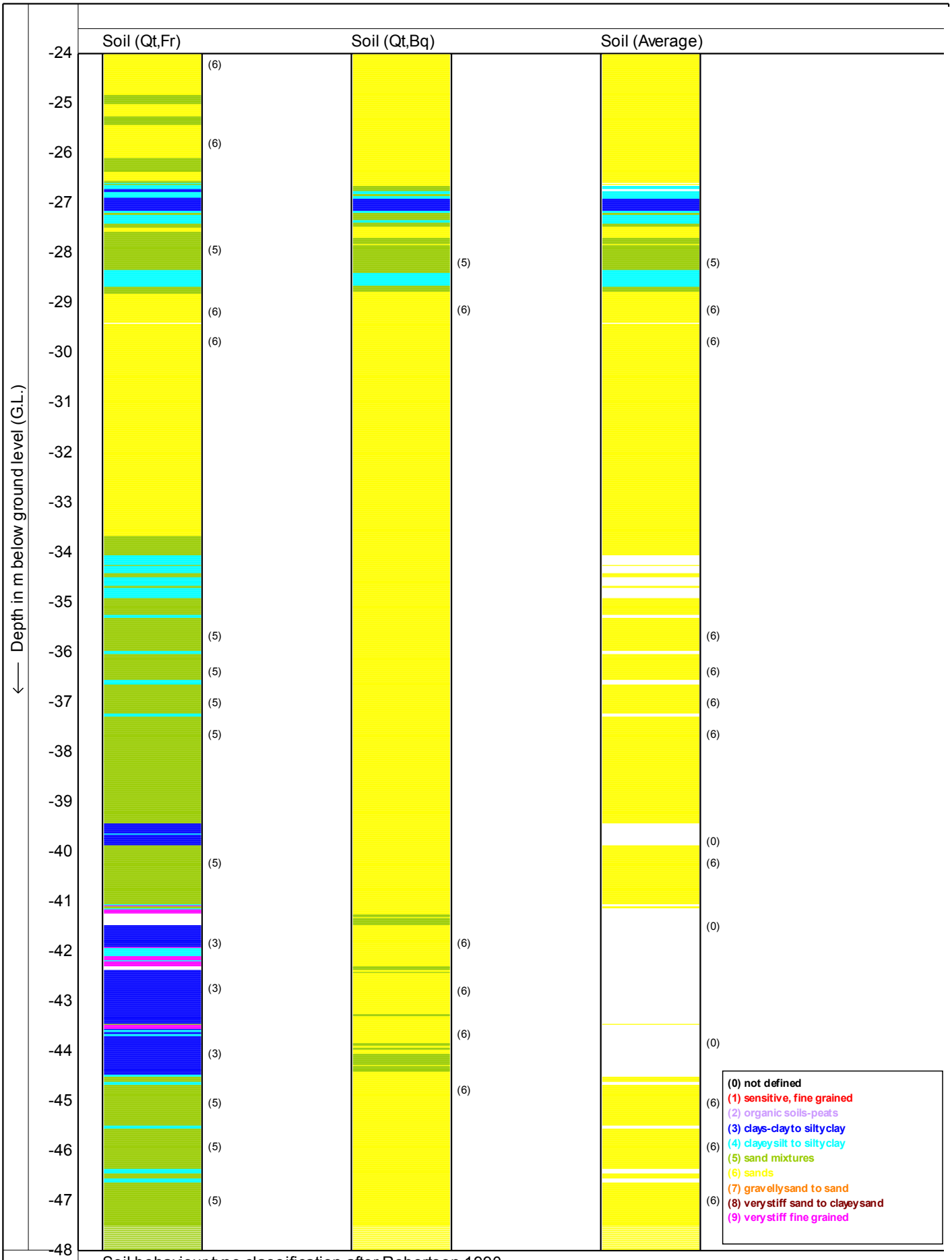
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kpct5** 10/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

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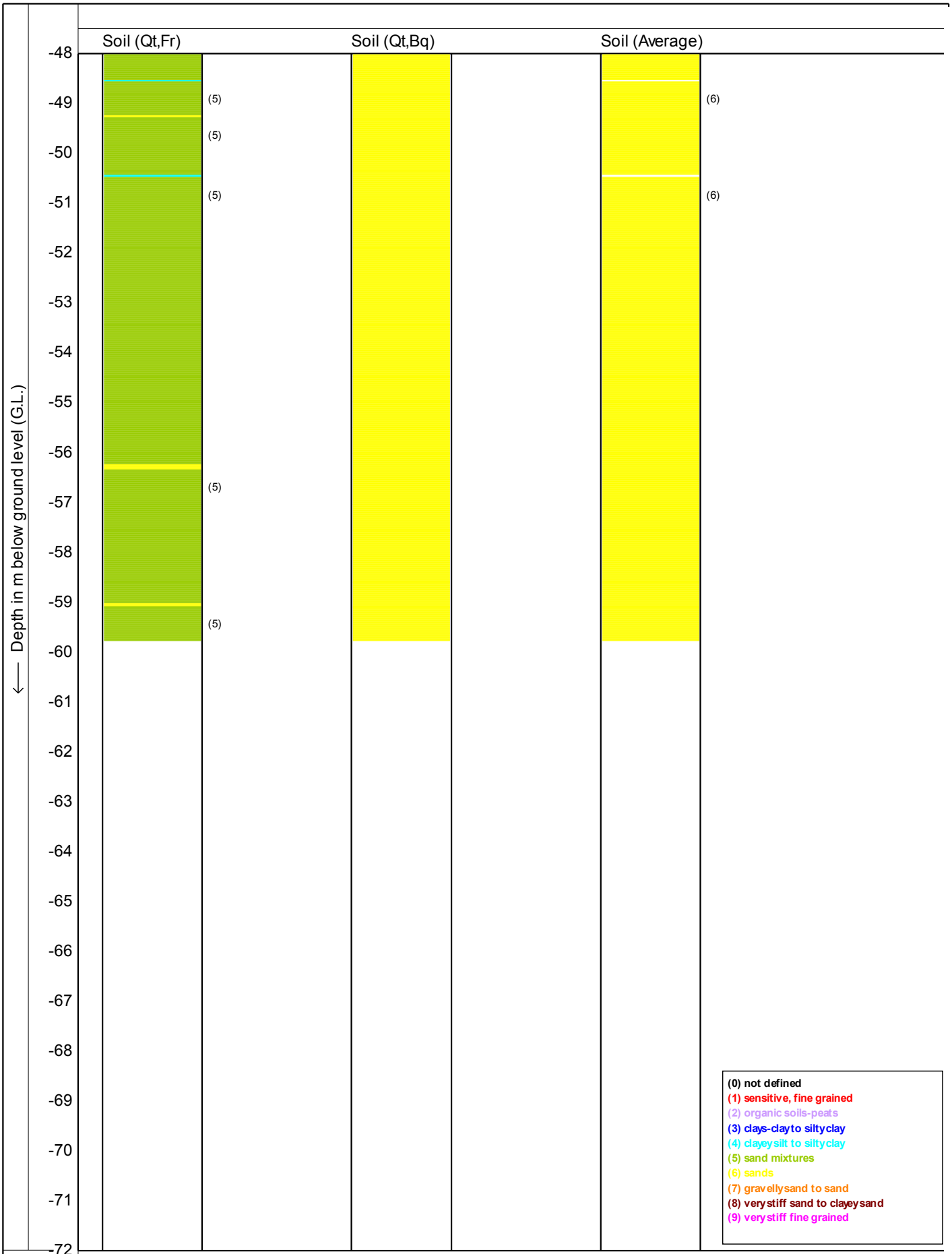
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kpct5** 11/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **24-6-2011**

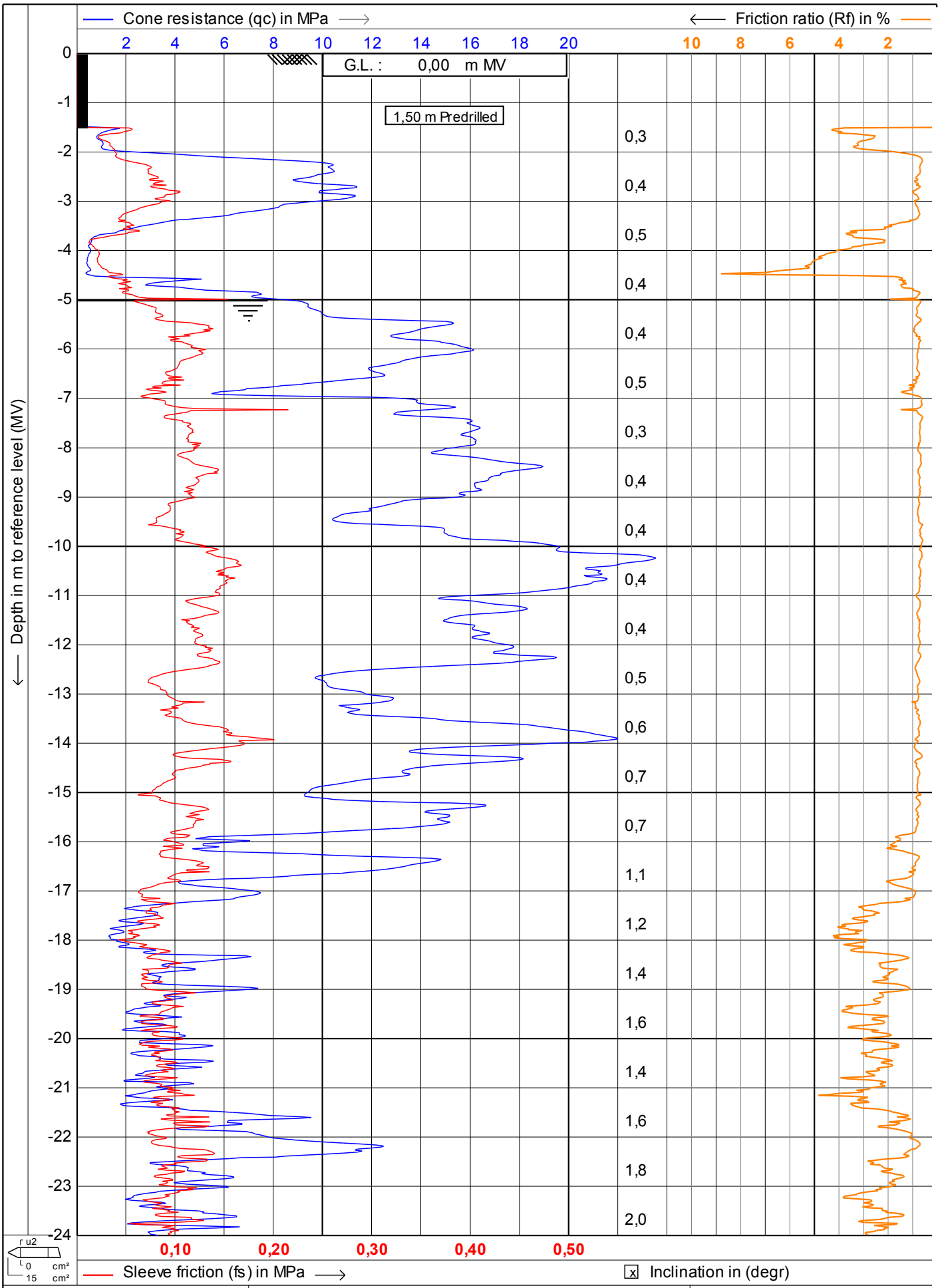
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kpct5** 12/12

MOS GRONDMECHANICA

CPTask V1.14



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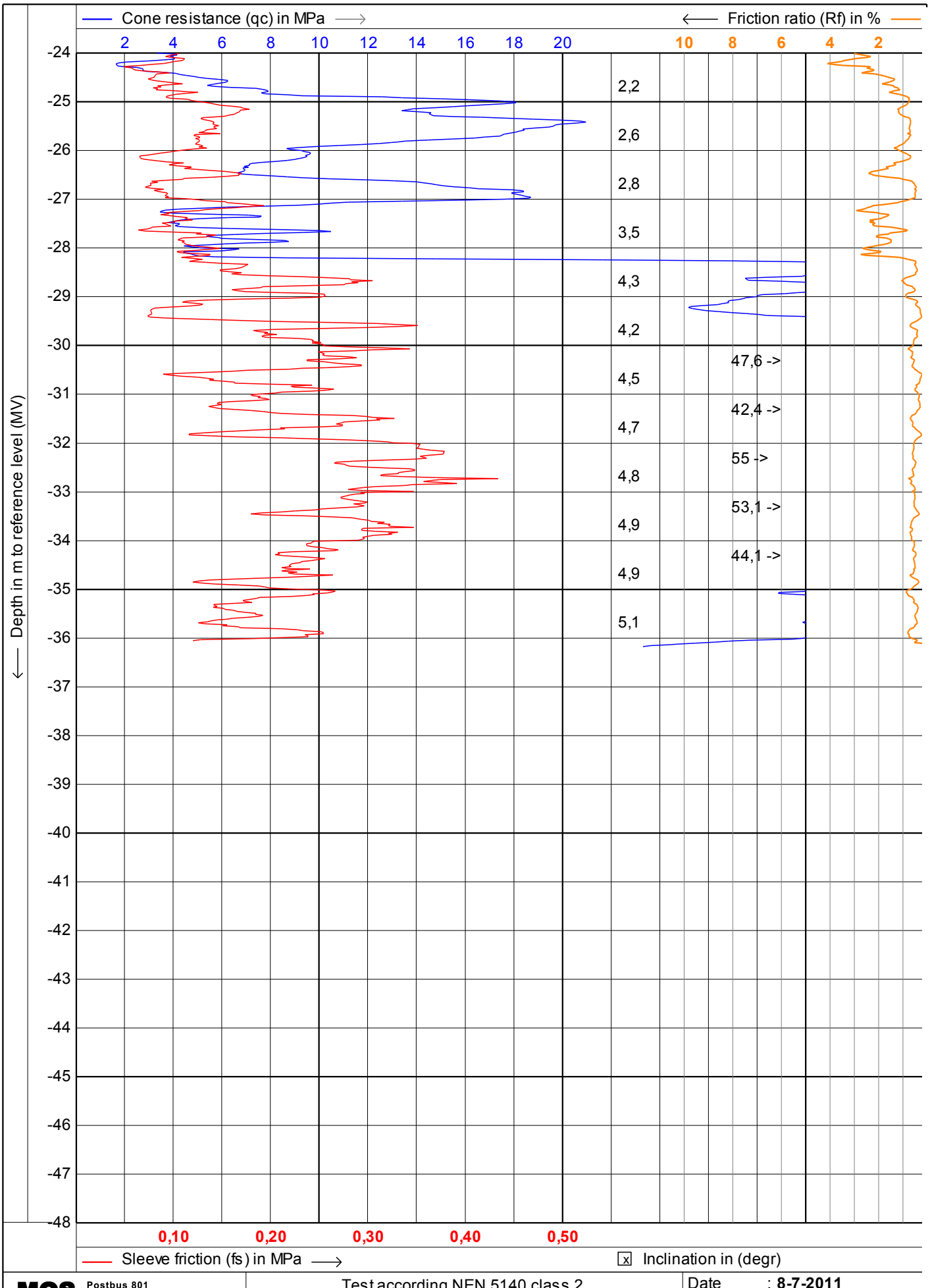
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt6** 1/8

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**

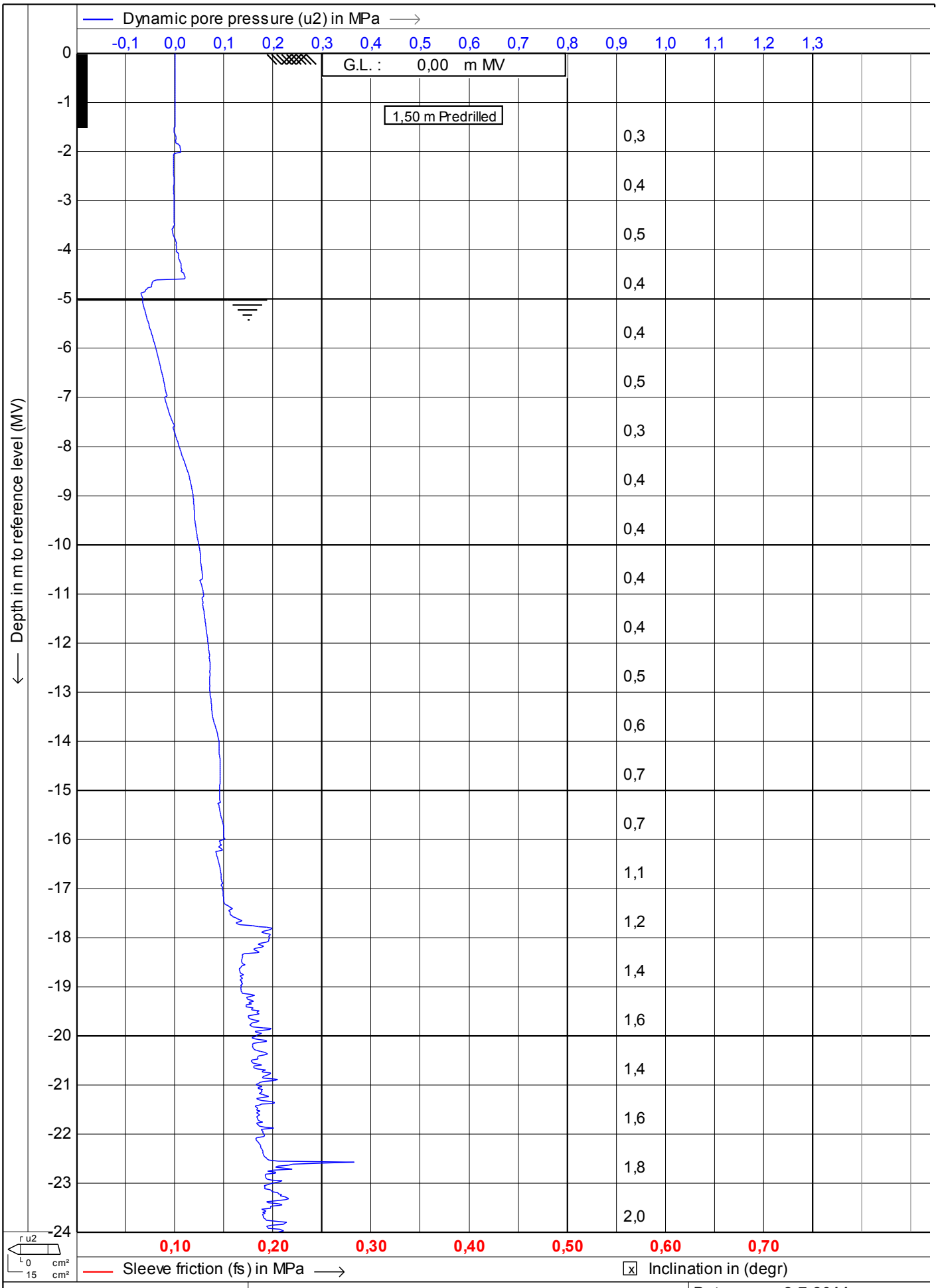
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt6**

CPTask V1.14

MOS GRONDMECHANICA



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**

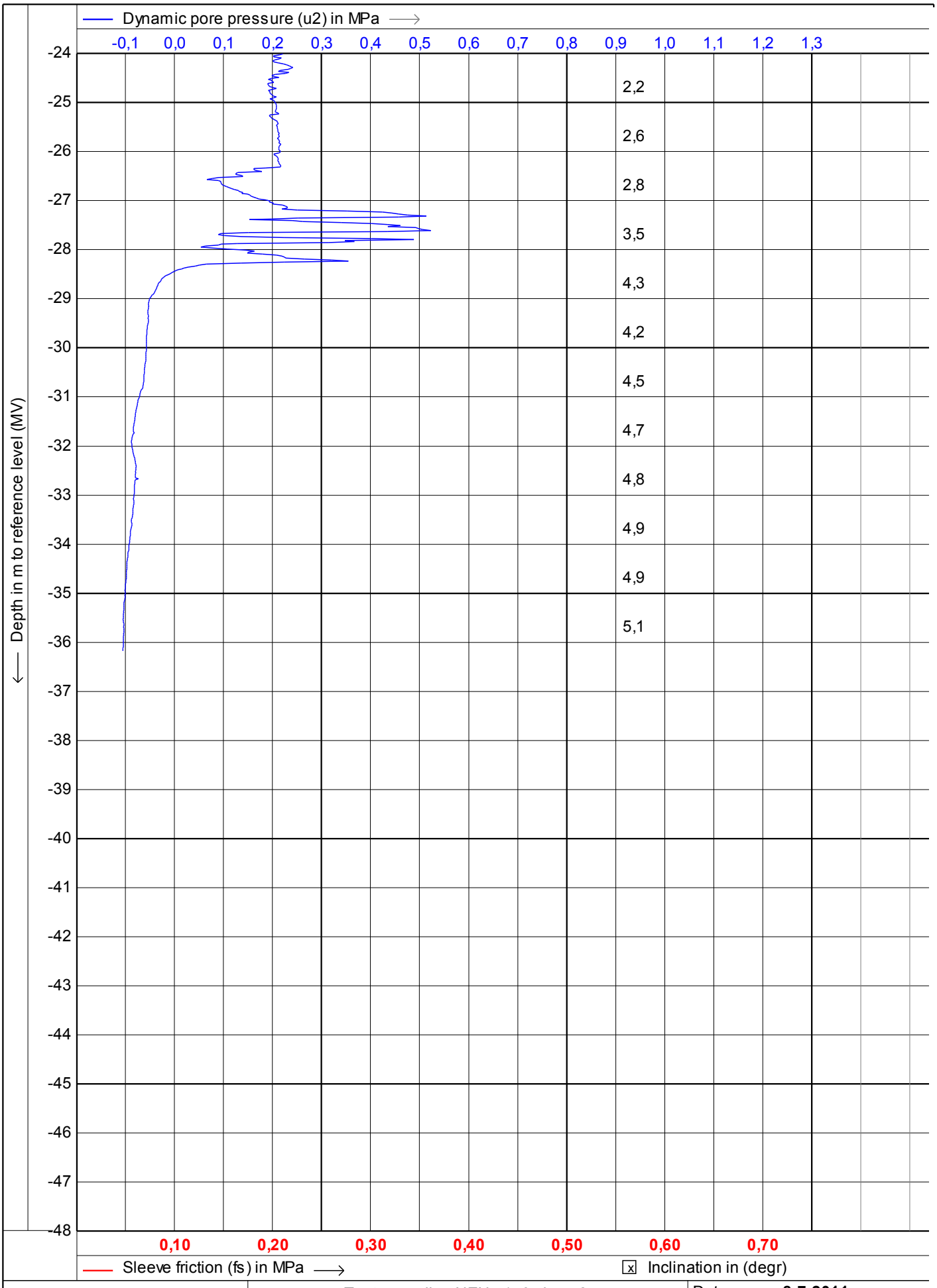
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt6**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

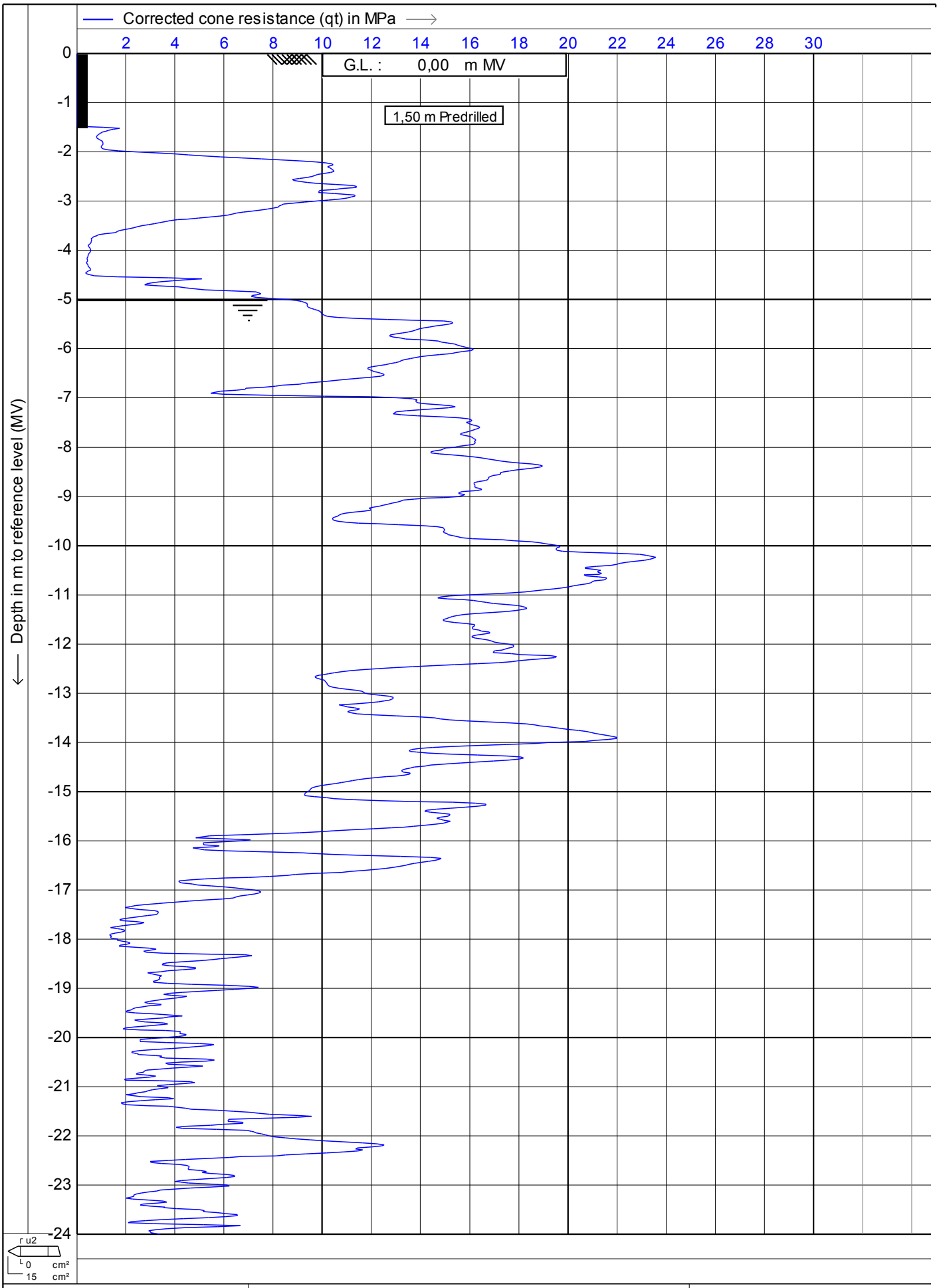
Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt6** **4/8**

CPTask V1.14

MOS



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Test according NEN 5140 class 2

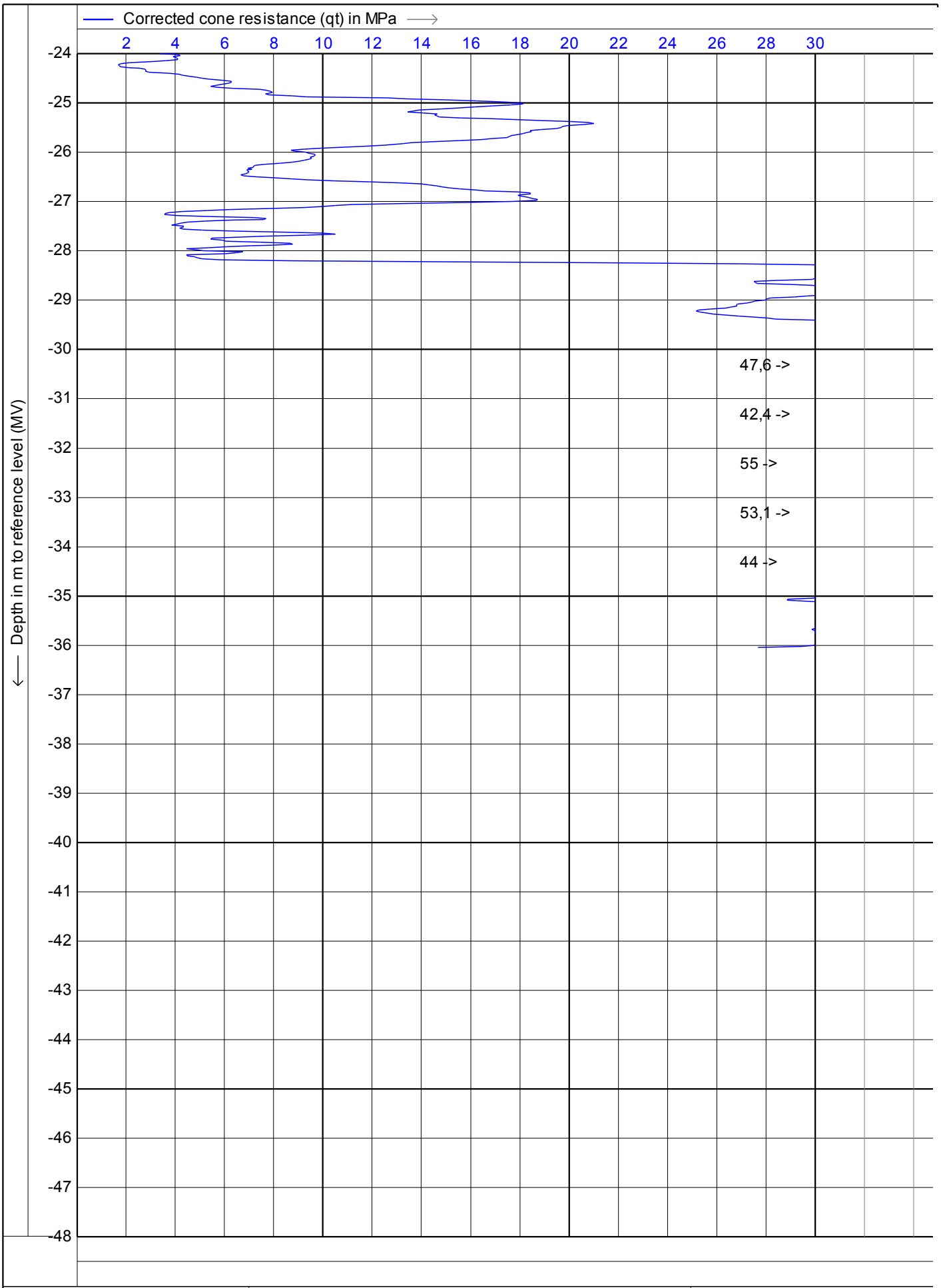
Project : **KCB2**

Location: **Borssele**

Date	: **8-7-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt6**

CPTask V1.14

MOS GRONDMECHANICA



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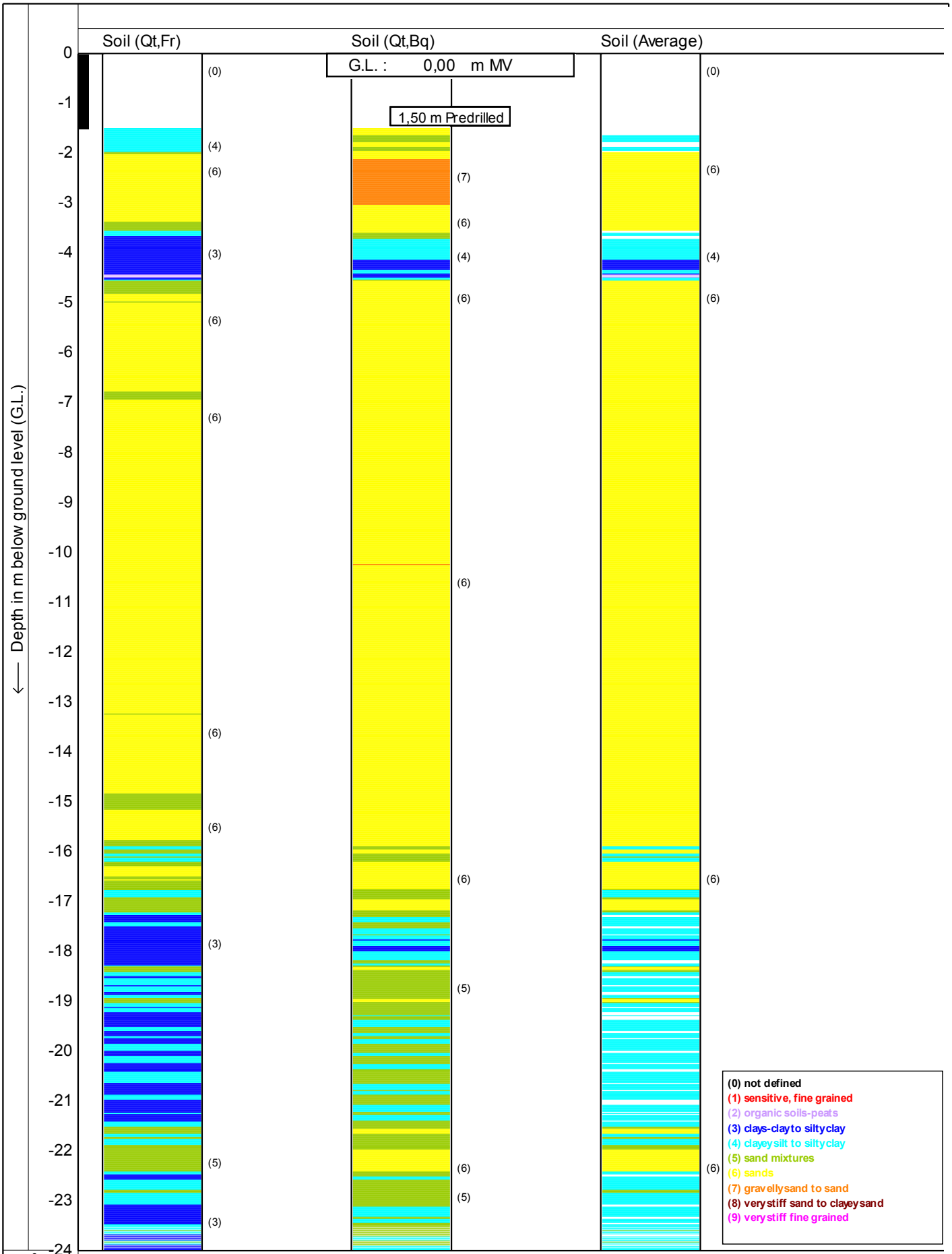
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **8-7-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt6**

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**

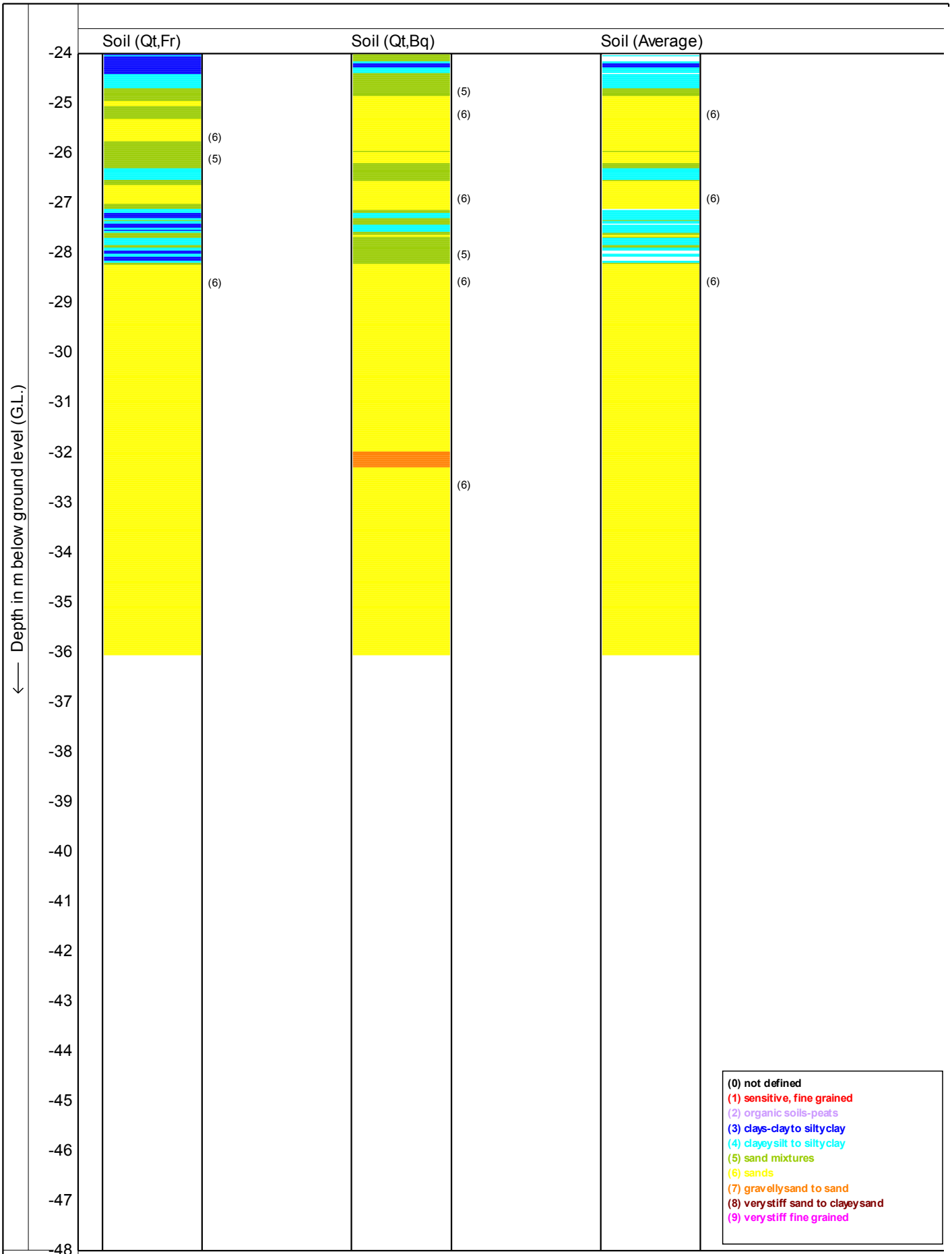
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt6** 7/8

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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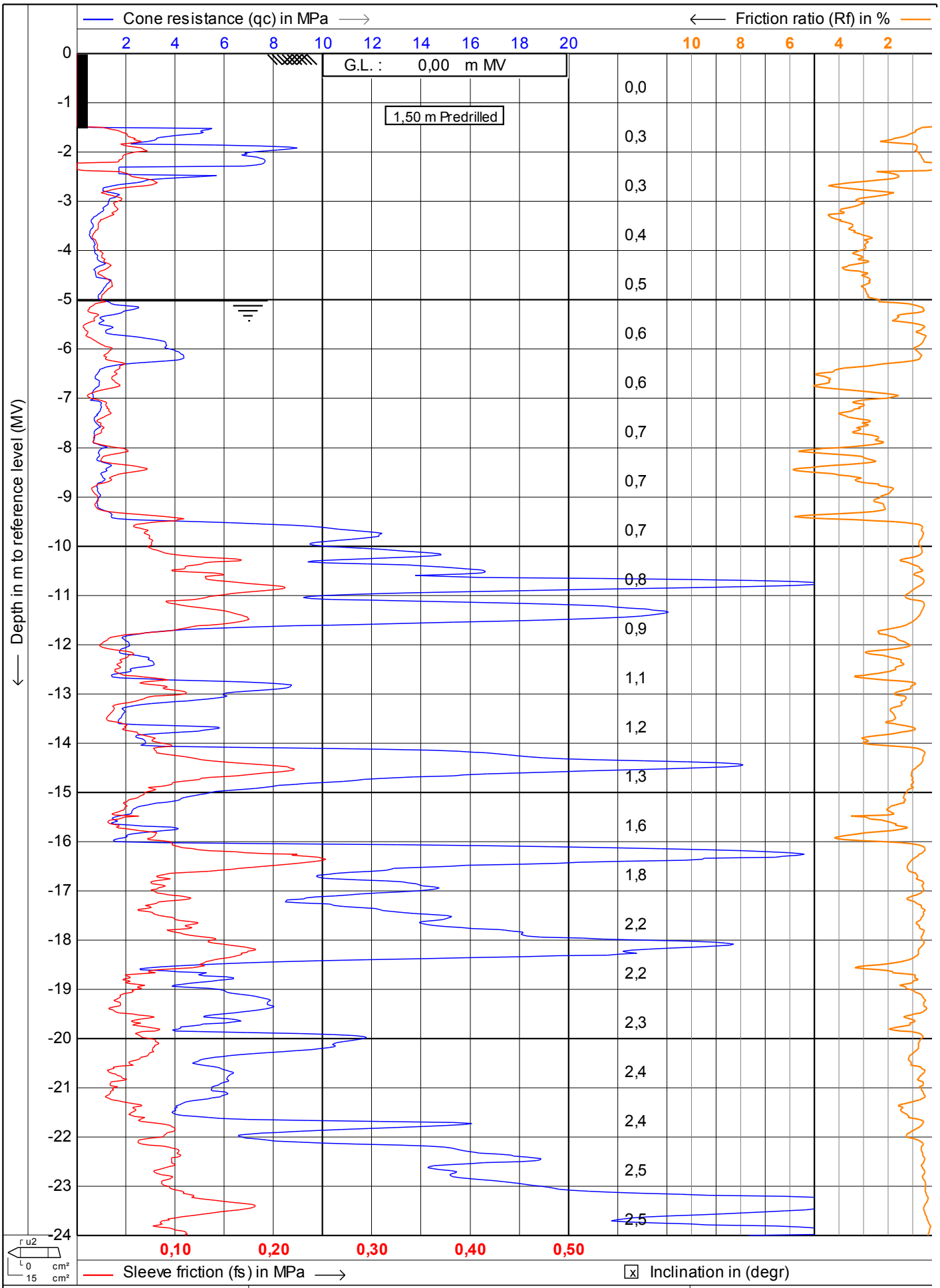
Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt6** **8/8**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

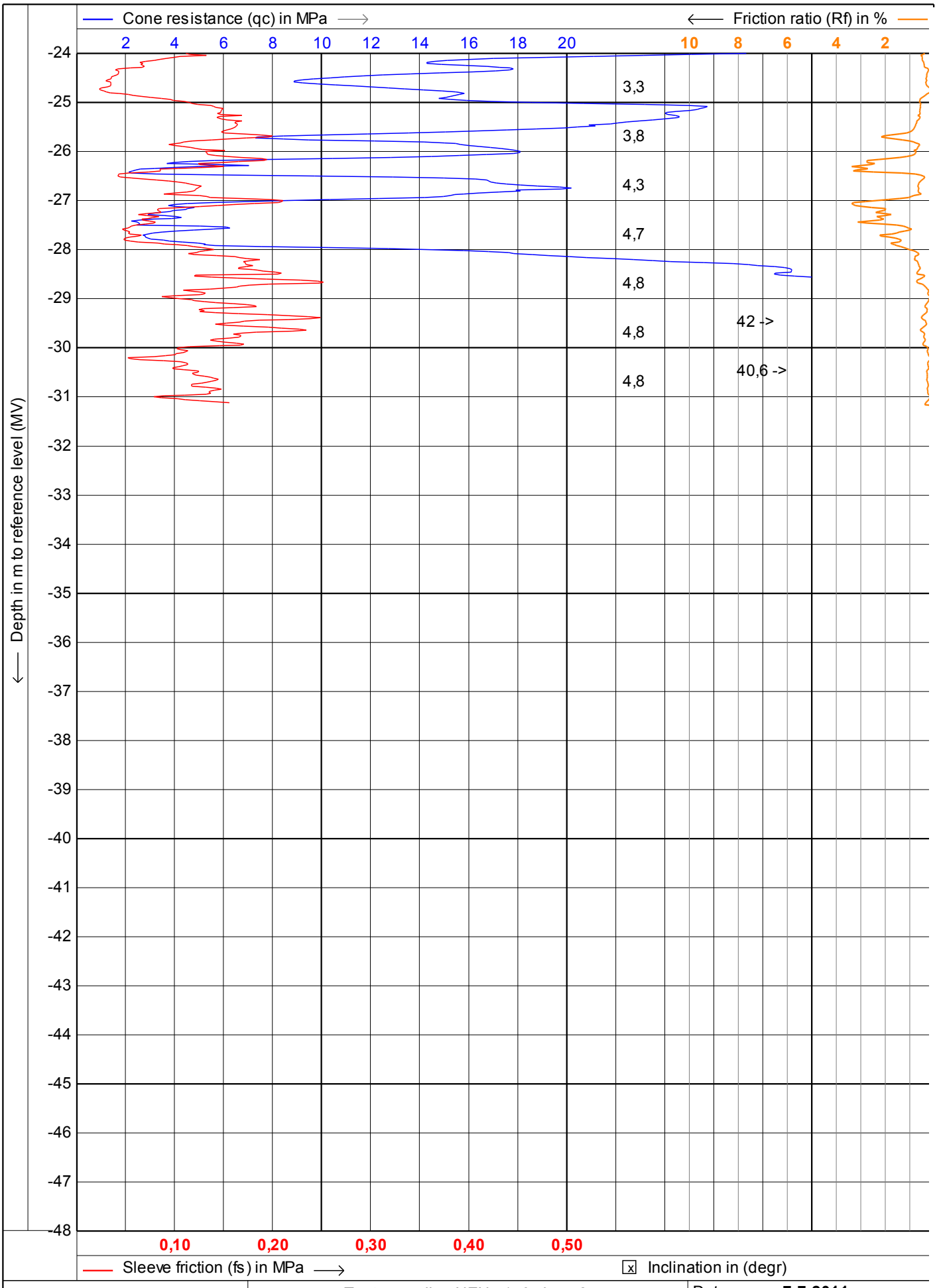
Date : **7-7-2011**

Cone no. : **C15CFIP.971**

Project no. : **0041011**

CPT no. : **kcpt7**

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

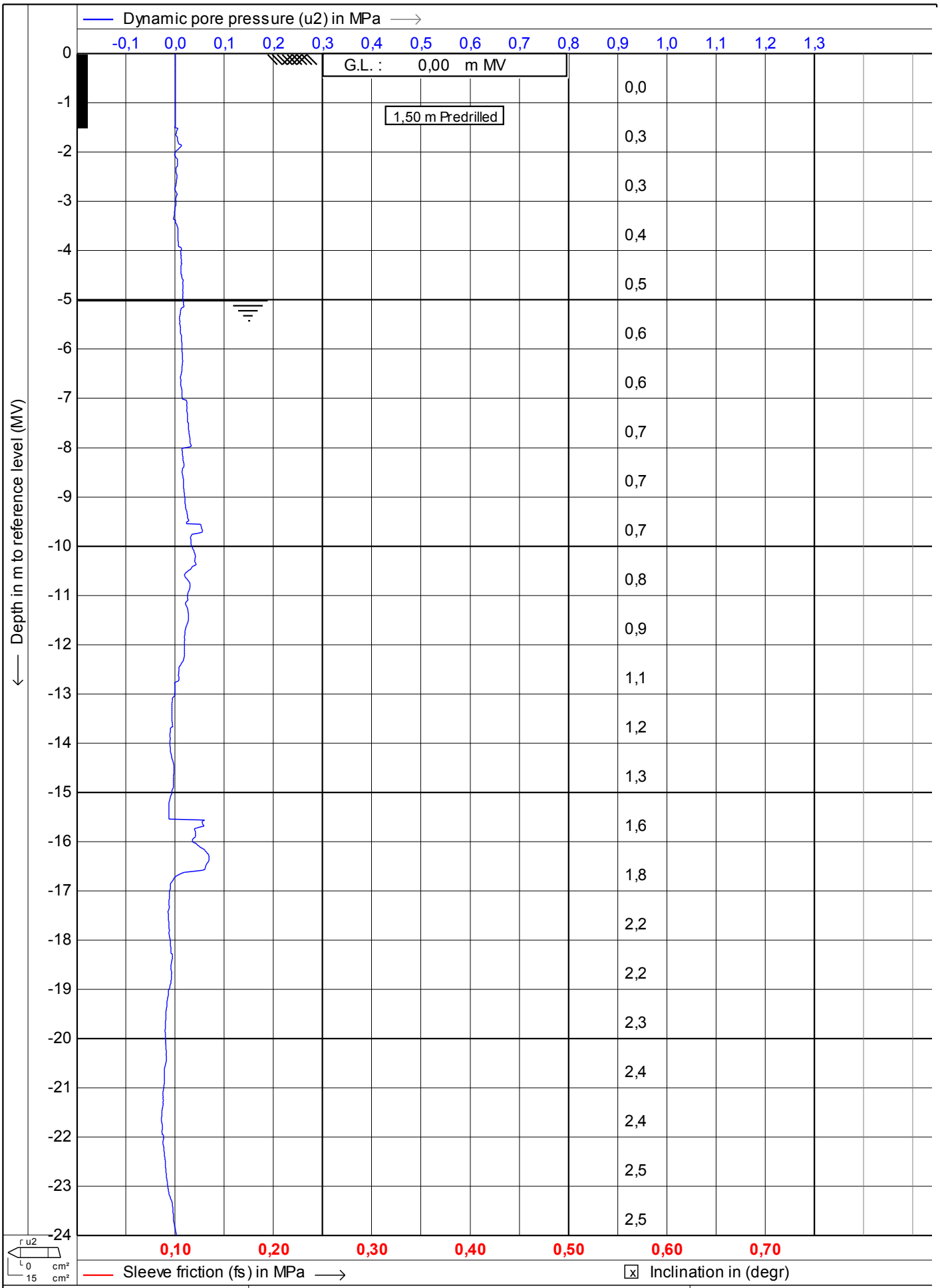
Cone no. : **C15CFIP.971**

Project no. : **0041011**

CPT no. : **kcpt7**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

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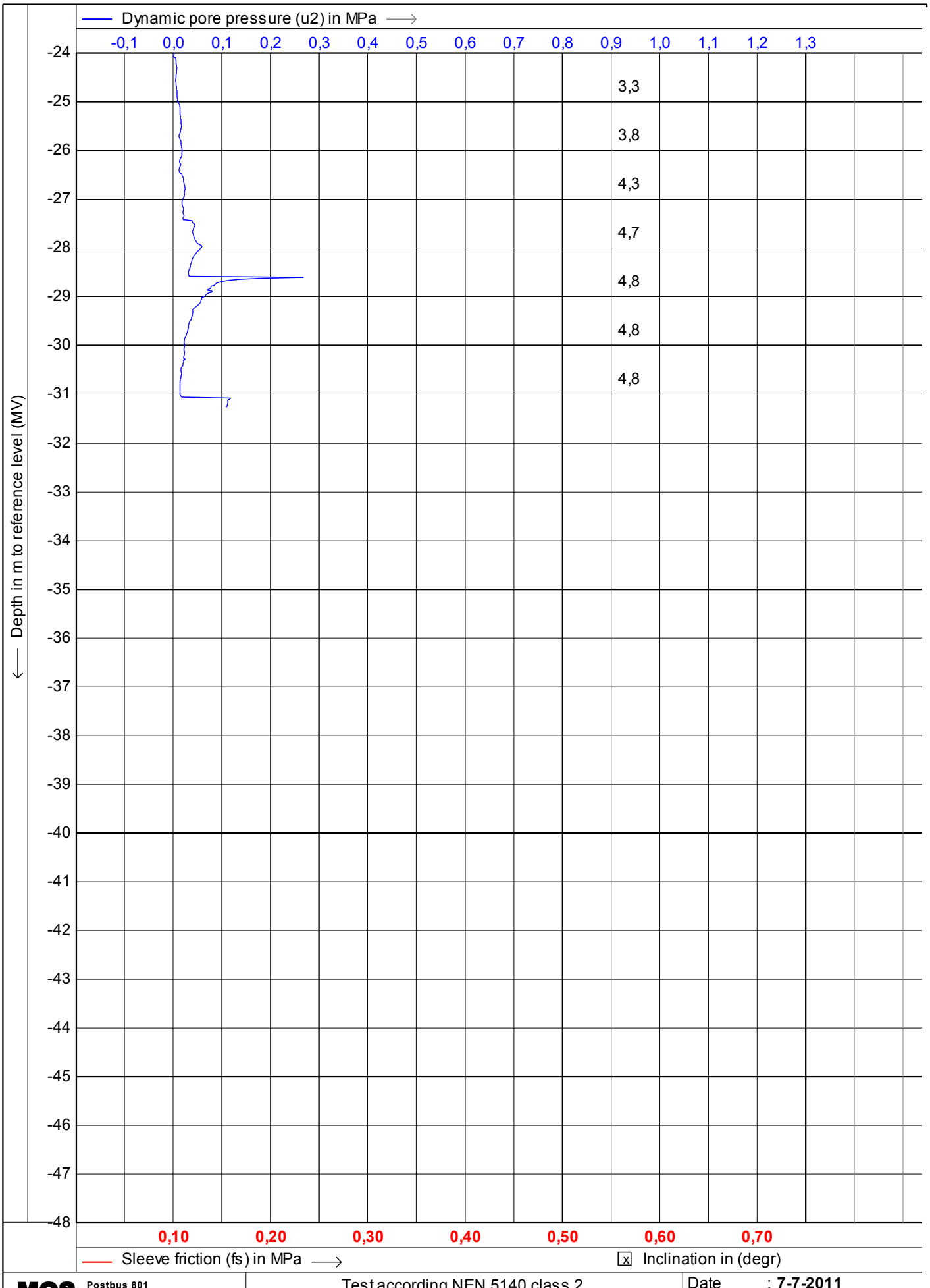
Cone no. : **C15CFIP.971**

Project no. : **0041011**

CPT no. : **kcpt7**

MOS GRONDMECHANICA

CPTask V1.14



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Location: **Borssele**

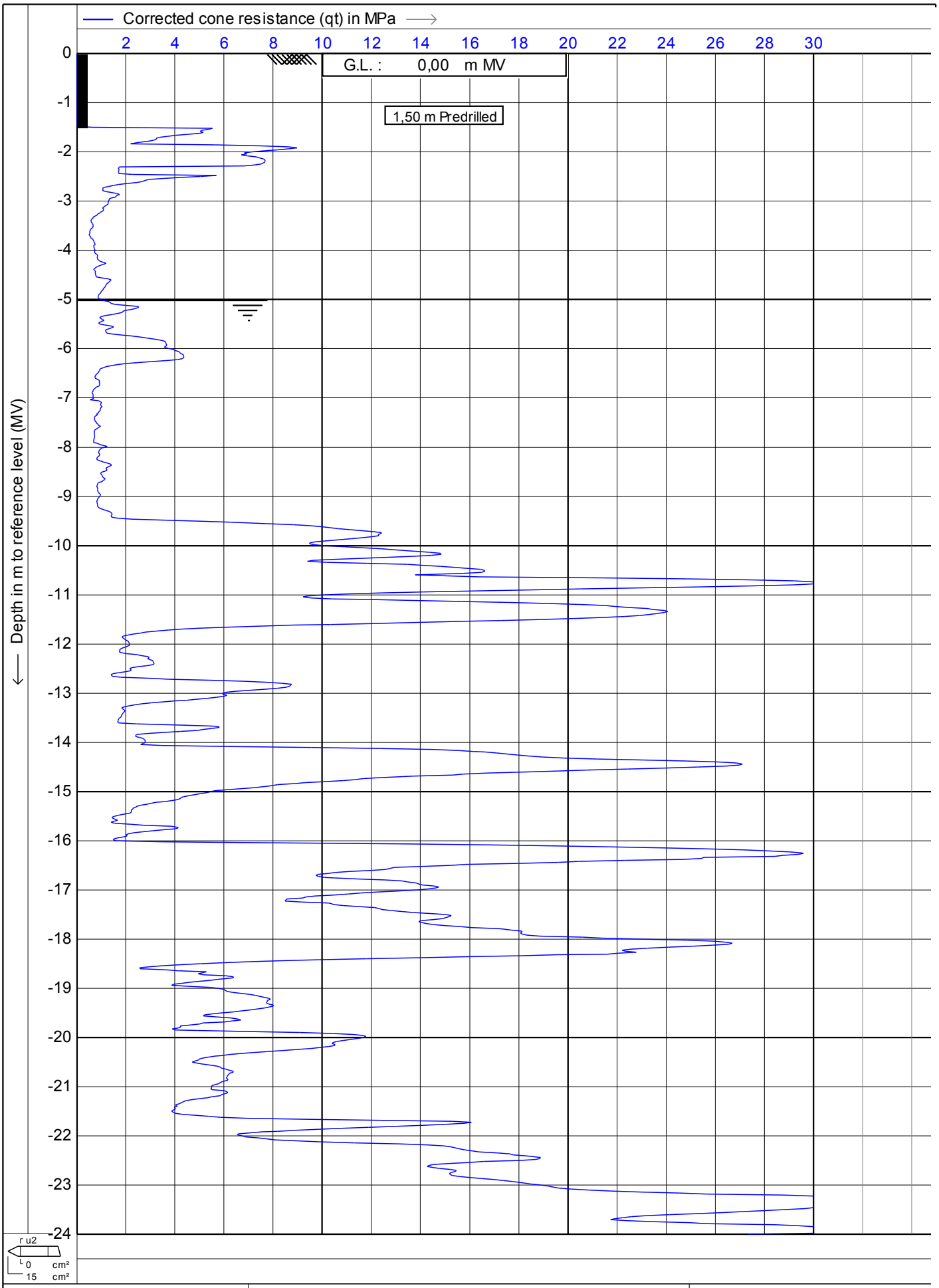
Date : **7-7-2011**

Cone no. : **C15CFIP.971**

Project no. : **0041011**

CPT no. : **kcpt7** 4/8

CPTask V1.14



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Test according NEN 5140 class 2

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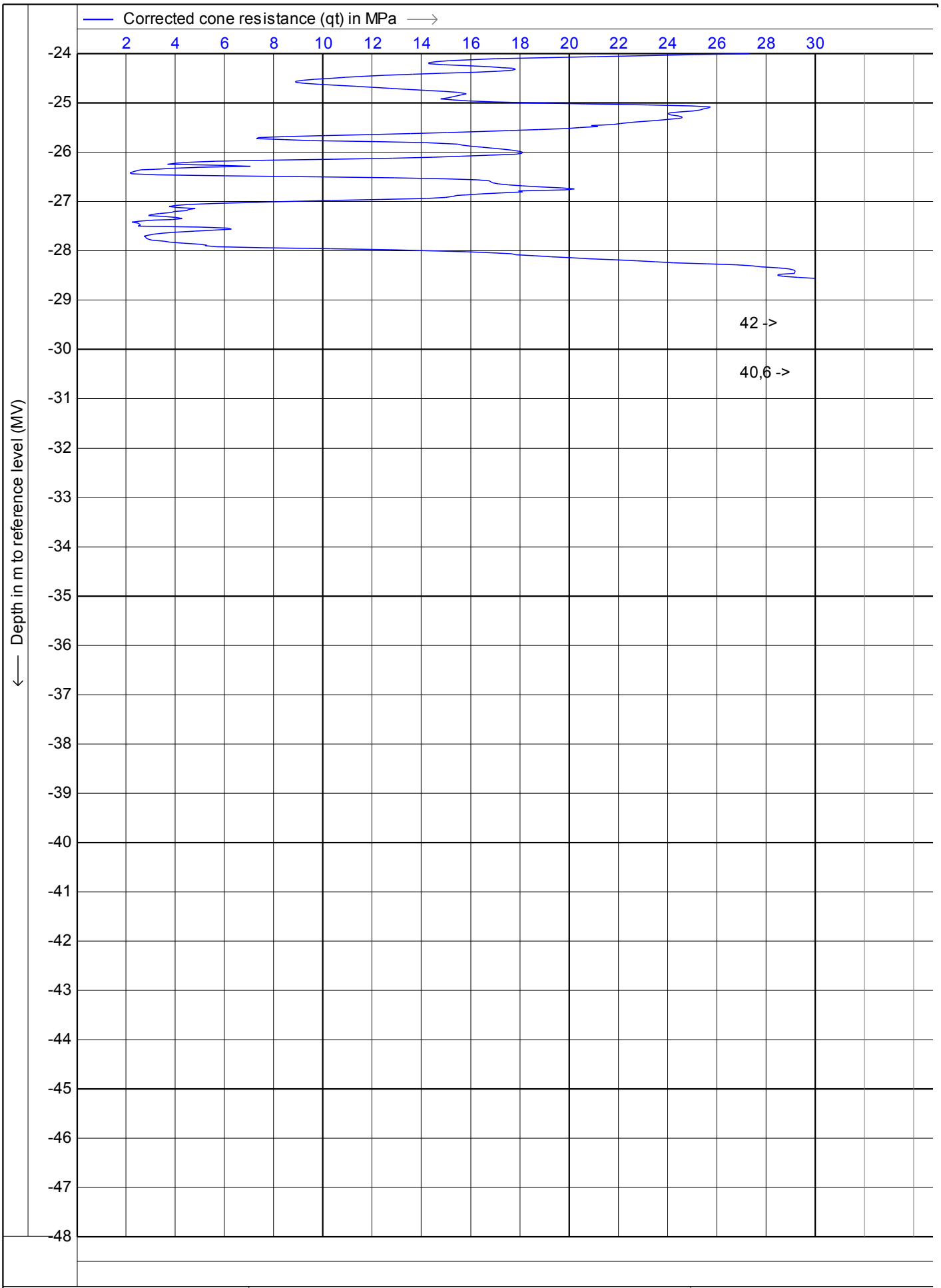
Cone no. : **C15CFIP.971**
Project no. : **0041011**
CPT no. : **kcpt7** **5/8**

MOS GRONDMECHANICA

CPTask V1.14



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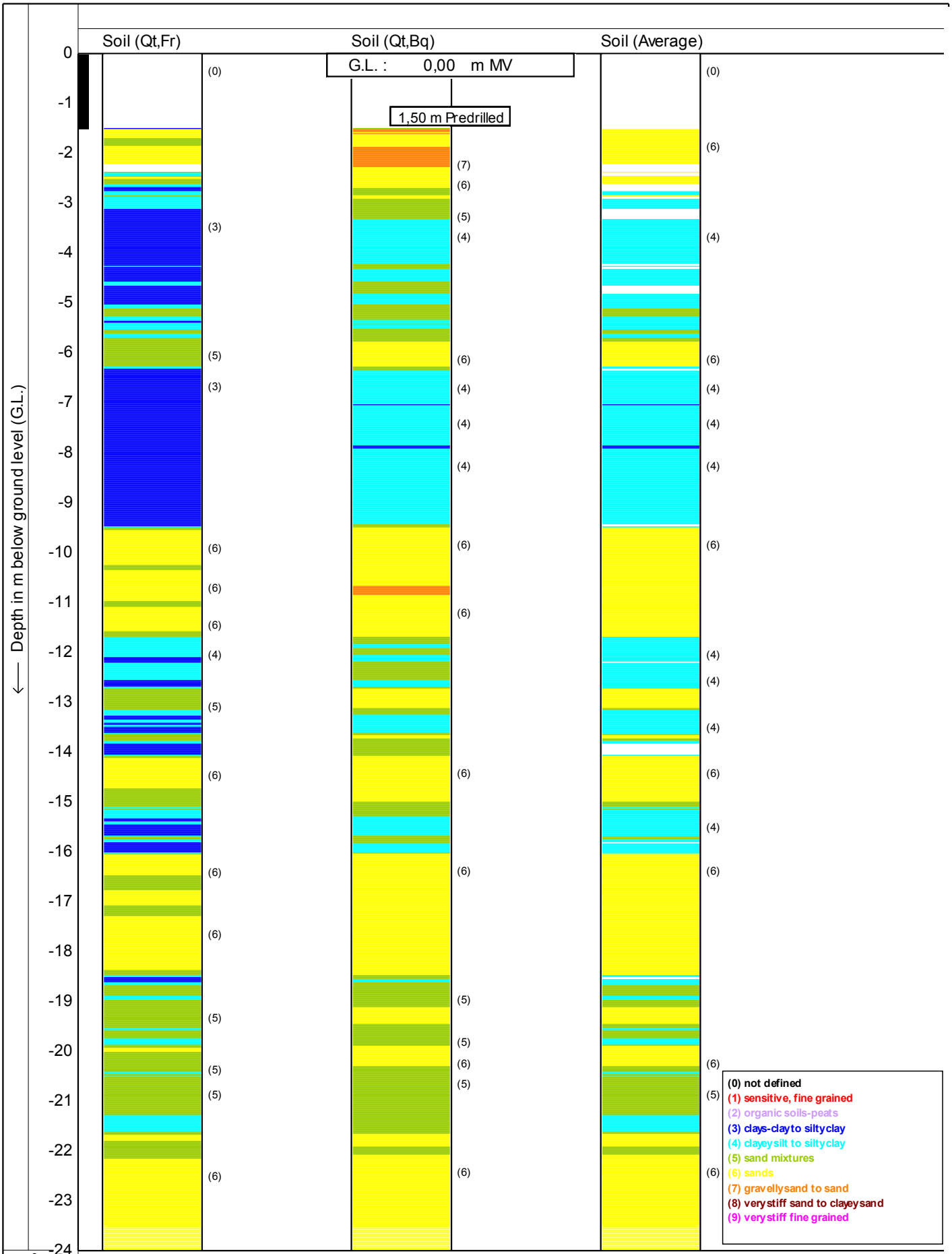
Project no.	: **0041011**
CPT no.	: **kcpt7**

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

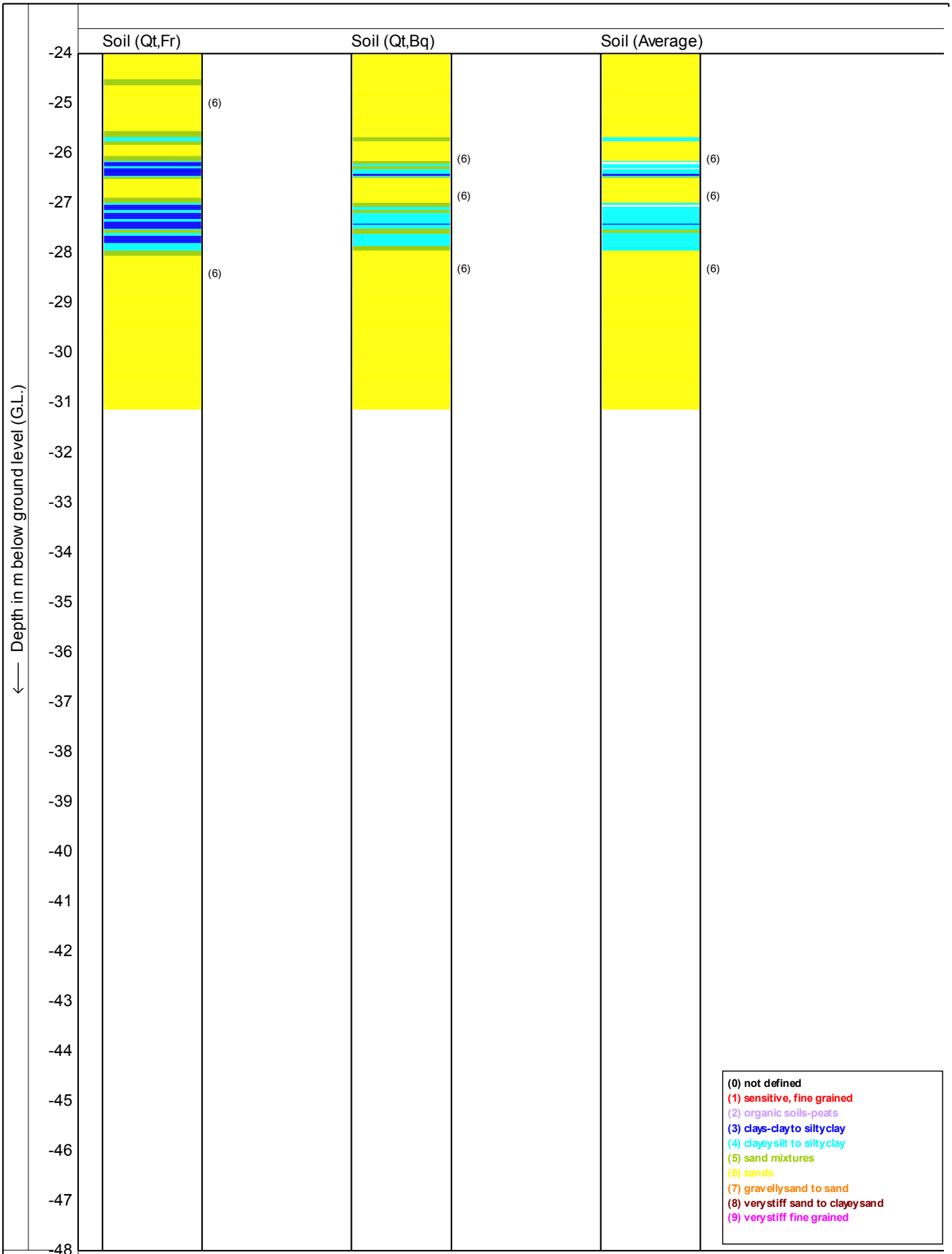
Cone no. : **C15CFIP.971**

Project no. : **0041011**

CPT no. : **kcpt7** 7/8

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

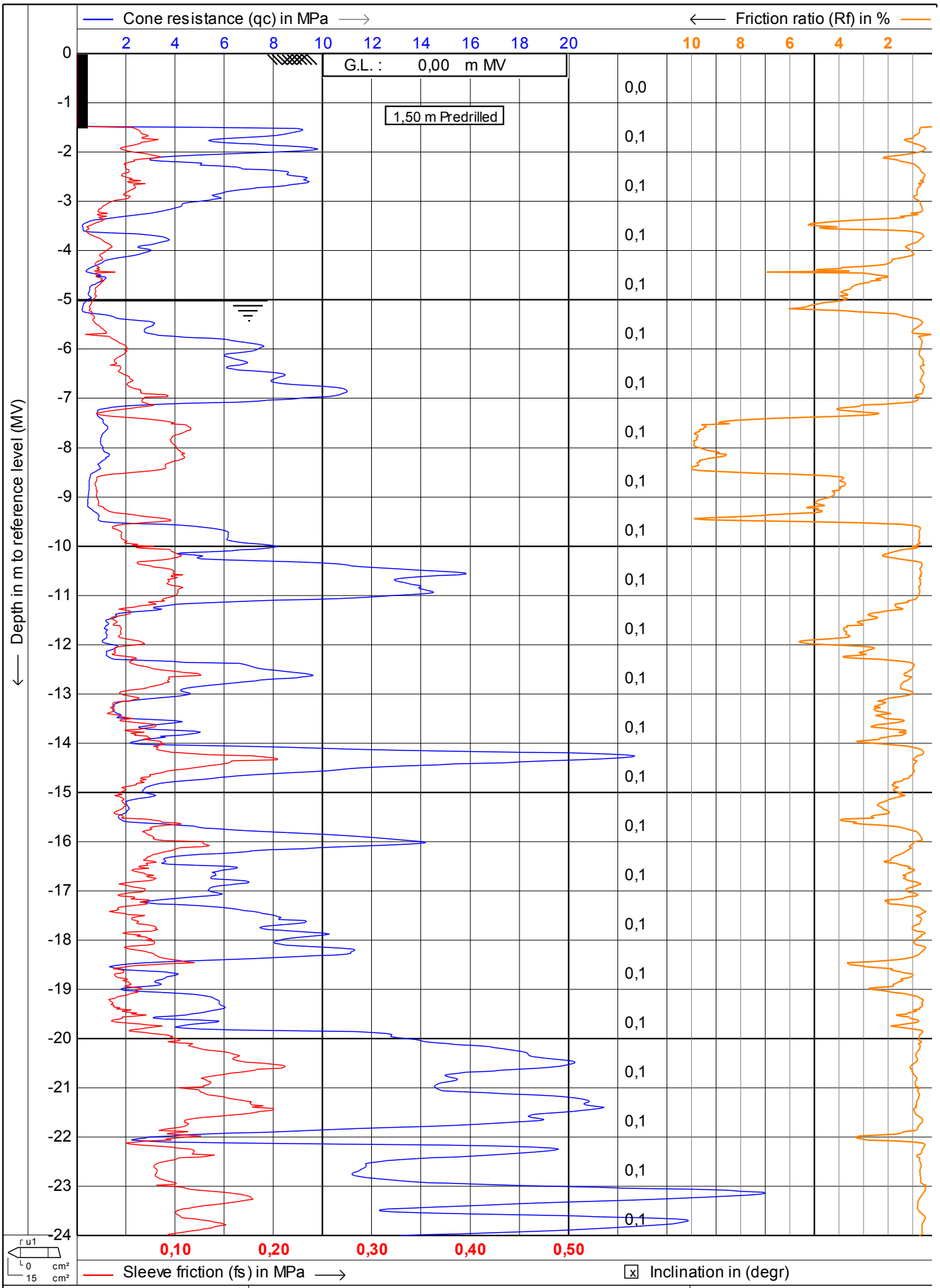
Cone no. : **C15CFIP.971**

Project no. : **0041011**

CPT no. : **kcpt7** **8/8**

CPTask V1.14

MOS GRONDMECHANICA



MOS GRONDMECHANICA

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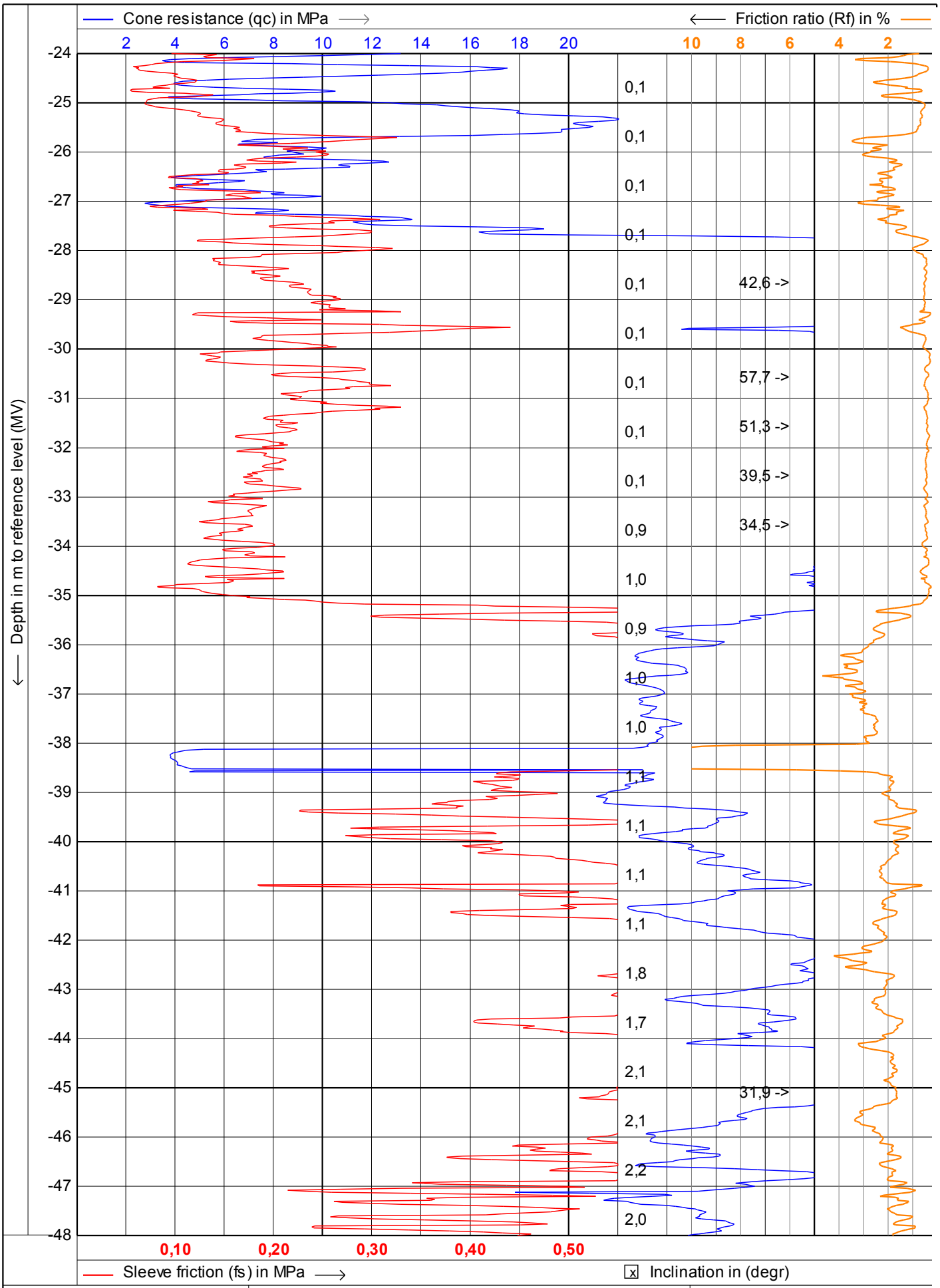
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **28-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt8a** 1/12

CPTask V1.14



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Test according NEN 5140 class 2

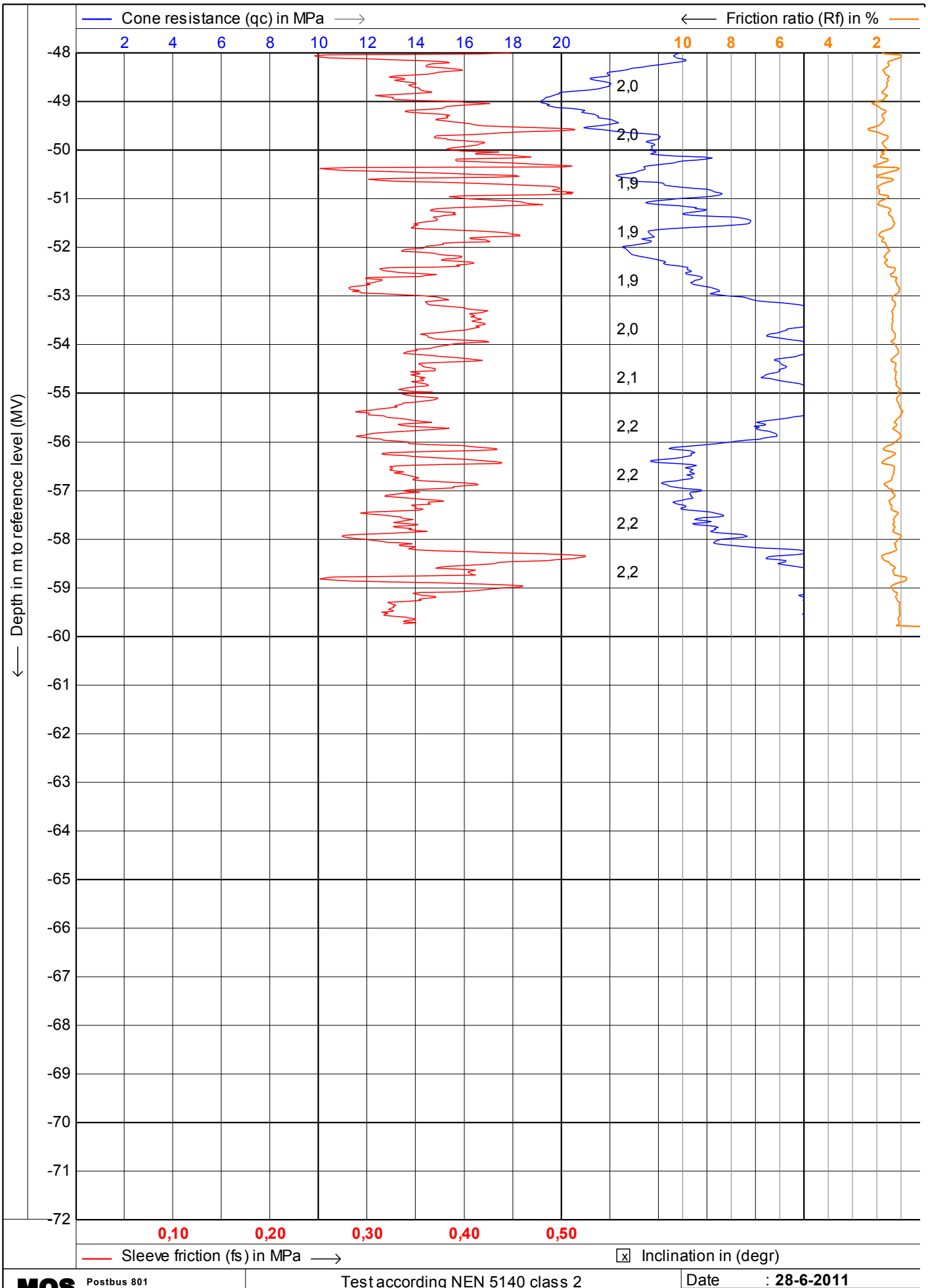
Project : **KCB2**

Location: **Borssele**

Date : **28-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt8a** 2/12

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

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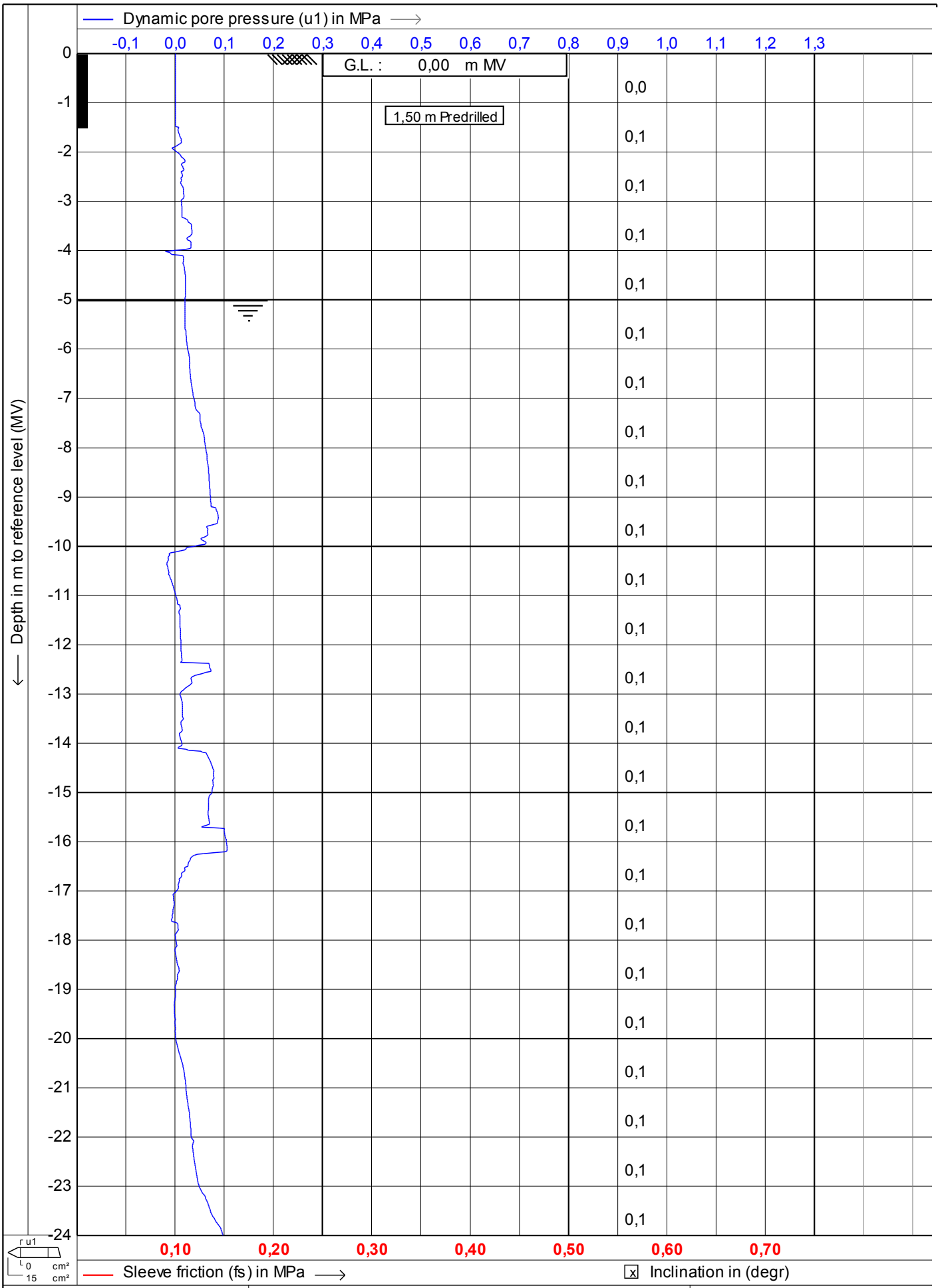
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt8a** **3/12**

MOS GRONDMECHANICA

CPTask V1.14



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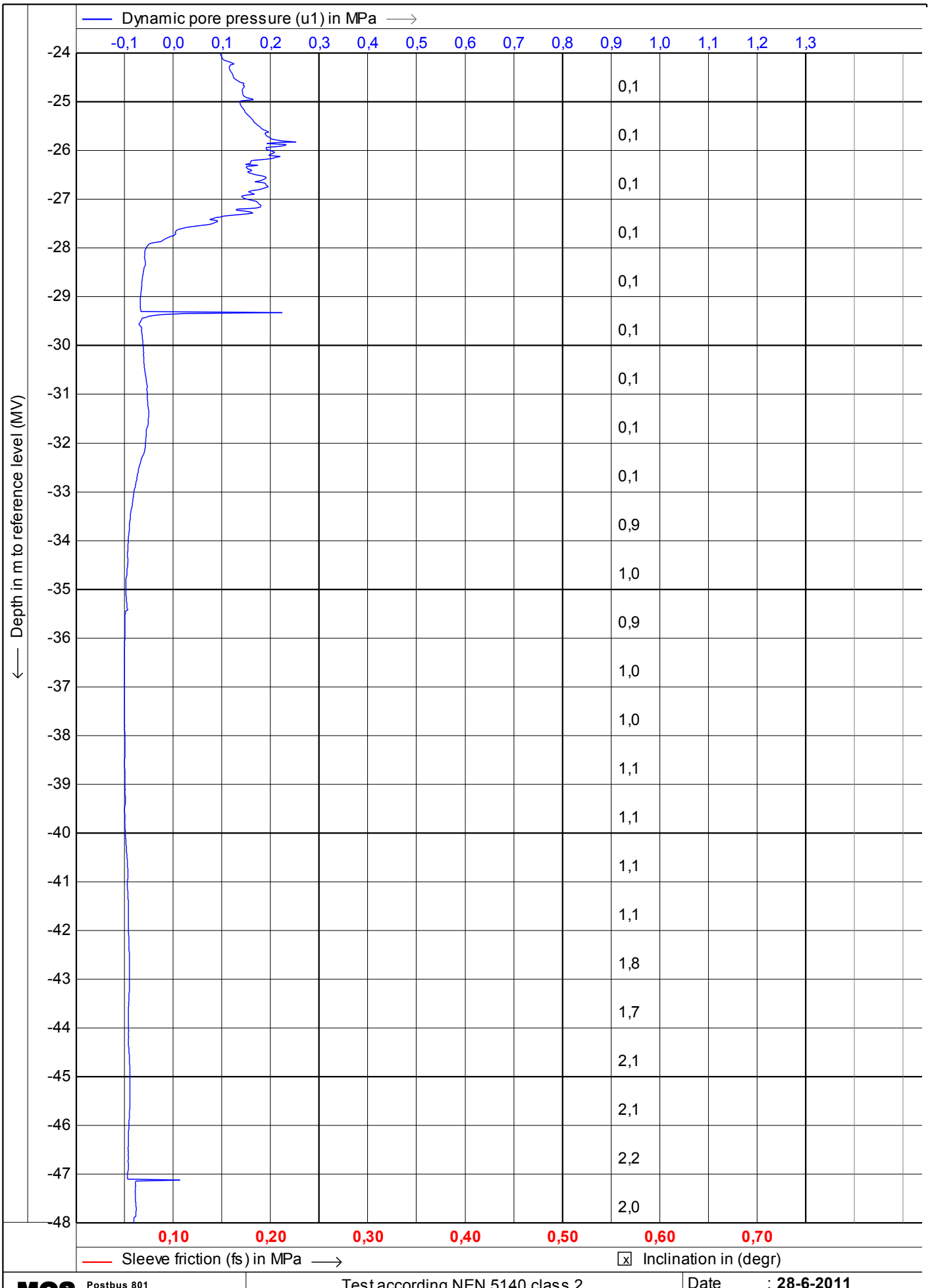
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt8a** 4/12

CPTask V1.14



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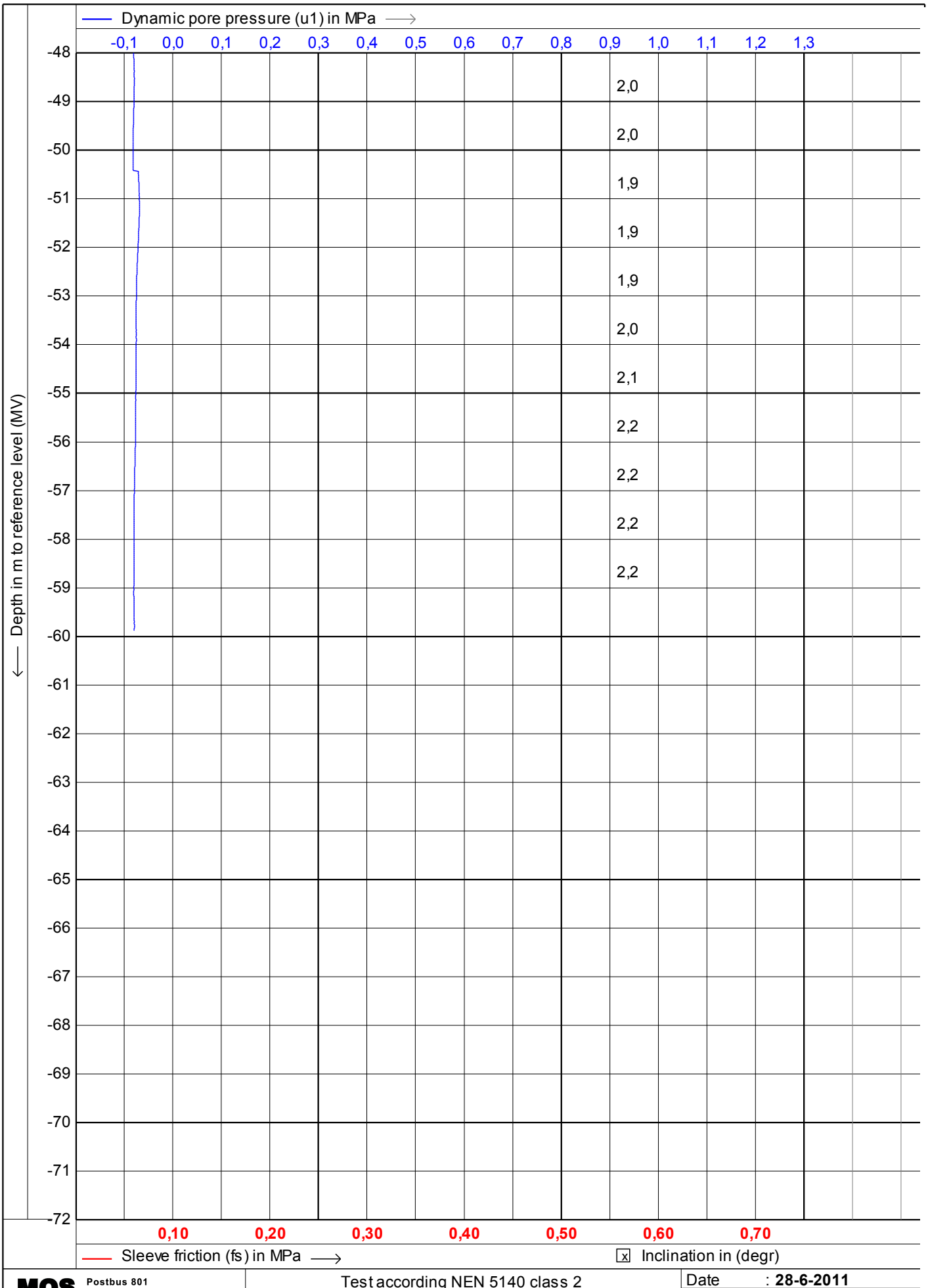
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt8a** **5/12**

CPTask V1.14



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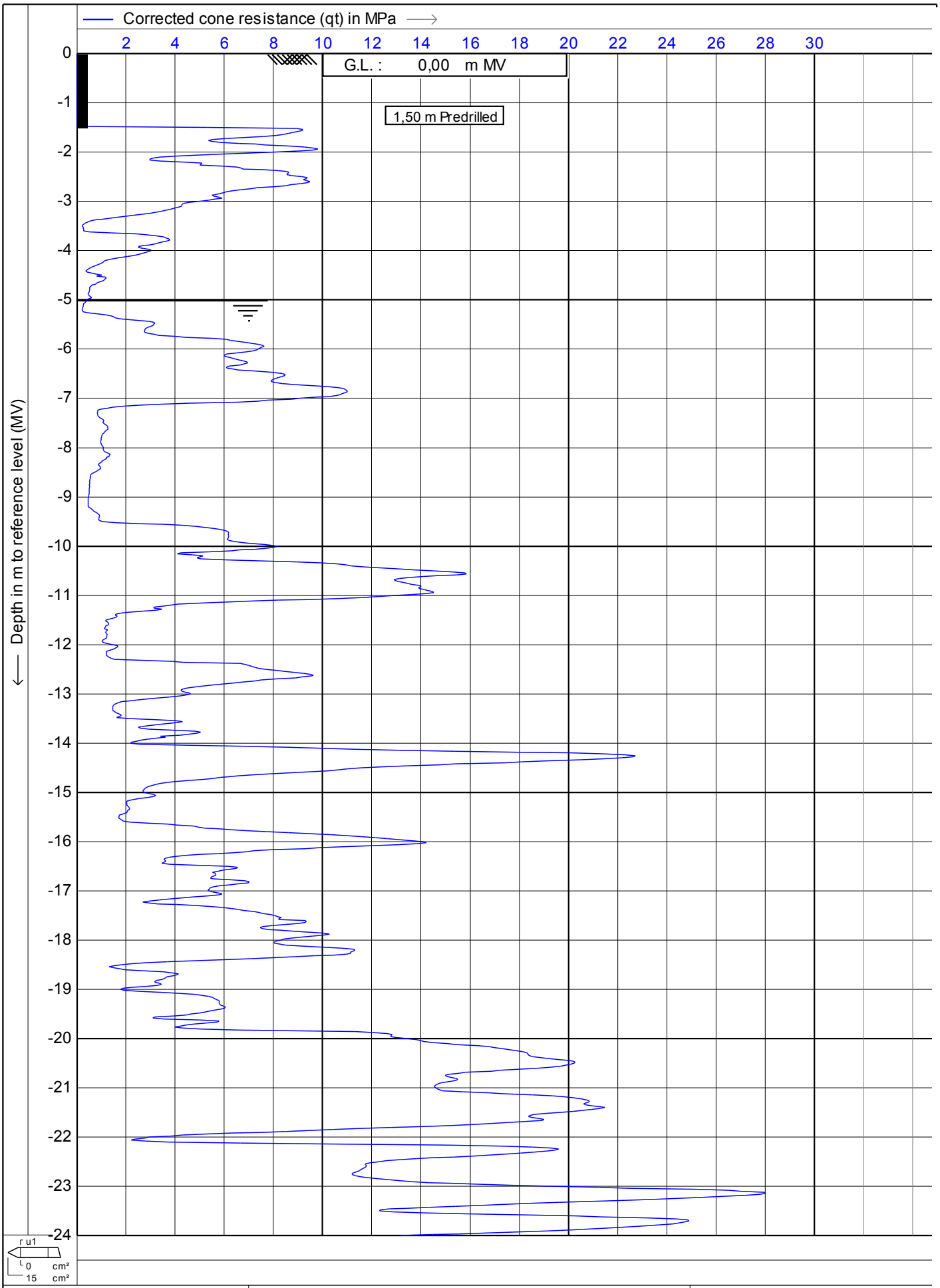
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt8a** **6/12**

CPTask V1.14



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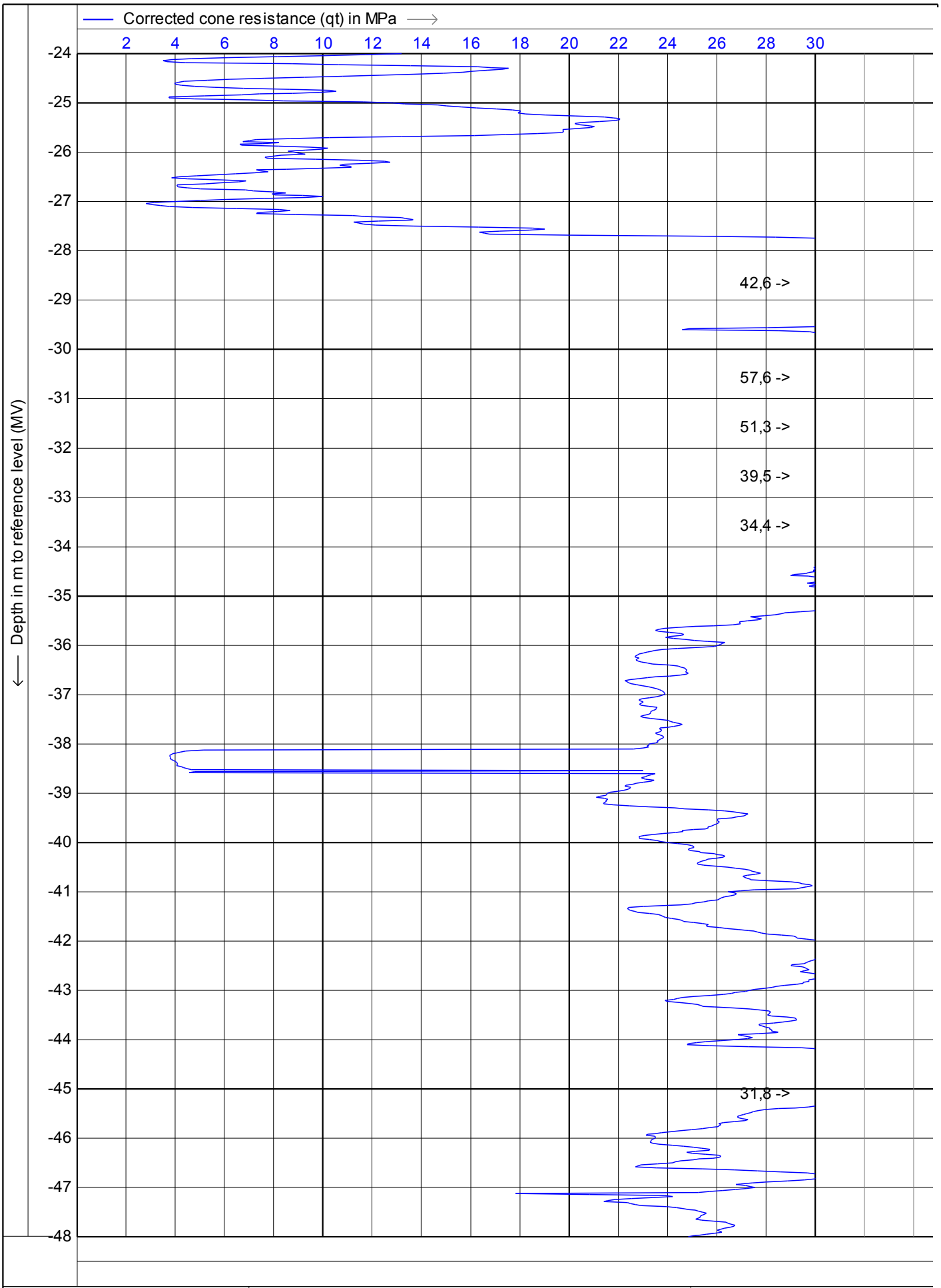
CPT no.	: **kcpt8a**

MOS GRONDMECHANICA
CPTask V1.14



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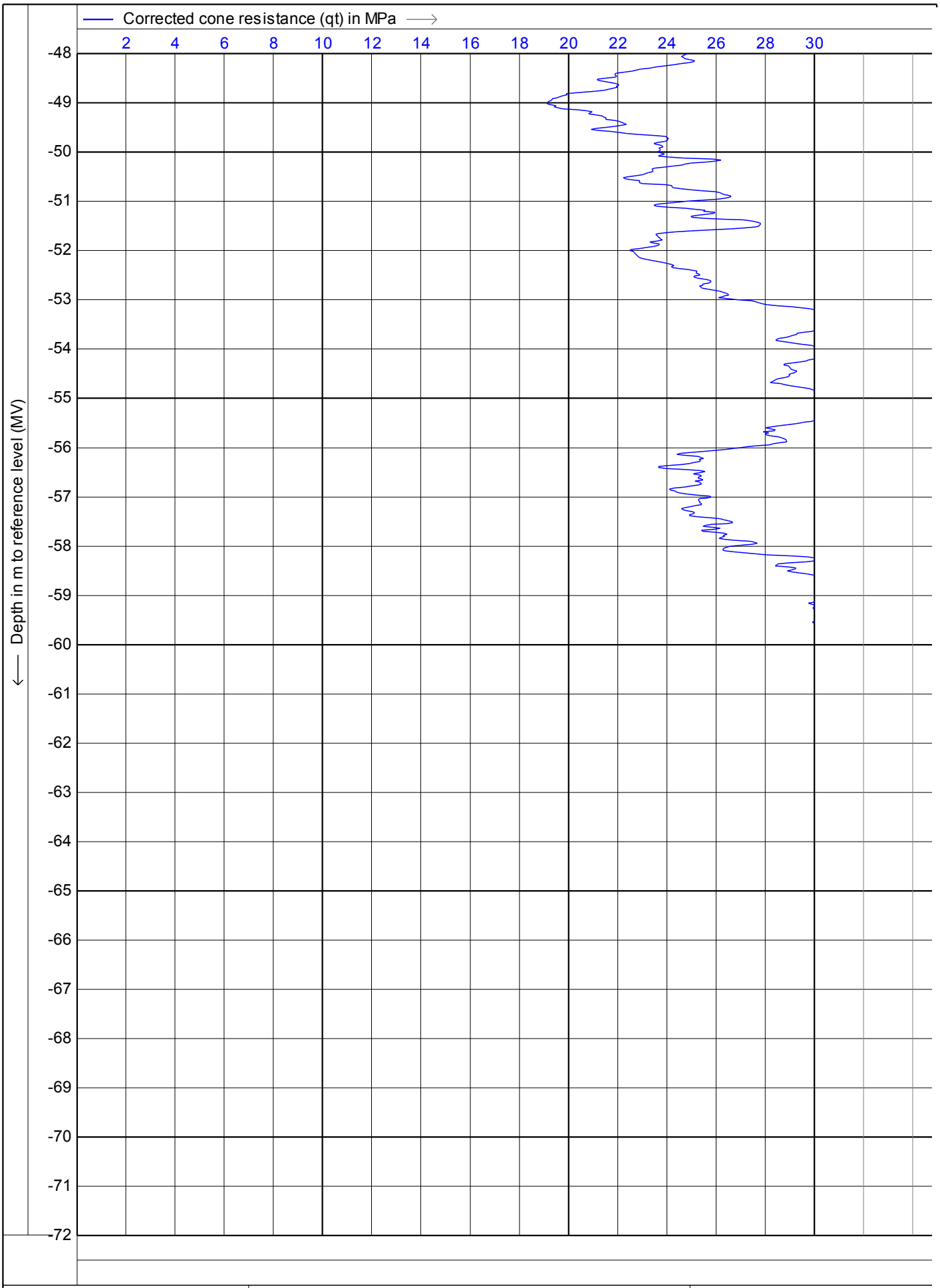
CPT no.	: **kcpt8a**

MOS GRONDMECHANICA
CPTask V1.14



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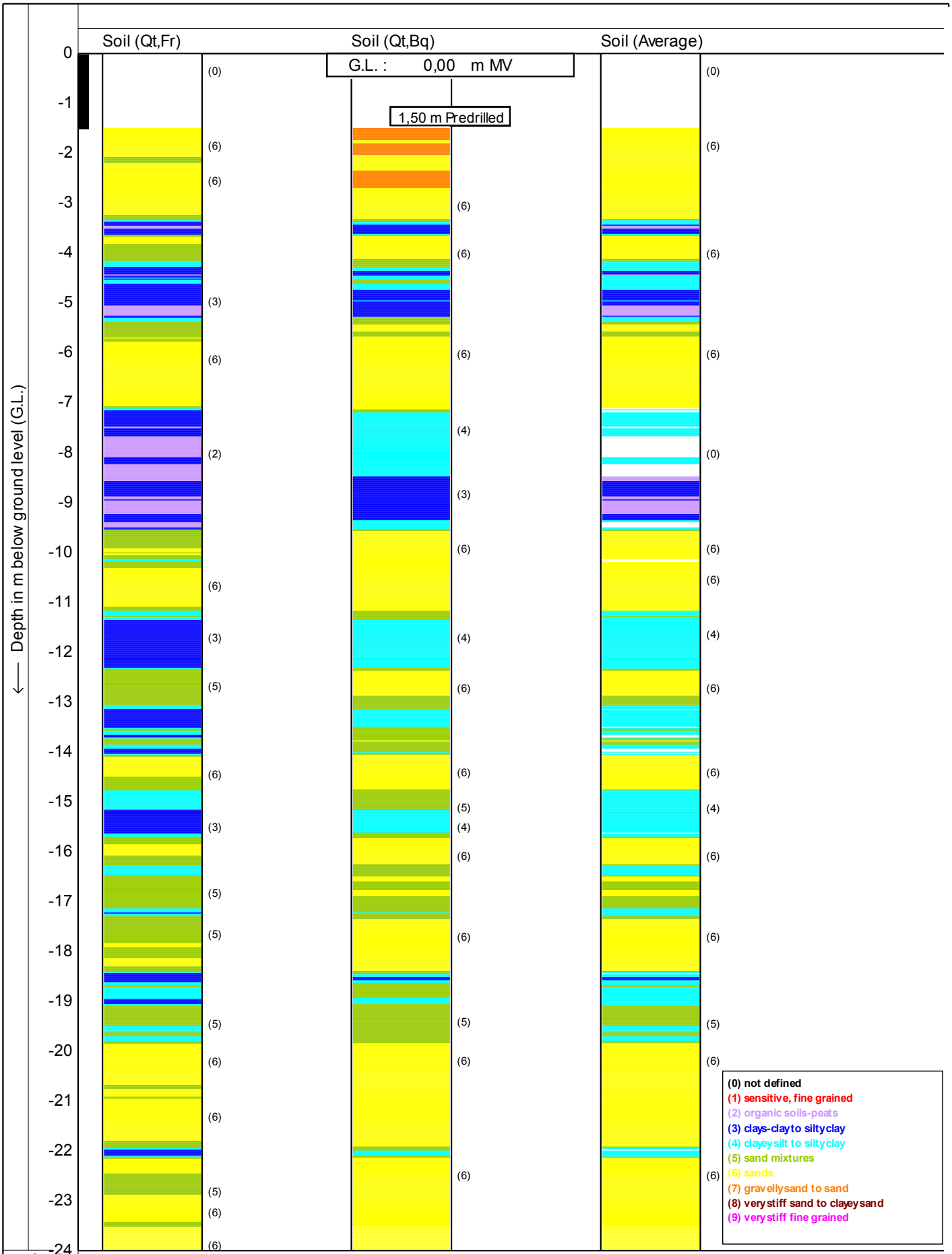
CPT no.	: **kcpt8a**

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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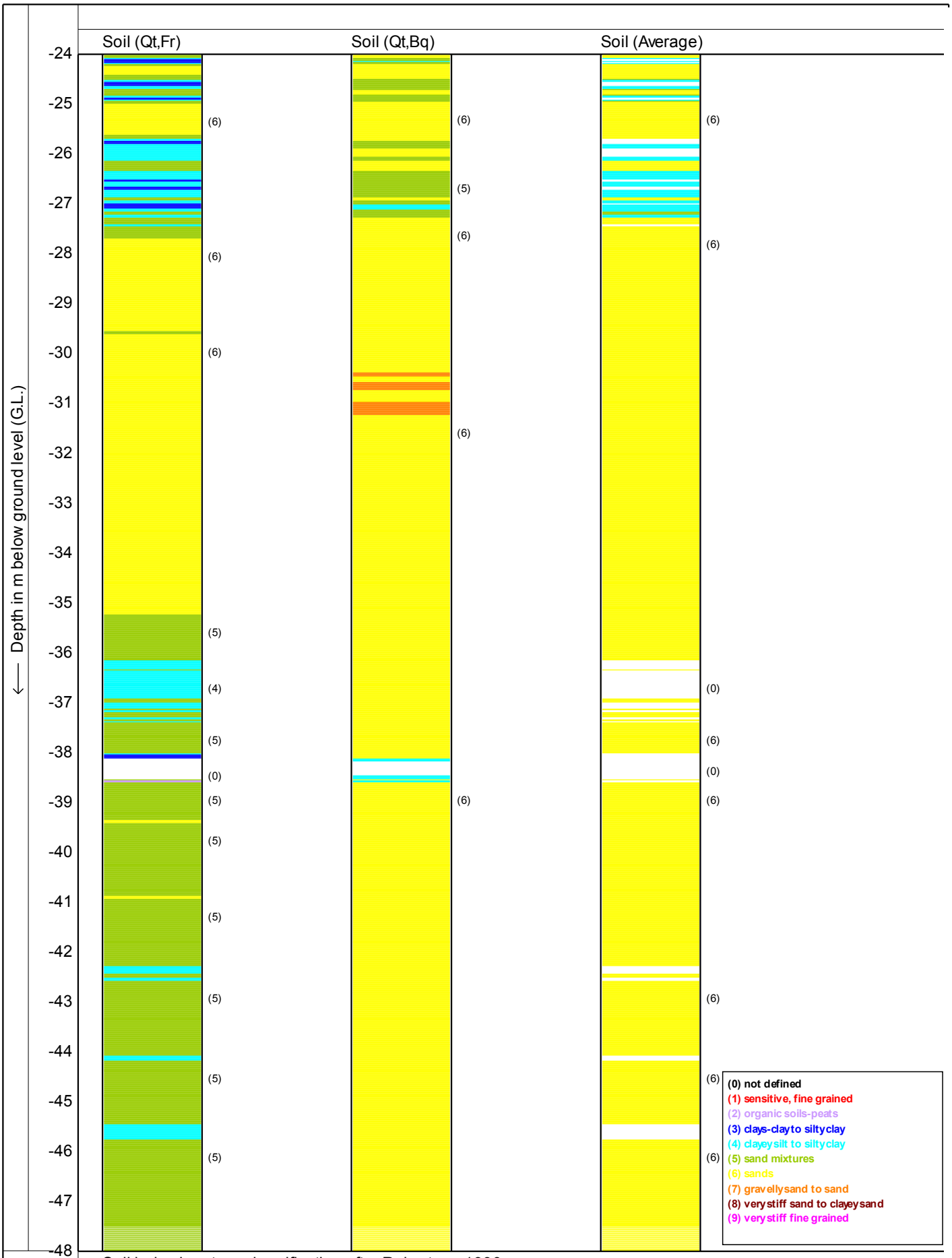
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt8a** 10/12

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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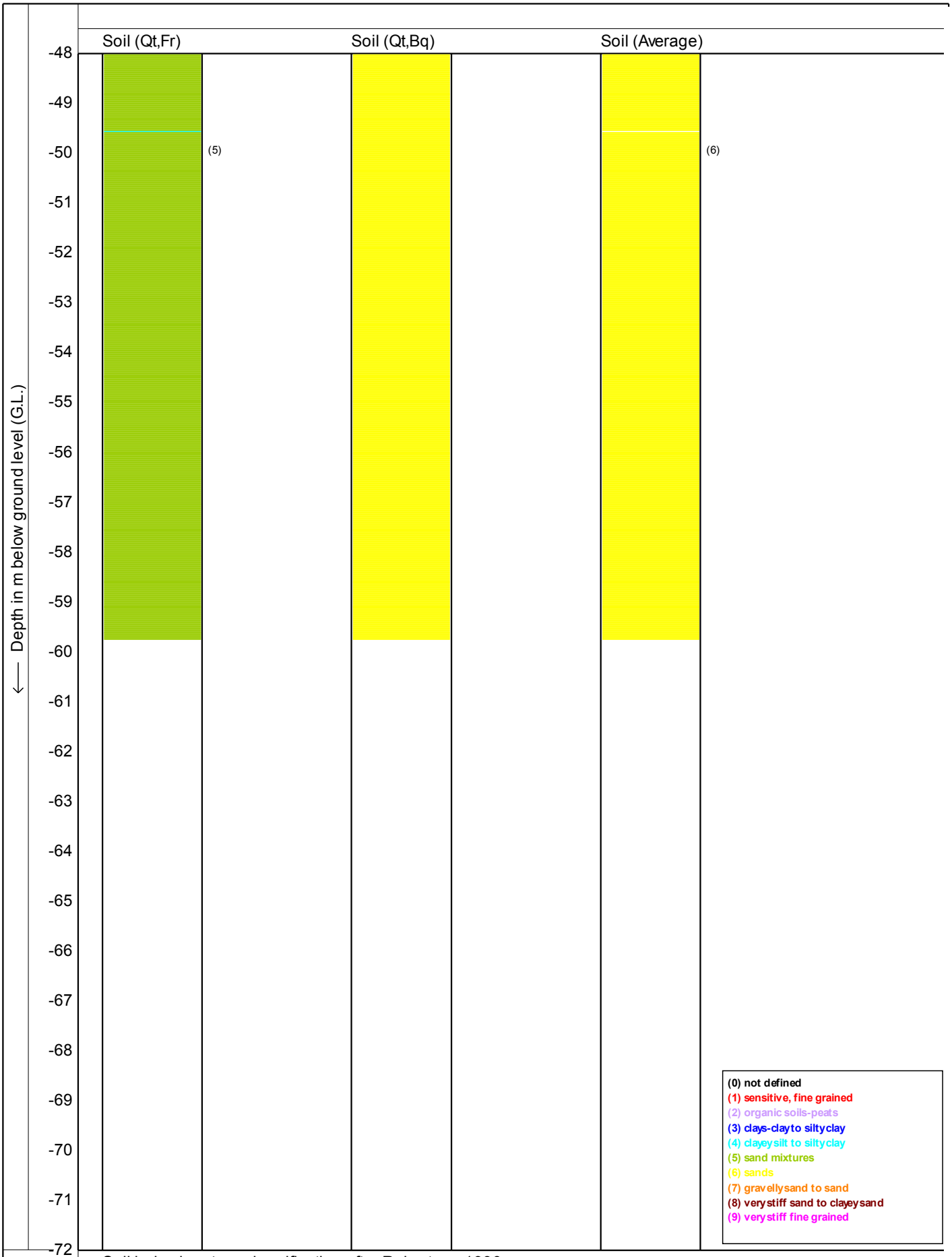
Project no. : **0041011**

CPT no. : **kcpt8a** 11/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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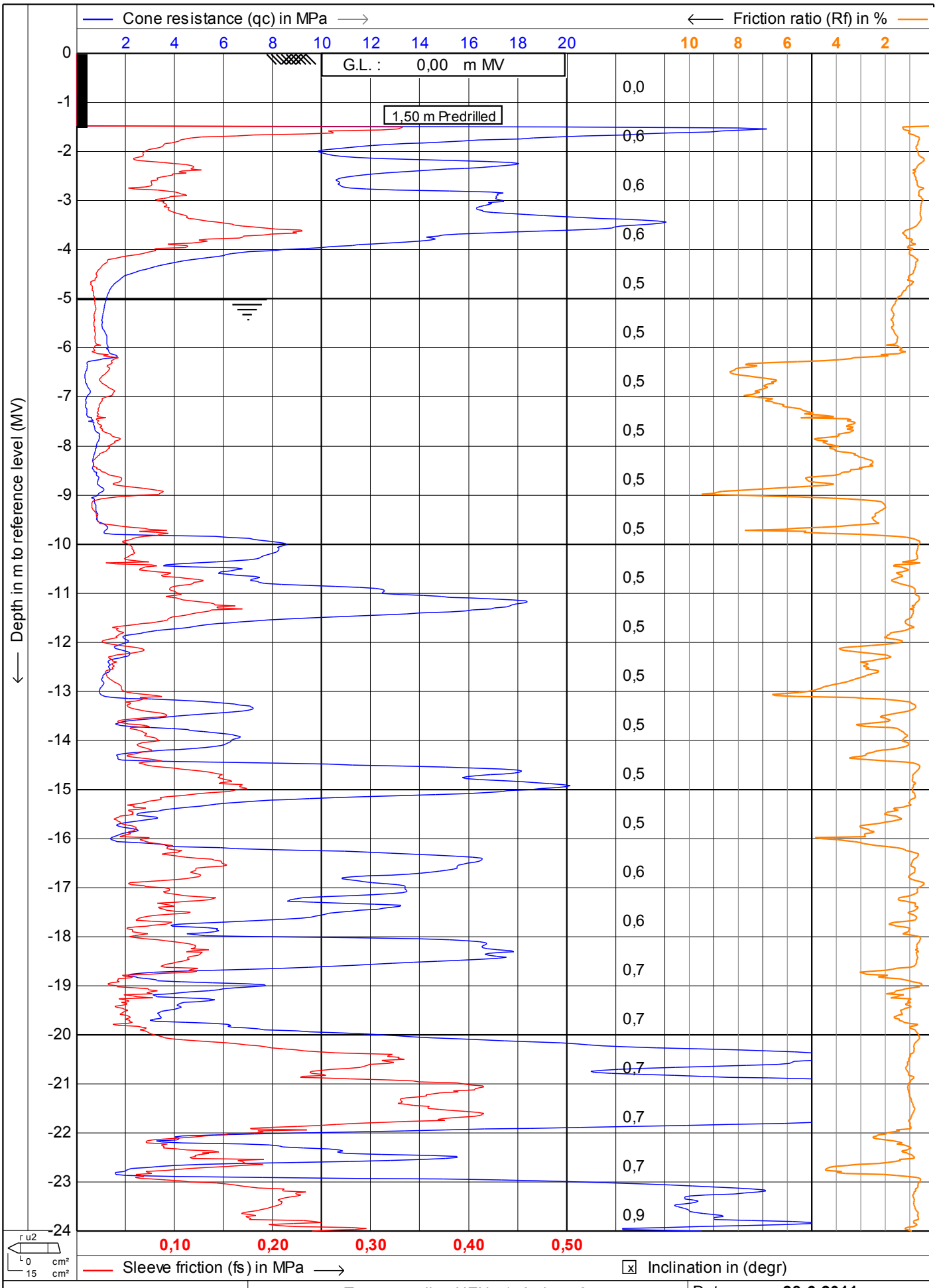
Date : **28-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt8a** 12/12

MOS GRONDMECHANICA

CPTask V1.14



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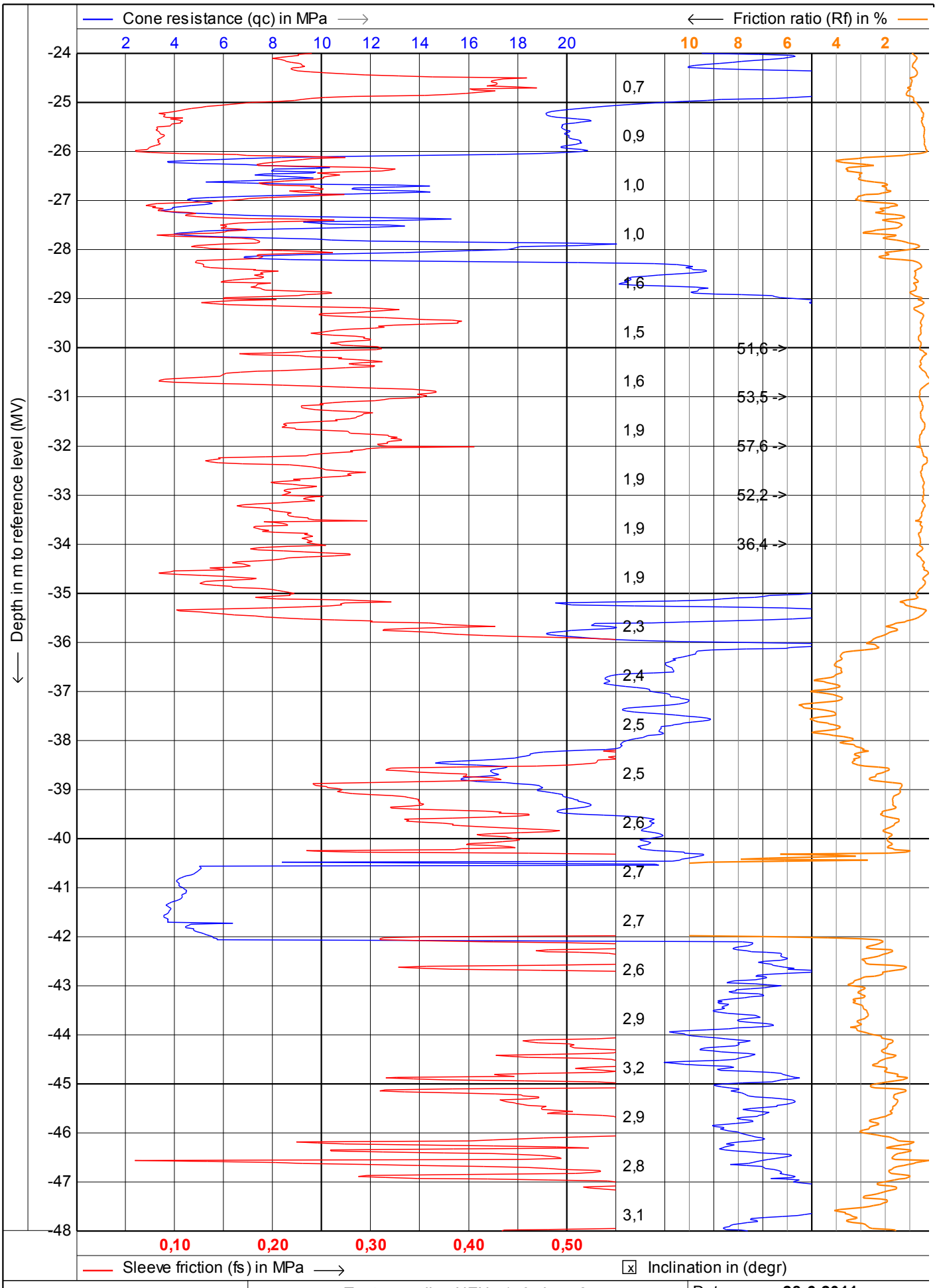
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **28-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt10c** 1/12

CPTask V1.14



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Test according NEN 5140 class 2

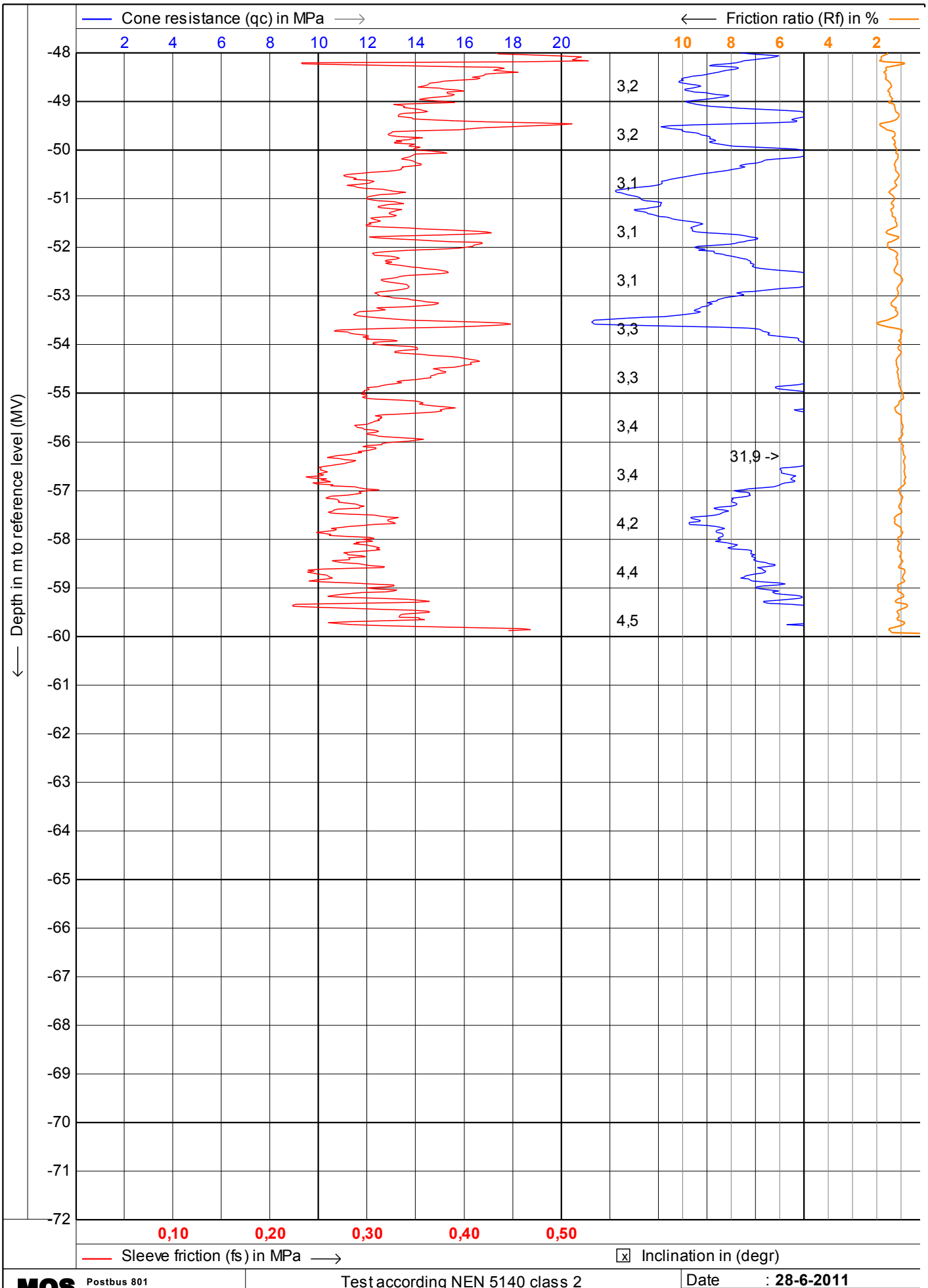
Project : **KCB2**

Location: **Borssele**

Date : **28-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt10c** 2/12

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **28-6-2011**

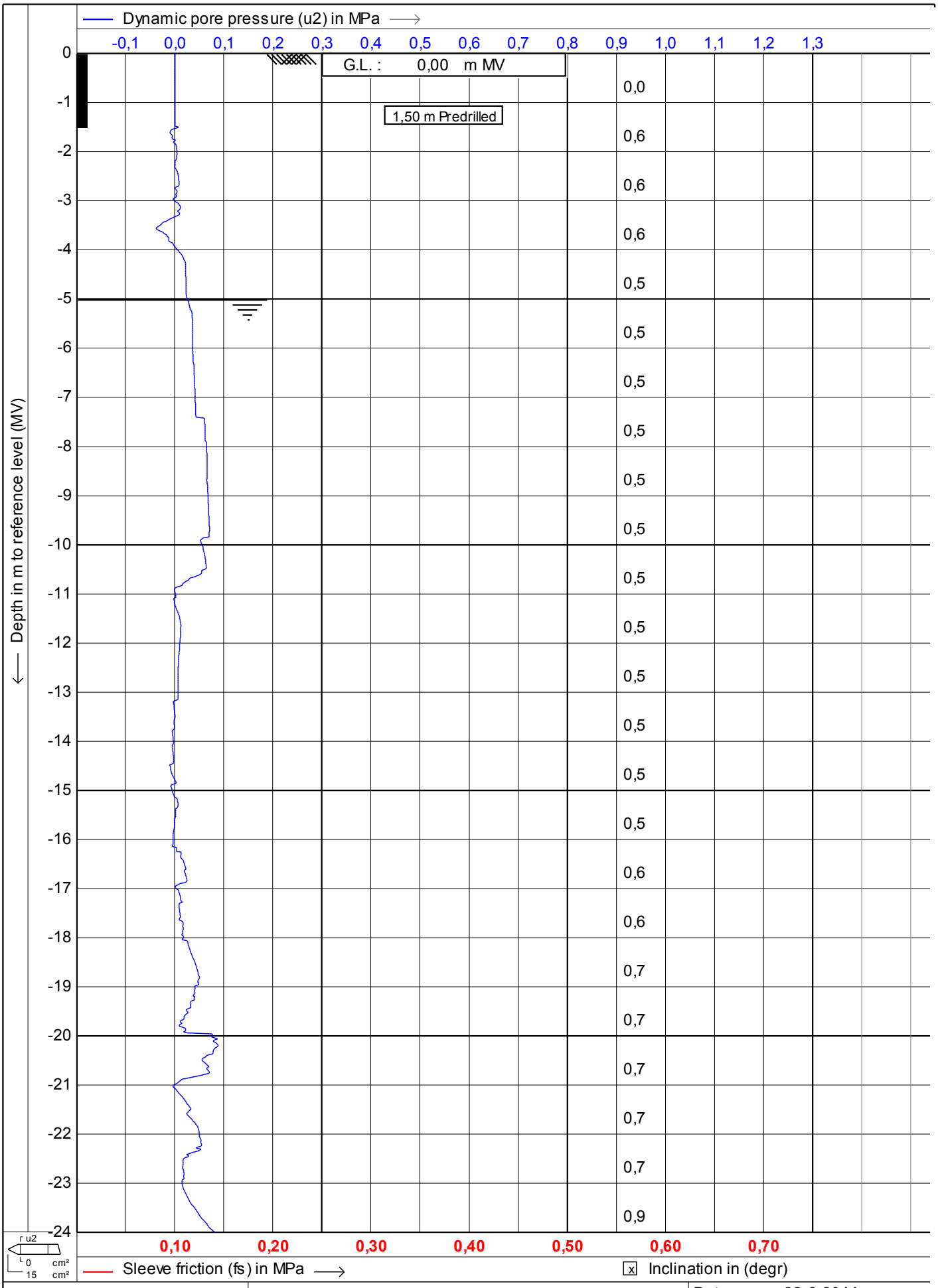
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt10c** 3/12

MOS GRONDMECHANICA

CPTask V1.14



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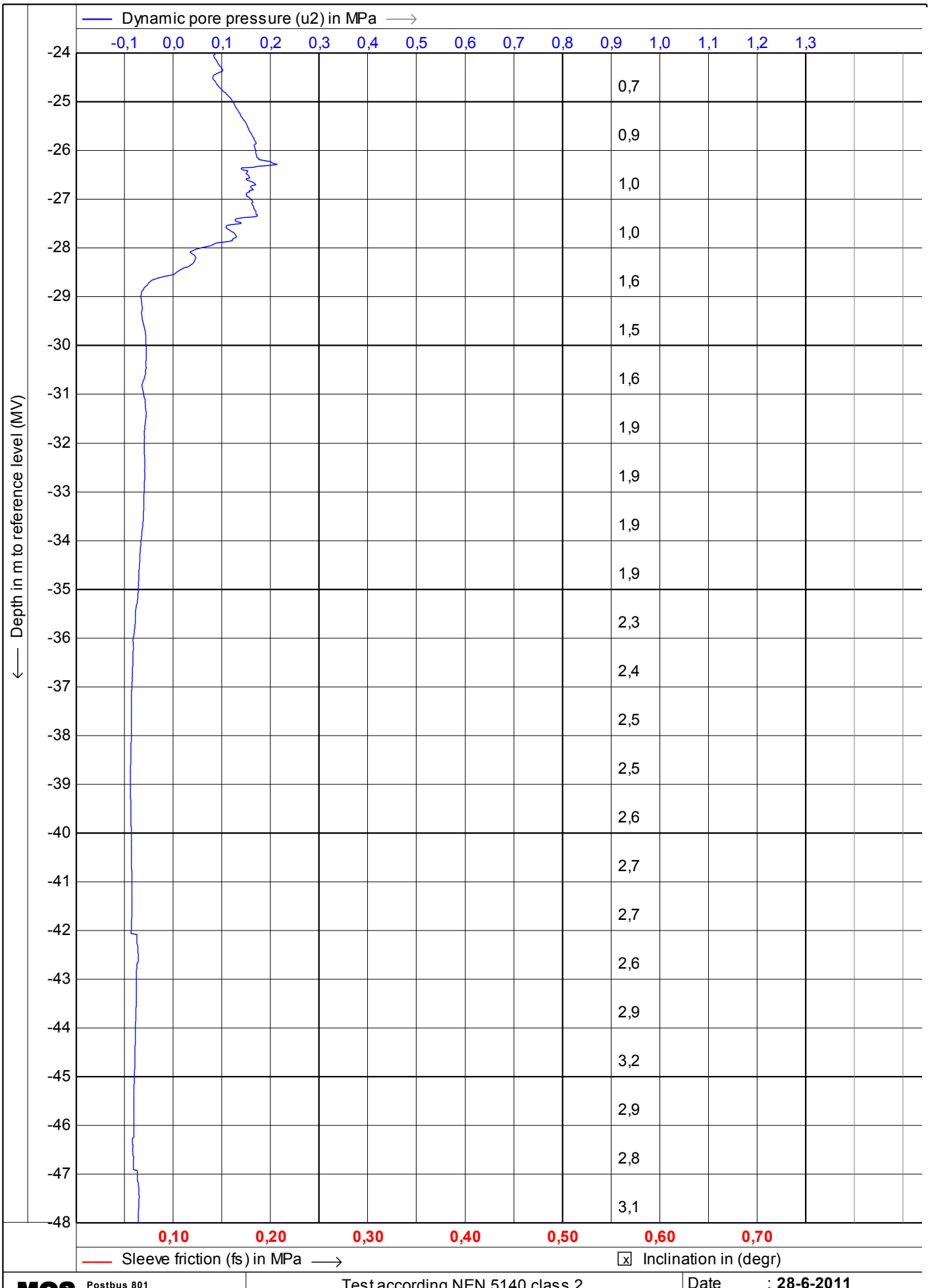
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **28-6-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt10c**

CPTask V1.14



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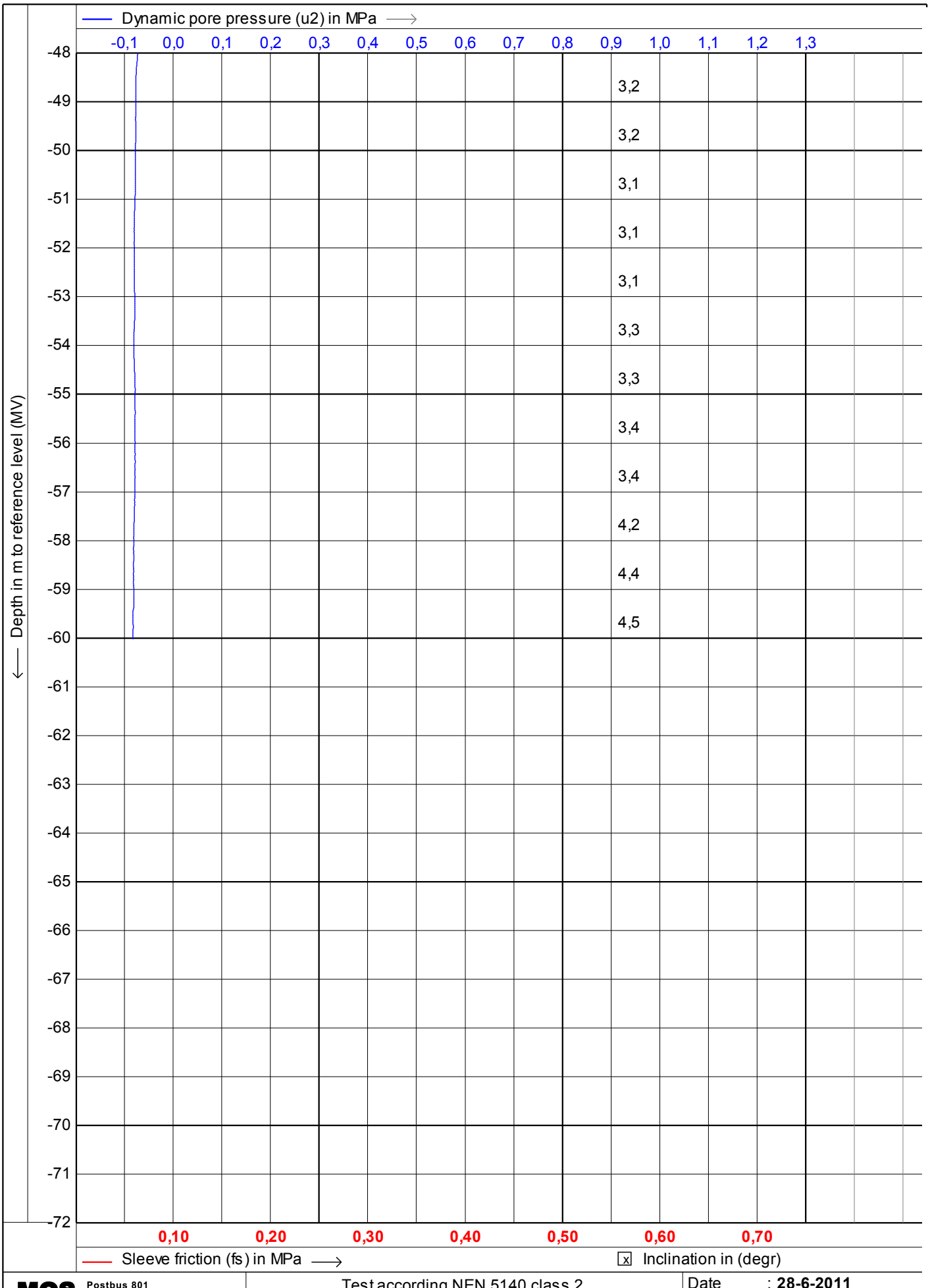
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **28-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt10c** **5/12**

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

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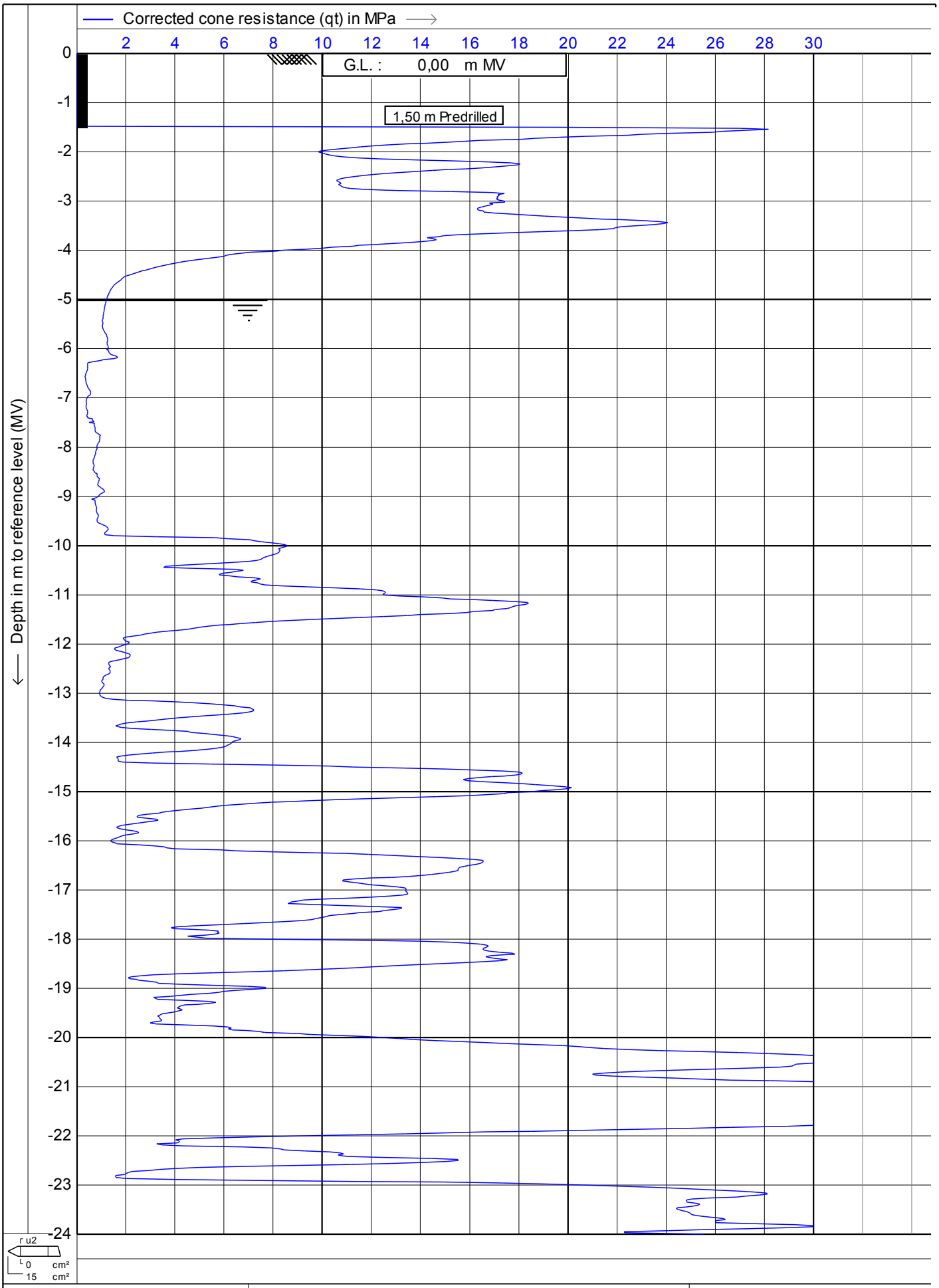
CPT no.	: **kcpt10c**

CPTask V1.14



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Project : **KCB2**

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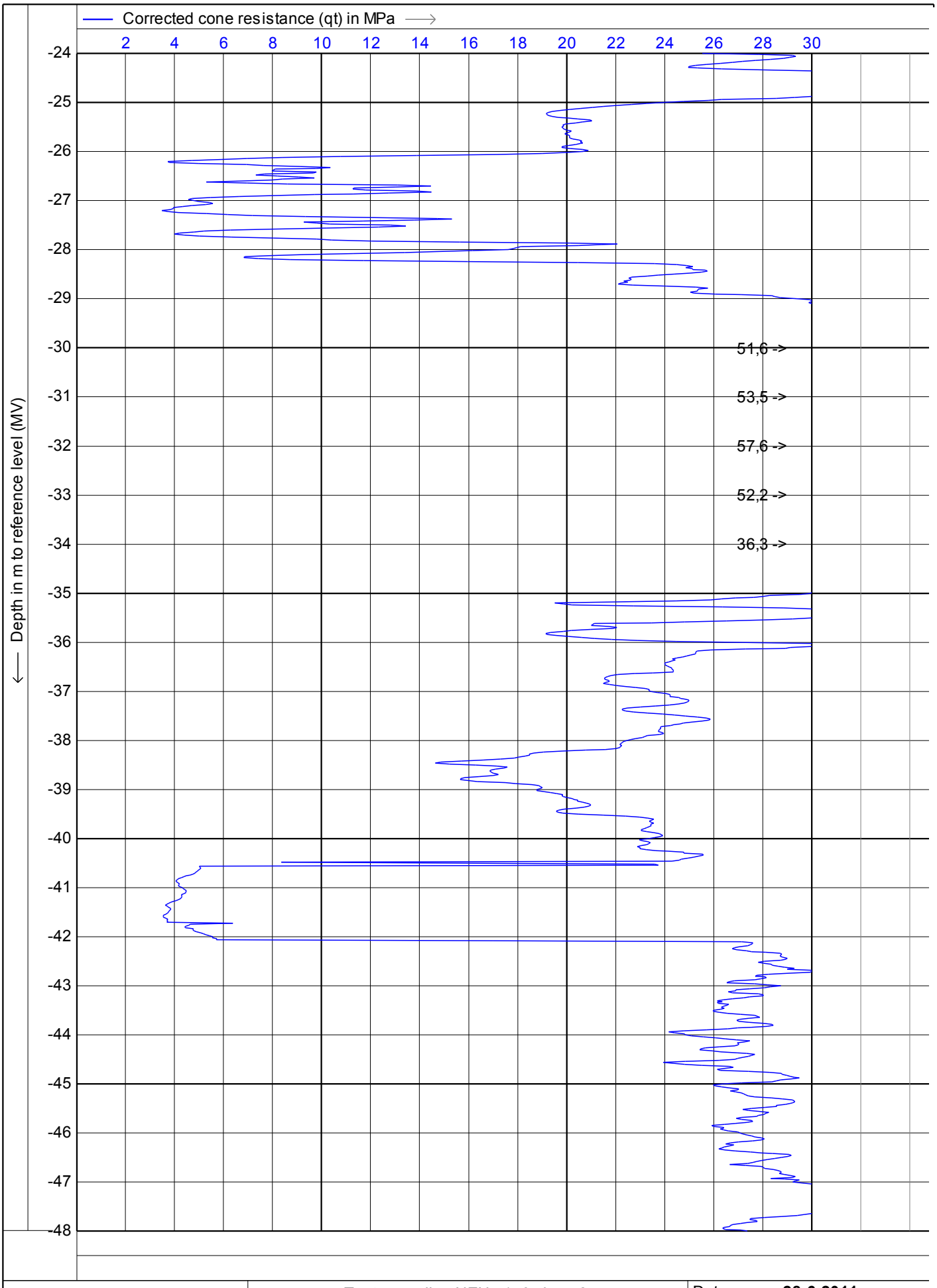
Project no.	: **0041011**
CPT no.	: **kcpt10c** 7/12

MOS GRONDMECHANICA

CPTask V1.14



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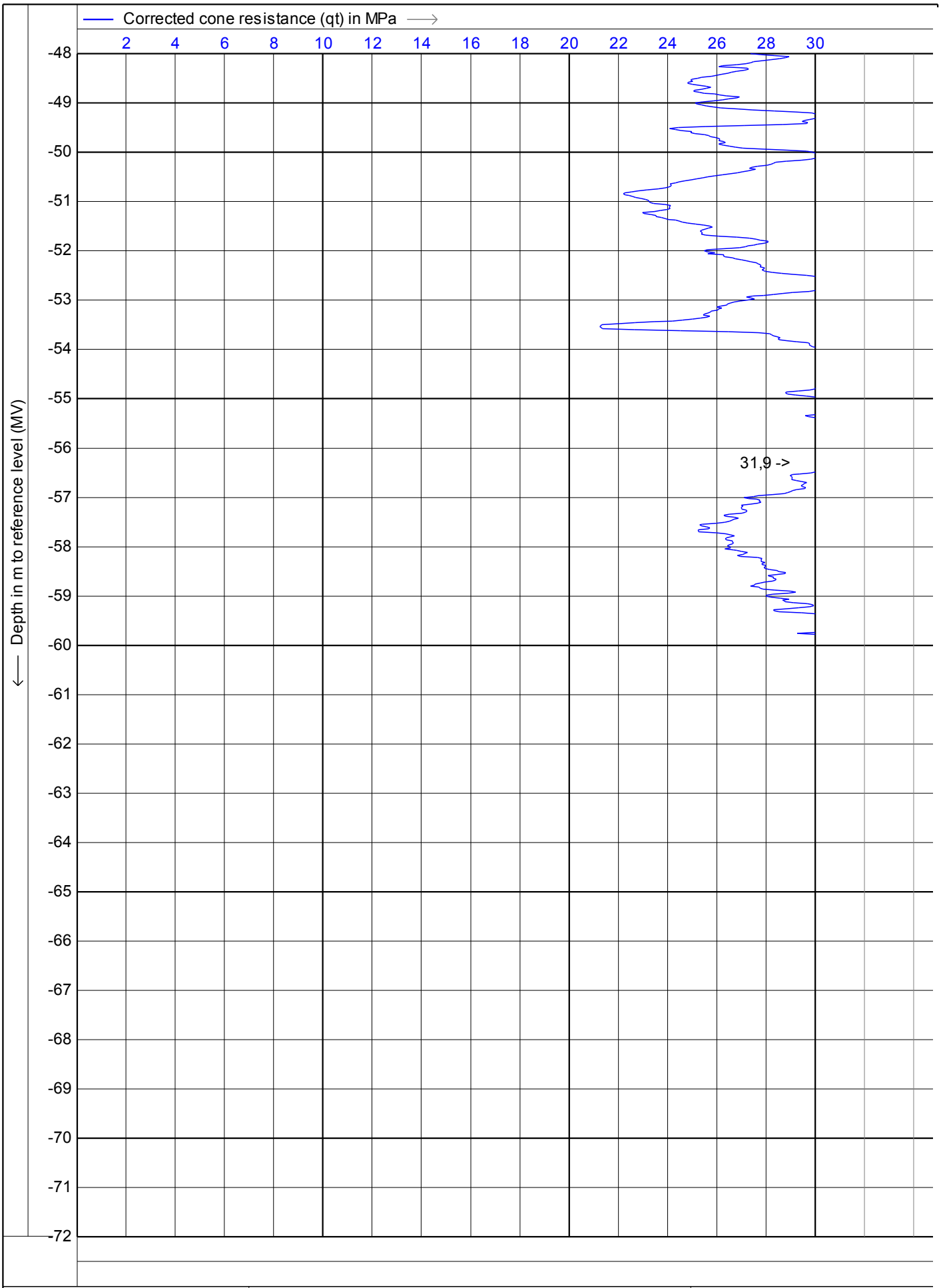
MOS GRONDMECHANICA

CPTask V1.14



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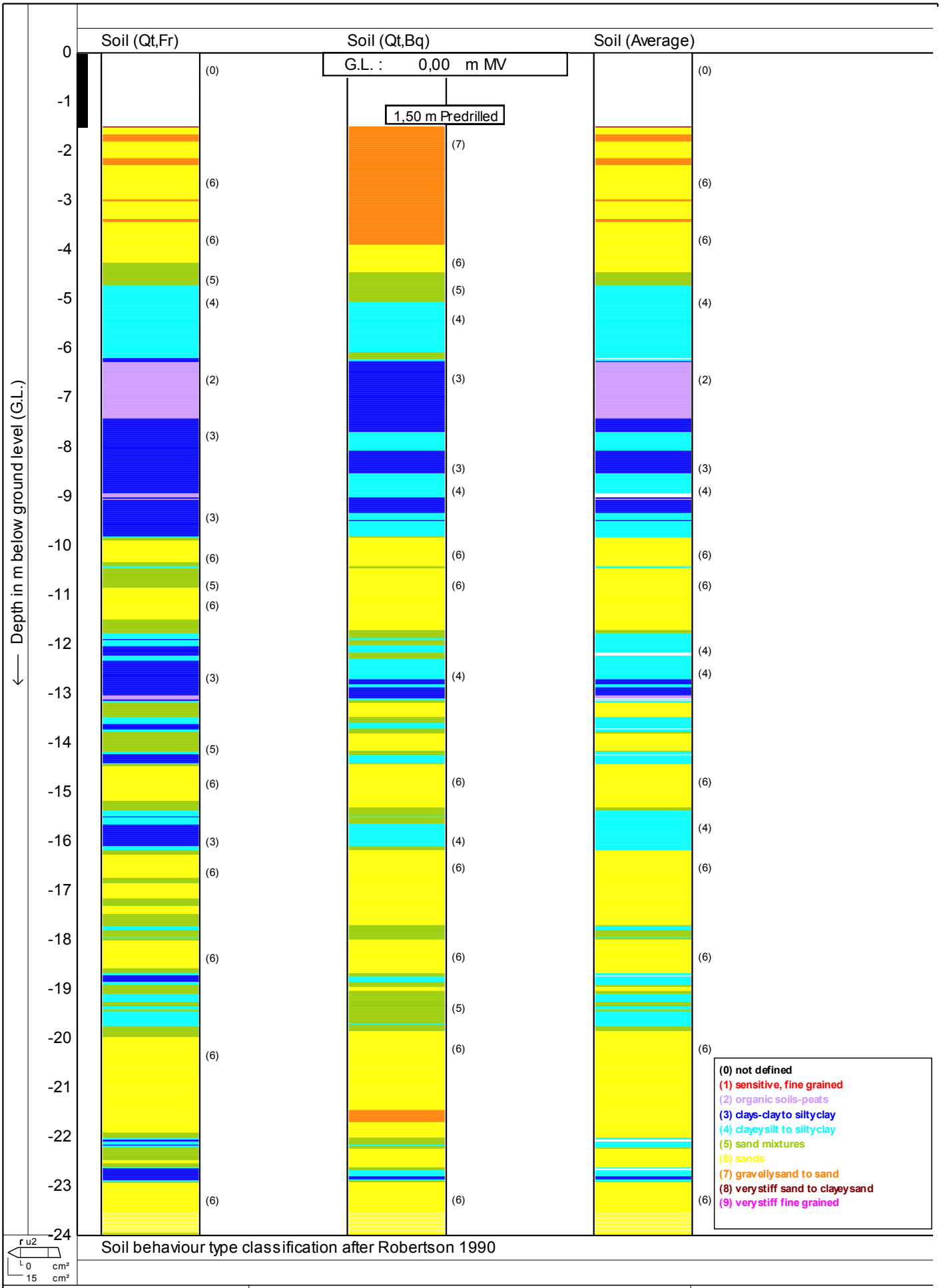
CPTask V1.14



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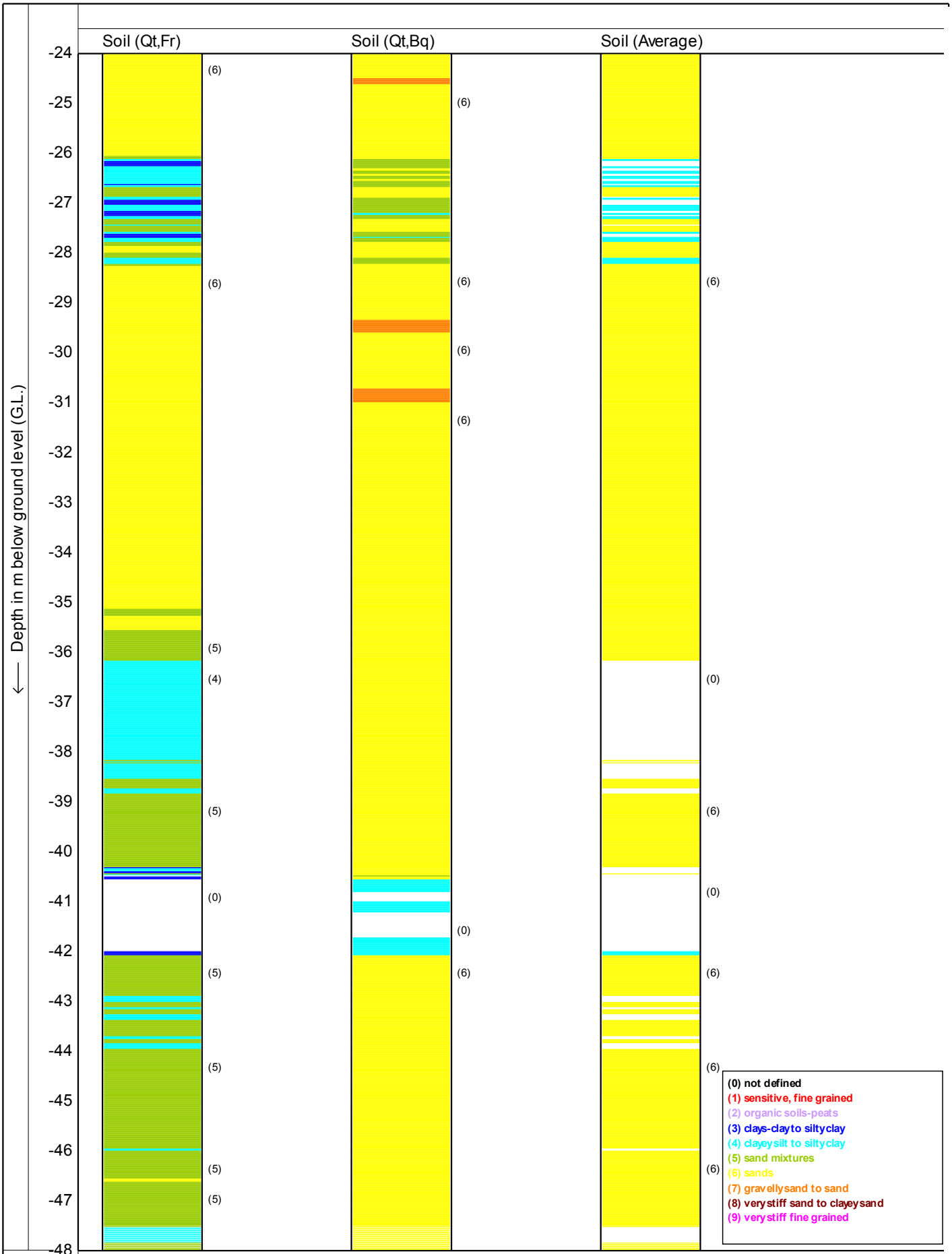
CPT no. : **kcpt10c** 10/12

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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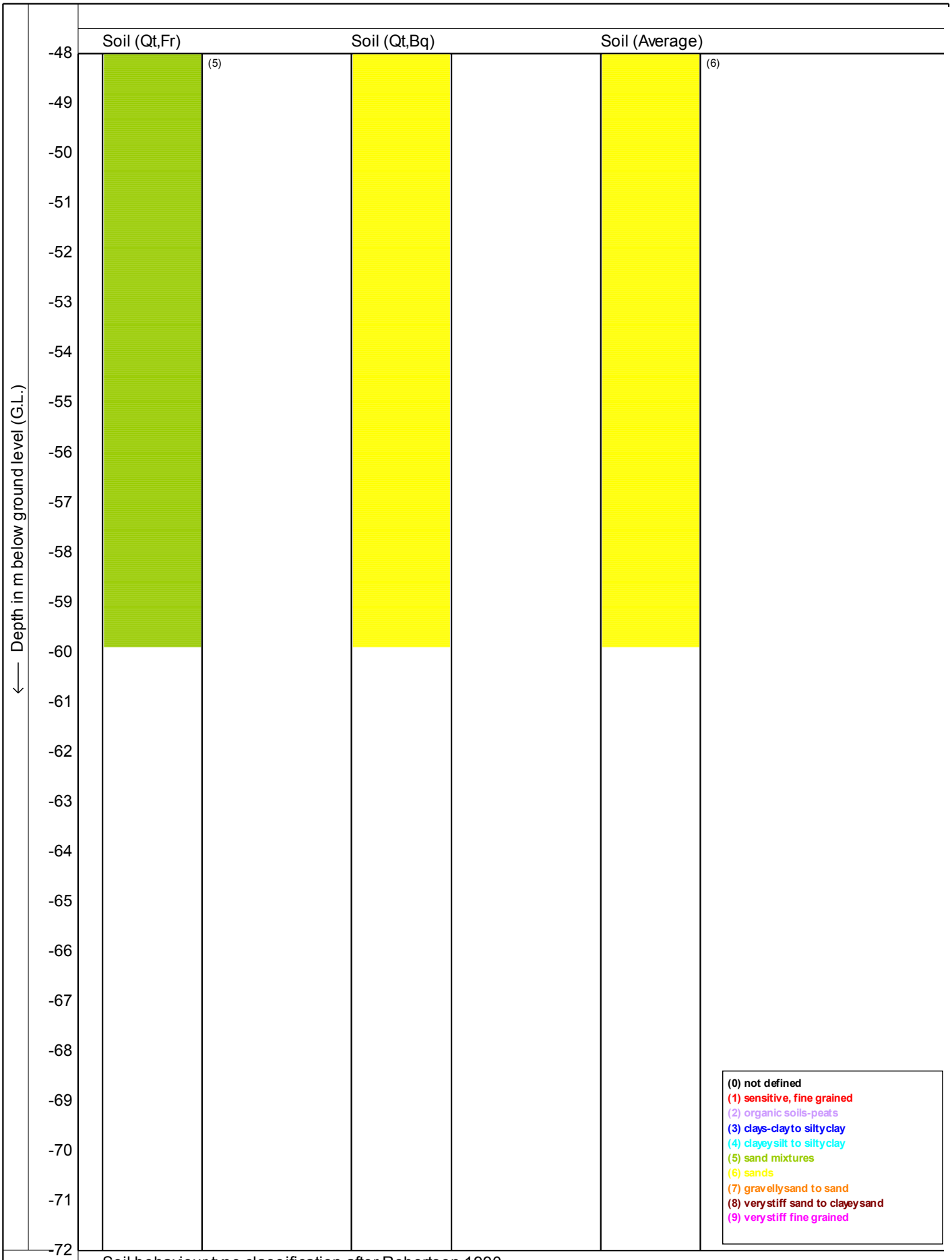
CPT no. : **kcpt10c** 11/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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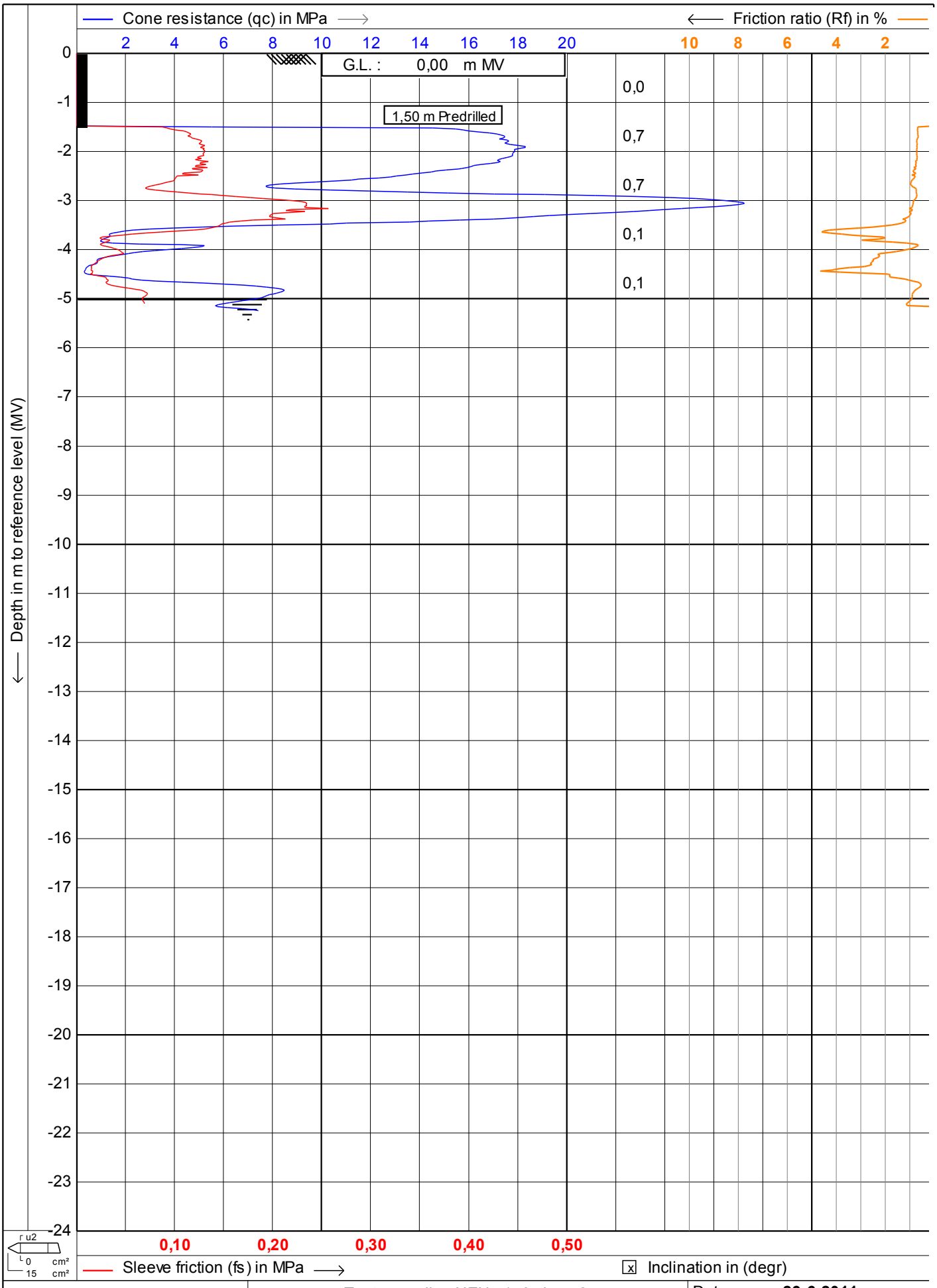
CPT no. : **kcpt10c** 12/12

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

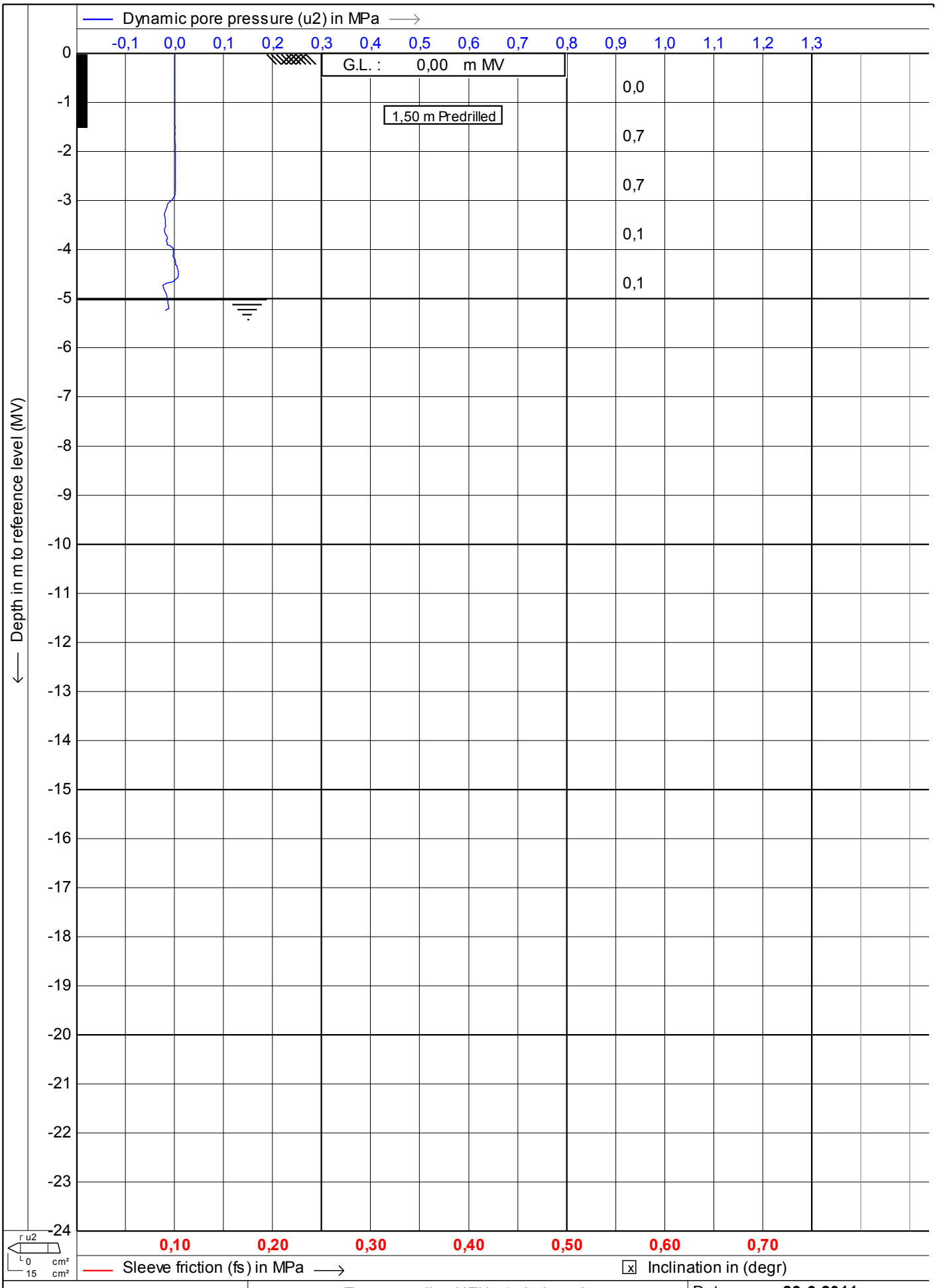
Project : **KCB2**

Location: **Borssele**

Date : **29-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt11** 1/4

MOS GRONDMECHANICA

CPTask V1.14



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Date : **29-6-2011**
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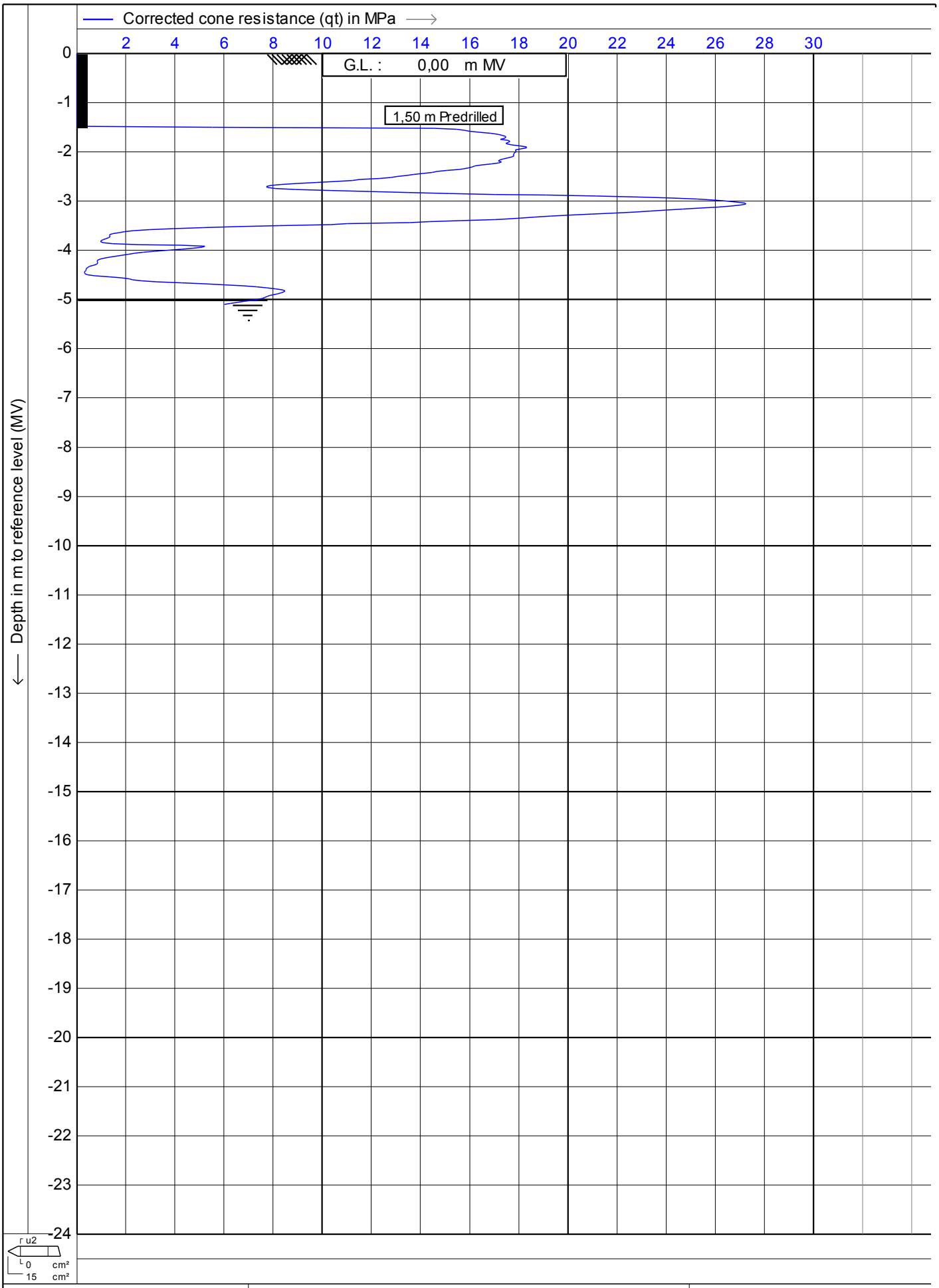
CPTask V1.14



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Test according NEN 5140 class 2

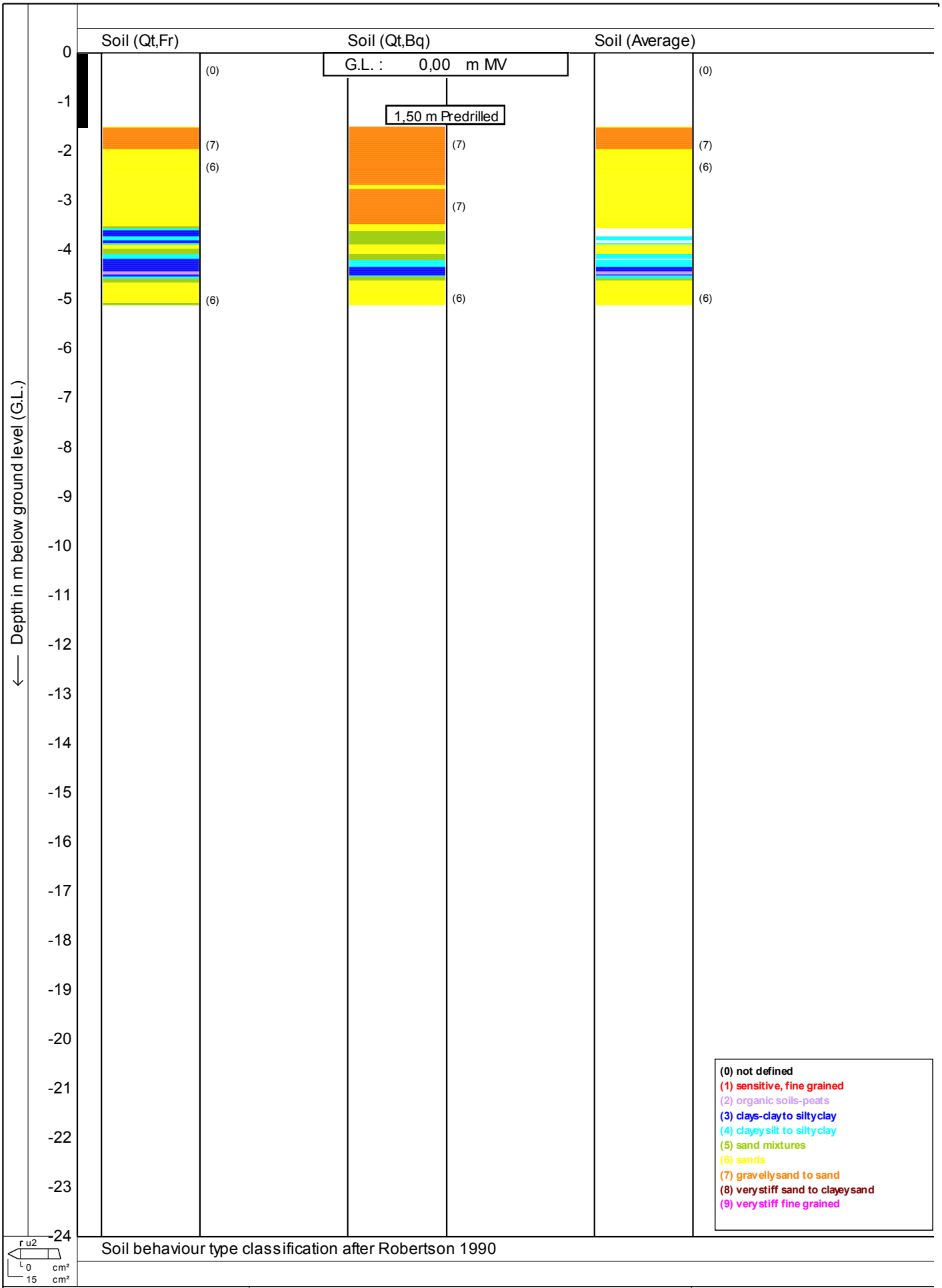
Project : **KCB2**

Location: **Borssele**

Date : **29-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt11** **3/4**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

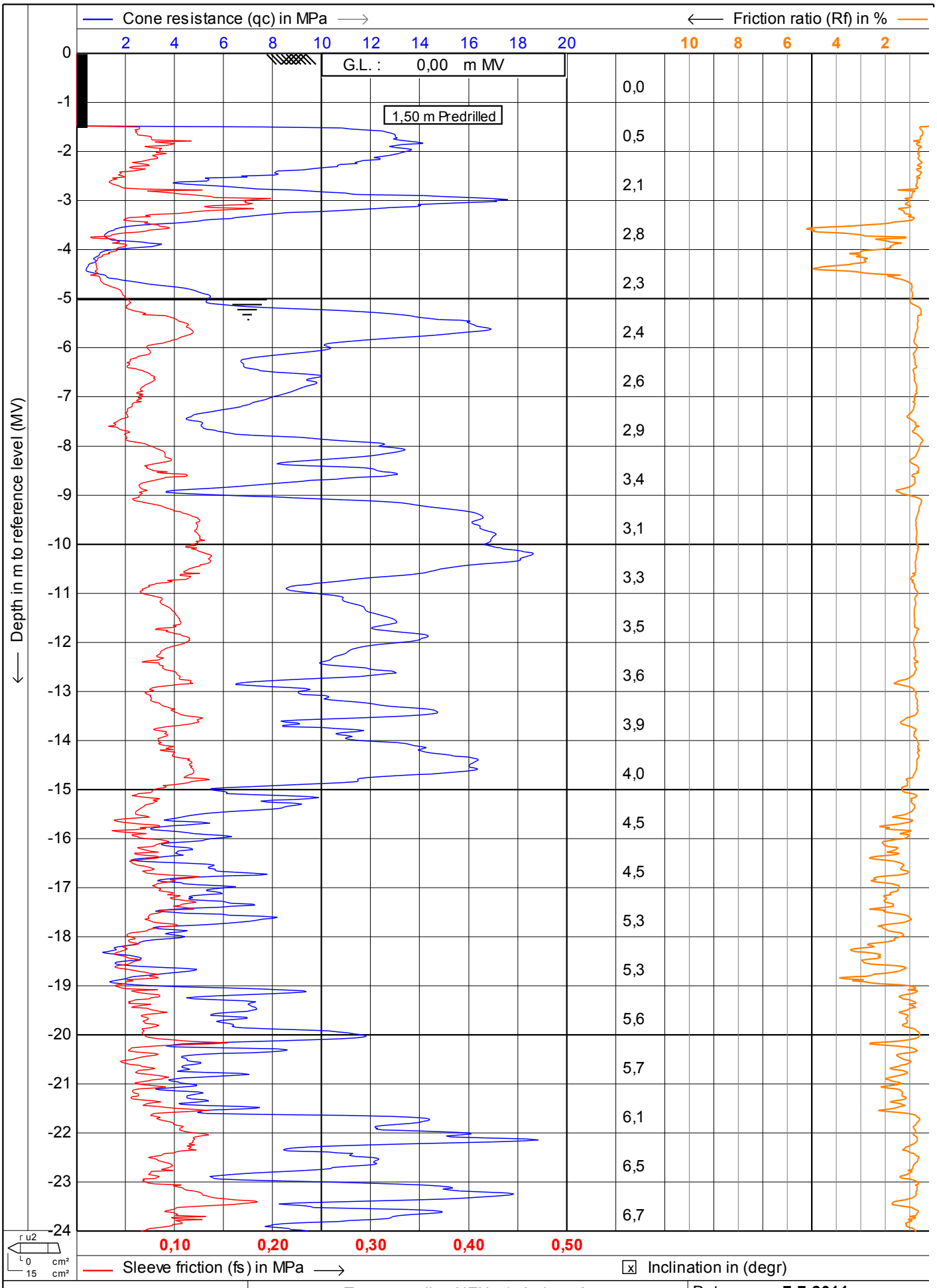
Date : **29-6-2011**

Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt11** 4/4

CPTask V1.14



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Test according NEN 5140 class 2

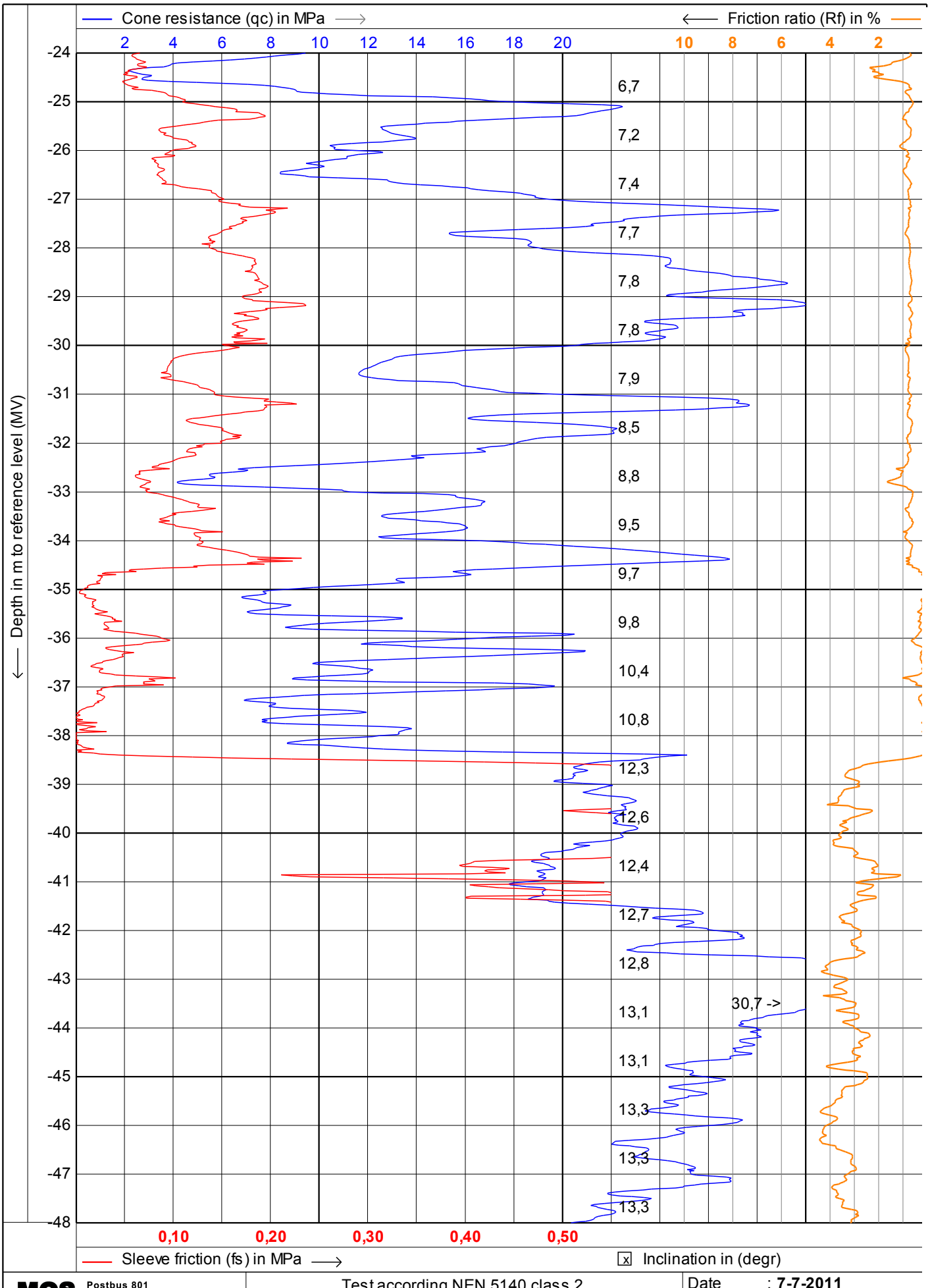
Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**
Cone no. : **S15CFIP.481**
Project no. : **0041011**
CPT no. : **kctp11b** 1/12

MOS GRONDMECHANICA

CPTask V1.14



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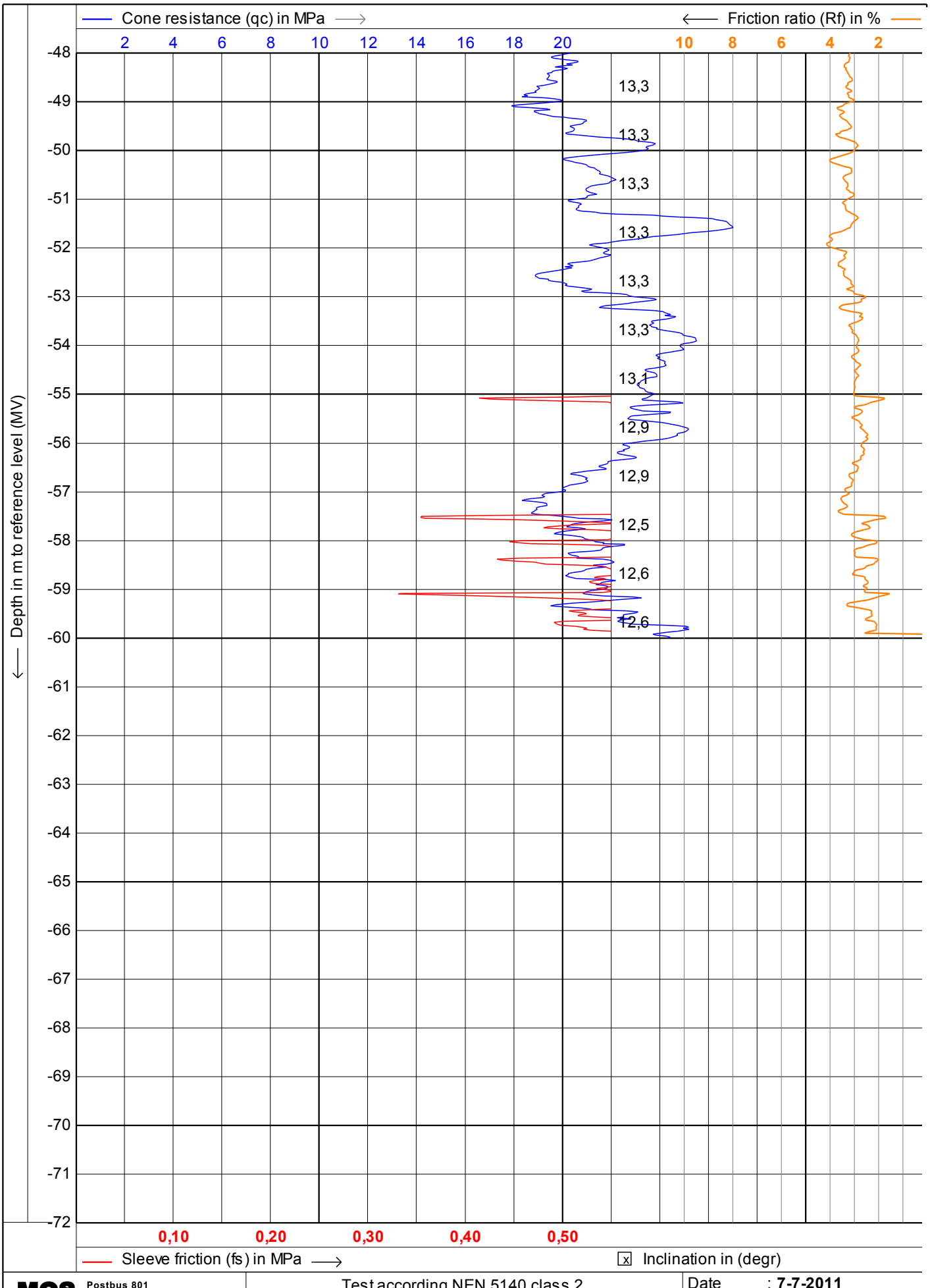
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**
Cone no. : **S15CFIP.481**
Project no. : **0041011**
CPT no. : **kctp11b** 2/12

CPTask V1.14



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Location: **Borssele**

Date : **7-7-2011**

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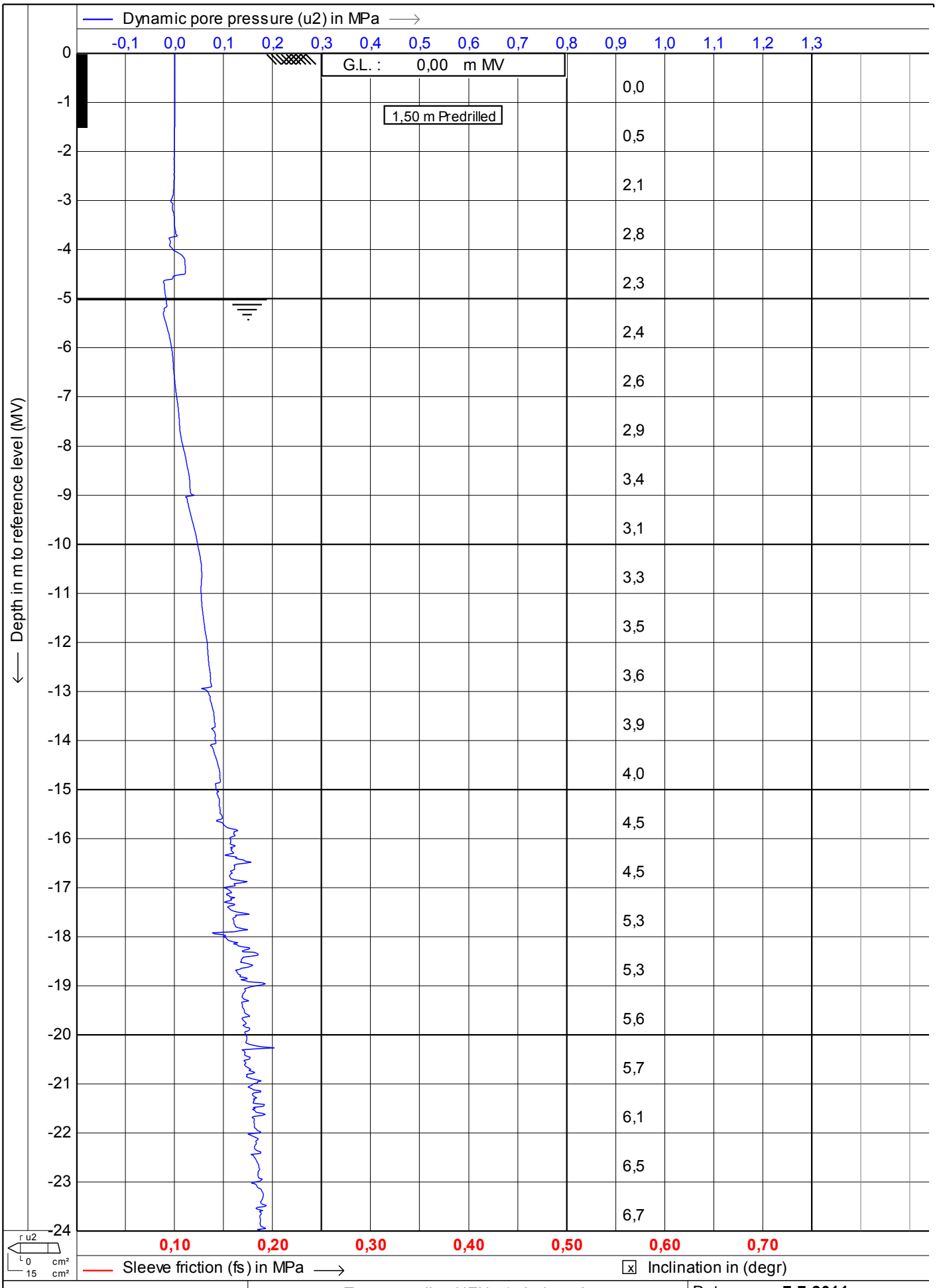
Project no. : **0041011**

CPT no. : **kctp11b** 3/12

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

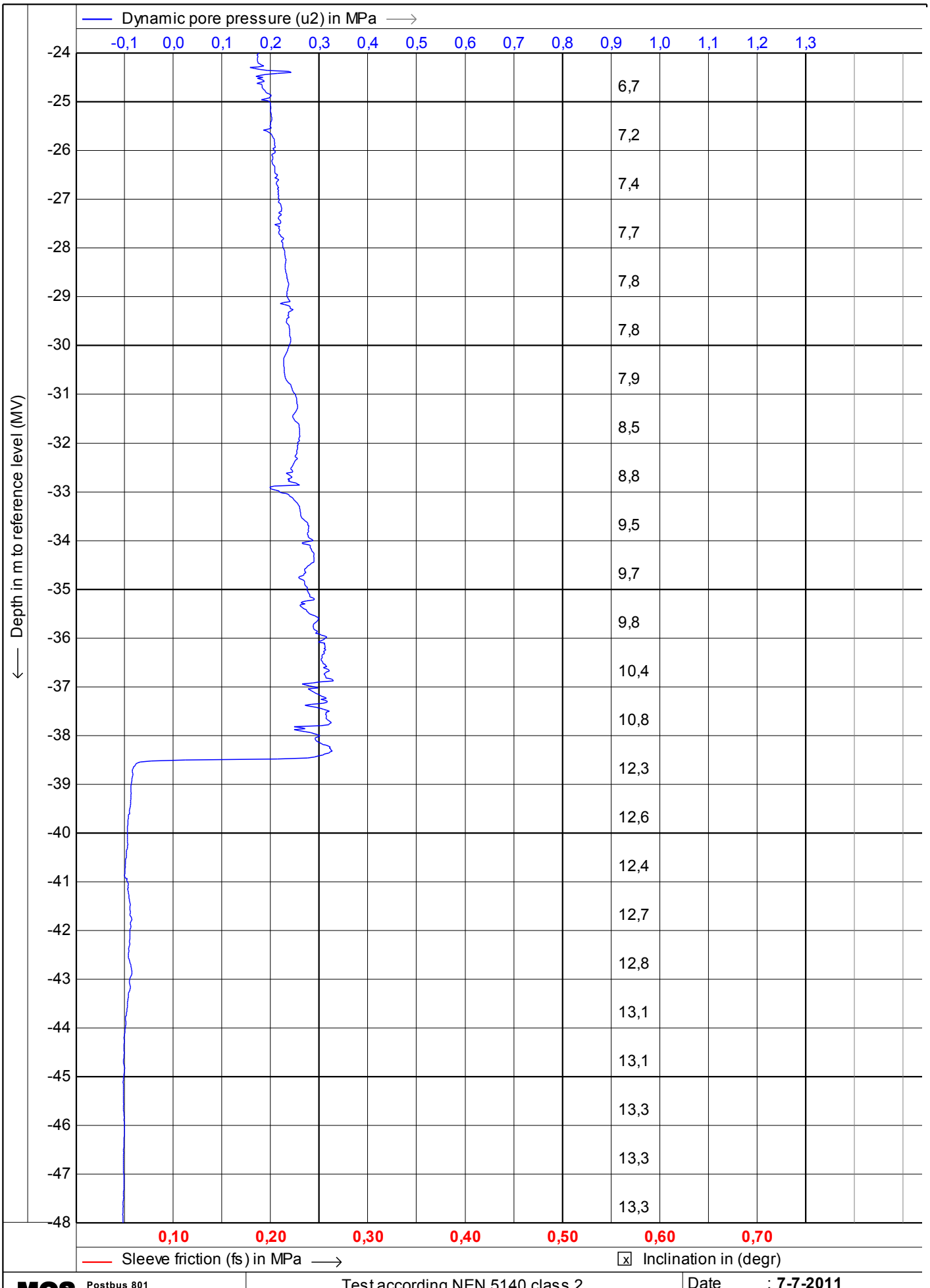
Date : **7-7-2011**

Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kctp11b** 4/12

CPTask V1.14



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Location: **Borssele**

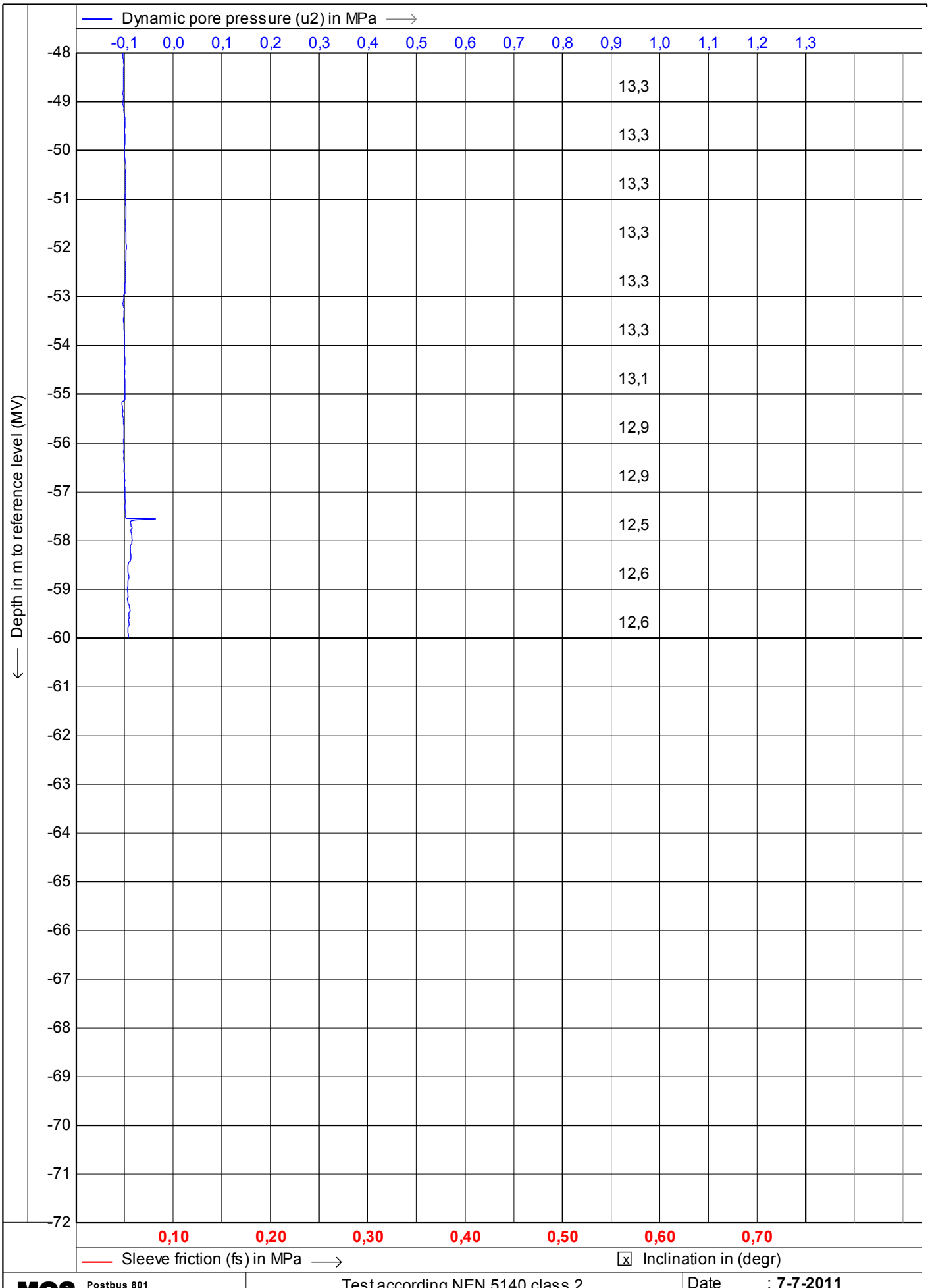
Date : **7-7-2011**

Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kctp11b** **5/12**

CPTask V1.14



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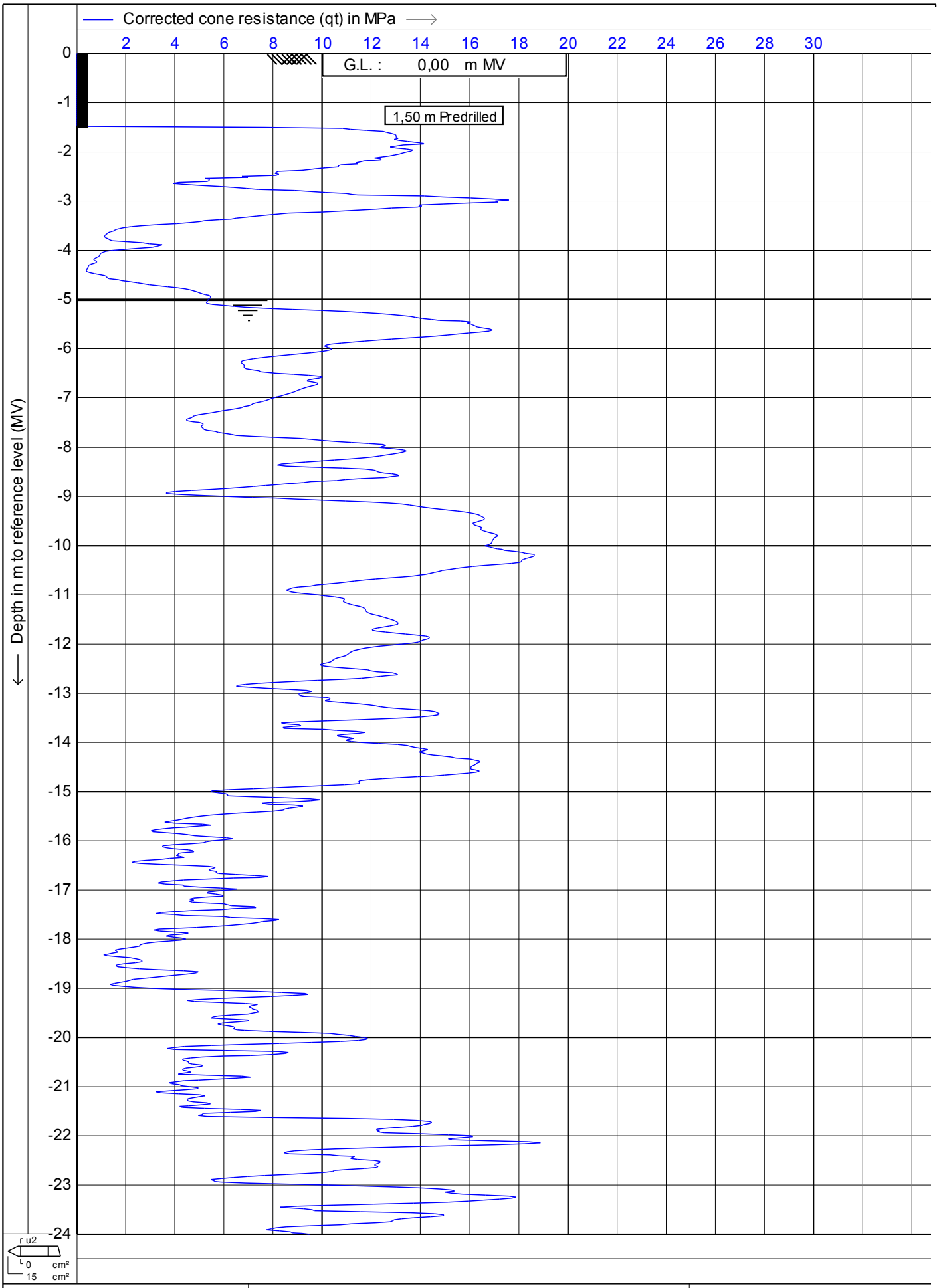
Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**
Cone no. : **S15CFIP.481**
Project no. : **0041011**
CPT no. : **kctp11b** **6/12**

CPTask V1.14

MOS



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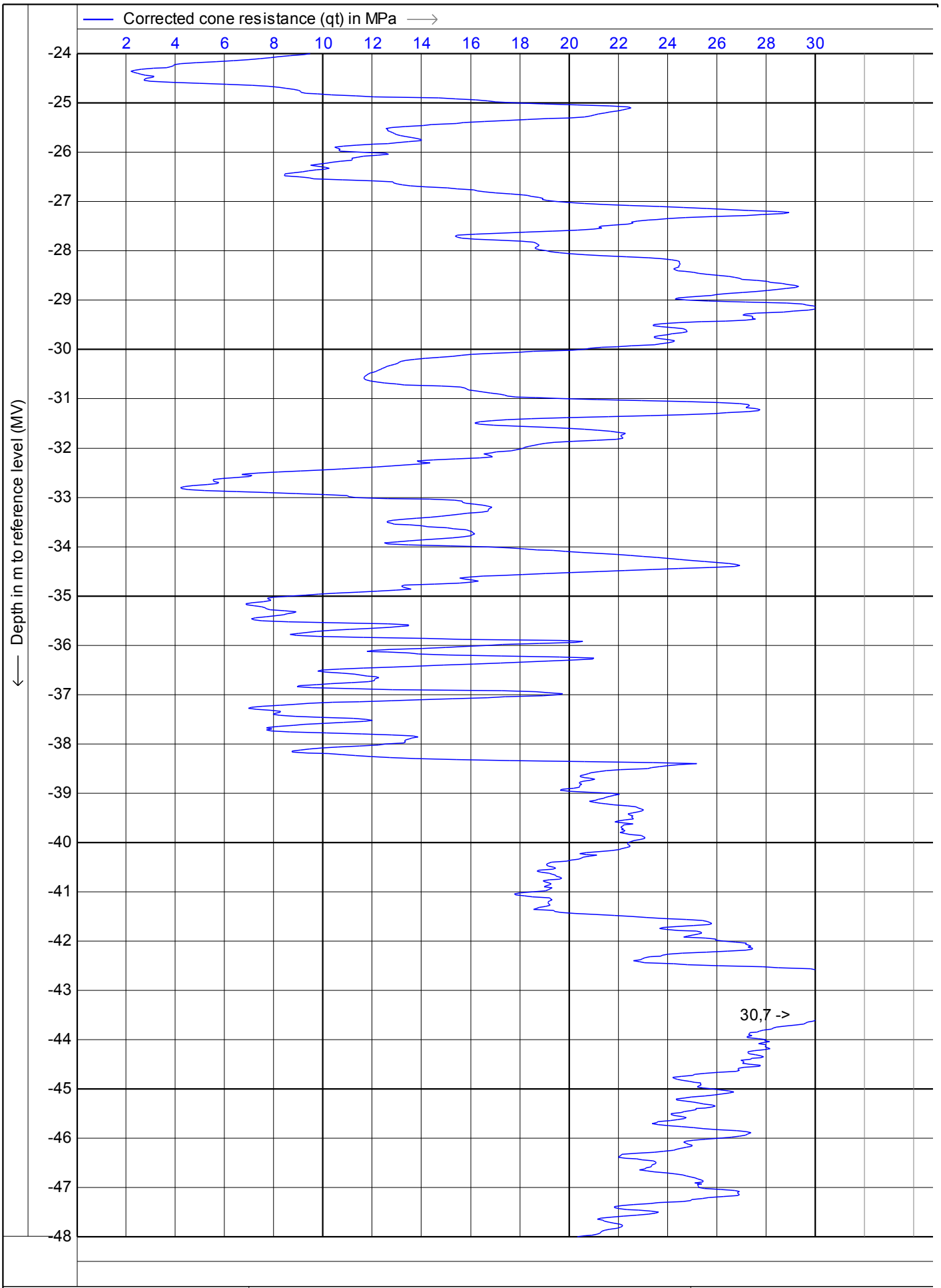
Project : **KCB2**

Location: **Borssele**

Date	: **7-7-2011**
Cone no.	: **S15CFIP.481**
Project no.	: **0041011**
CPT no.	: **kctp11b** 7/12

CPTask V1.14

MOS



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Test according NEN 5140 class 2

Project : **KCB2**

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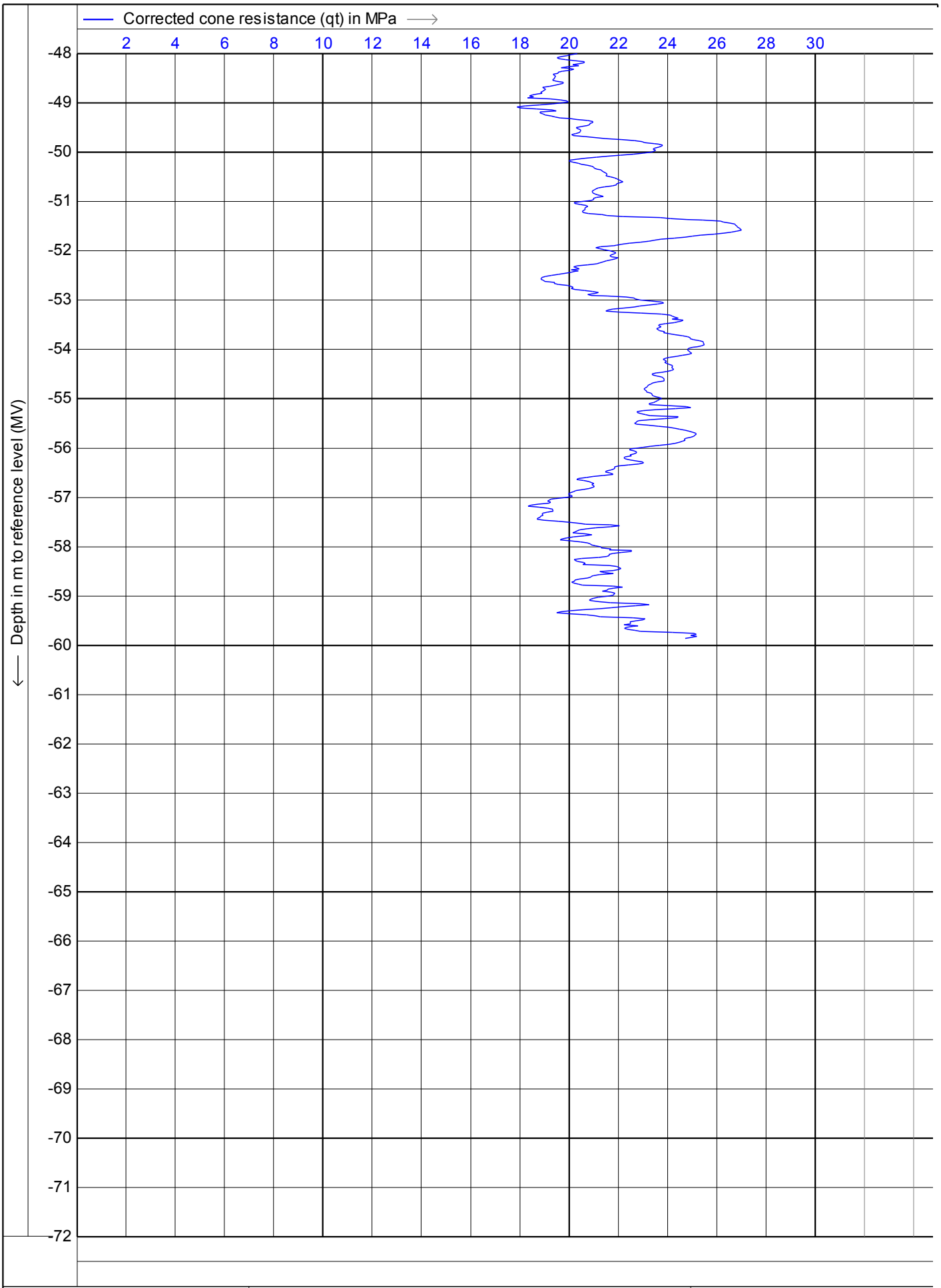
Date	: **7-7-2011**
Cone no.	: **S15CFIP.481**
Project no.	: **0041011**
CPT no.	: **kctp11b**

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

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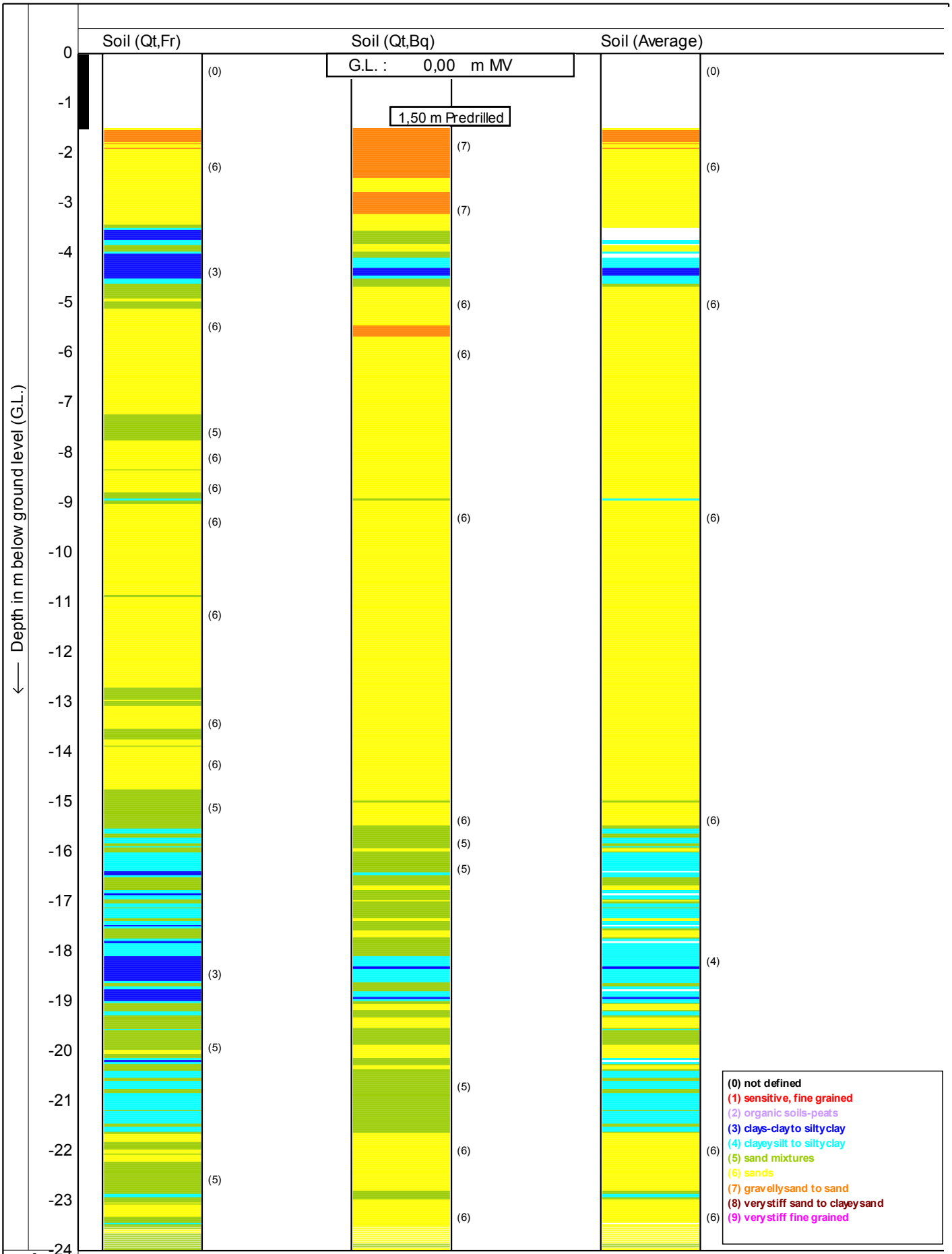
Date	: **7-7-2011**
Cone no.	: **S15CFIP.481**
Project no.	: **0041011**
CPT no.	: **kctp11b** **9/12**

CPTask V1.14

MOS



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

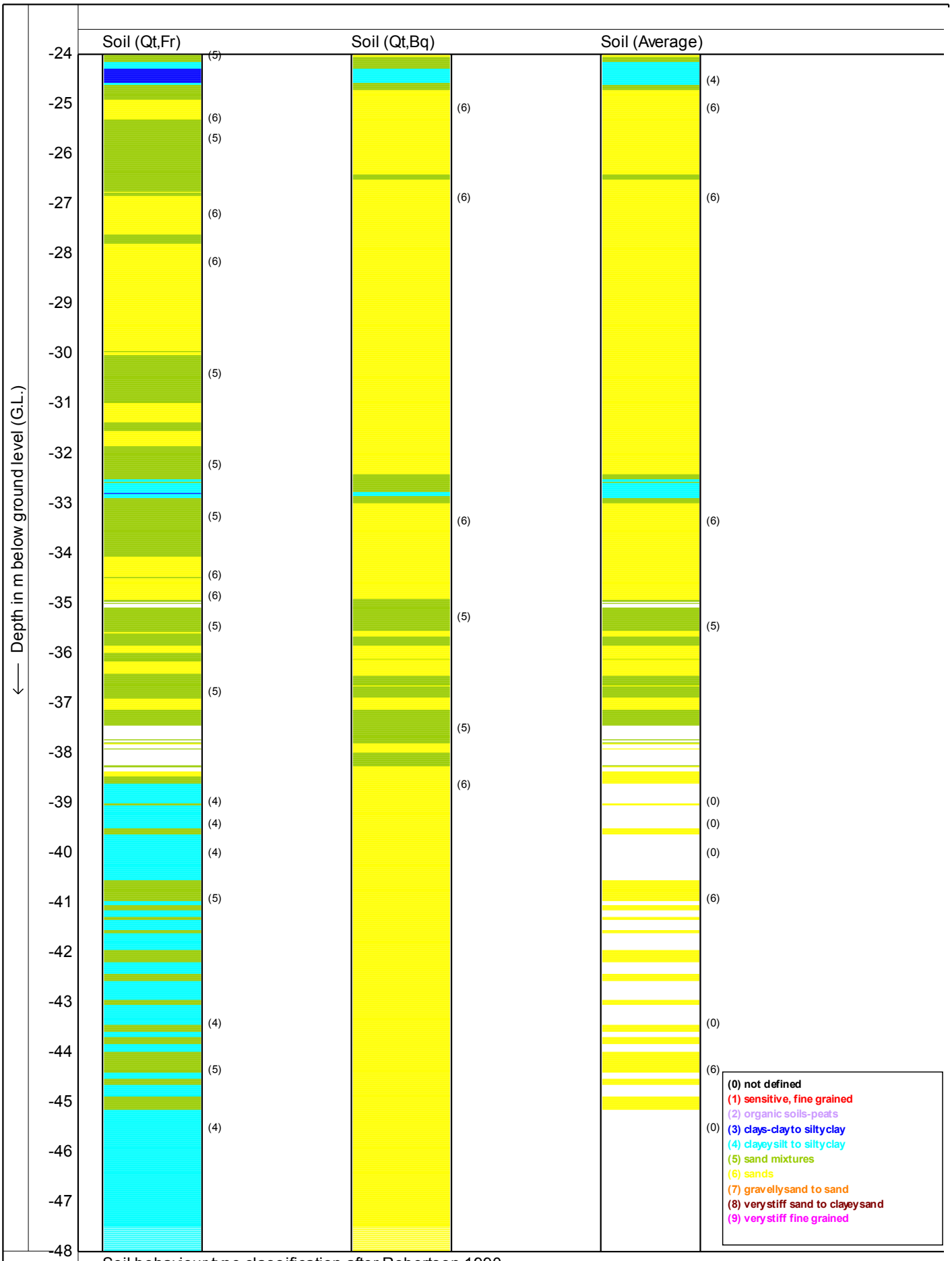
Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kctp11b** 10/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

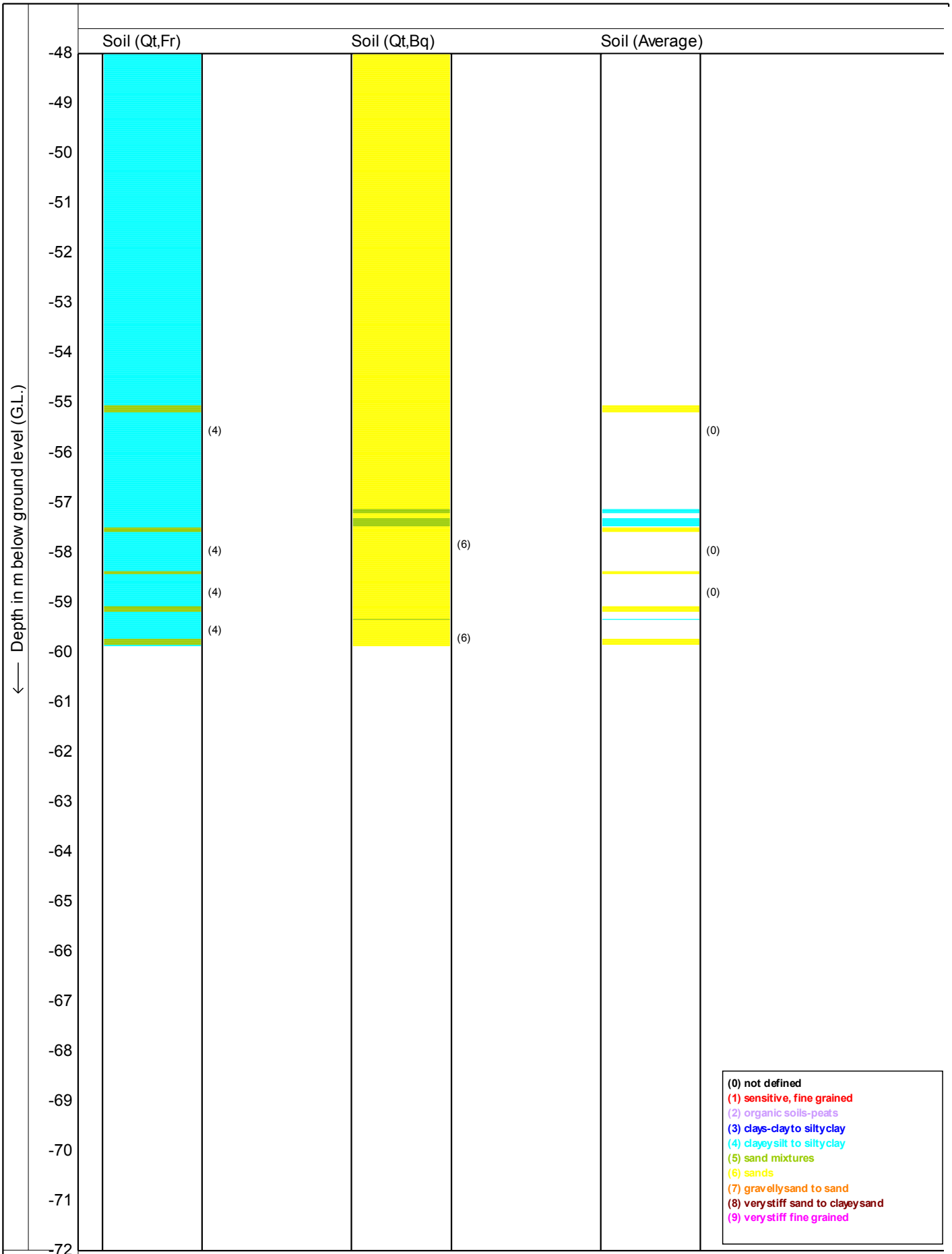
Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kctp11b** 11/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

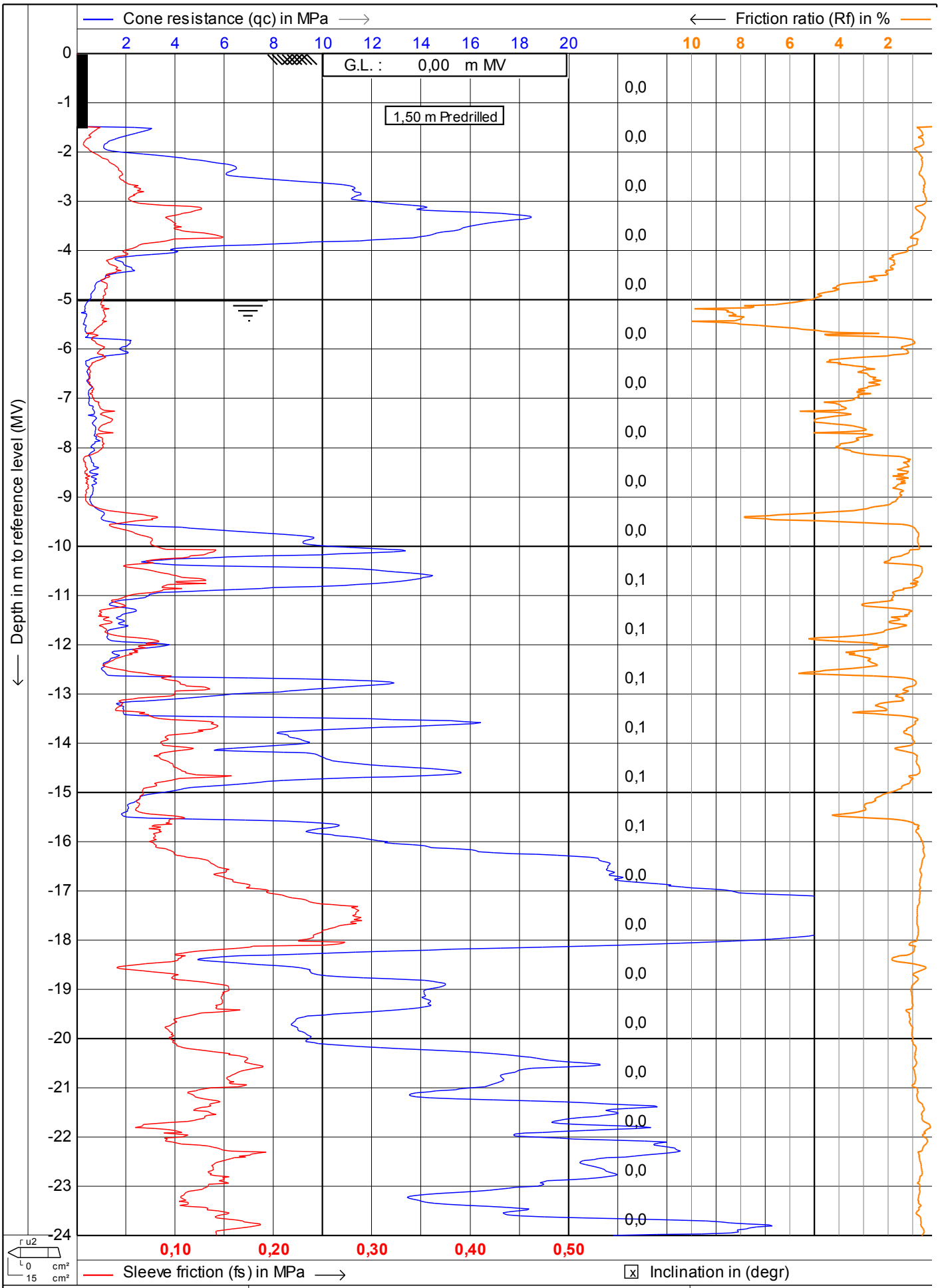
Cone no. : **S15CFIP.481**

Project no. : **0041011**

CPT no. : **kctp11b** 12/12

CPTask V1.14

MOS GRONDMECHANICA



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

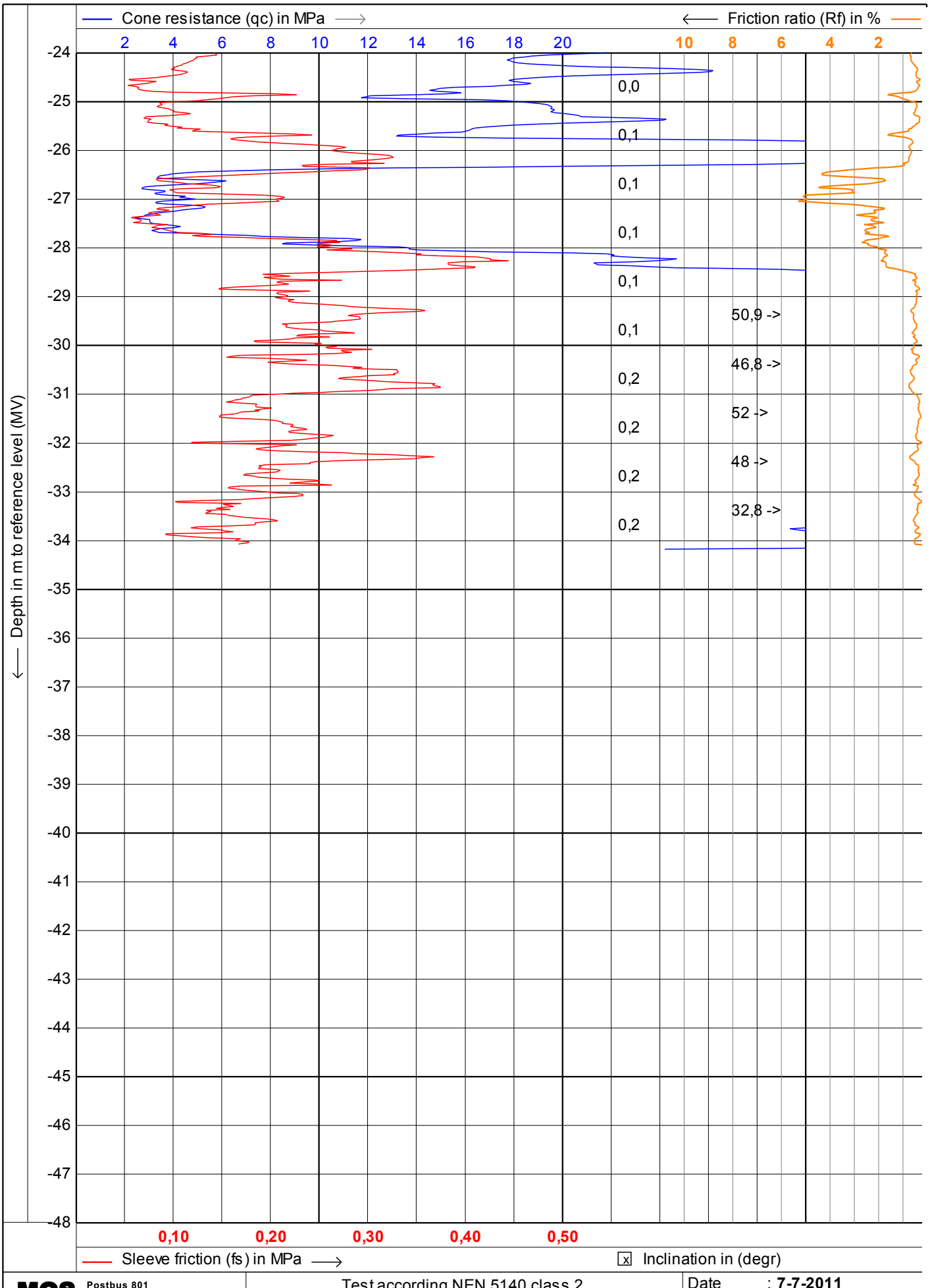
Date : **7-7-2011**

Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt12** 1/8

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**

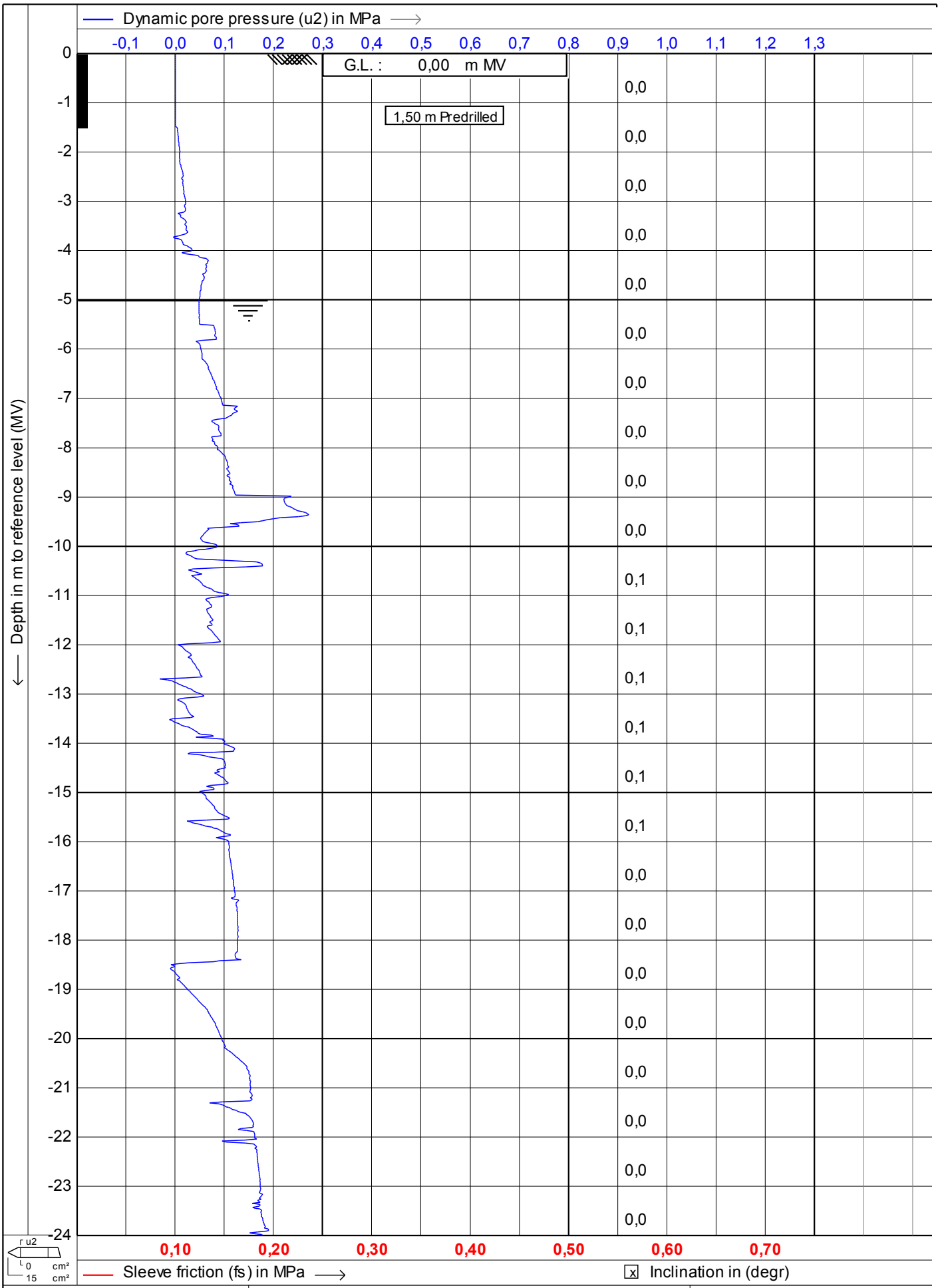
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt12** **2/8**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

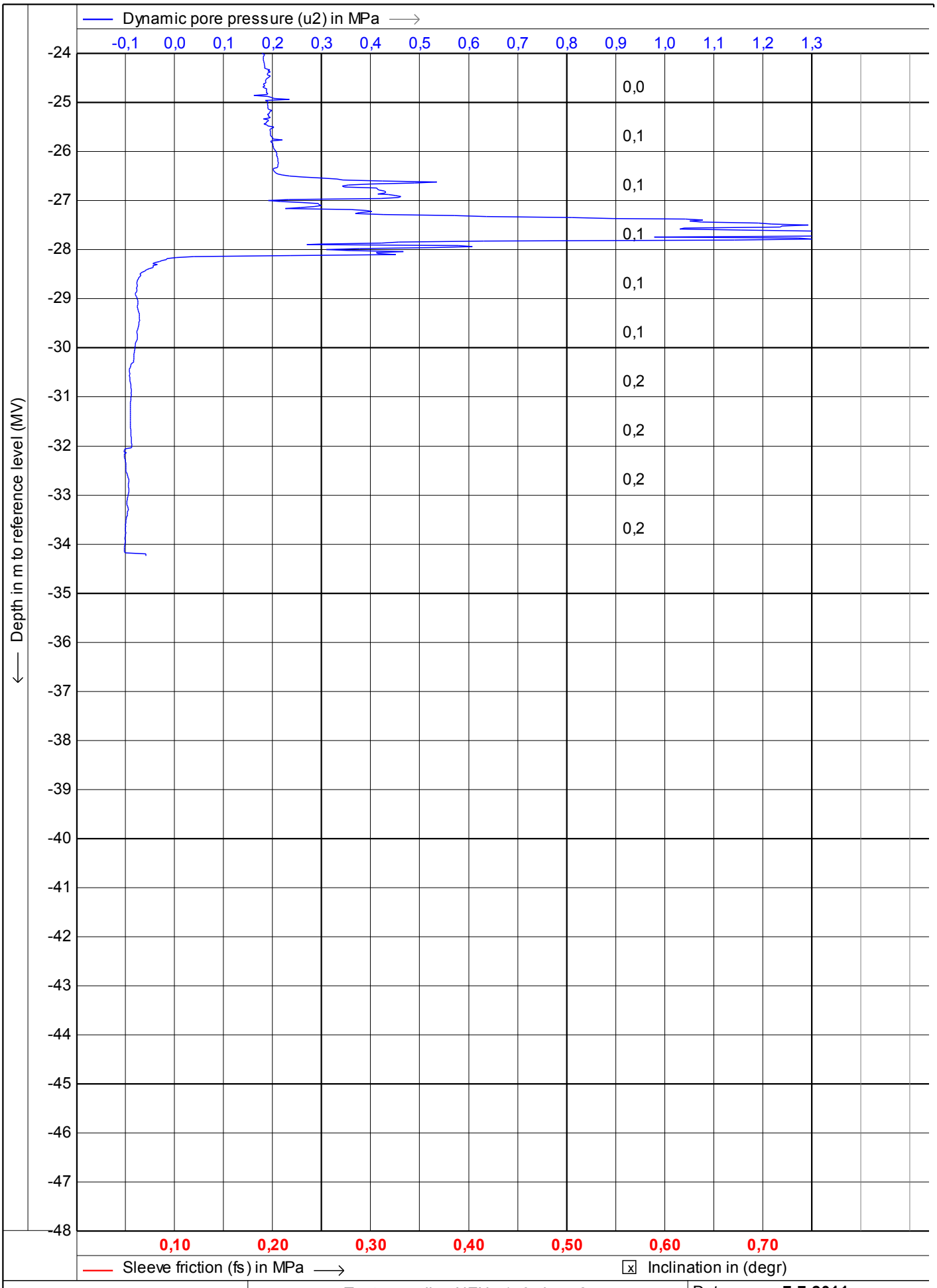
Date : **7-7-2011**

Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt12** 3/8

CPTask V1.14



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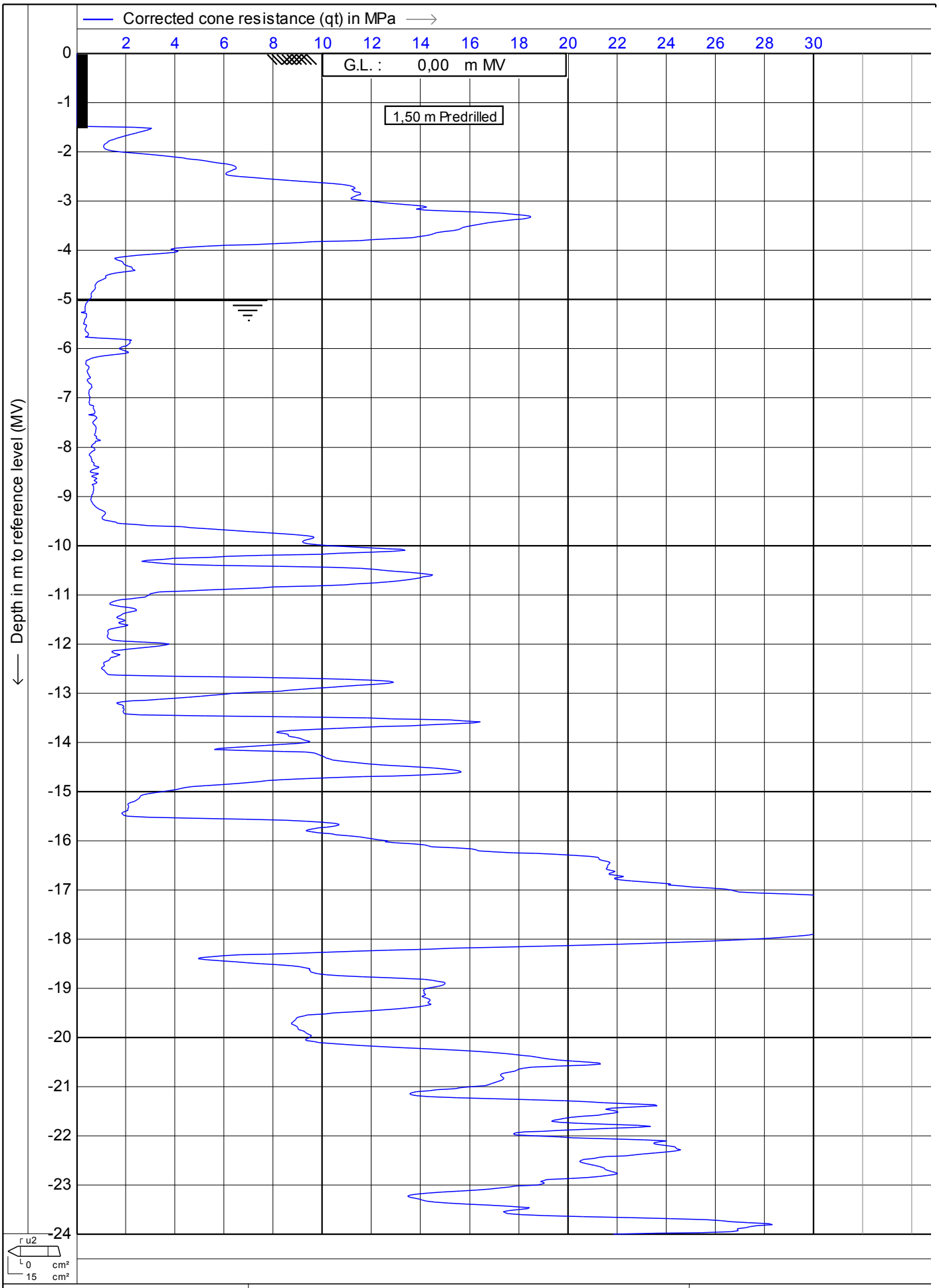
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt12** **4/8**

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **7-7-2011**
Cone no.	: **S15CFIP481**
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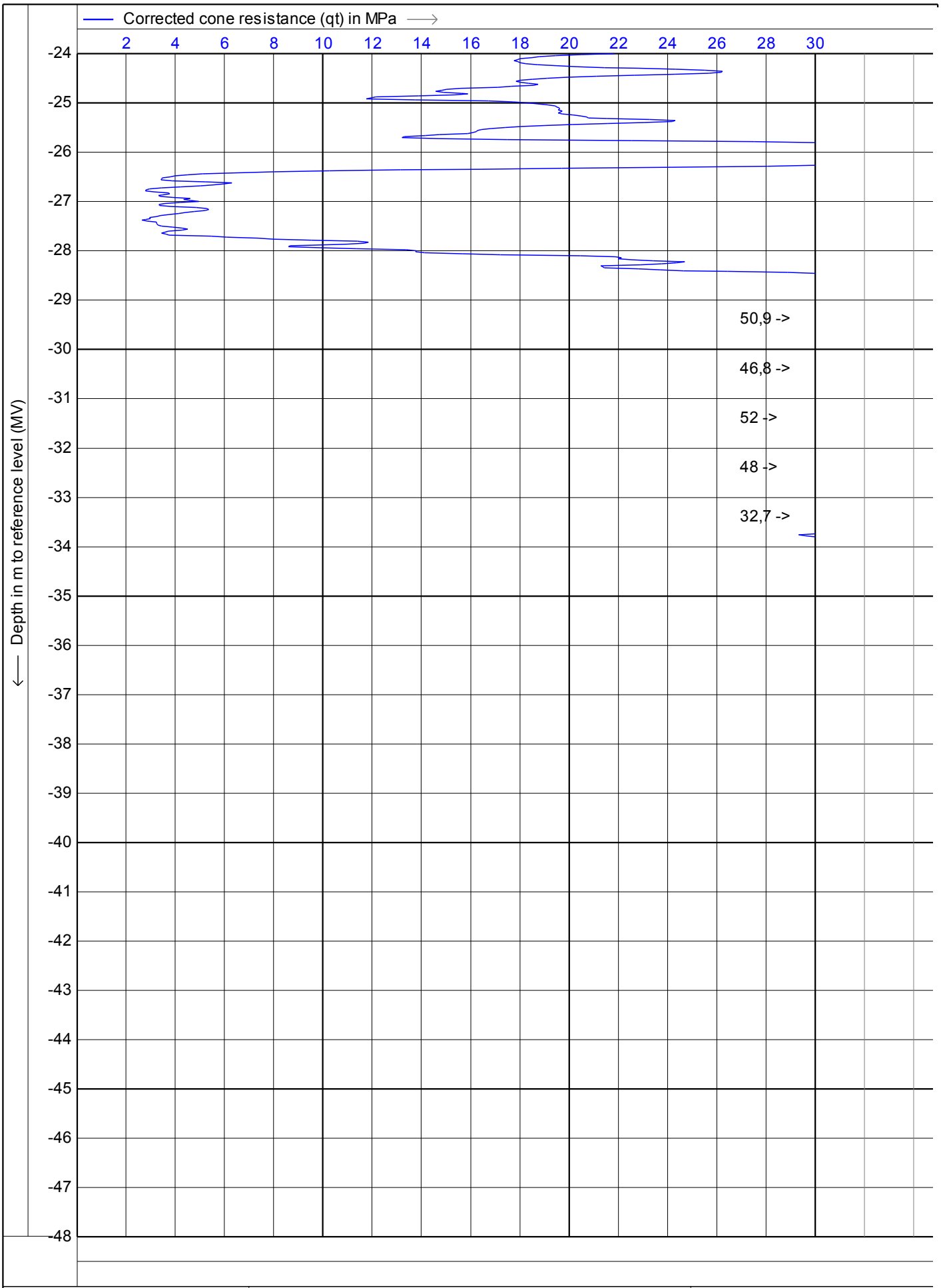
CPT no.	: **kcpt12**

CPTask V1.14

MOS GRONDMECHANICA



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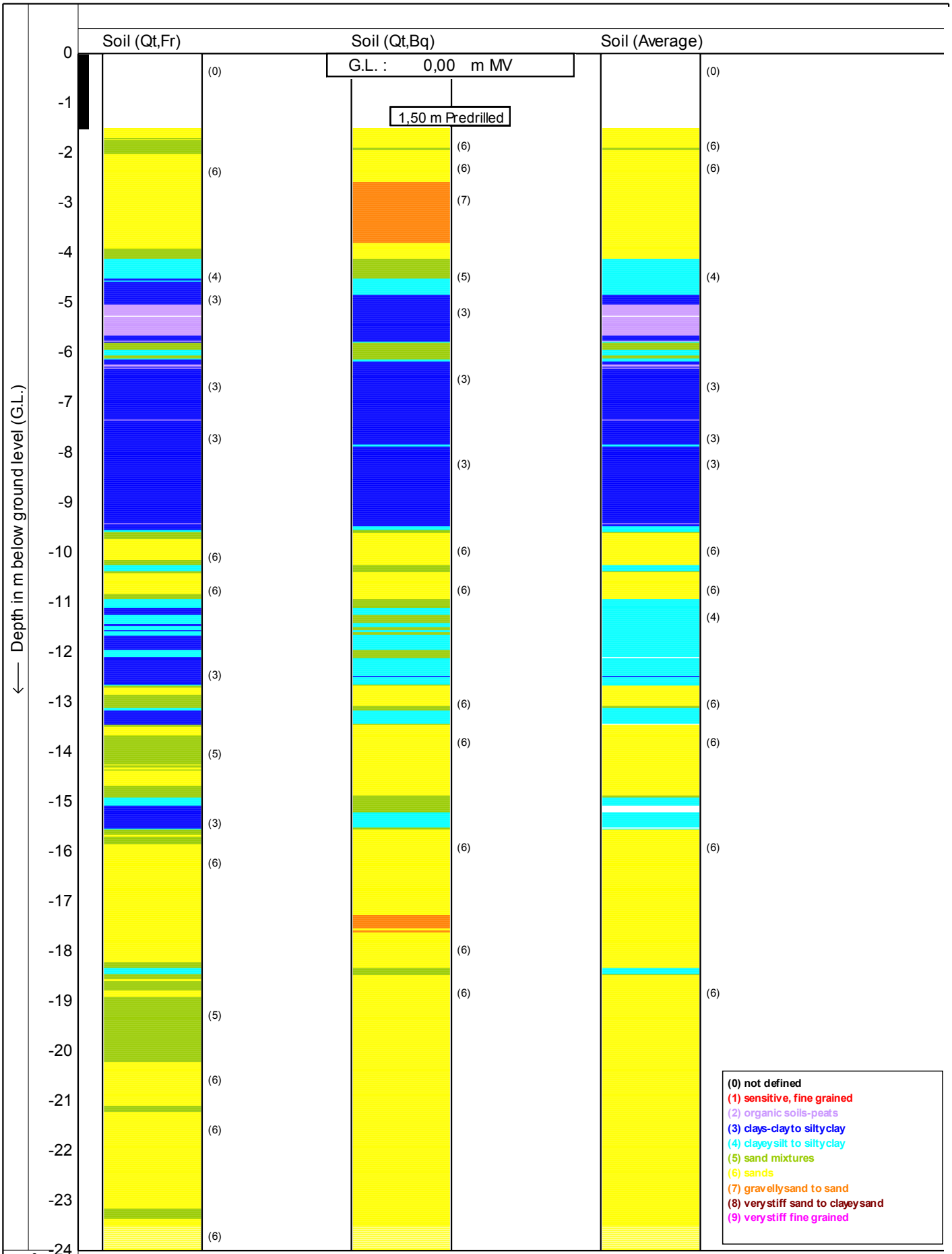
CPT no.	: **kcpt12**

CPTask V1.14

MOS



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Cone no. : **S15CFIP481**

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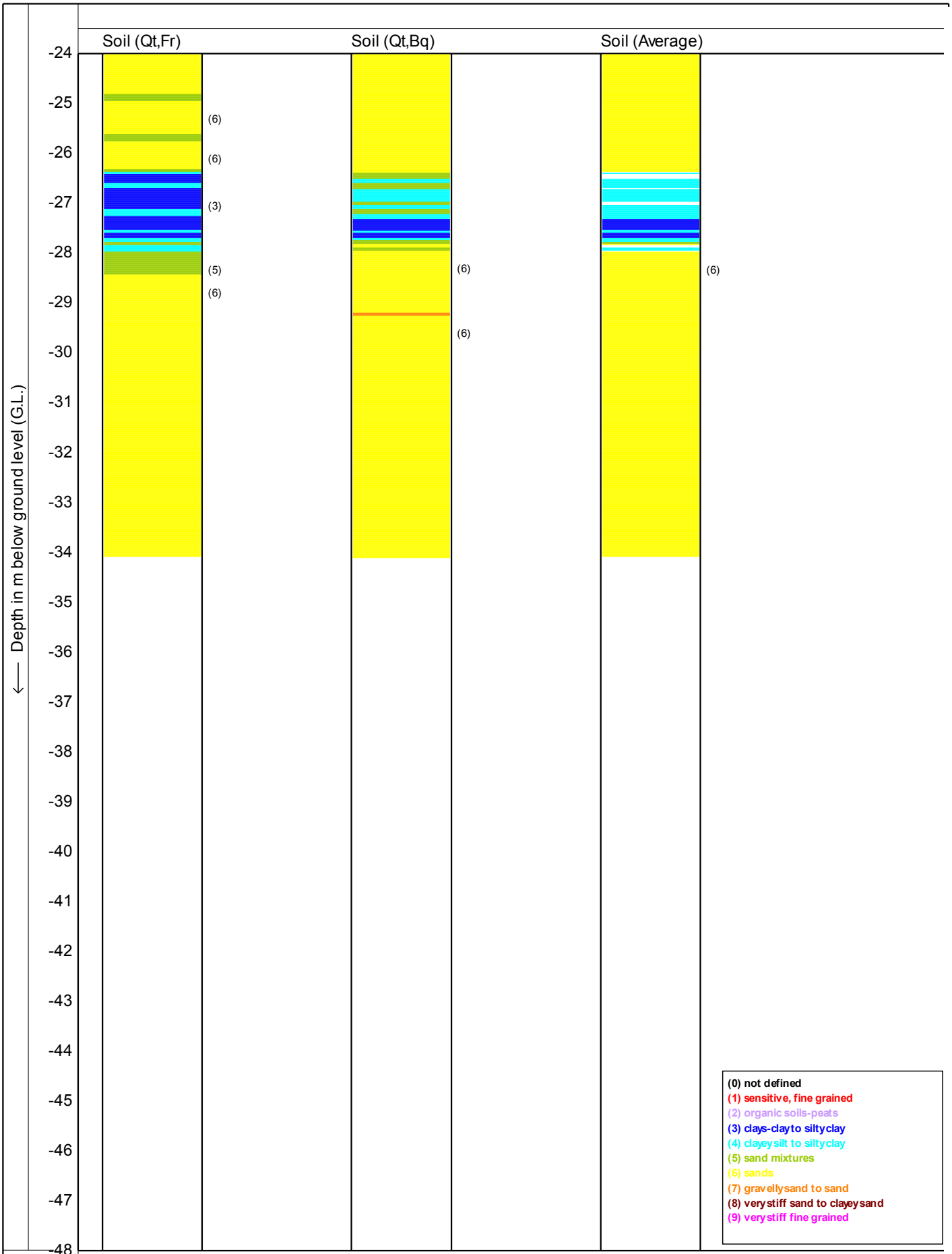
CPT no. : **kcpt12** 7/8

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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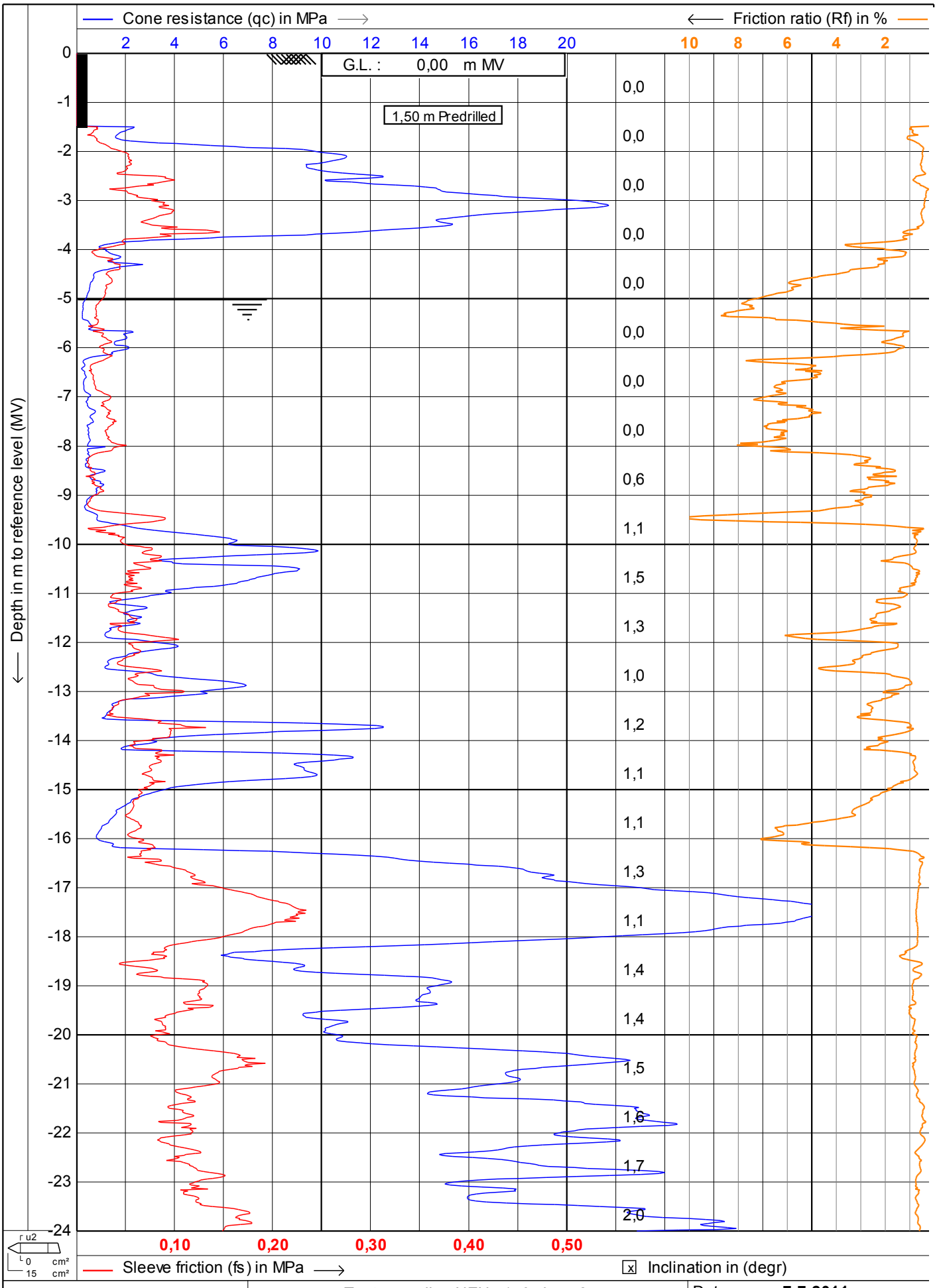
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt12** **8/8**

CPTask V1.14

MOS GRONDMECHANICA



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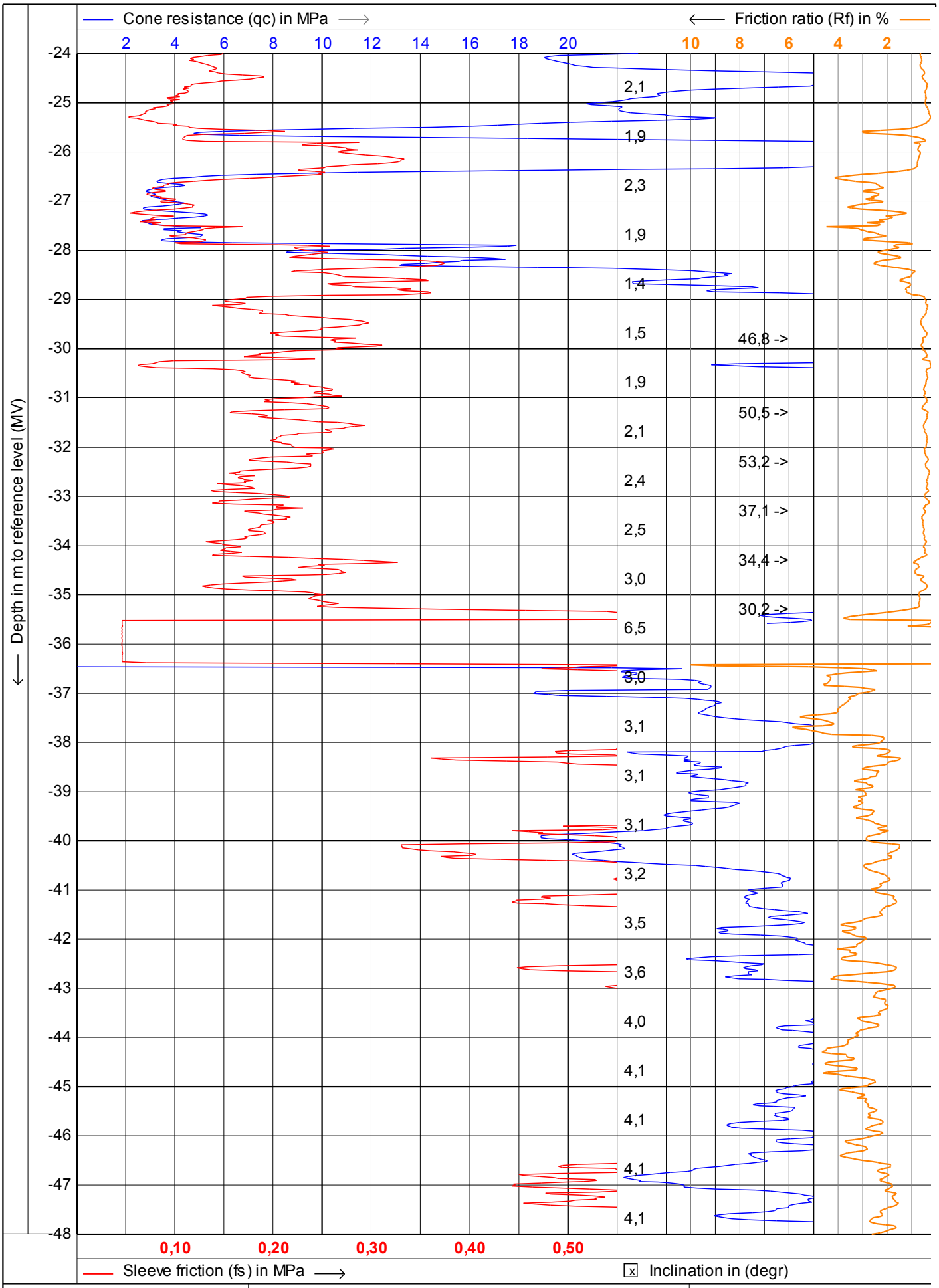
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt12b** 1/12

CPTask V1.14



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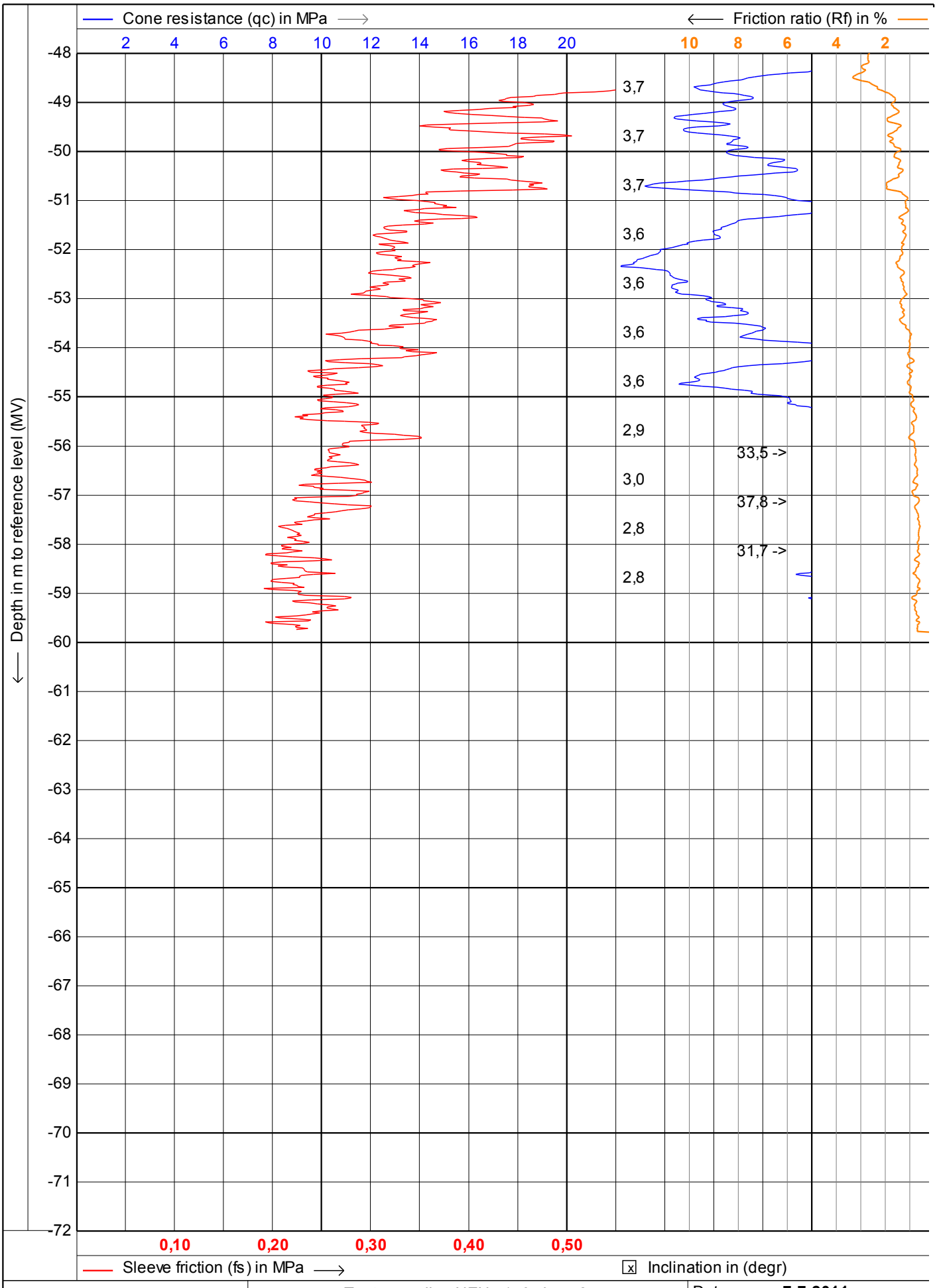
CPT no. : **kcpt12b** 2/12



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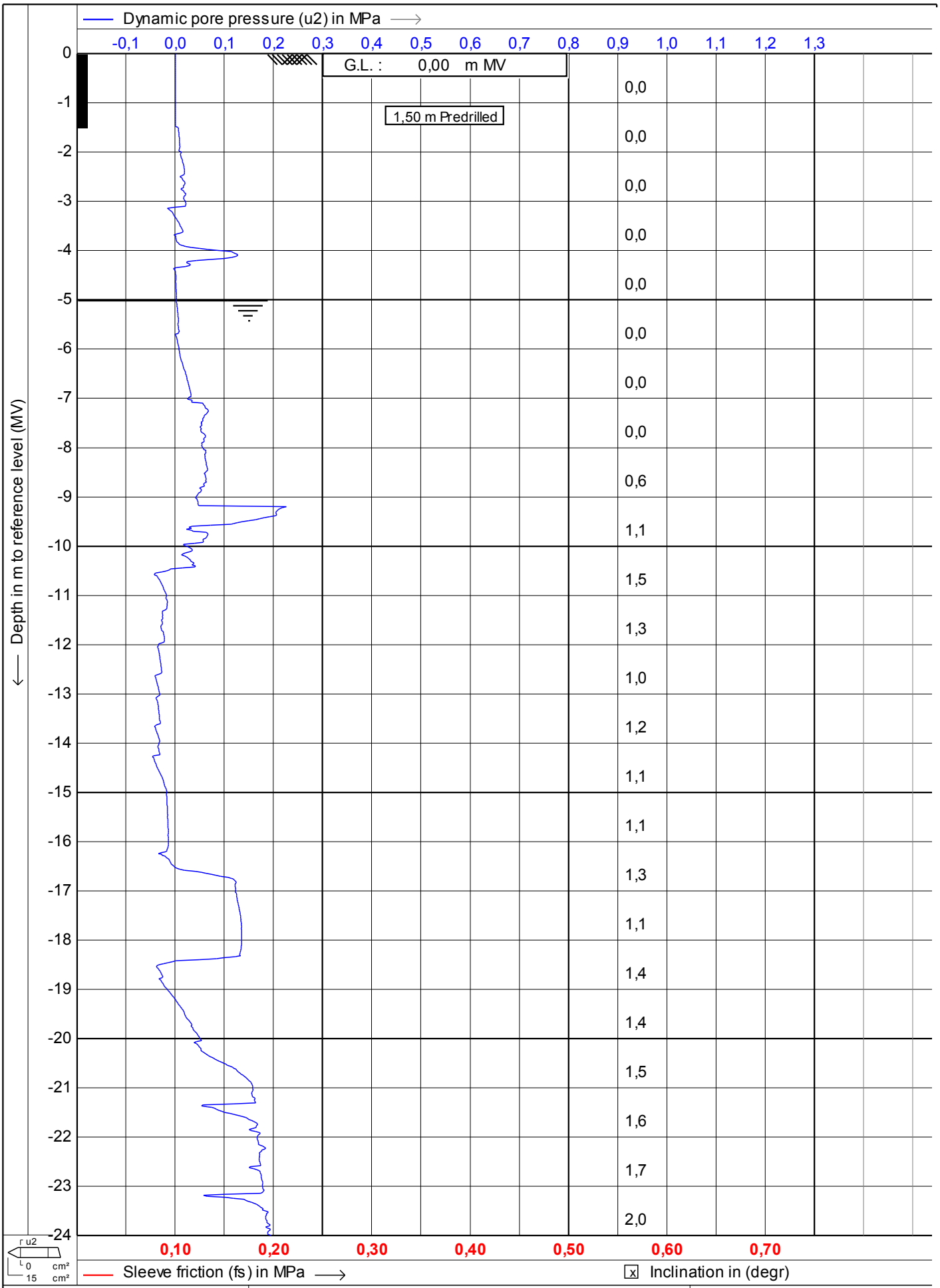
CPT no. : **kcpt12b** 3/12

MOS GRONDMECHANICA

CPTask V1.14



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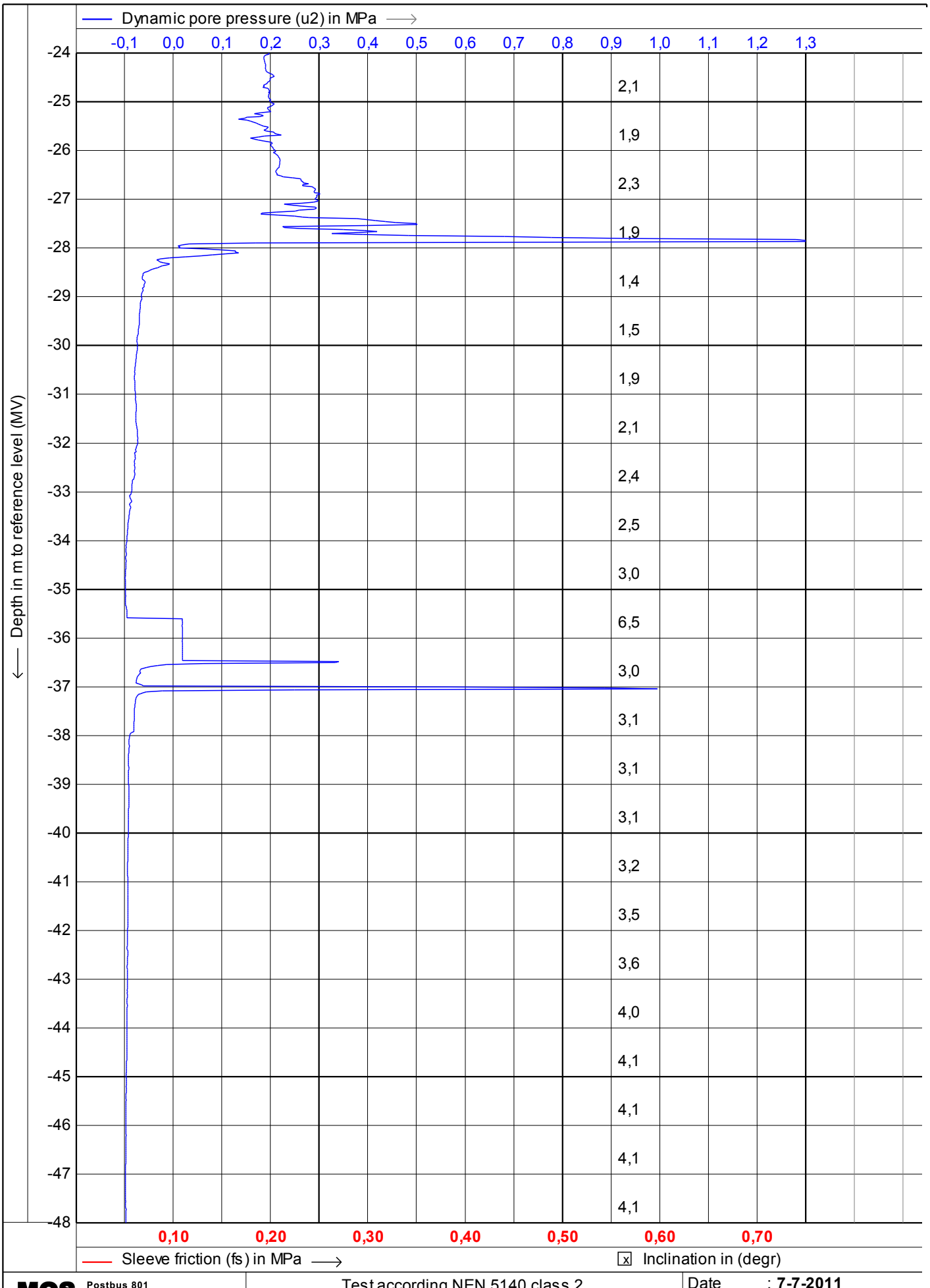
CPT no. : **kcpt12b** 4/12

CPTask V1.14



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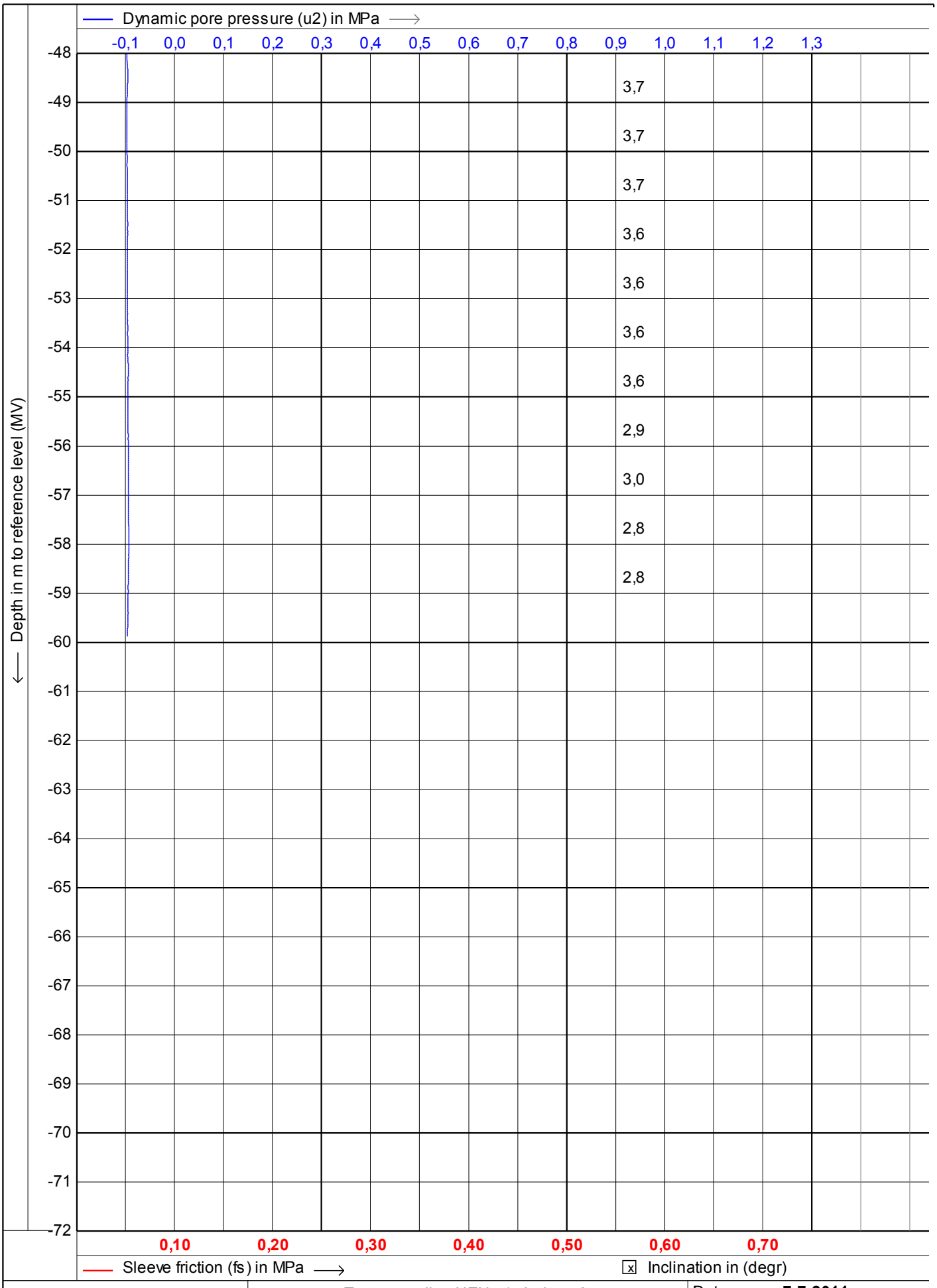
CPT no.	: **kcpt12b**

CPTask V1.14



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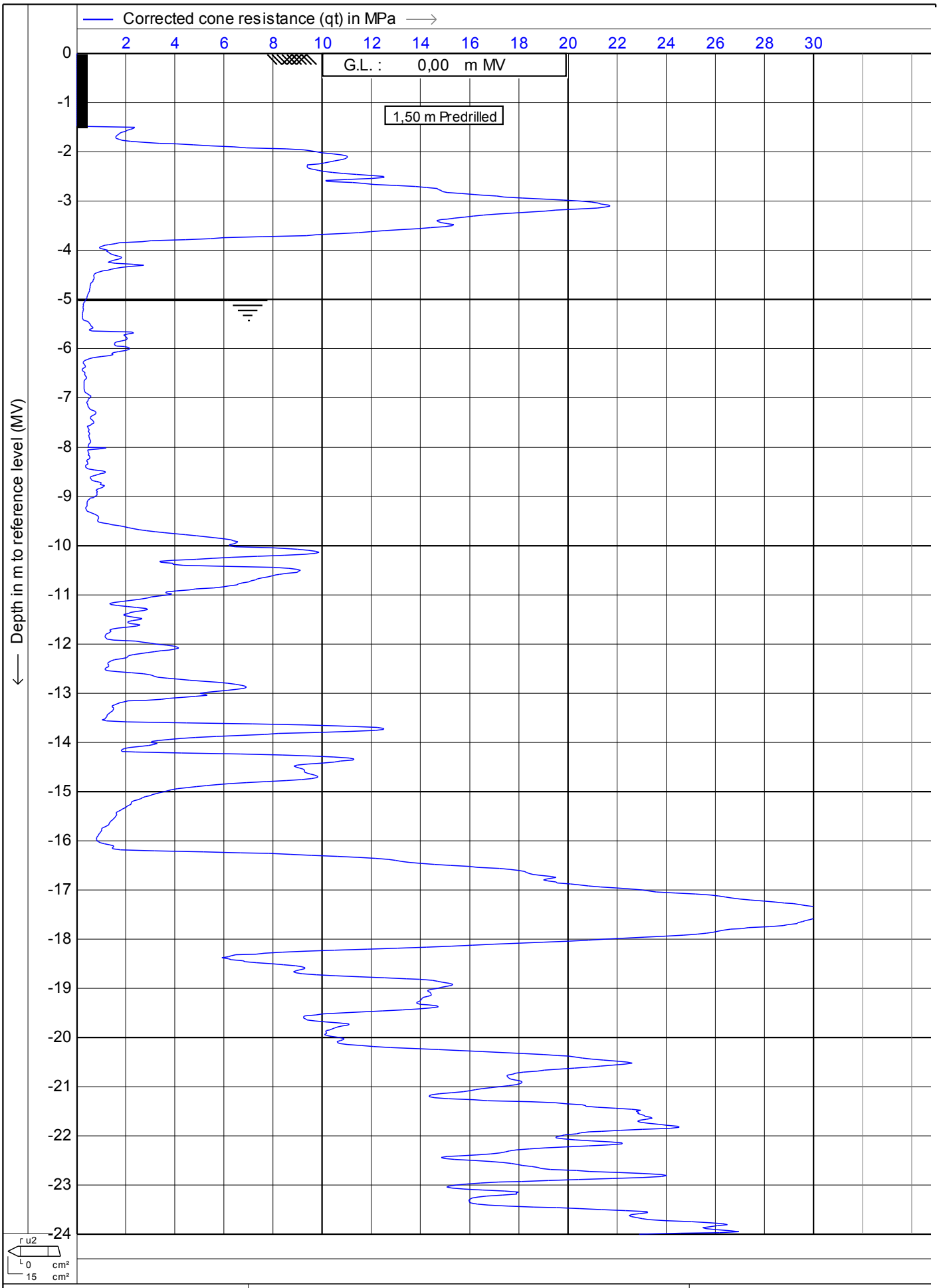
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt12b** **6/12**

CPTask V1.14



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3160 AA Rhoon
Tel: 010 - 50 30 200
Fax: 010 - 50 13 656
info@mosgeo.com
www.mosgeo.com

Test according NEN 5140 class 2

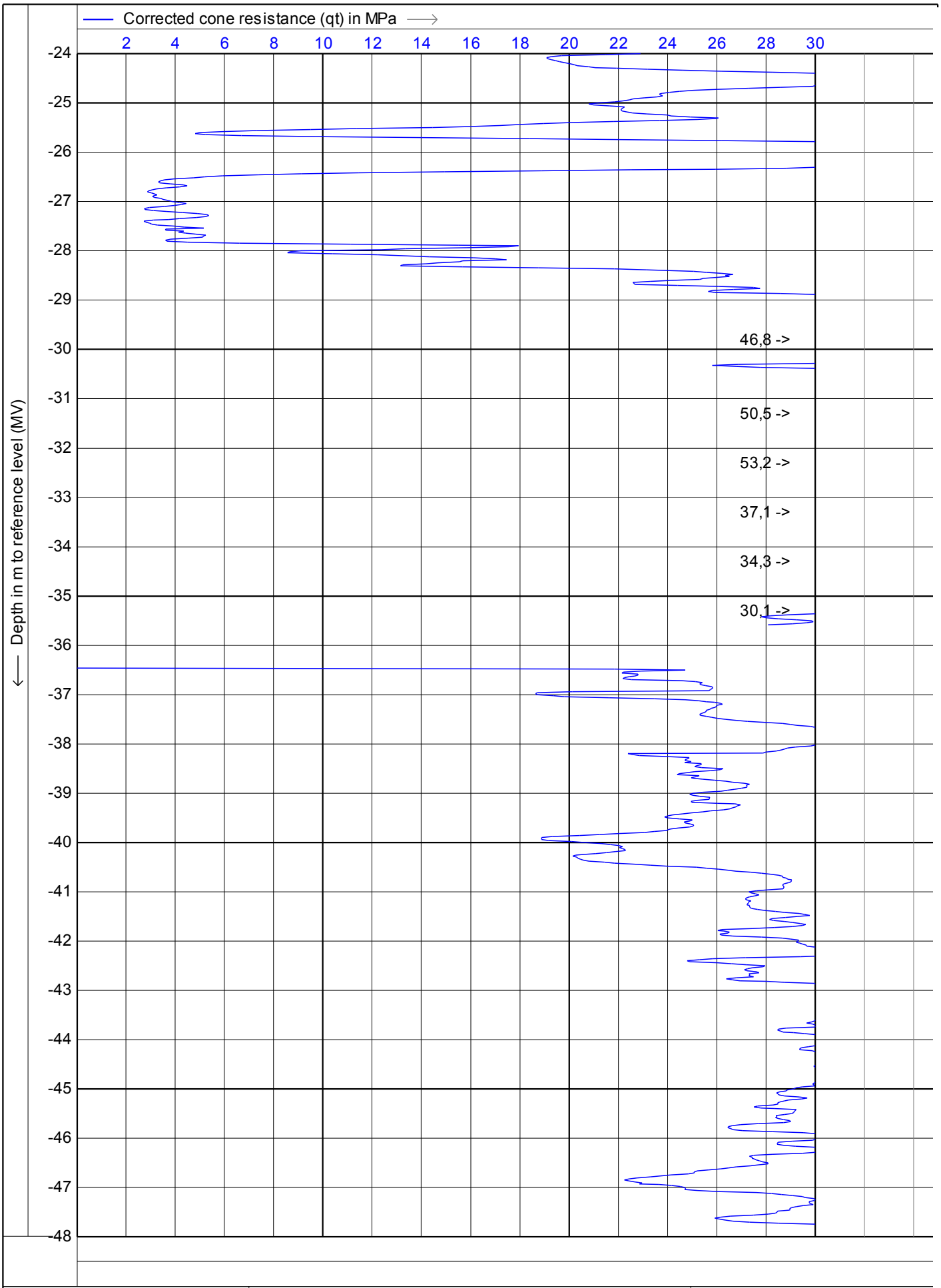
Project : **KCB2**

Location: **Borssele**

Date	: **7-7-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt12b**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

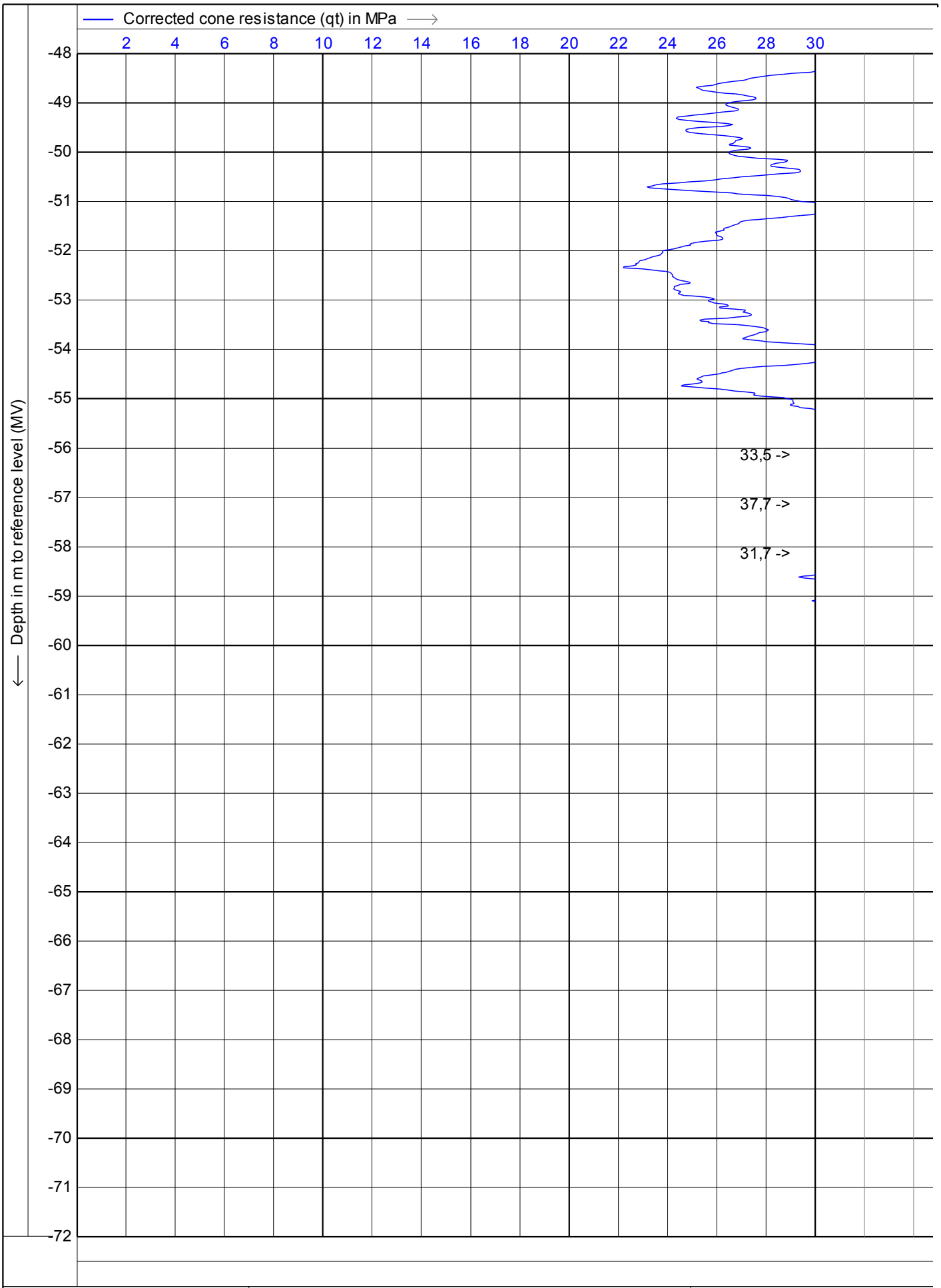
Project : **KCB2**

Location: **Borssele**

Date	: **7-7-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt12b**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

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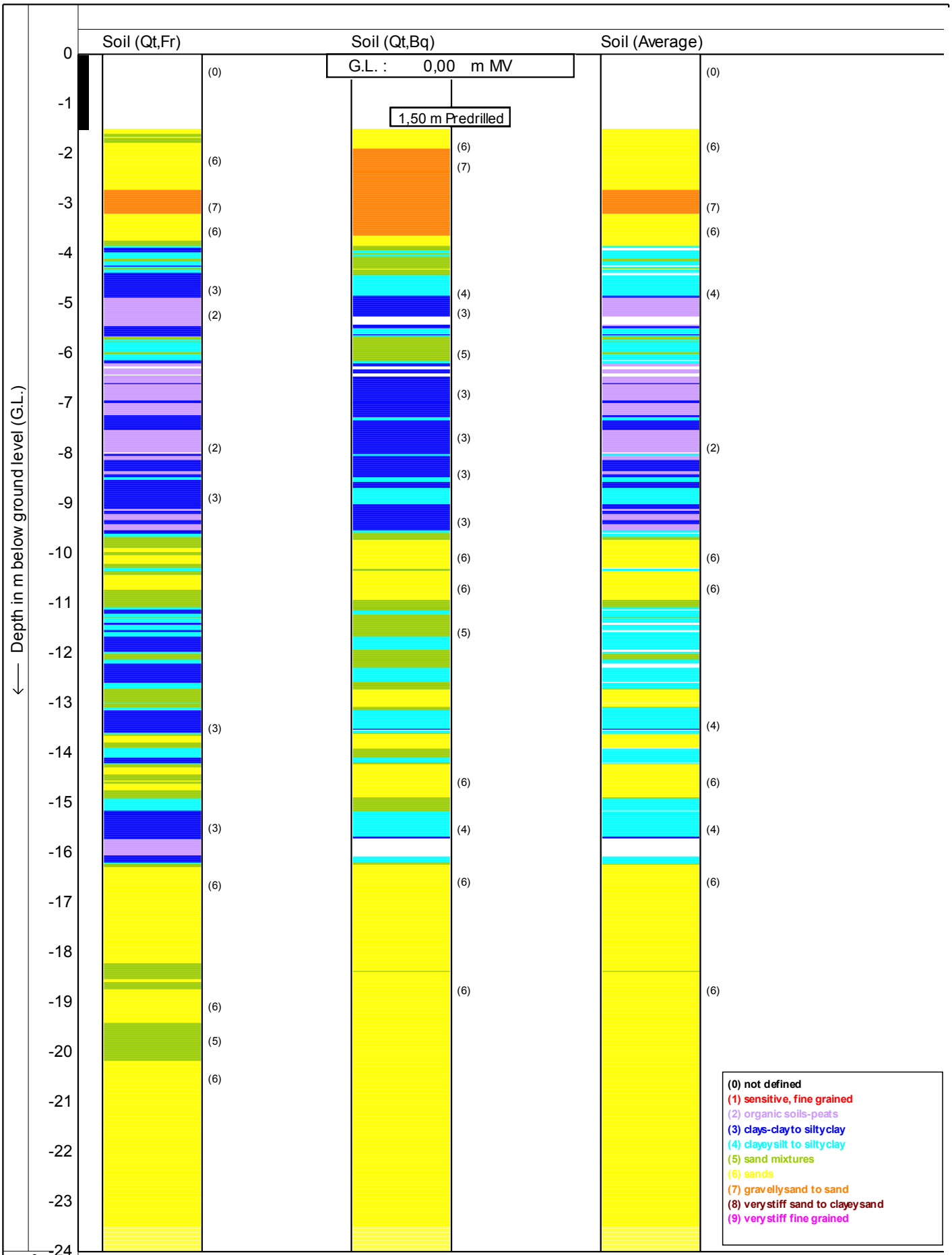
Date	: **7-7-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt12b**

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

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Date : **7-7-2011**

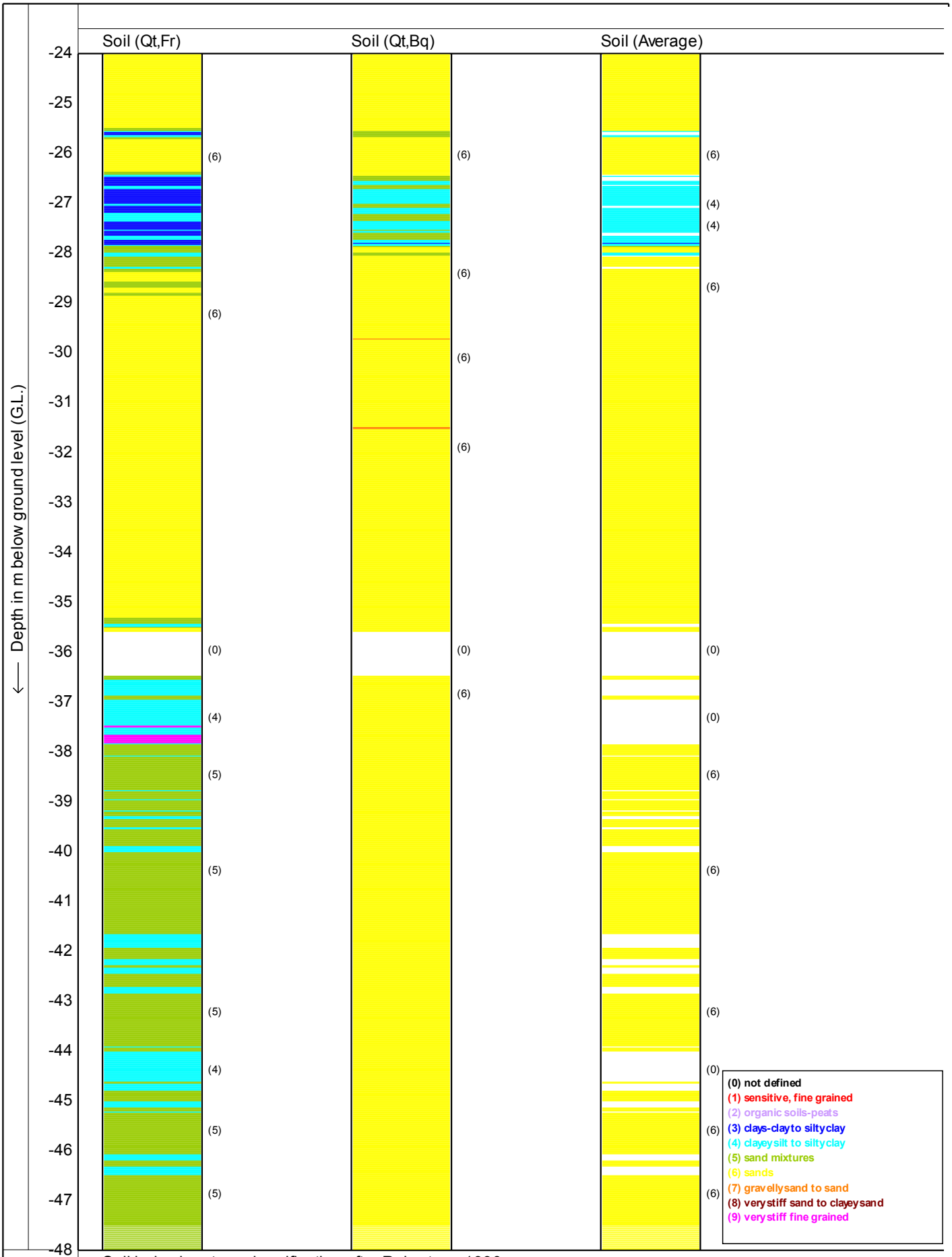
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt12b** 10/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

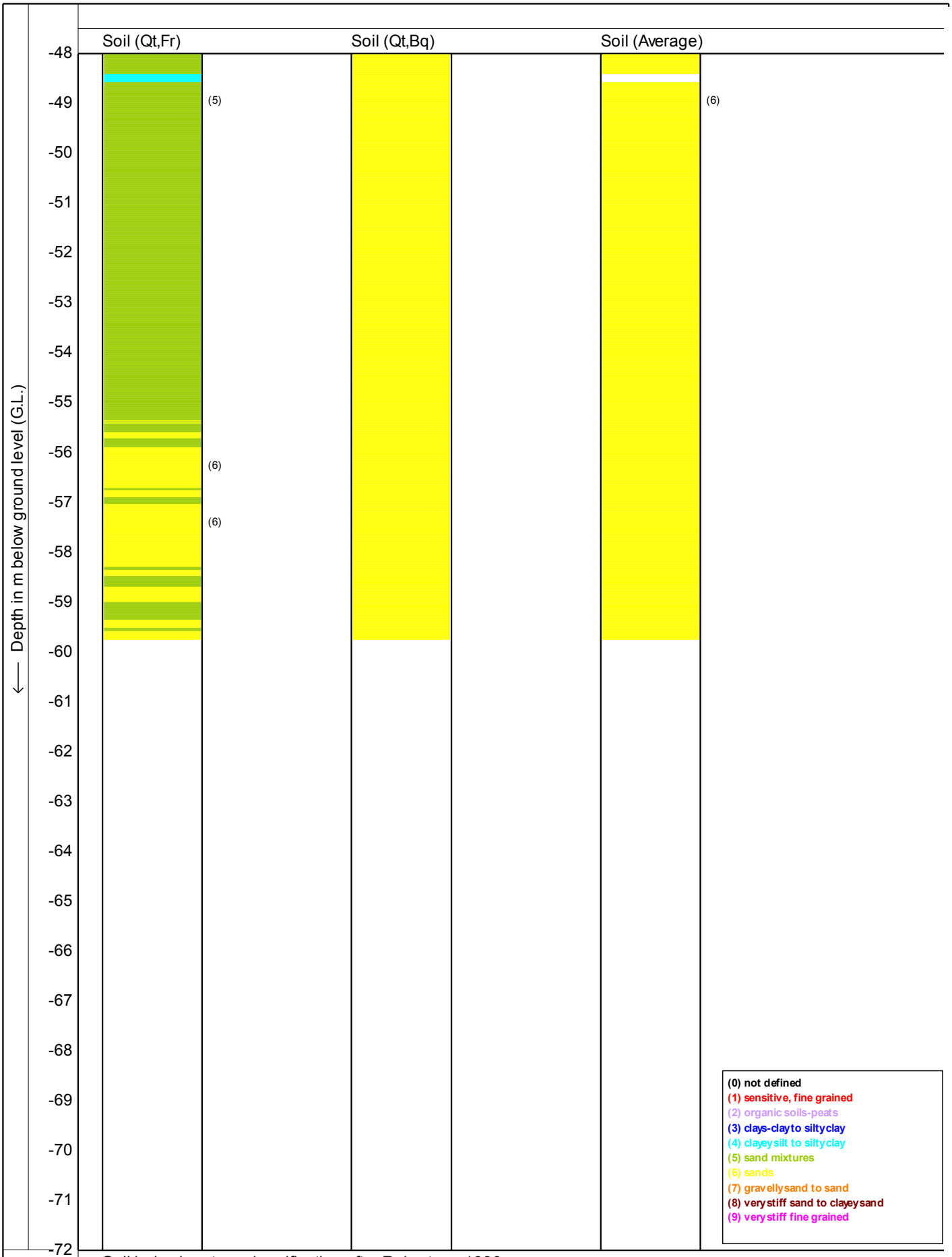
Project : **KCB2**

Location: **Borssele**

Date : **7-7-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt12b** 11/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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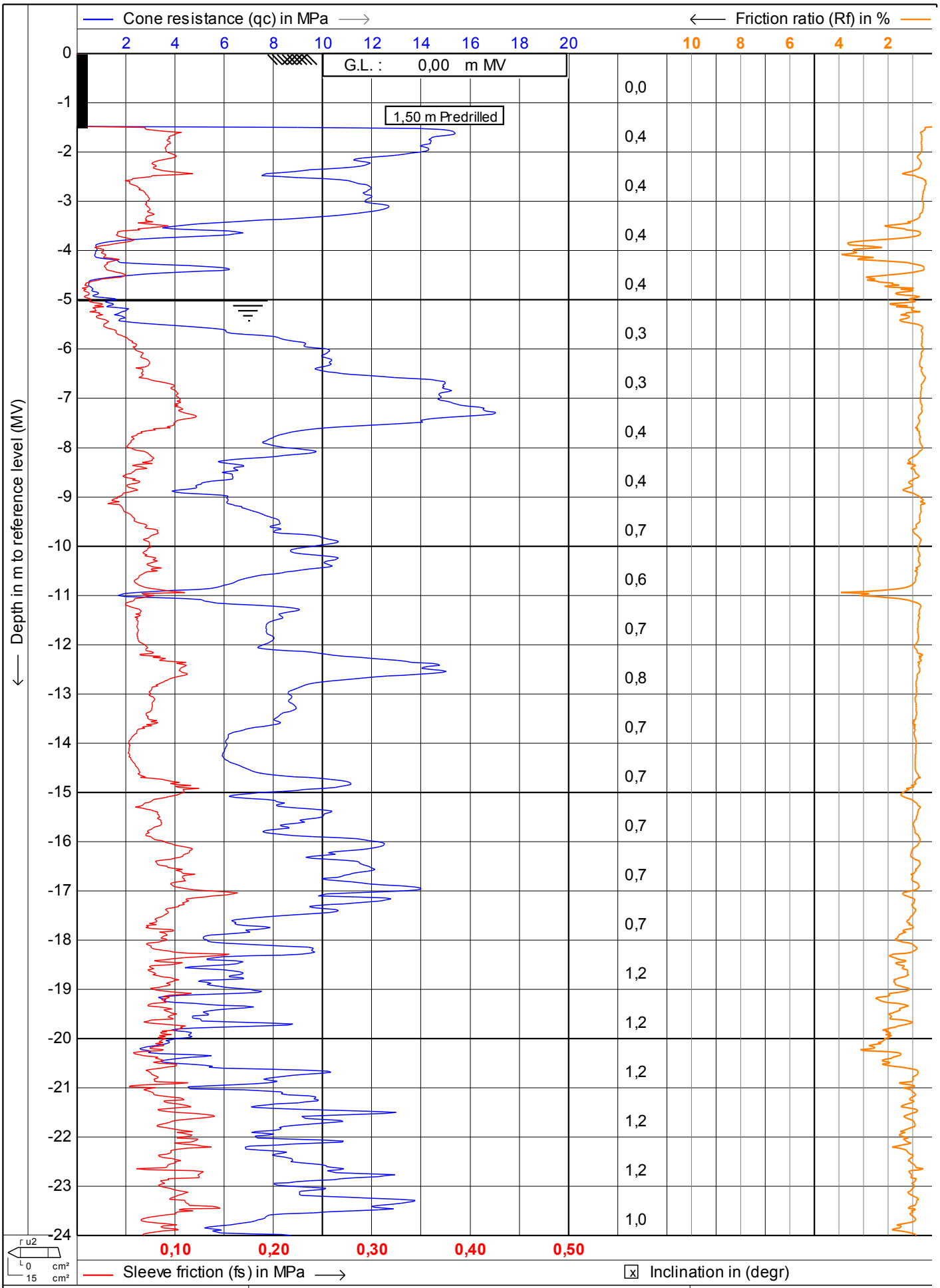
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt12b** 12/12

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

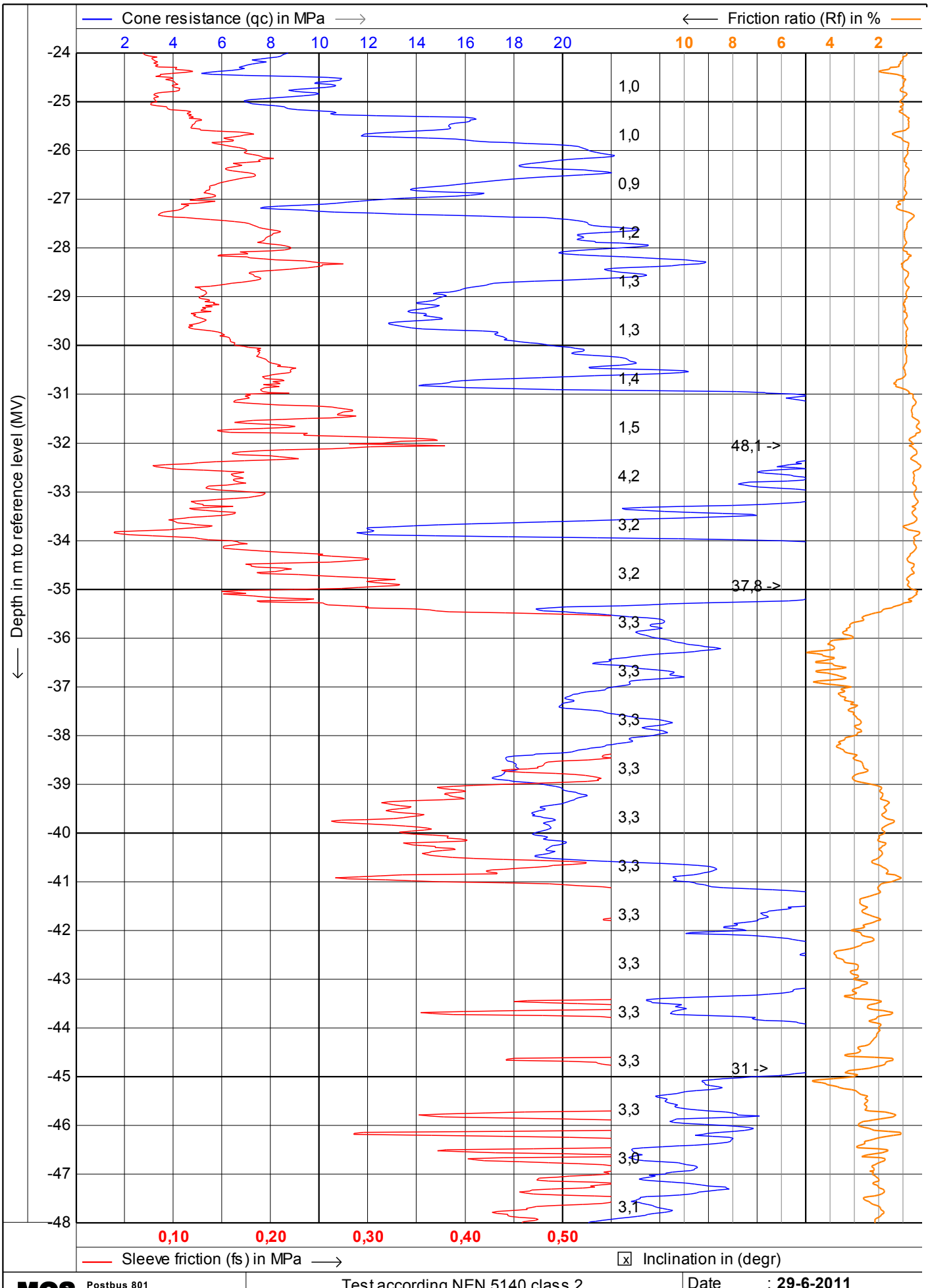
Project : **KCB2**

Location: **Borssele**

Date	: **29-6-2011**
Cone no.	: **S15CFIP481**
Project no.	: **0041011**
CPT no.	: **kcpt13**

CPTask V1.14

MOS GRONDMECHANICA



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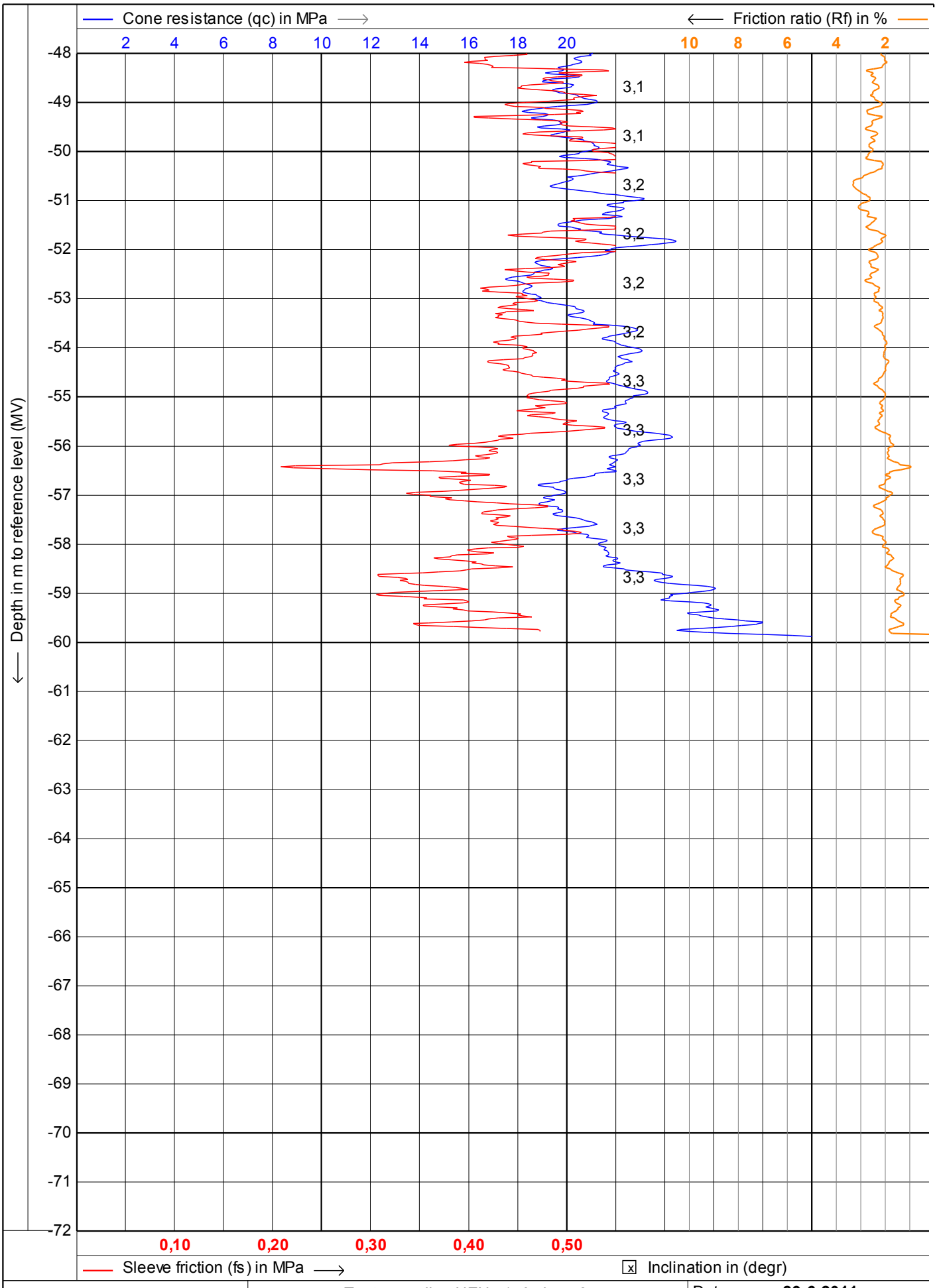
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **29-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt13**

CPTask V1.14



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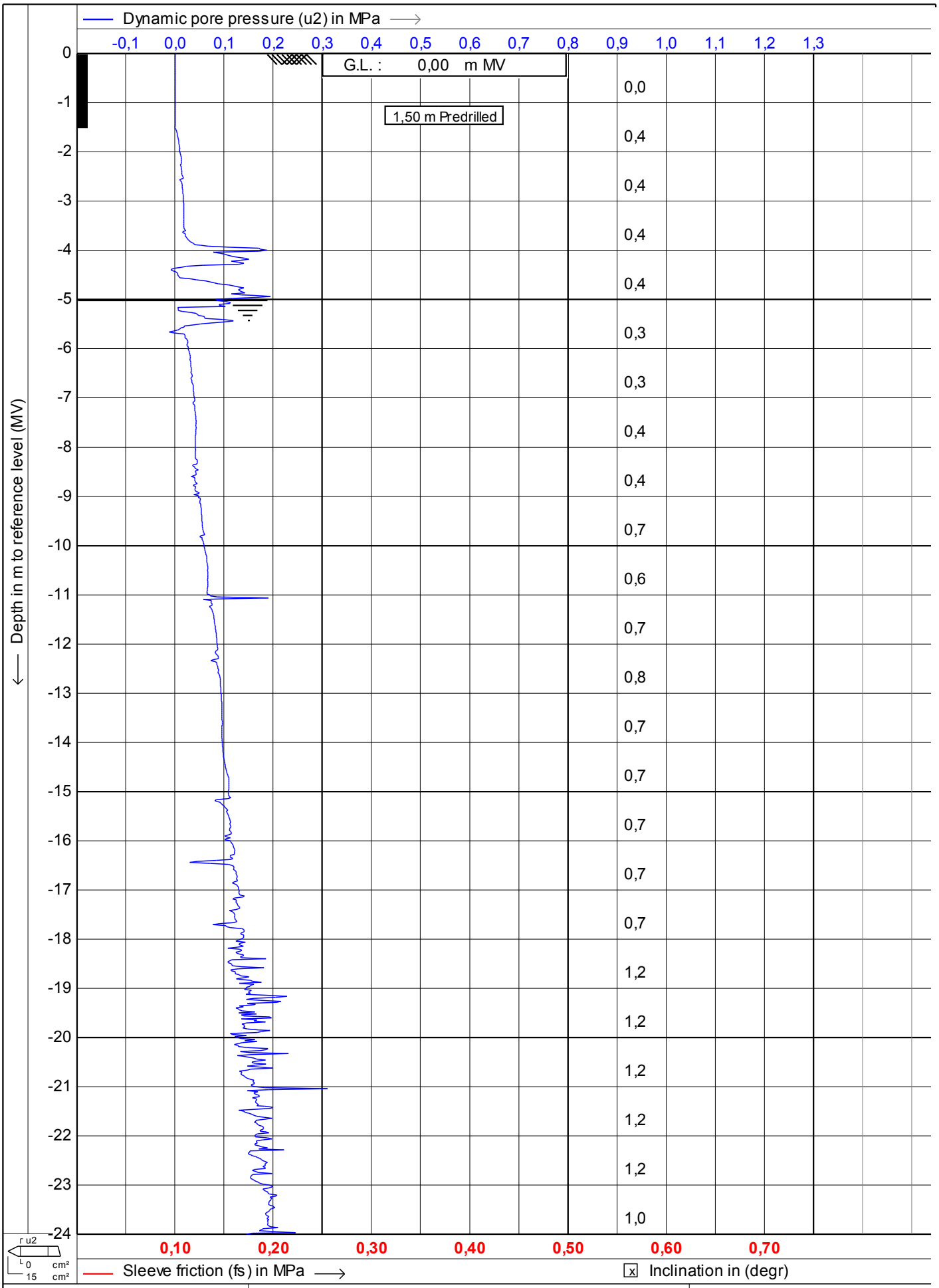
Project no. : **0041011**

CPT no. : **kcpt13**

CPTask V1.14



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Test according NEN 5140 class 2

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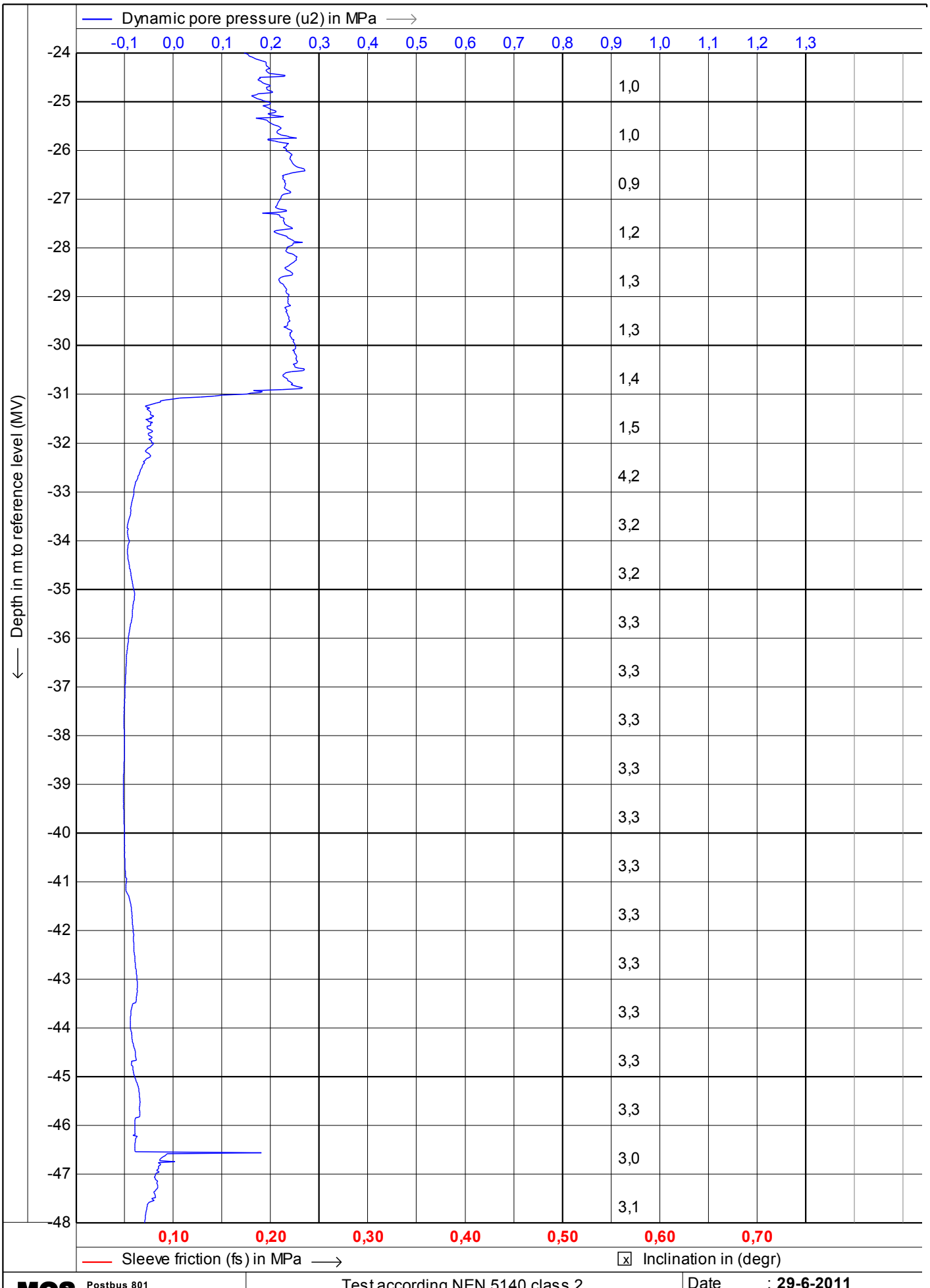
Location: **Borssele**

Date : **29-6-2011**
Cone no. : **S15CFIP481**
Project no. : **0041011**
CPT no. : **kcpt13** 4/12

CPTask V1.14



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Test according NEN 5140 class 2

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Cone no. : **S15CFIP481**
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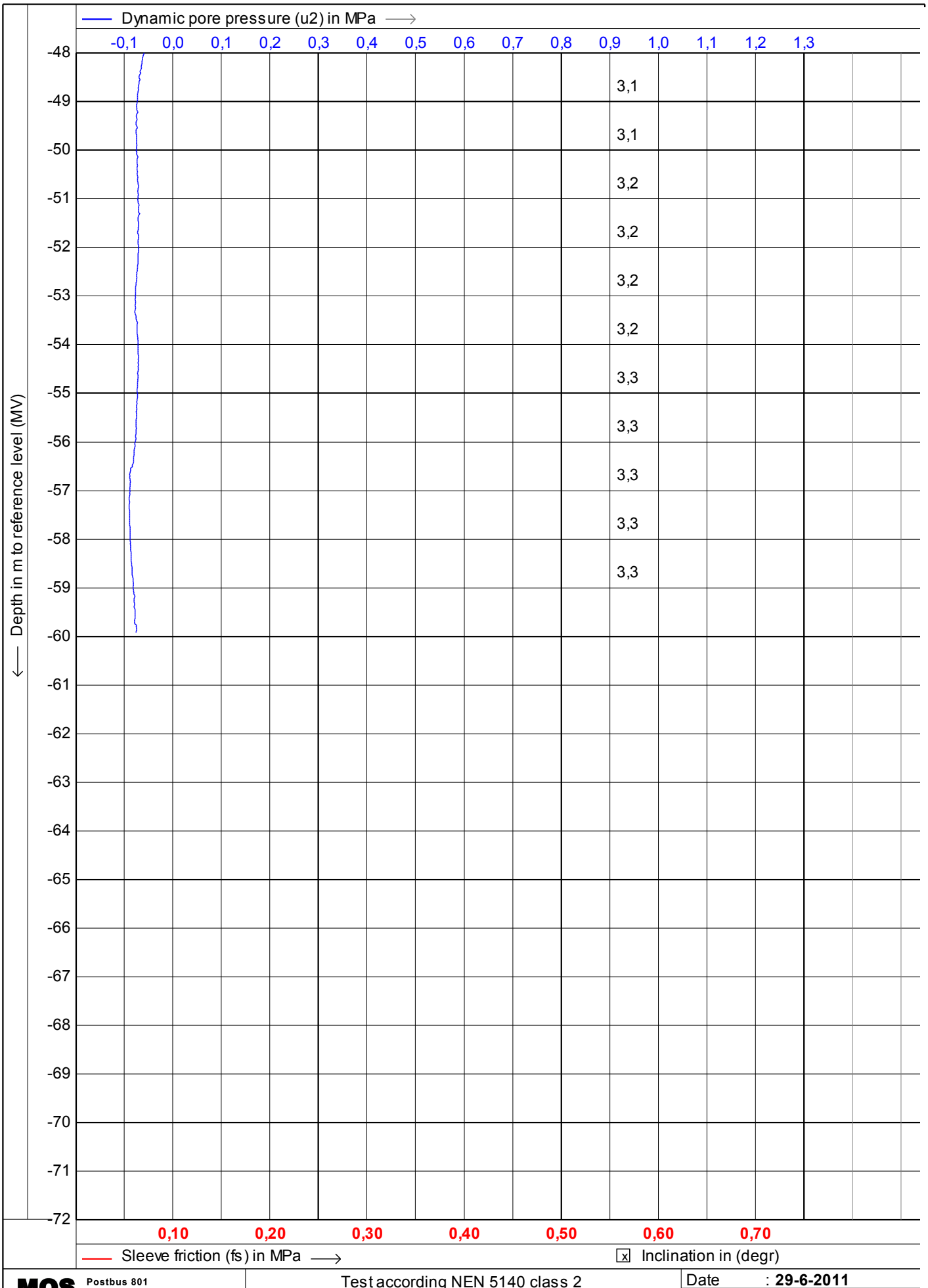
CPT no. : **kcpt13** 5/12

CPTask V1.14

MOS



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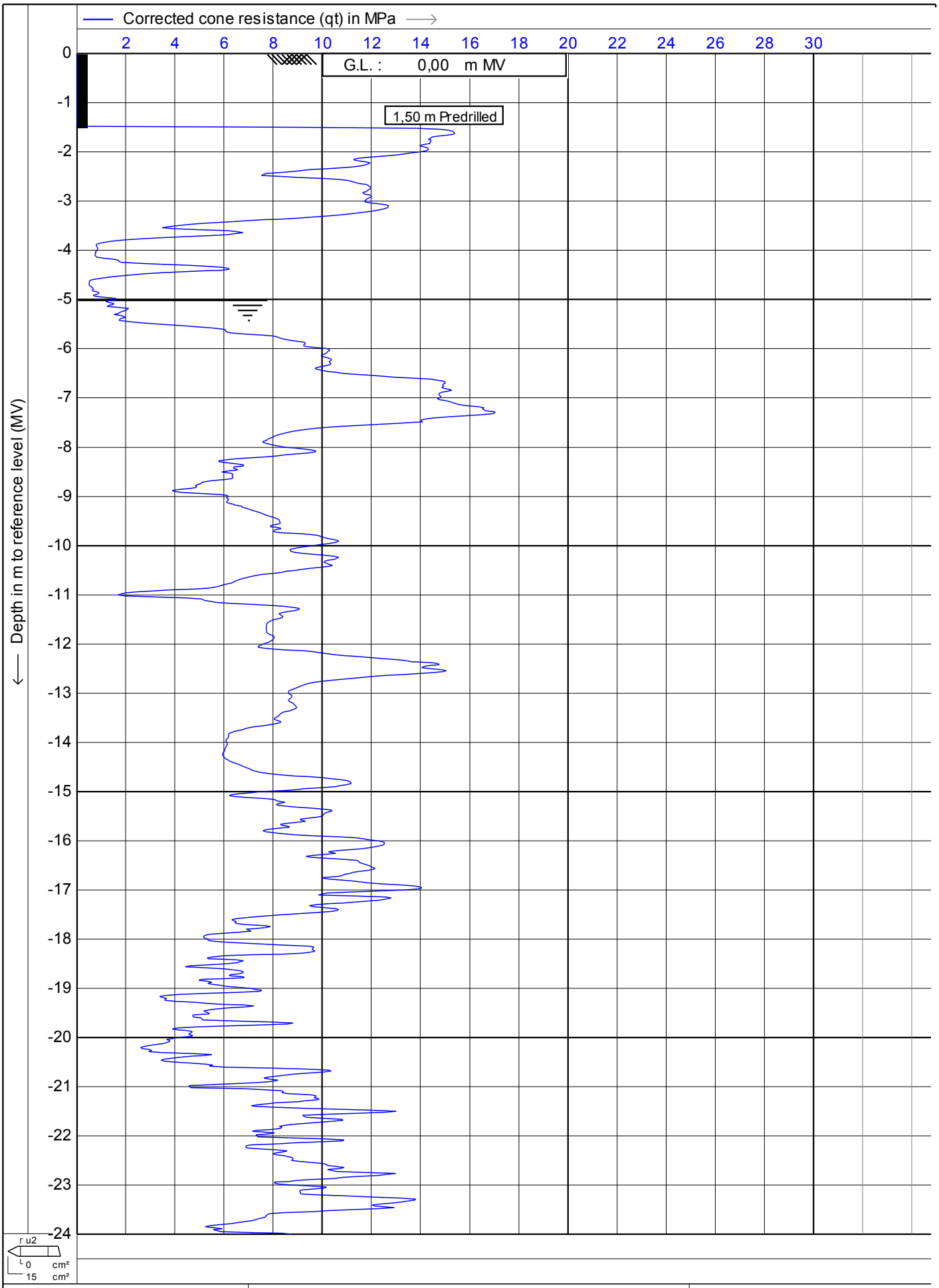
CPT no.	: **kcpt13**

CPTask V1.14



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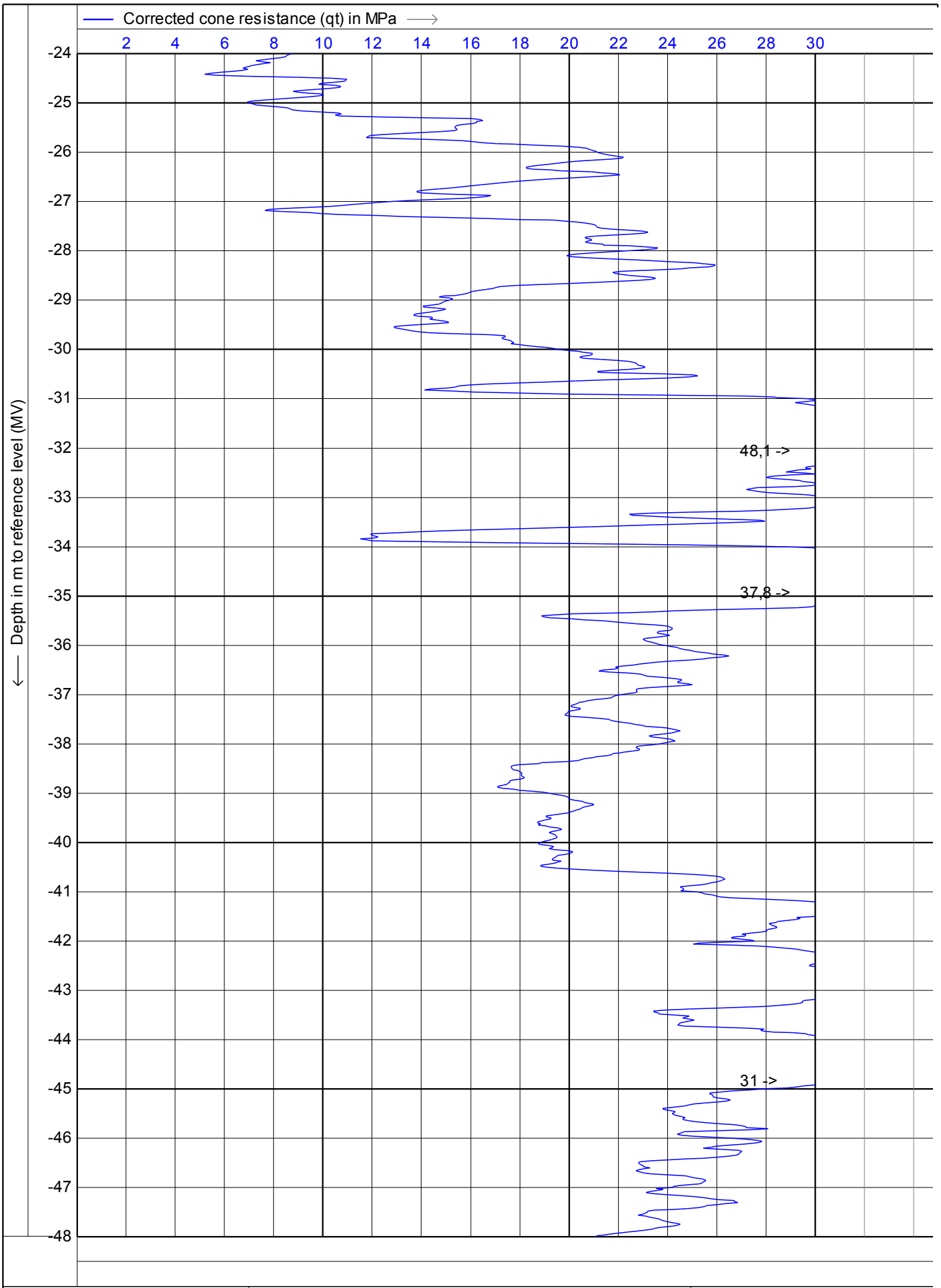
MOS GRONDMECHANICA
CPTask V1.14



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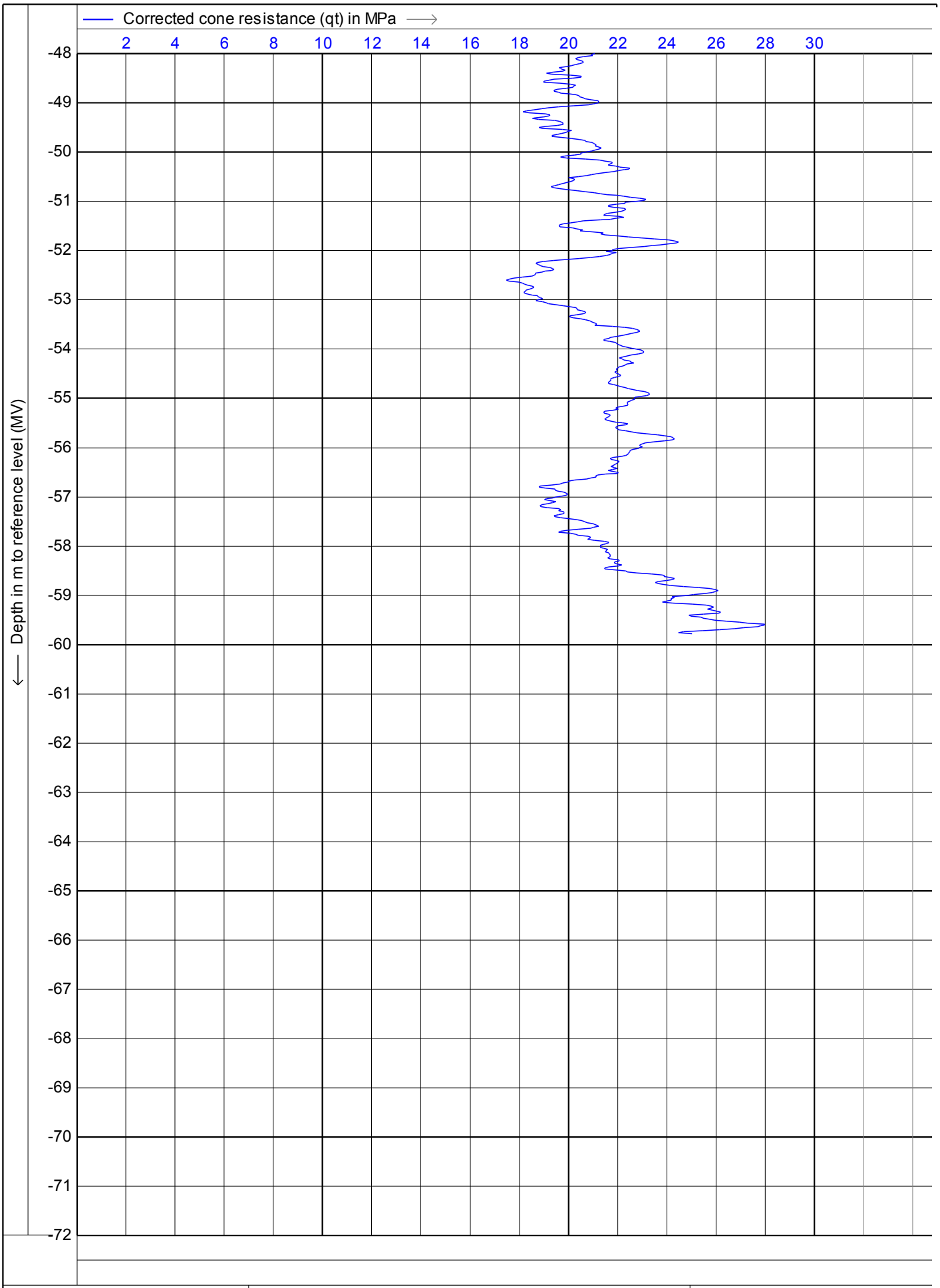
MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

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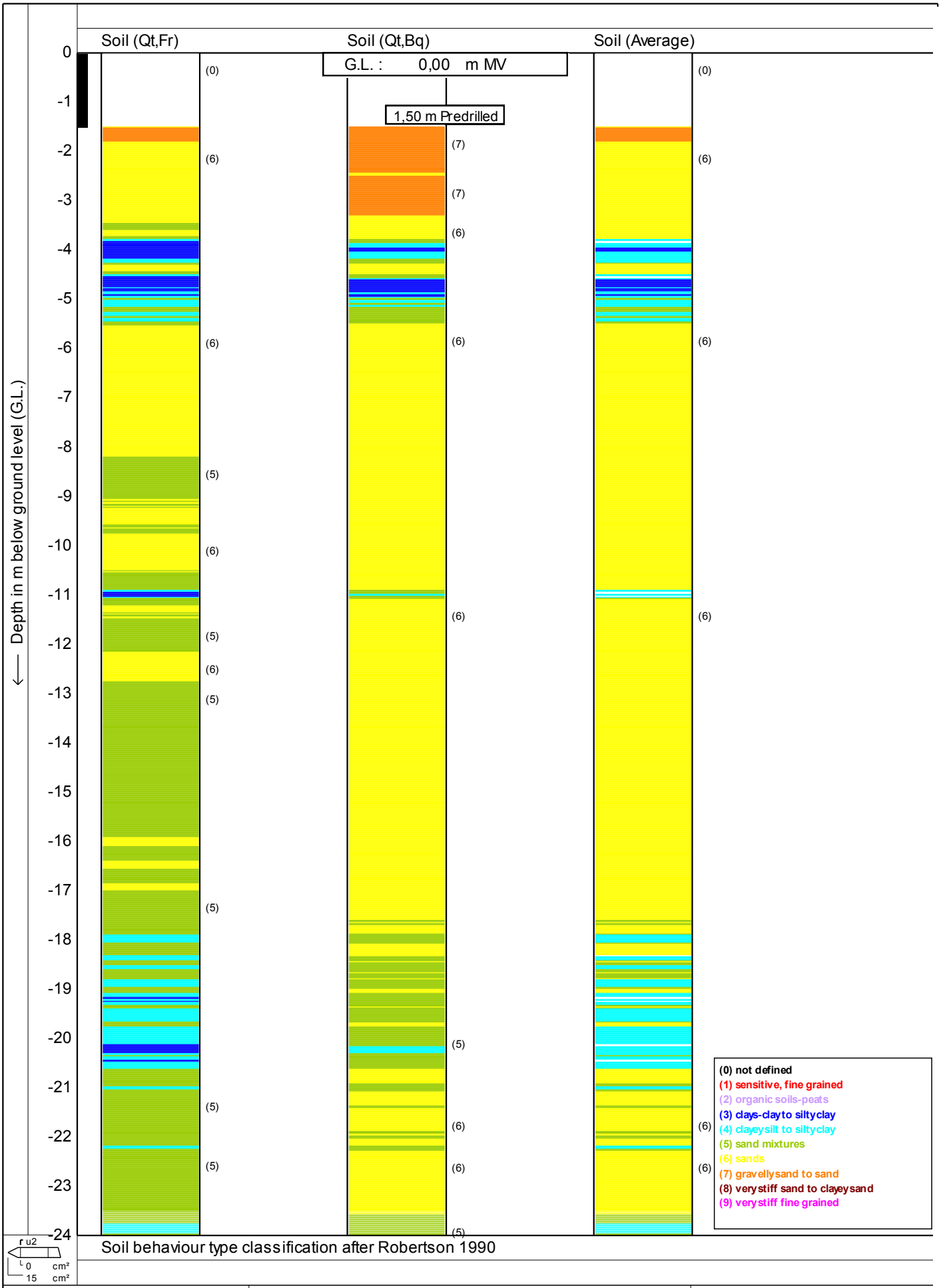
CPT no.	: **kcpt13**

MOS GRONDMECHANICA

CPTask V1.14



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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **29-6-2011**

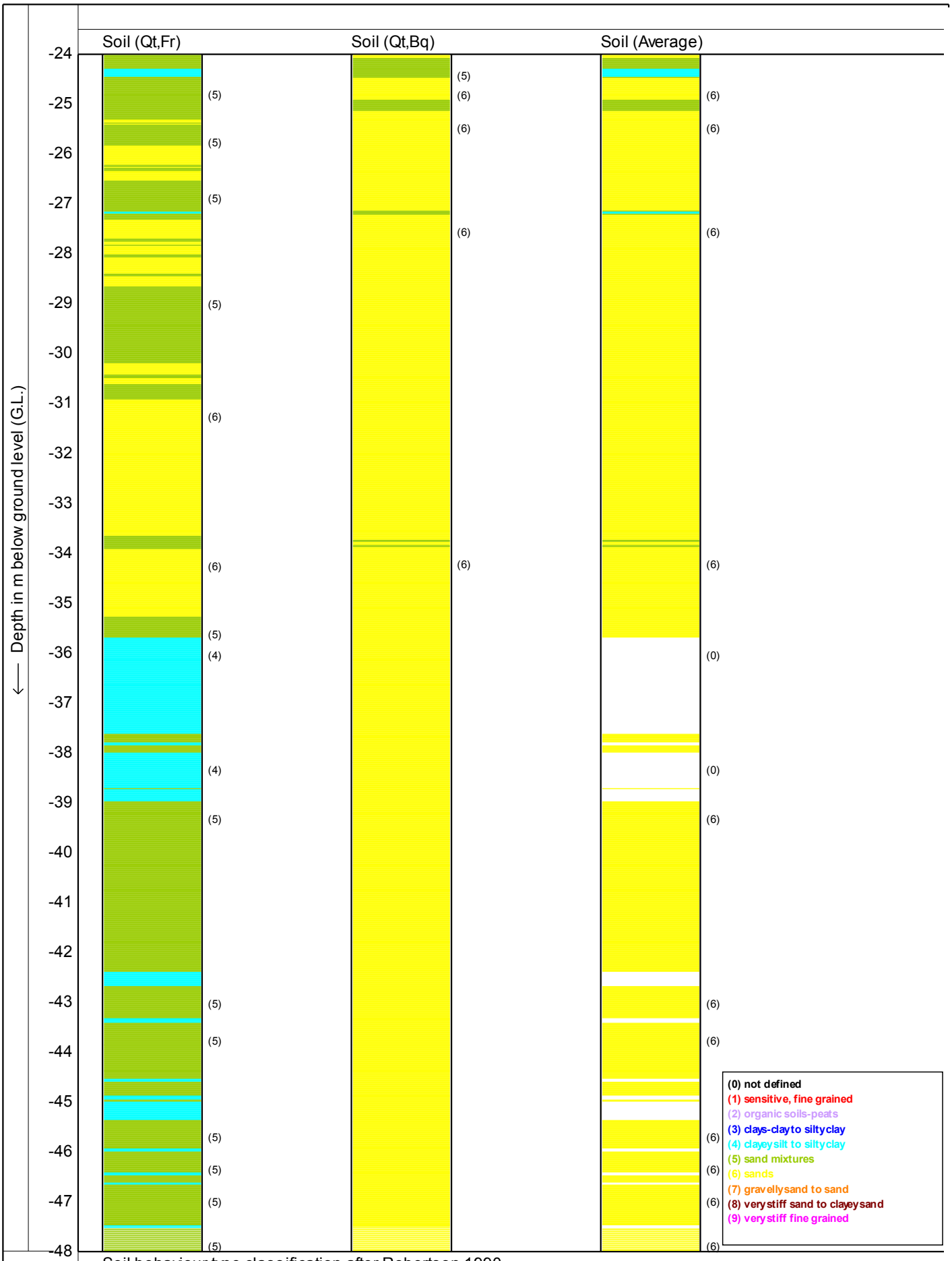
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt13** 10/12

MOS GRONDMECHANICA

CPTask V1.14



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **29-6-2011**

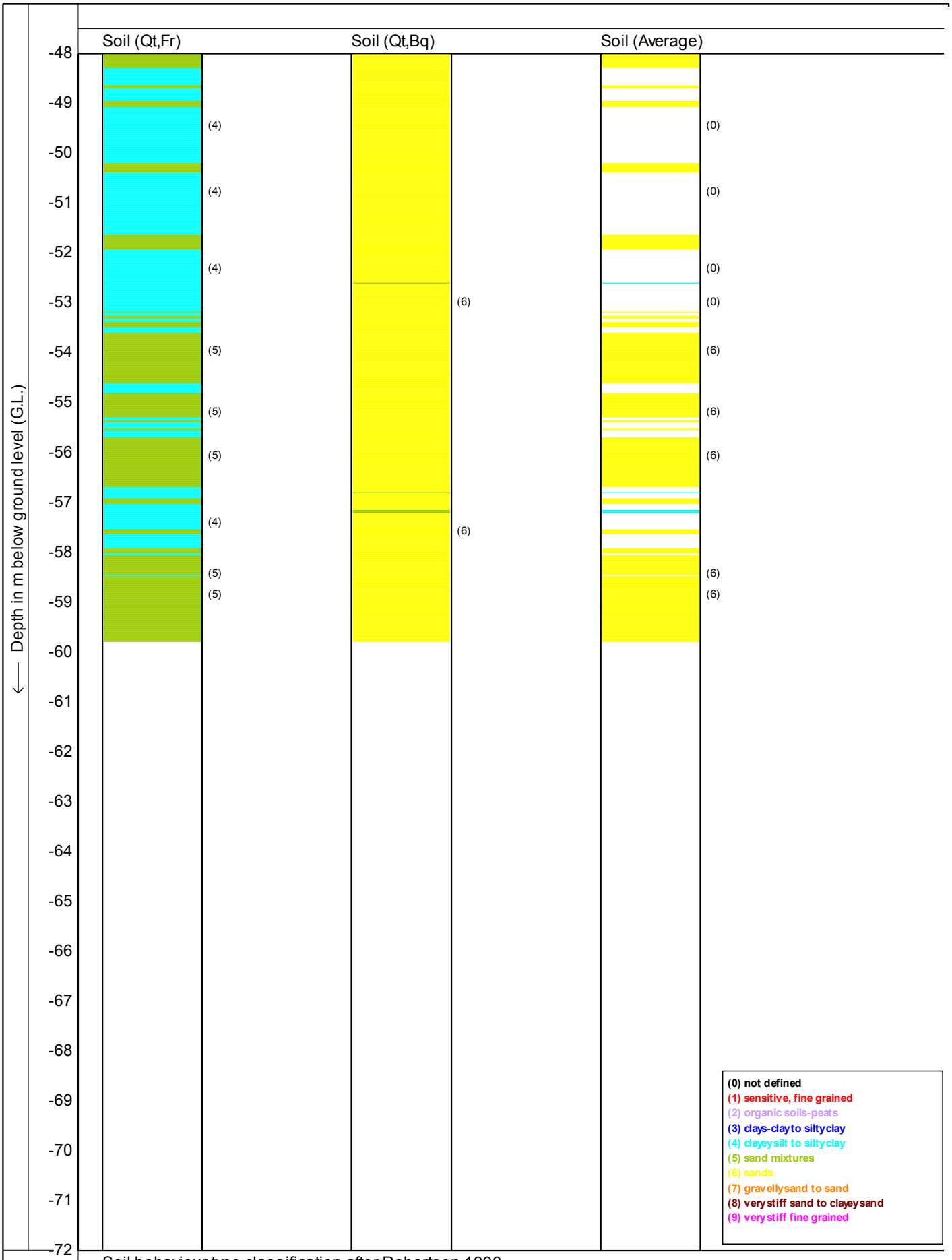
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt13** 11/12

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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Test according NEN 5140 class 2

Project : **KCB2**

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Date : **29-6-2011**

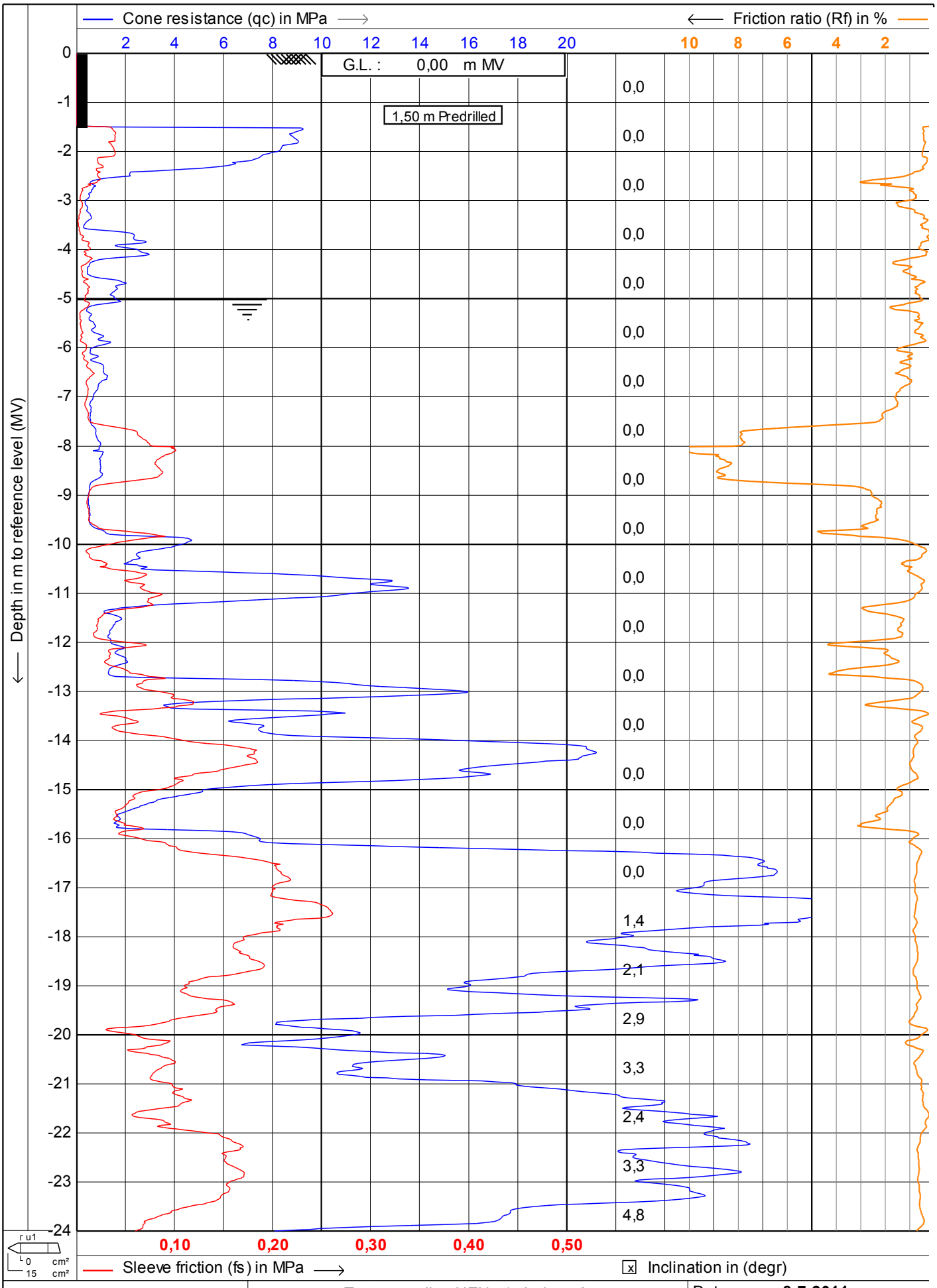
Cone no. : **S15CFIP481**

Project no. : **0041011**

CPT no. : **kcpt13** 12/12

CPTask V1.14

MOS GRONDMECHANICA



MOS GRONDMECHANICA

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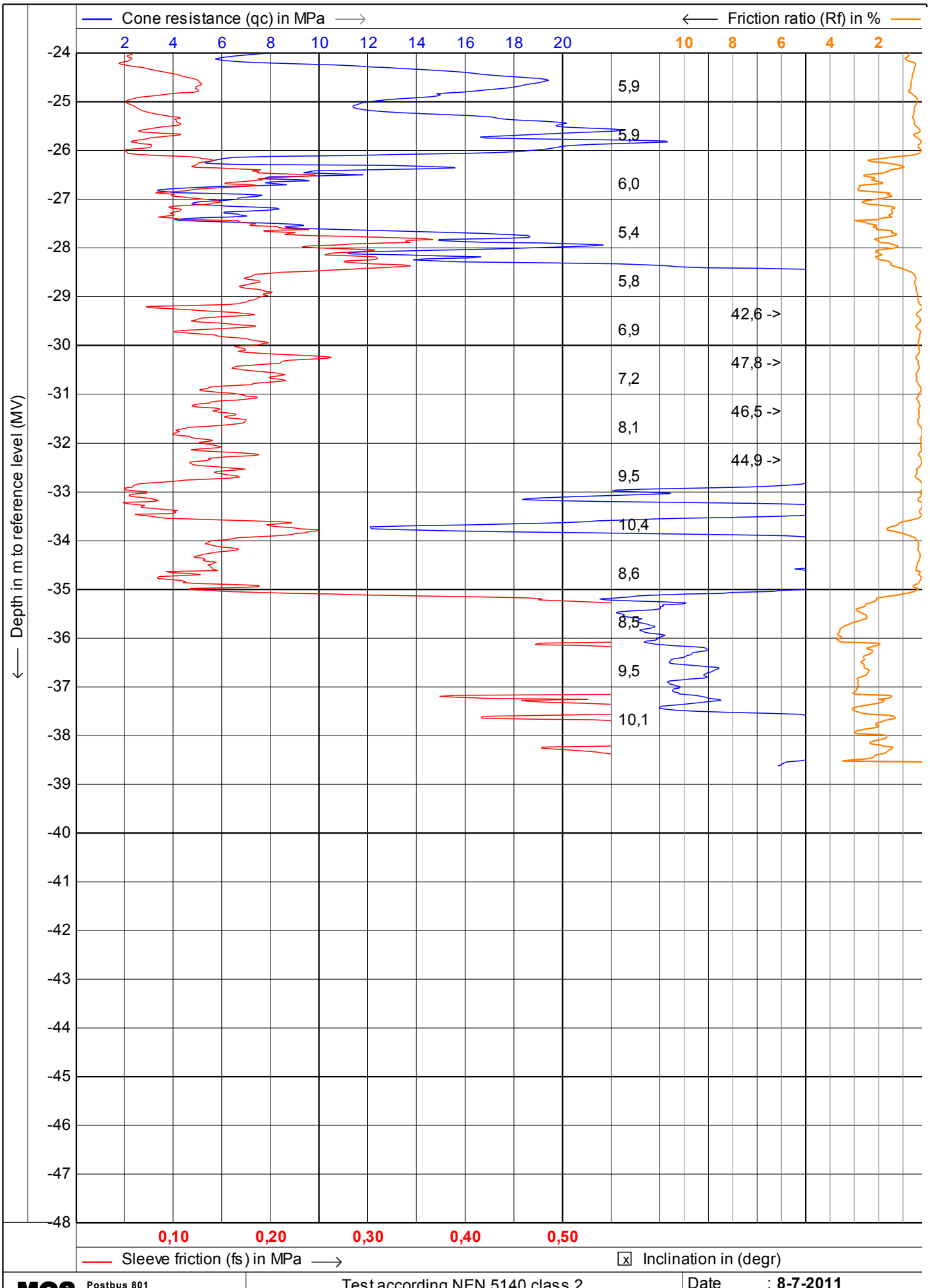
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **C15CFIP971**
Project no. : **0041011**
CPT no. : **kcpt17** 1/8

CPTask V1.14



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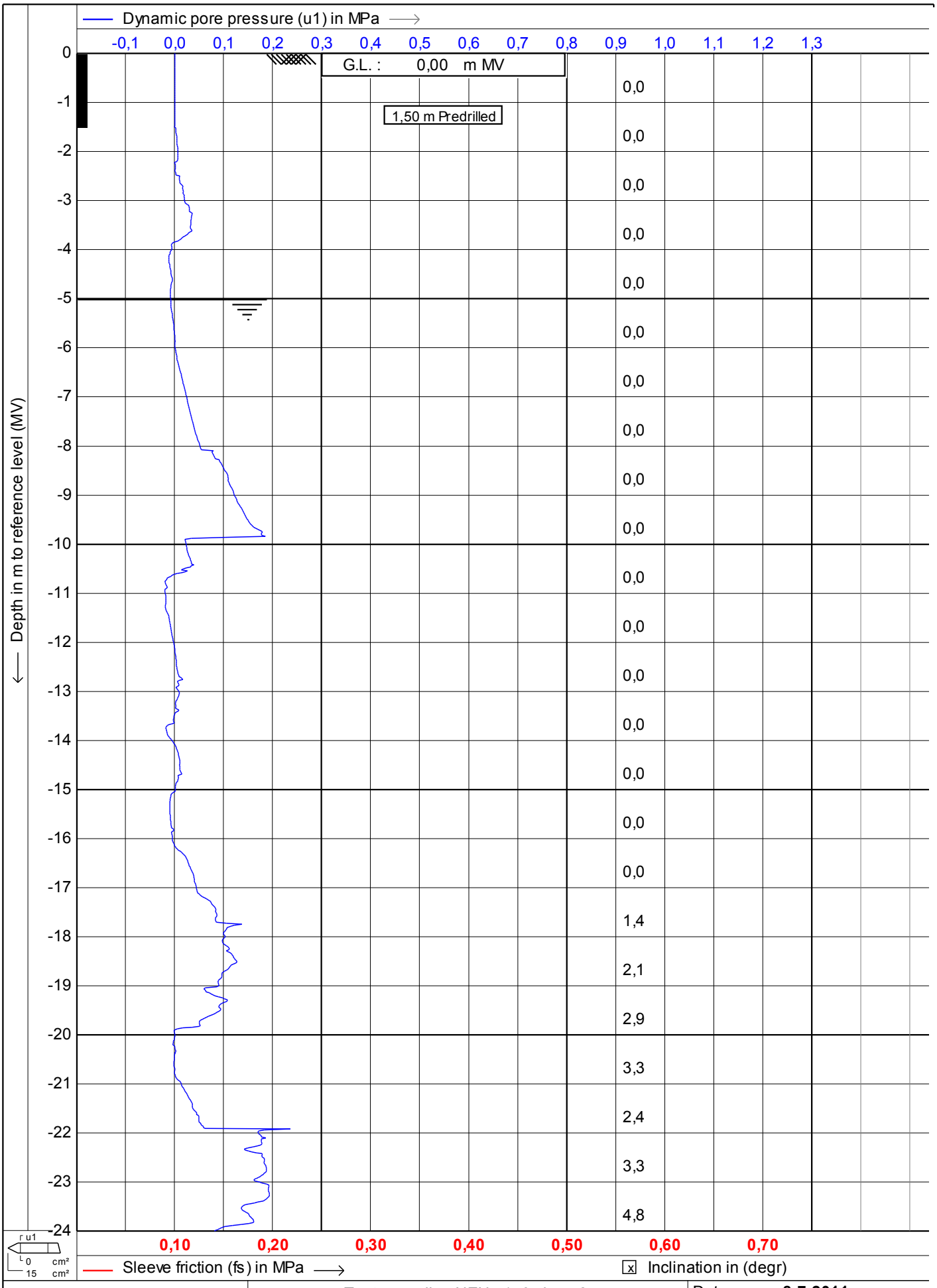
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **C15CFIP971**
Project no. : **0041011**
CPT no. : **kcpt17** **2/8**

CPTask V1.14



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Project : **KCB2**

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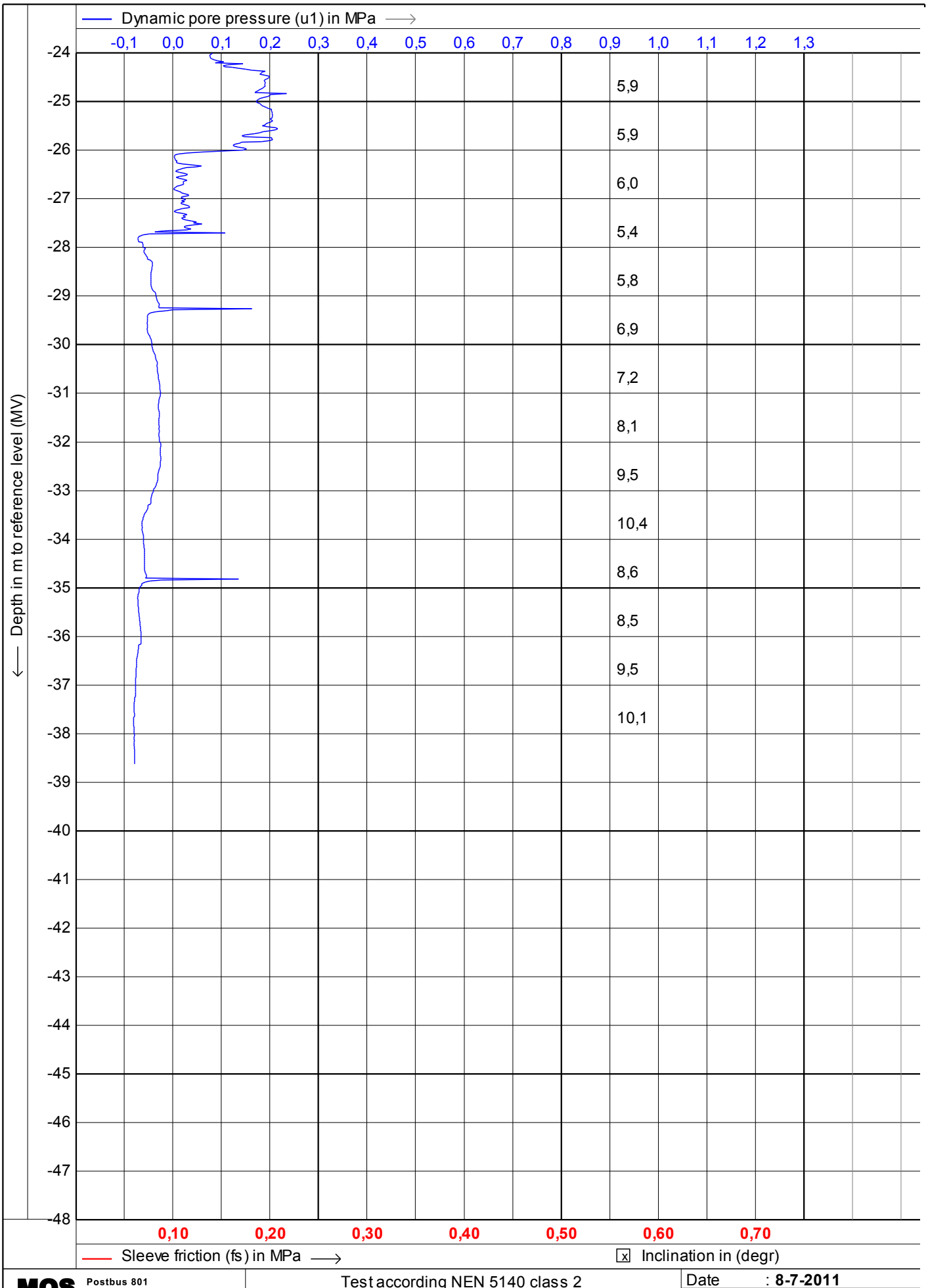
Date : **8-7-2011**

Cone no. : **C15CFIP971**

Project no. : **0041011**

CPT no. : **kcpt17** 3/8

CPTask V1.14



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Test according NEN 5140 class 2

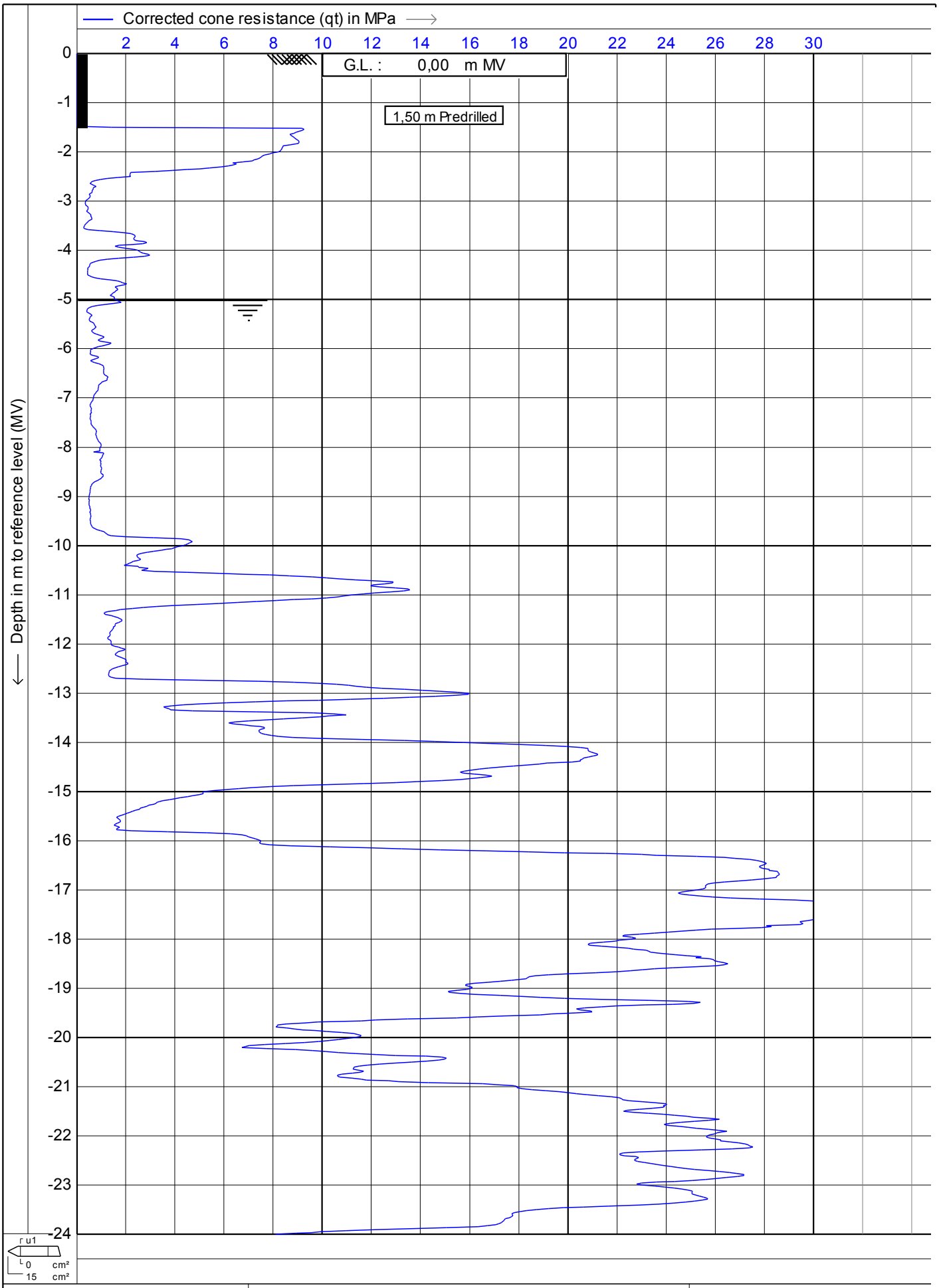
Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **C15CFIP971**
Project no. : **0041011**
CPT no. : **kcpt17** 4/8

MOS GRONDMECHANICA

CPTask V1.14



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www.mosgeo.com

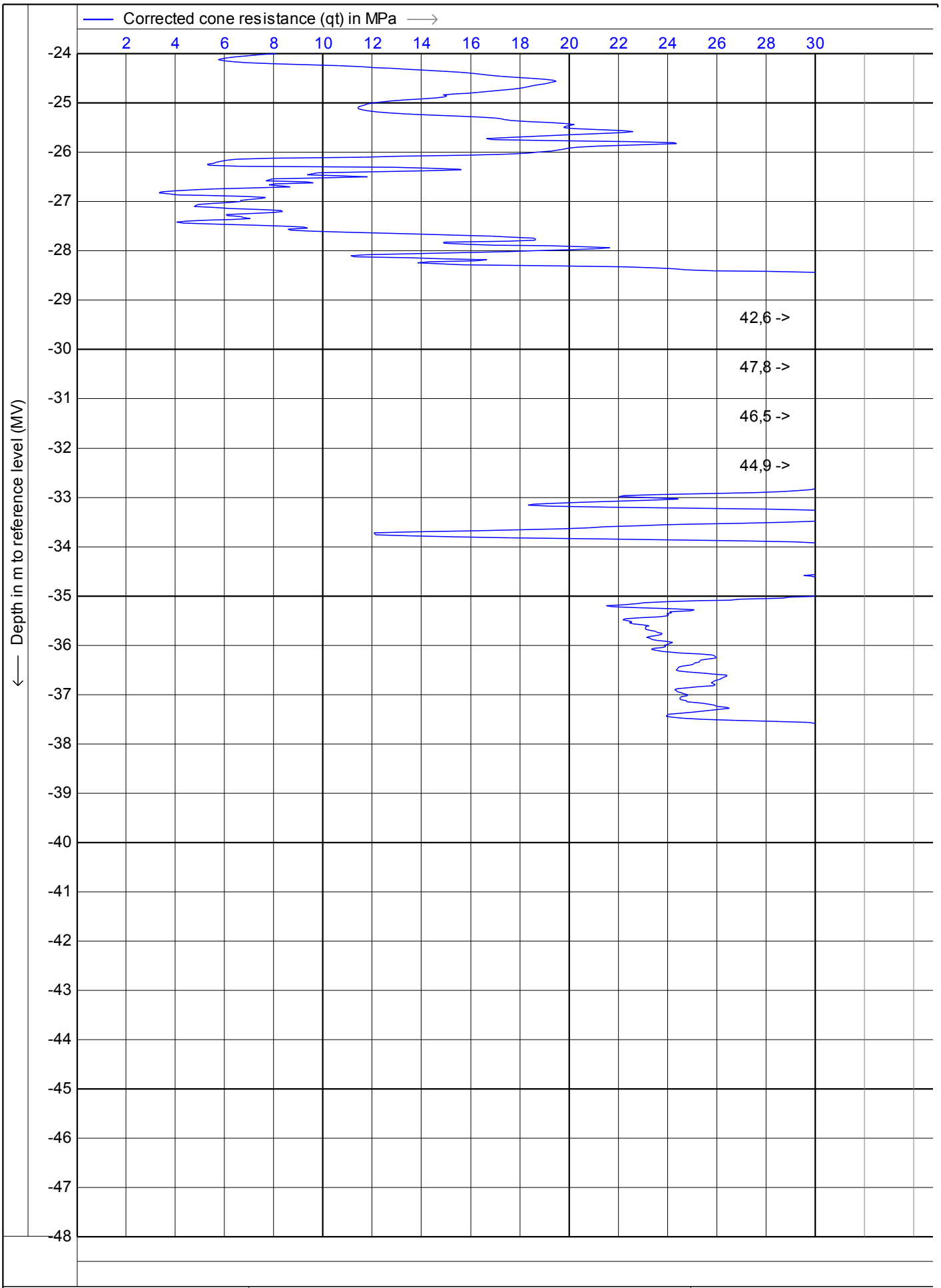
Test according NEN 5140 class 2

Project : **KCB2**

Location: **Borssele**

Date	: **8-7-2011**
Cone no.	: **C15CFIP971**
Project no.	: **0041011**
CPT no.	: **kcpt17**

CPTask V1.14



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Test according NEN 5140 class 2

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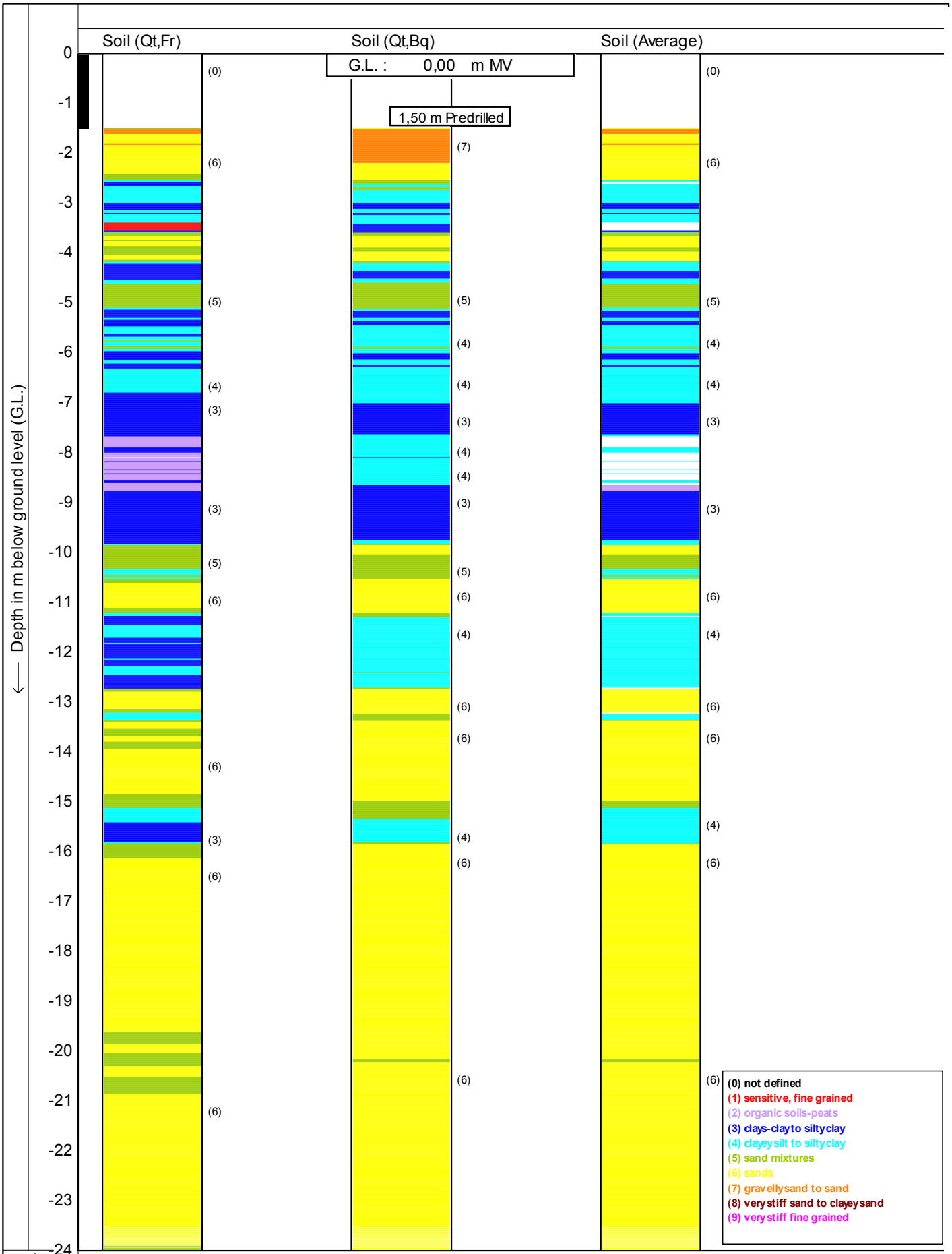
CPT no.	: **kcpt17**

MOS GRONDMECHANICA
CPTask V1.14



Soil behaviour type classification after Robertson 1990

r u1
0 cm²
15 cm²

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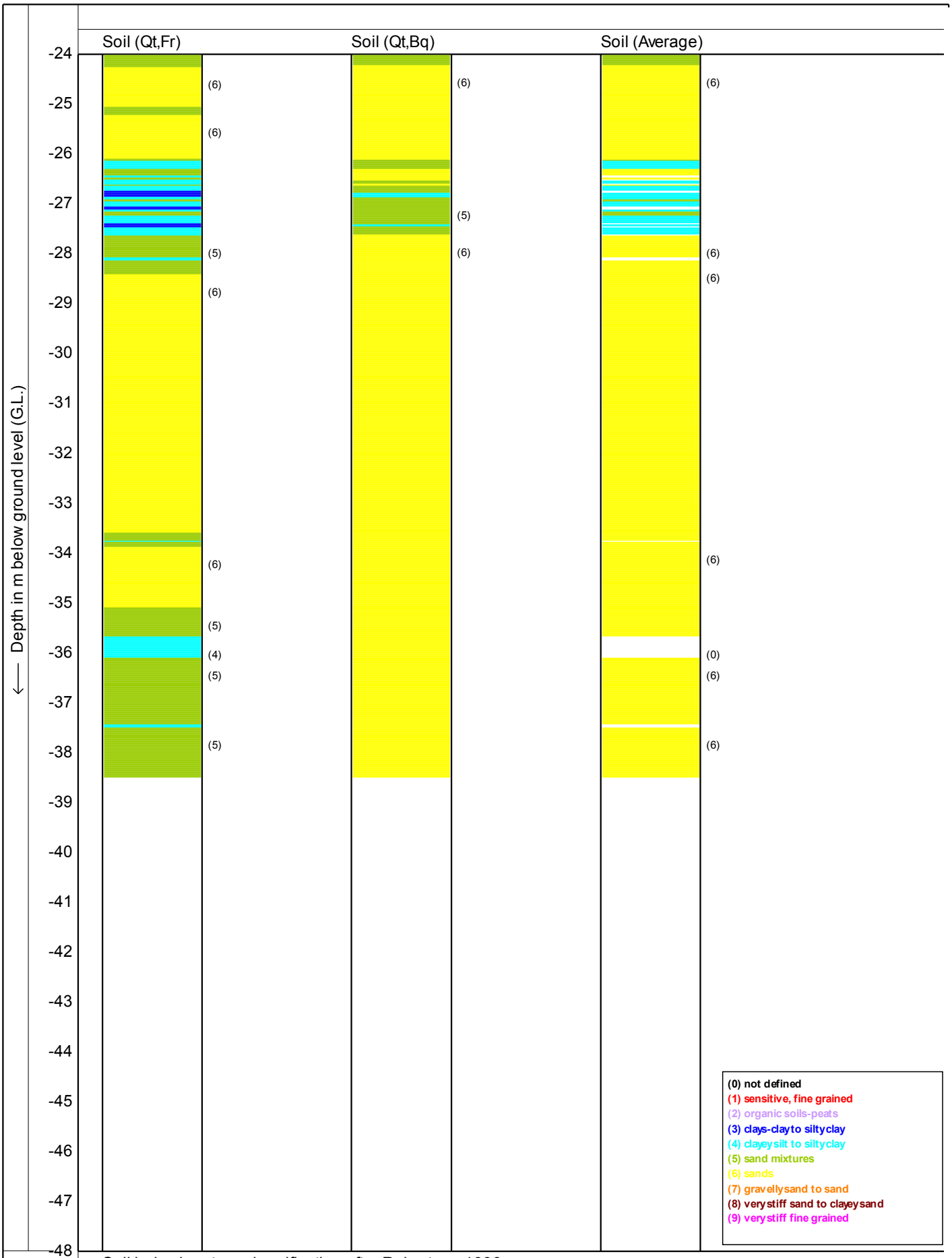
Project : **KCB2**

Location: **Borssele**

Date : **8-7-2011**
Cone no. : **C15CFIP971**
Project no. : **0041011**
CPT no. : **kcpt17** 7/8

CPTask V1.14

MOS GRONDMECHANICA



Soil behaviour type classification after Robertson 1990

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Project no. : **0041011**
CPT no. : **kcpt17** 8/8

MOS GRONDMECHANICA

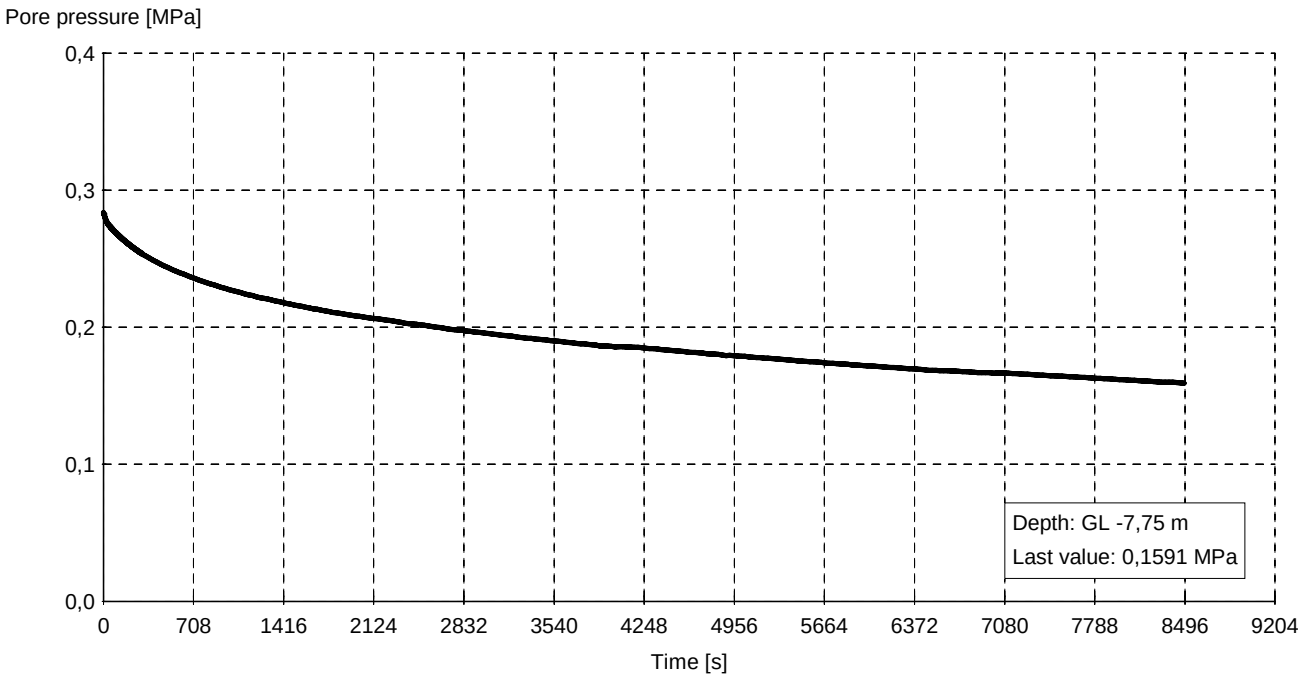
CPTask V1.14

Annex B
Dissipation tests

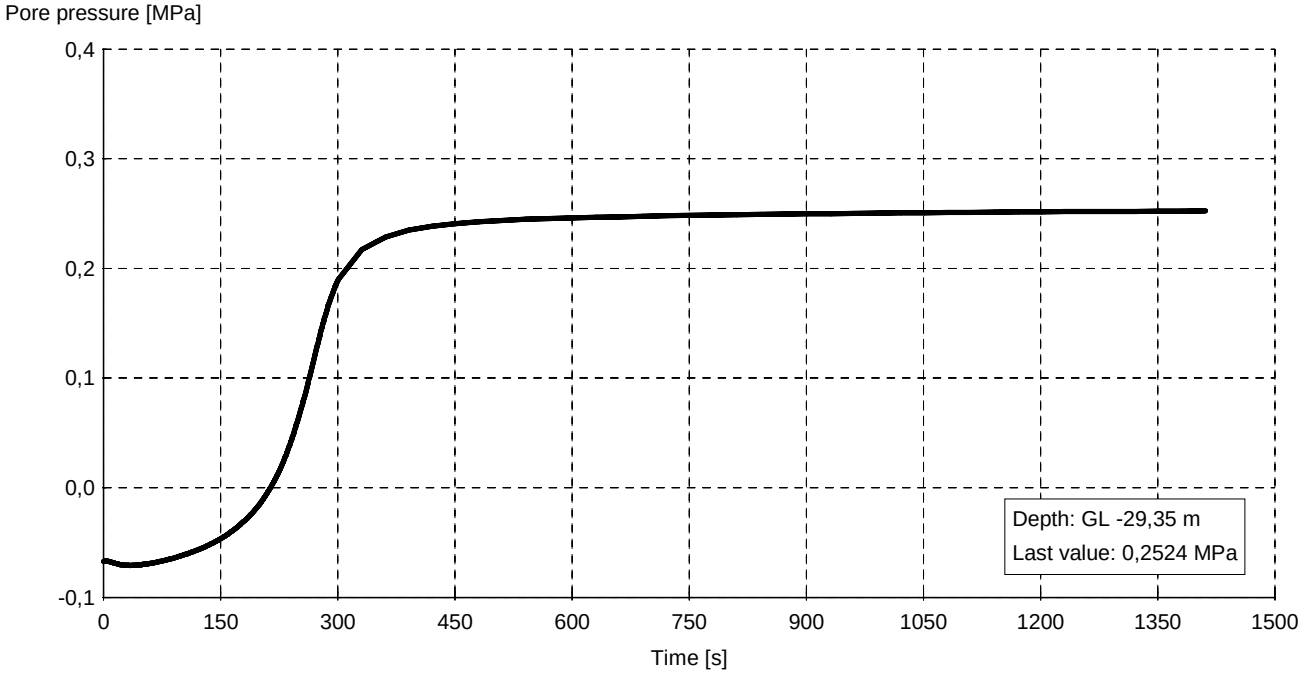
Dissipation test long duration

DISSIPATION TEST

Cpt : kpct5
TestNr. : 1 X : GL : MV 0m
Date : 24-6-2011 Y :

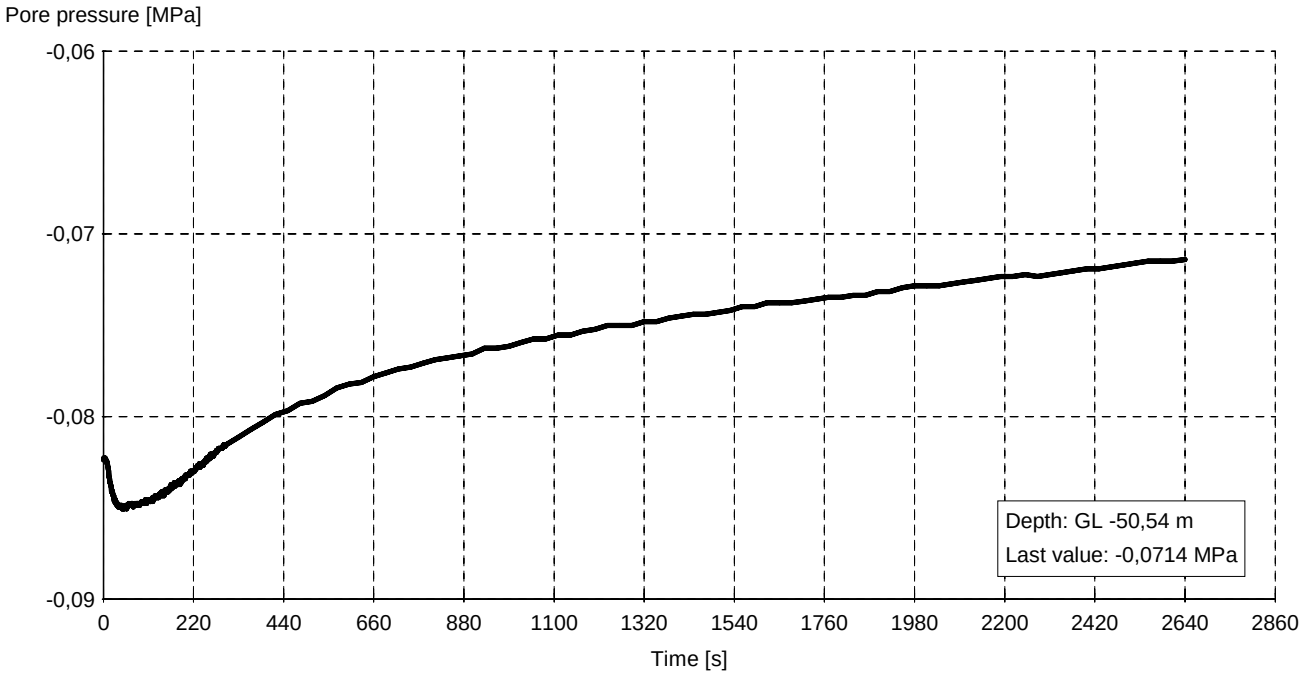


Cpt : kcpt8a
TestNr. : 3 X : GL : MV 0m
Date : 27-6-2011 Y :

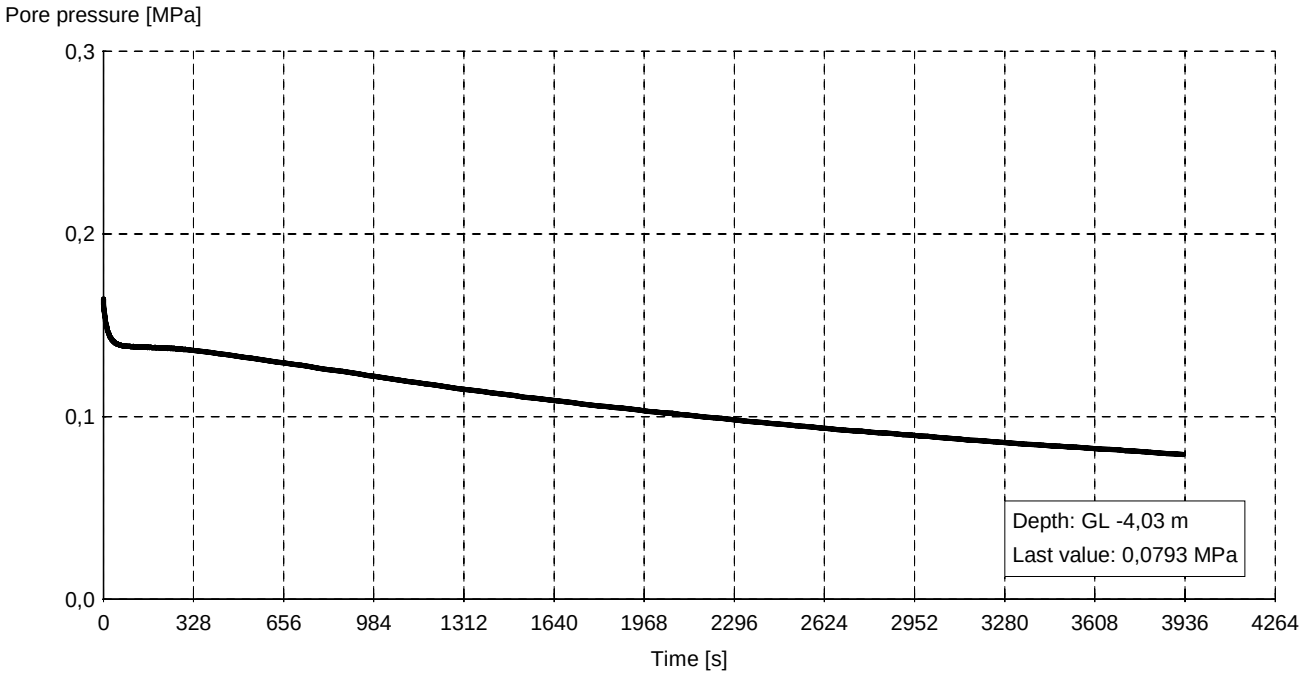


DISSIPATION TEST

Cpt : kcpt8a
TestNr. : 4 X :
Date : 27-6-2011 Y :
GL : MV 0m

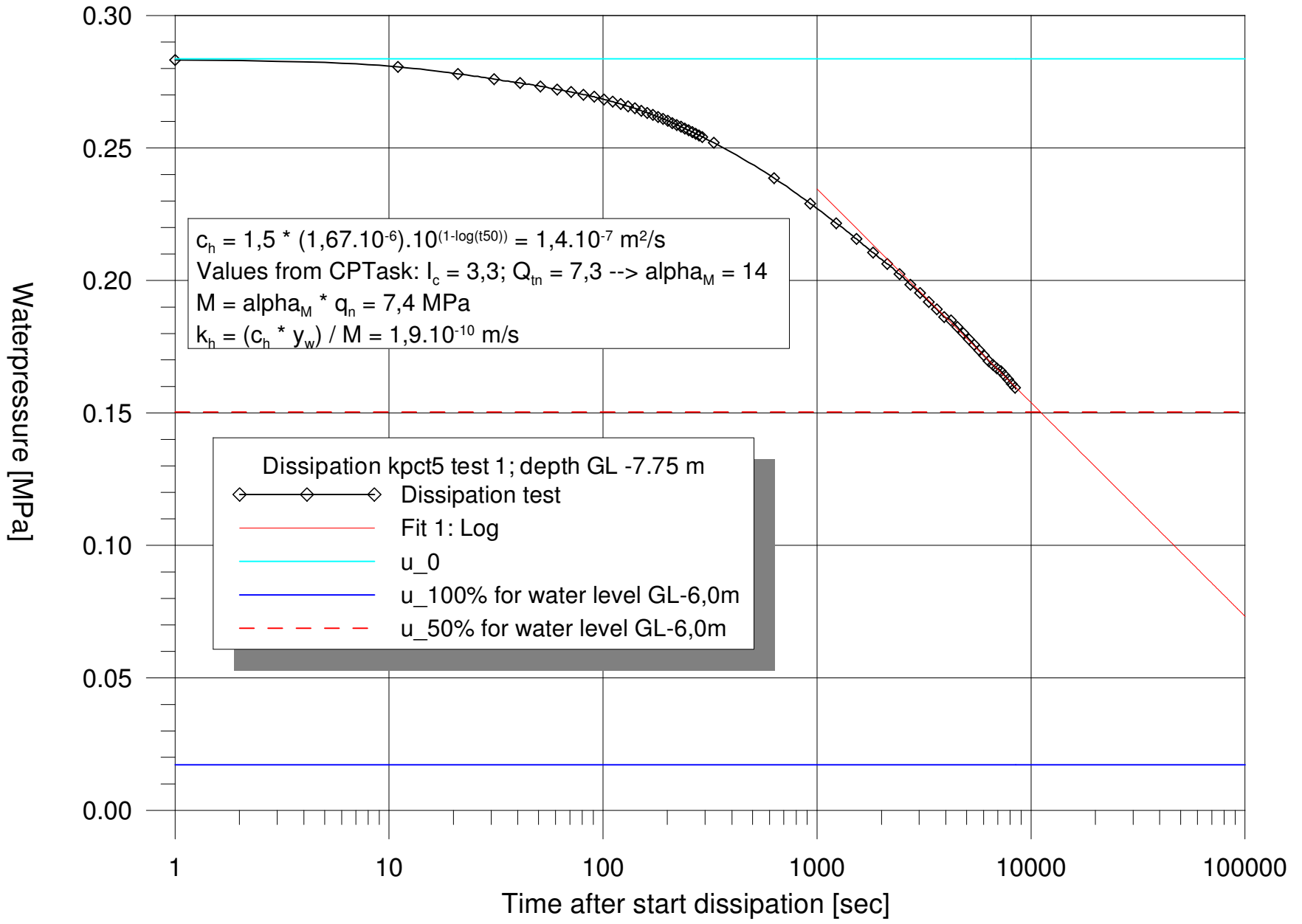


Cpt : kcpt13
TestNr. : 1 X :
Date : 28-6-2011 Y :
GL : MV 0m



MOS GRONDMECHANICA Postbus 801, 3160 AA Rhoon - telefoon 010 - 5030200 - fax 010 - 5013656

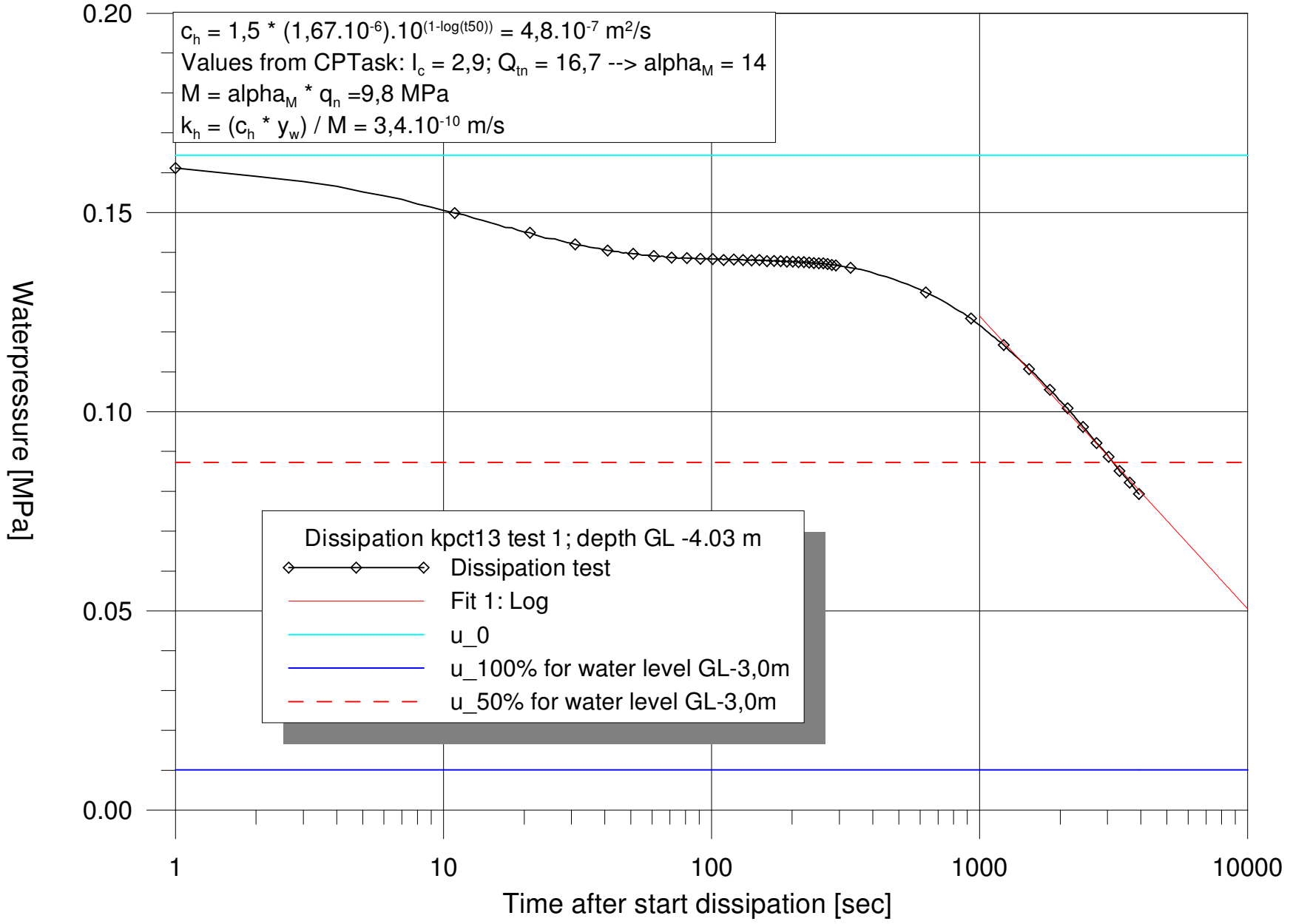
Order : 0041011
Location : Borssele
Project : KCB2 CPT



MOS GRONDMECHANICA Postbus 801, 3160 AA Rhoon - telefoon 010 - 5030200 - fax 010 - 5013656

Order : 0041011
Location : Borssele
Project : KCB2 CPT

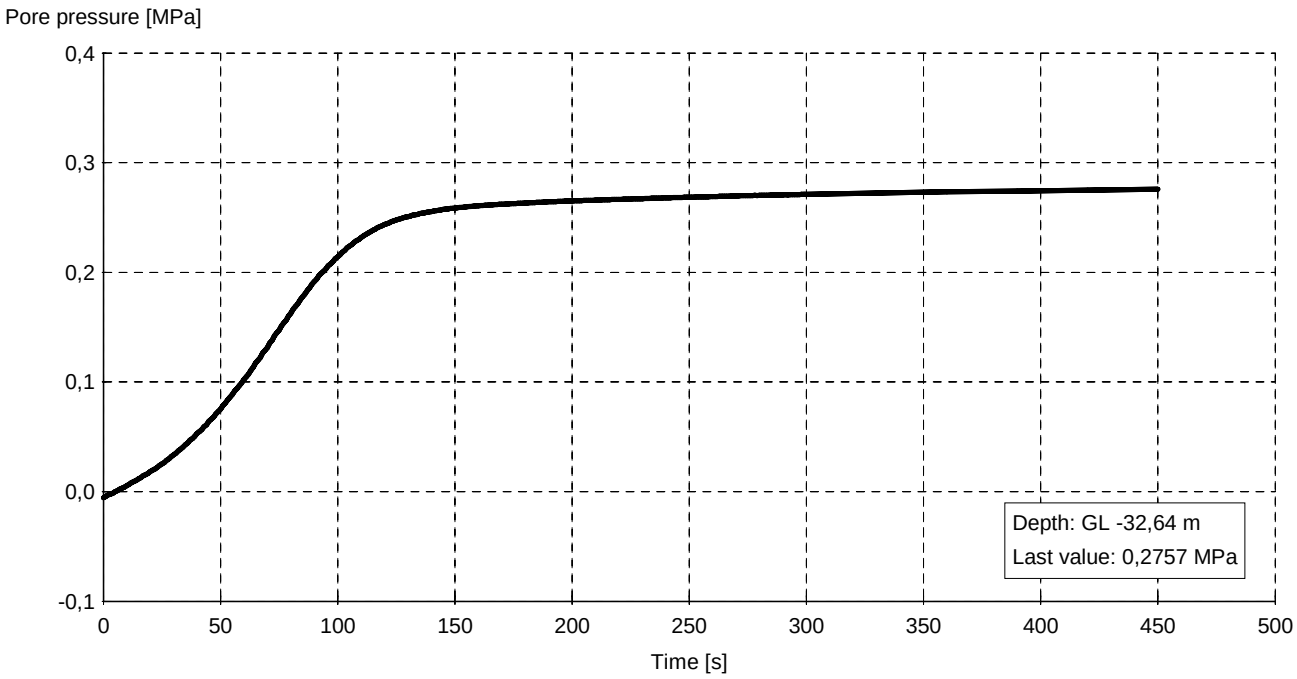
$c_h = 1,5 * (1,67.10^{-6}).10^{(1-\log(t50))} = 4,8.10^{-7}$ m²/s
Values from CPTask: $I_c = 2,9$; $Q_{tn} = 16,7$ --> $alpha_M = 14$
$M = alpha_M * q_n = 9,8$ MPa
$k_h = (c_h * y_w) / M = 3,4.10^{-10}$ m/s



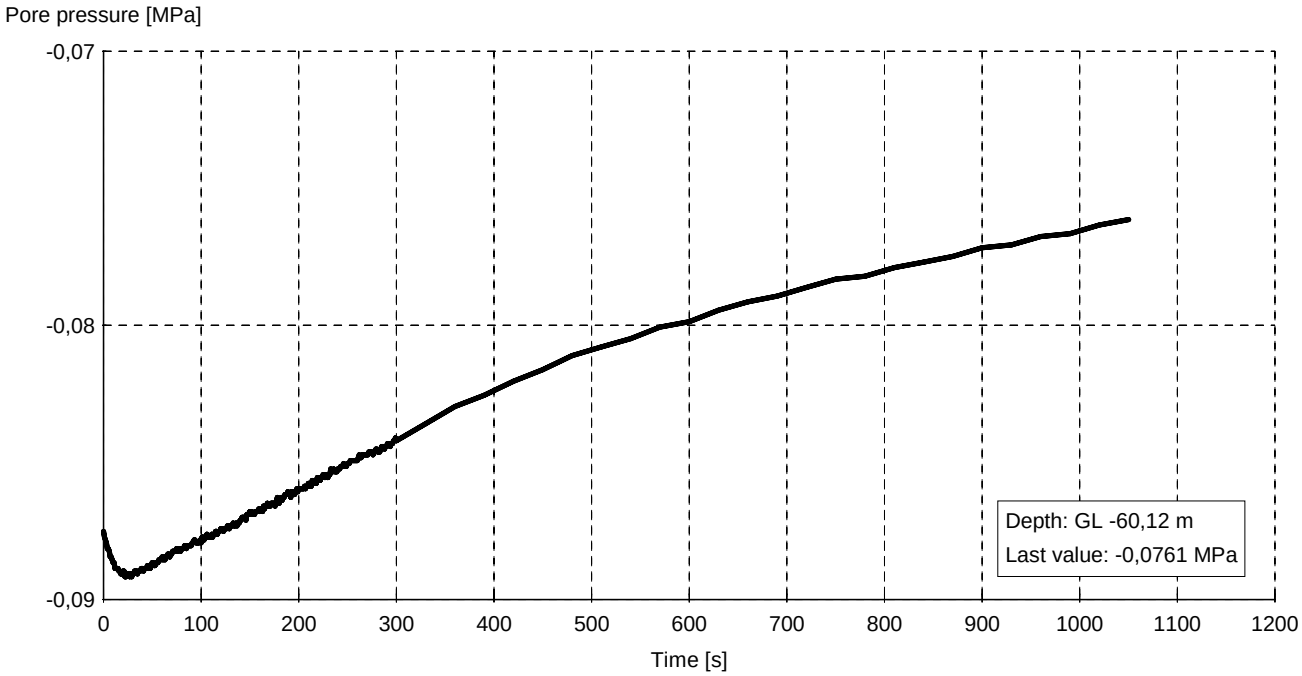
All dissipation tests

DISSIPATION TEST

Cpt : kcpt1b
TestNr. : 1 X :
Date : 22-6-2011 Y :
GL : MV 0m



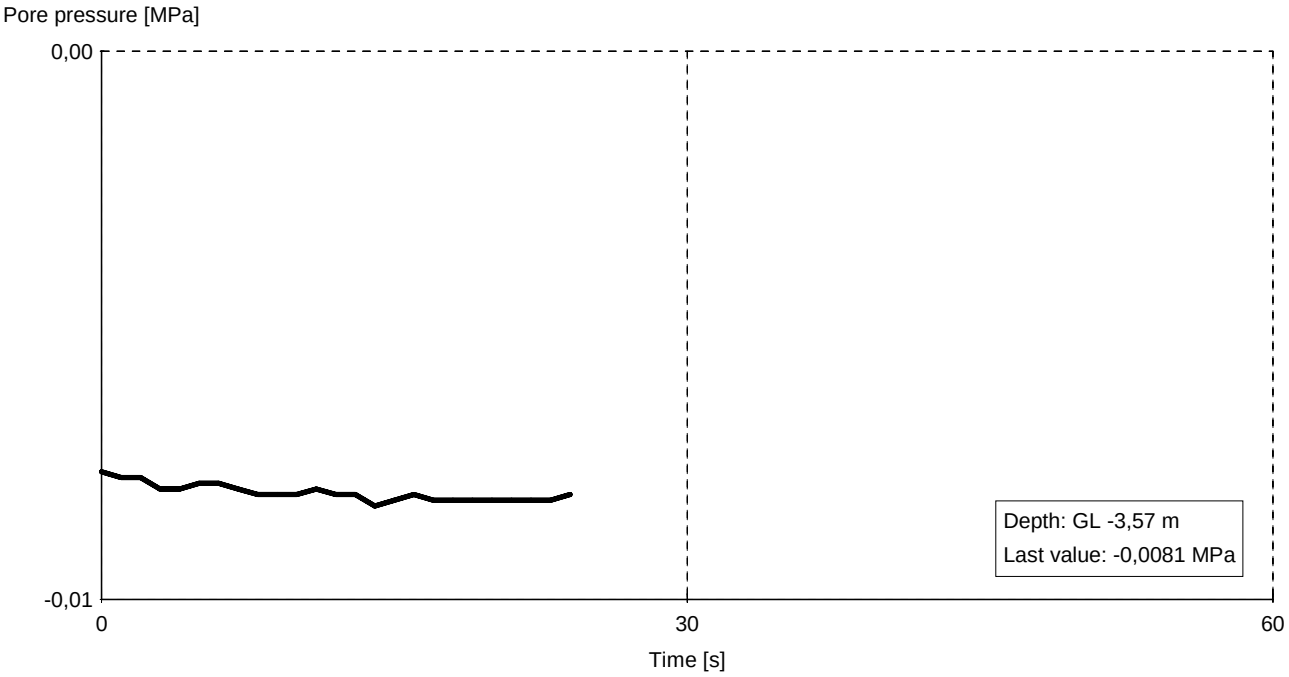
Cpt : kcpt1c
TestNr. : 1 X :
Date : 22-6-2011 Y :
GL : MV 0m



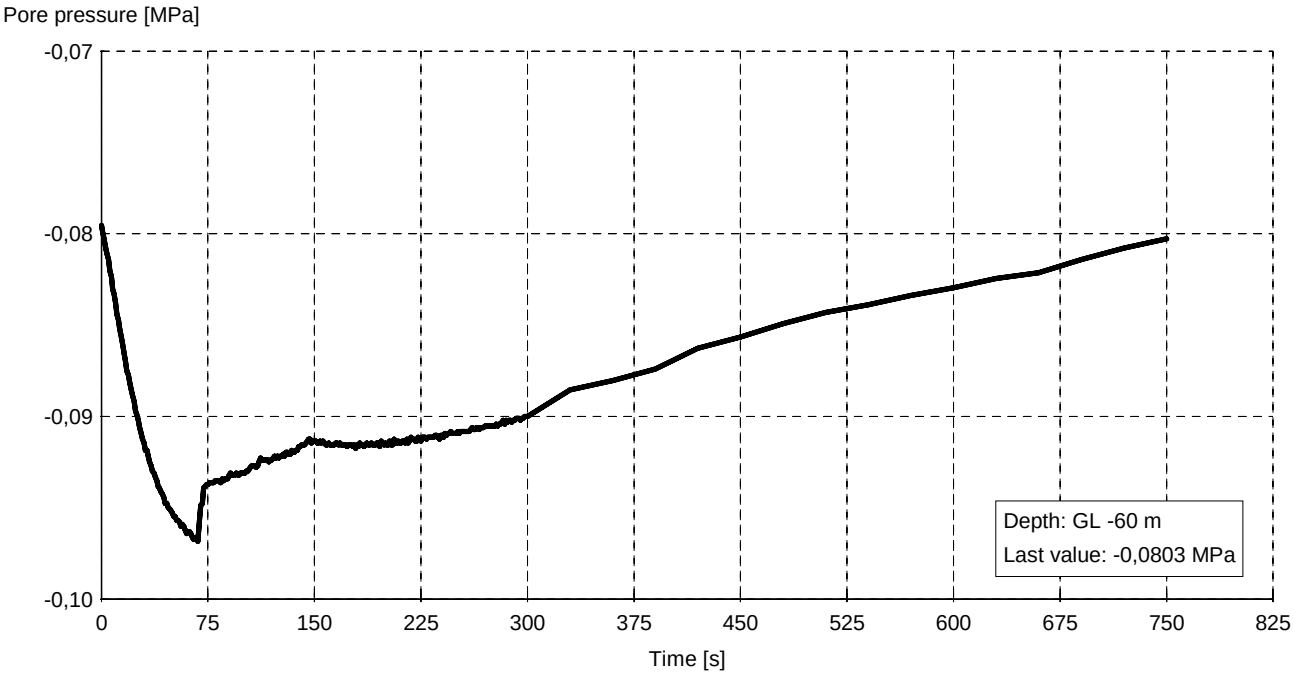
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt1a
TestNr. : 1 X :
Date : 22-6-2011 Y :
GL : MV 0m

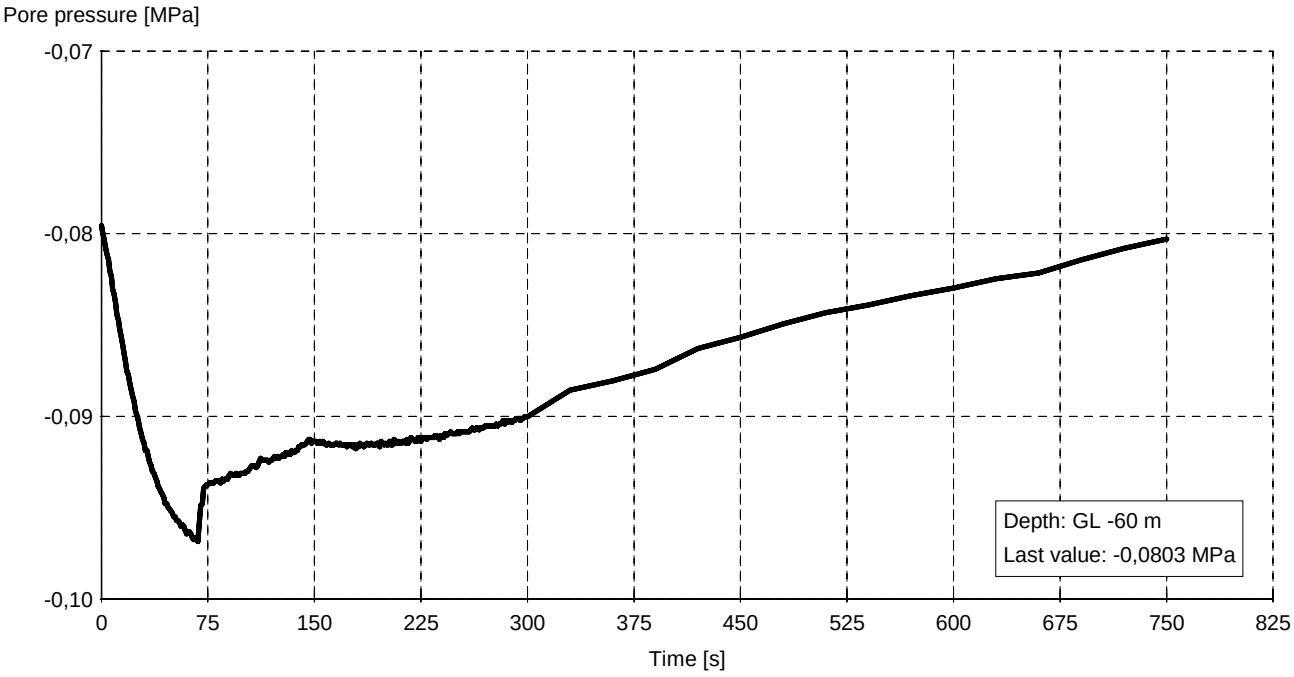


Cpt : kcpt3b
TestNr. : 1 X :
Date : 21-6-2011 Y :
GL : MV 0m

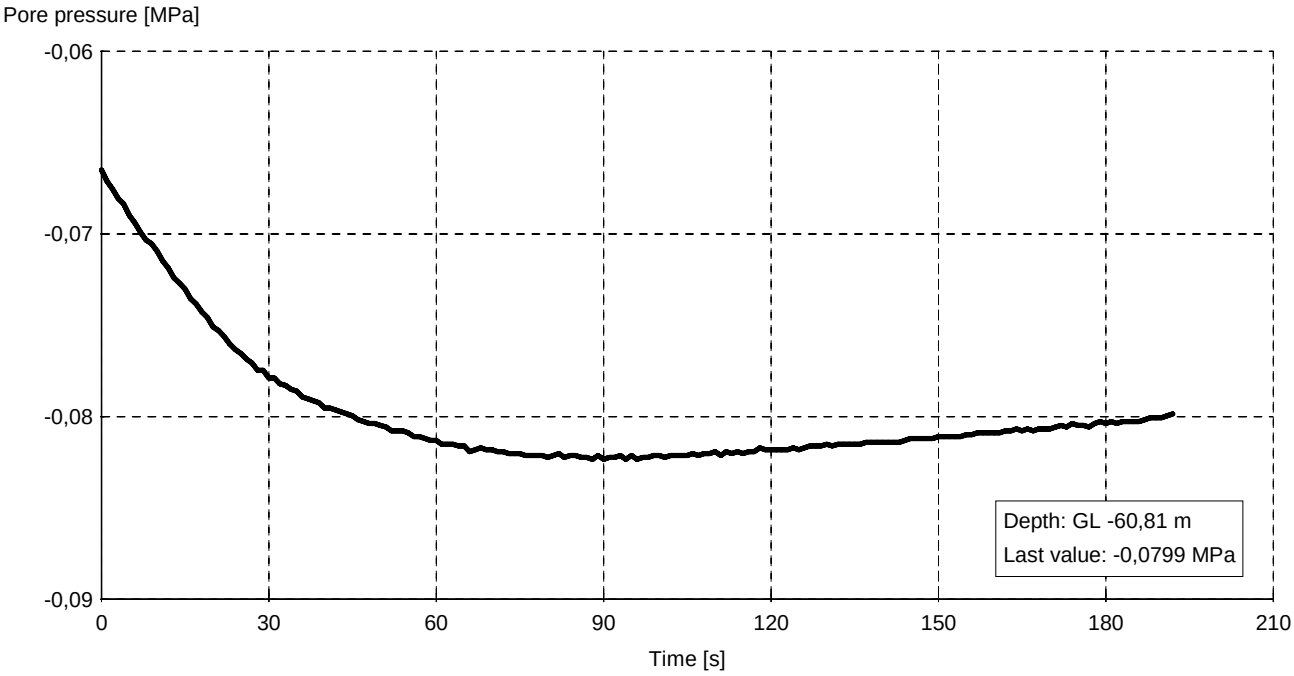


DISSIPATION TEST

Cpt : kcpt3b
TestNr. : 01 X : GL : MV 0m
Date : 21-6-2011 Y :



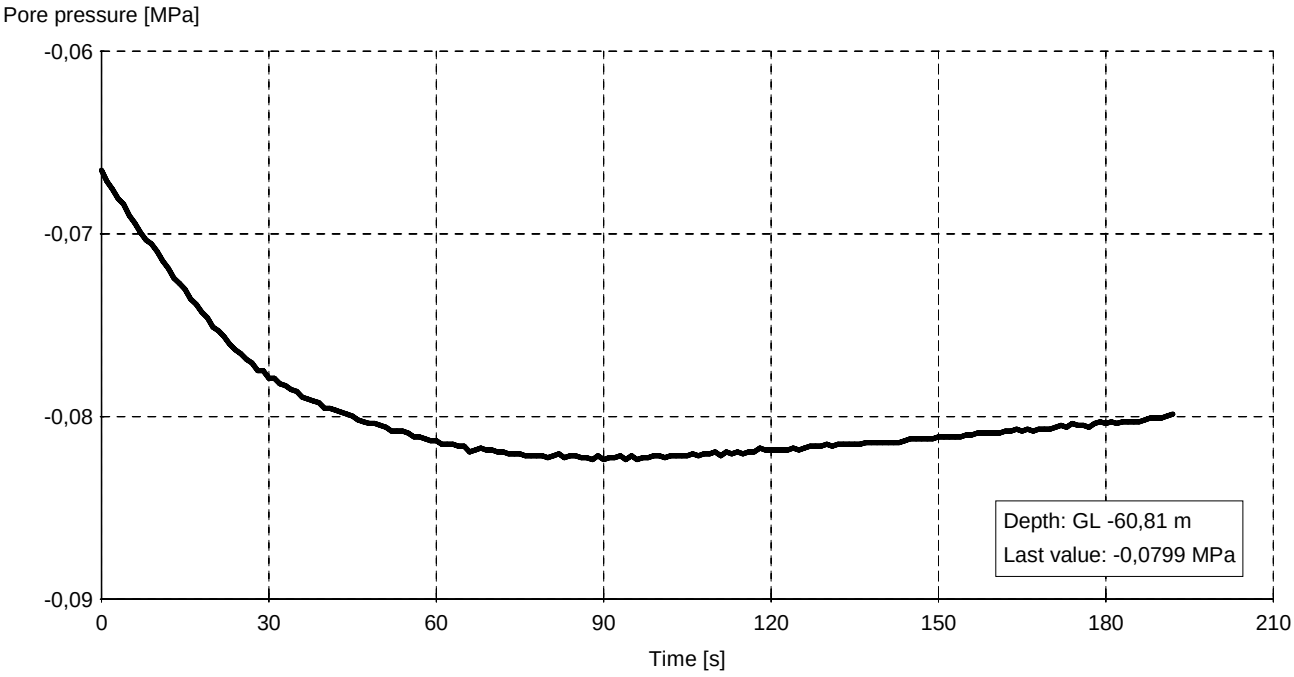
Cpt : kcpt3b
TestNr. : 2 X : GL : MV 0m
Date : 21-6-2011 Y :



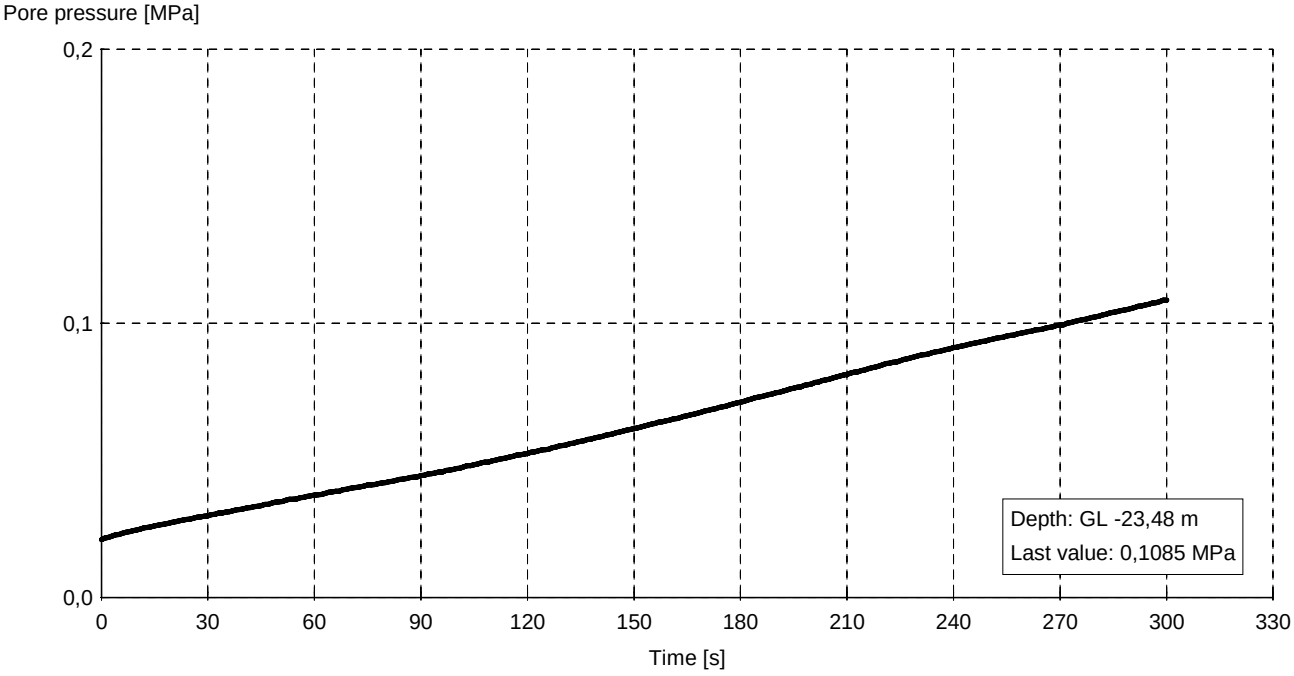
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt3b
TestNr. : 02 X : GL : MV 0m
Date : 21-6-2011 Y :



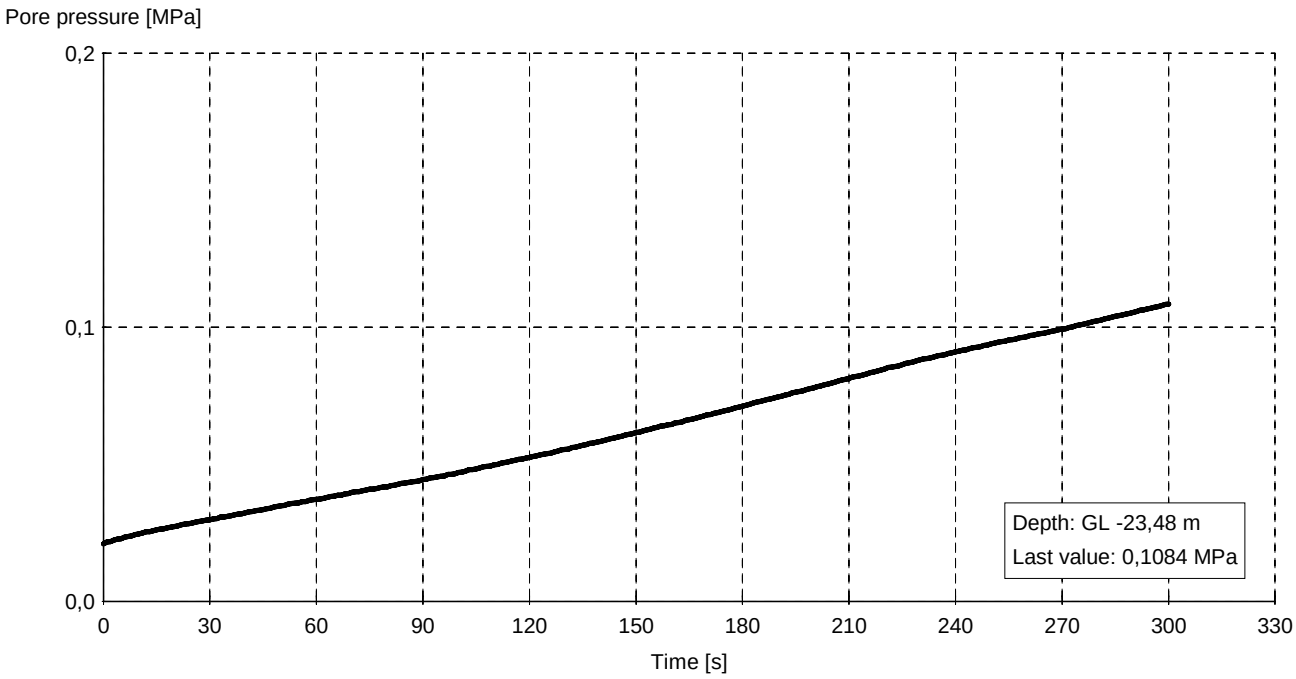
Cpt : kcpt4a
TestNr. : 1 X : GL : MV 0m
Date : 21-6-2011 Y :



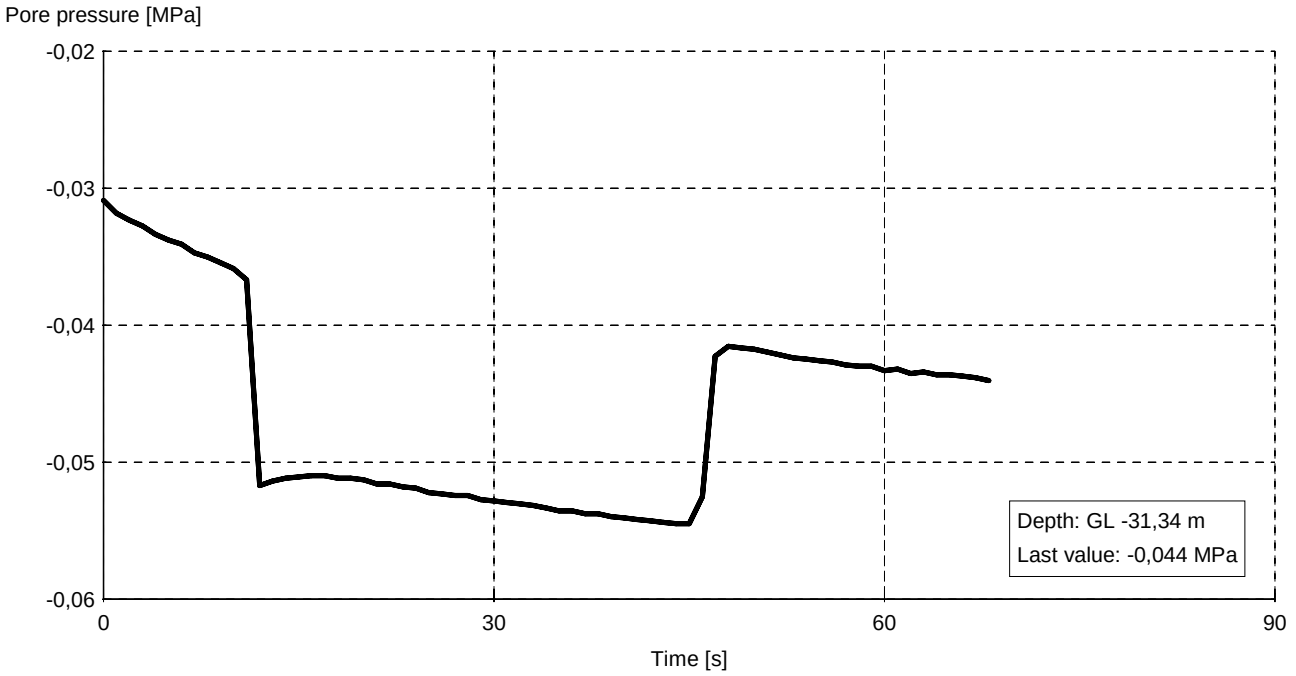
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt **: kcpt4a**
TestNr. : 01 X : GL : MV 0m
Date : 21-6-2011 Y :



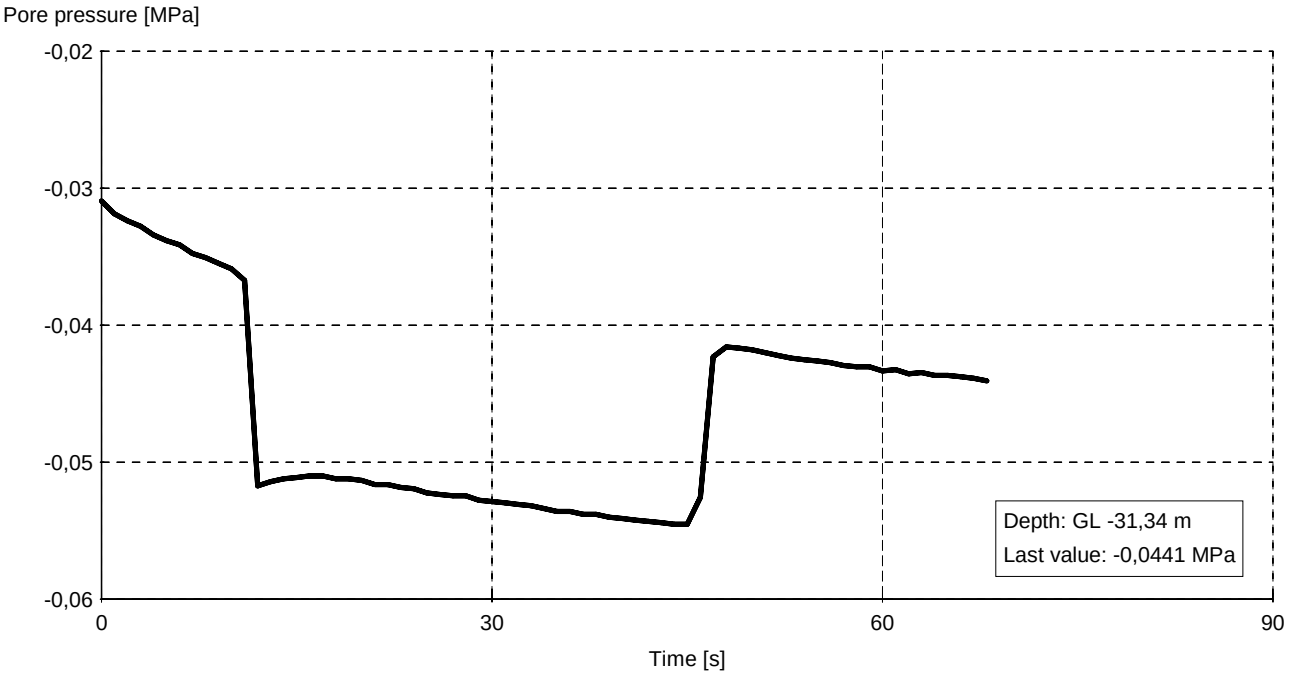
Cpt **: kcpt4a**
TestNr. : 2 X : GL : MV 0m
Date : 21-6-2011 Y :



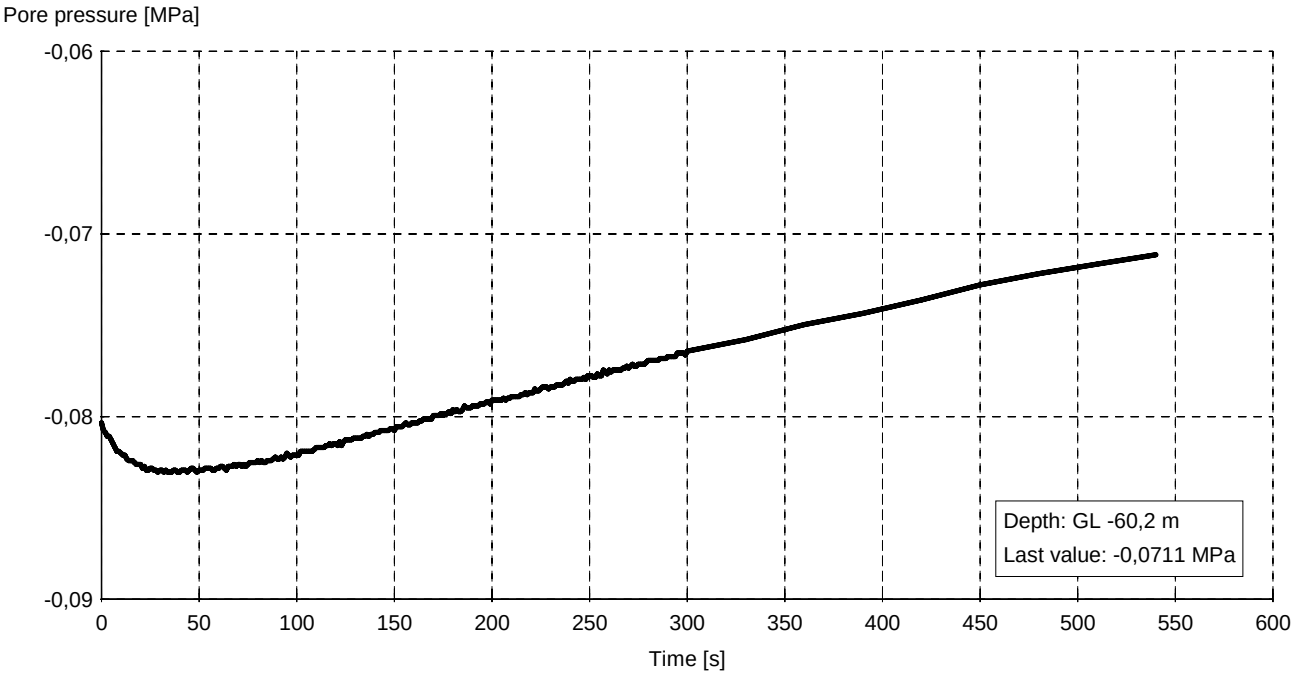
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt4a
TestNr. : 02 X : GL : MV 0m
Date : 21-6-2011 Y :



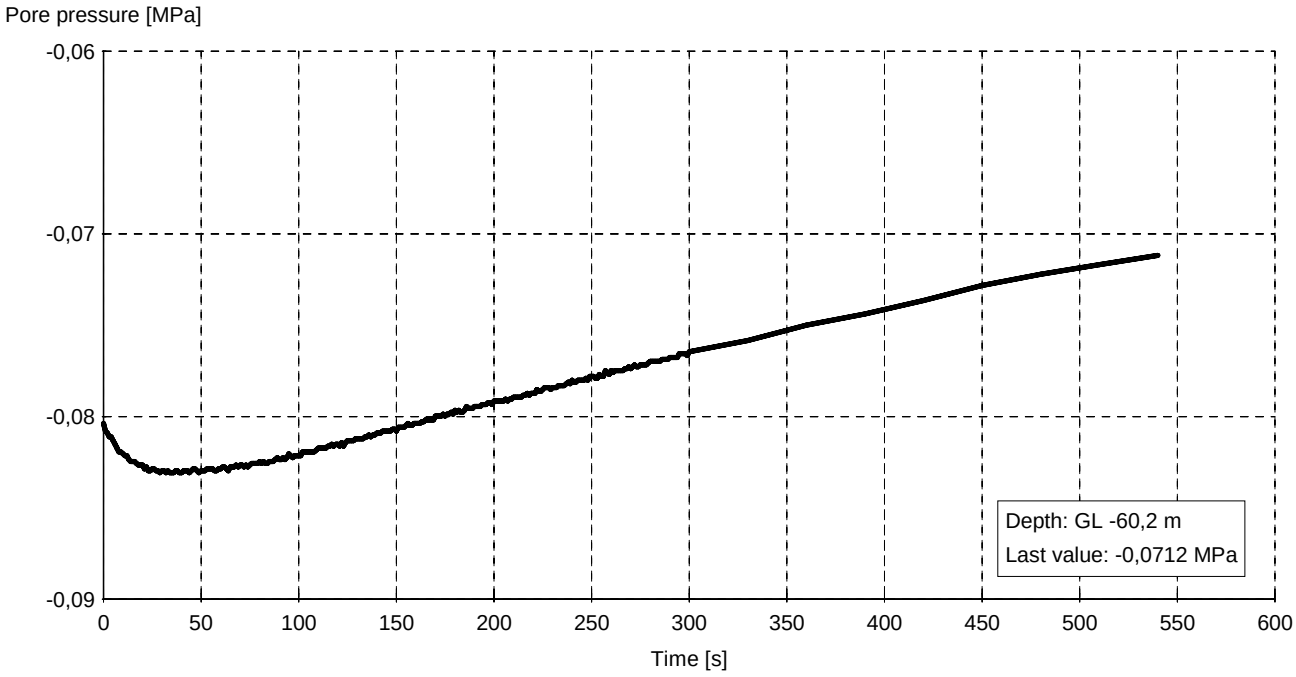
Cpt : kcpt4a
TestNr. : 3 X : GL : MV 0m
Date : 21-6-2011 Y :



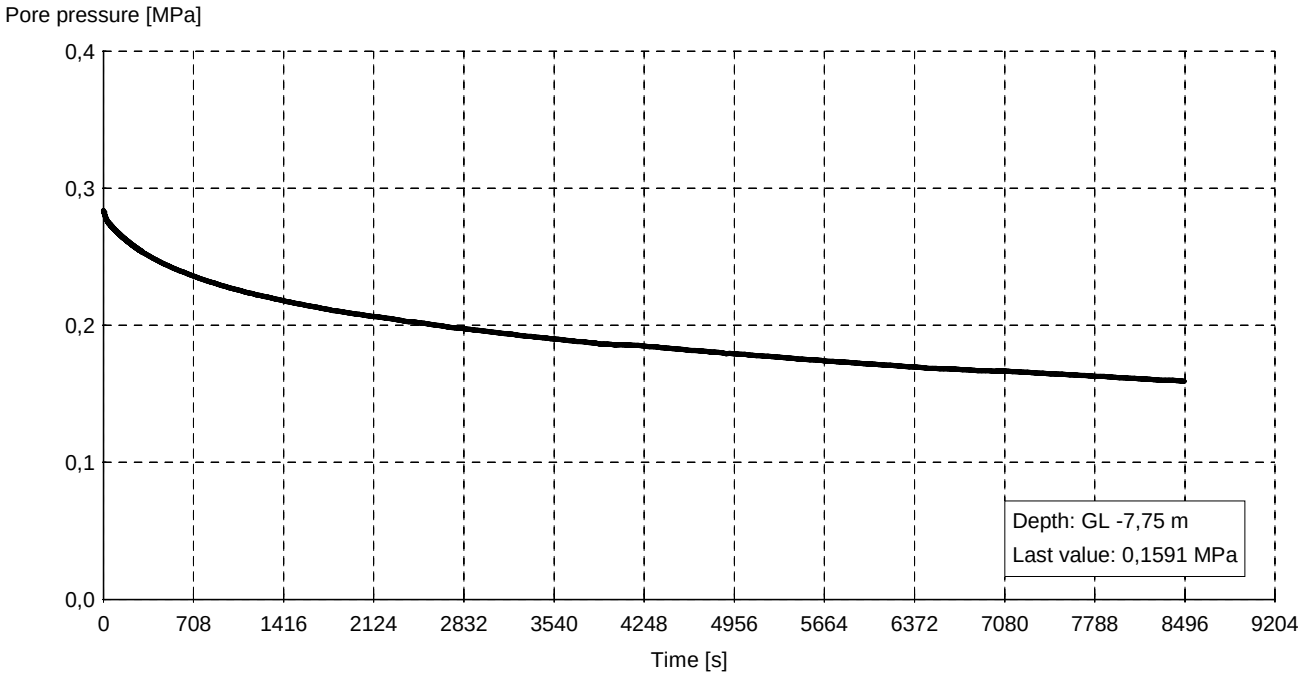
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt4a
TestNr. : 03 X : GL : MV 0m
Date : 21-6-2011 Y :



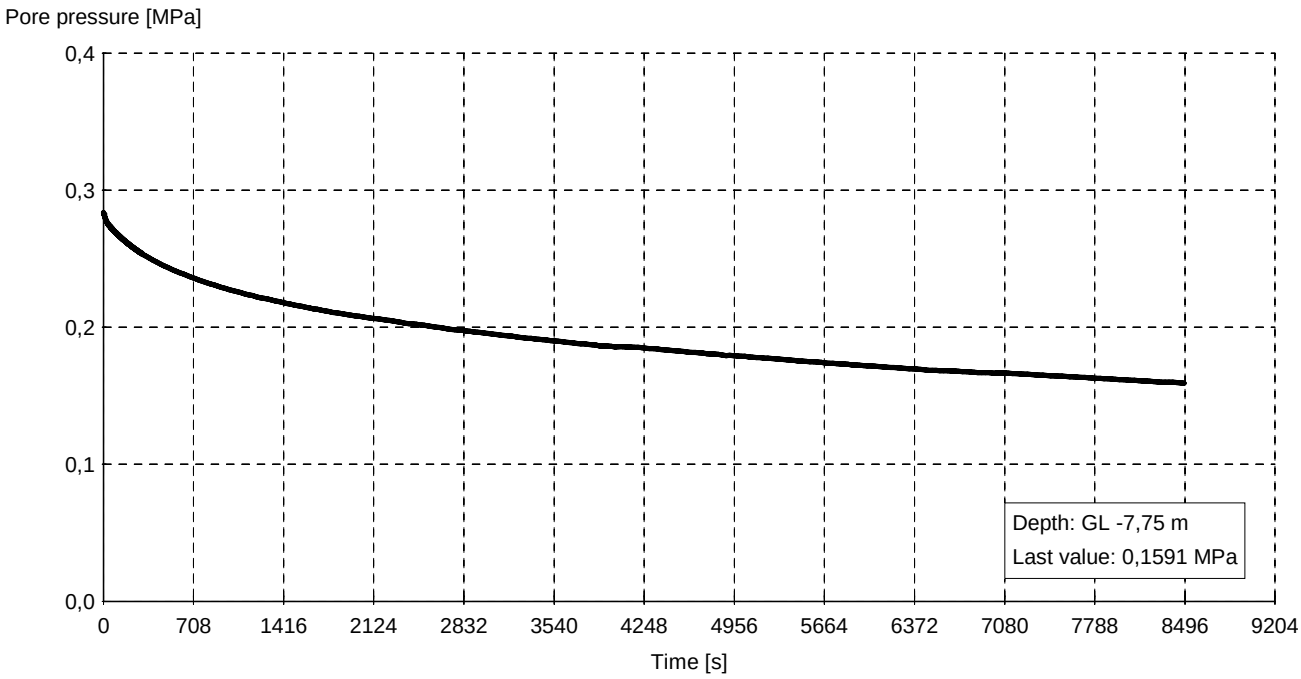
Cpt : kpct5
TestNr. : 01 X : GL : MV 0m
Date : 24-6-2011 Y :



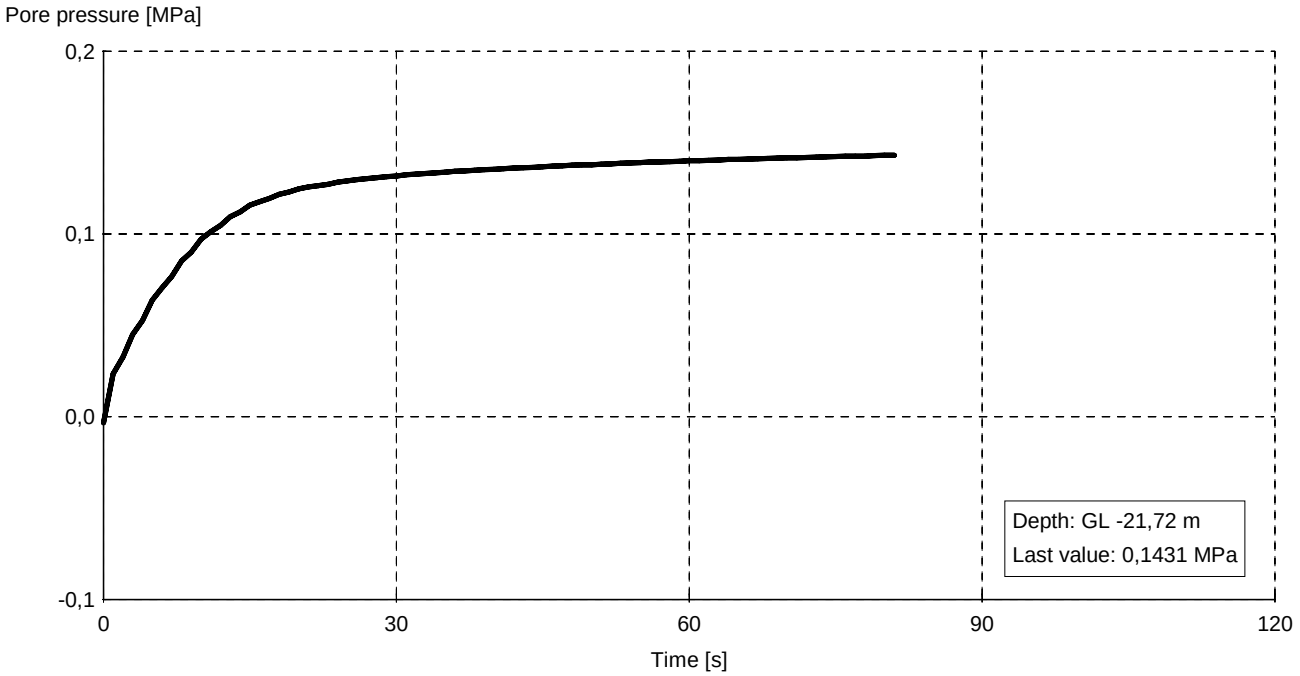
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt **: kpct5**
TestNr. : 1 X : GL : MV 0m
Date : 24-6-2011 Y :



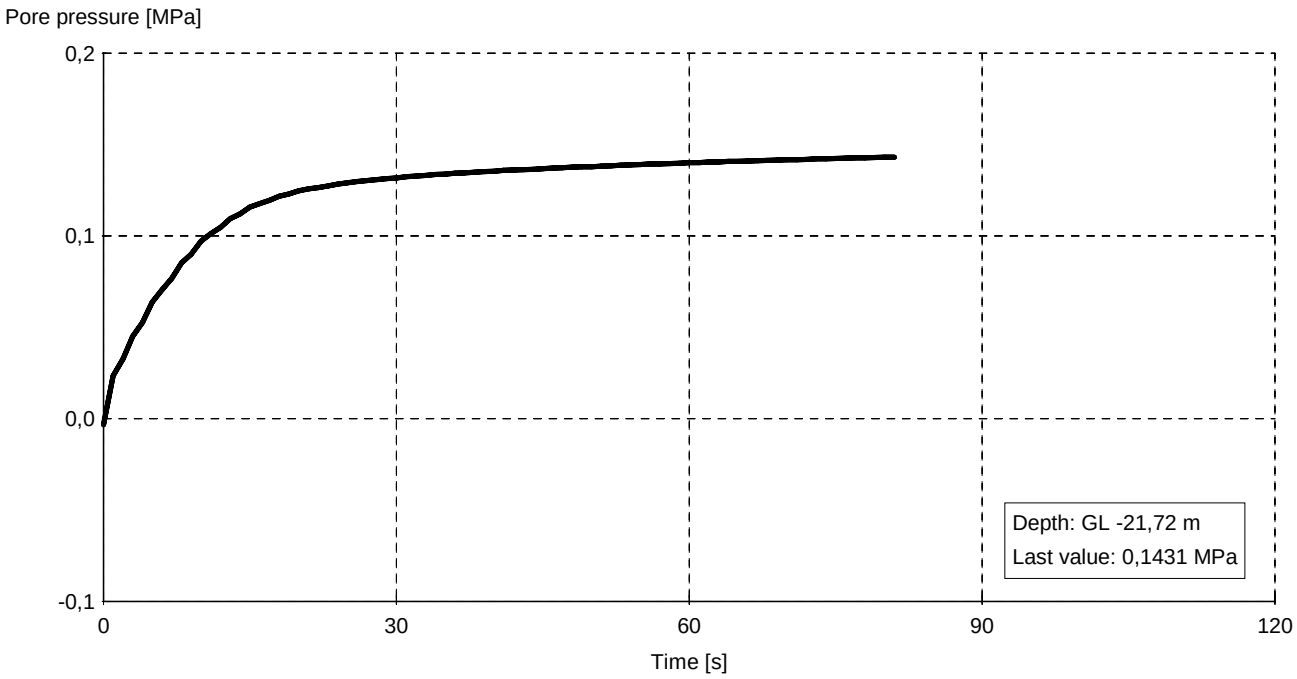
Cpt **: kpct5**
TestNr. : 2 X : GL : MV 0m
Date : 24-6-2011 Y :



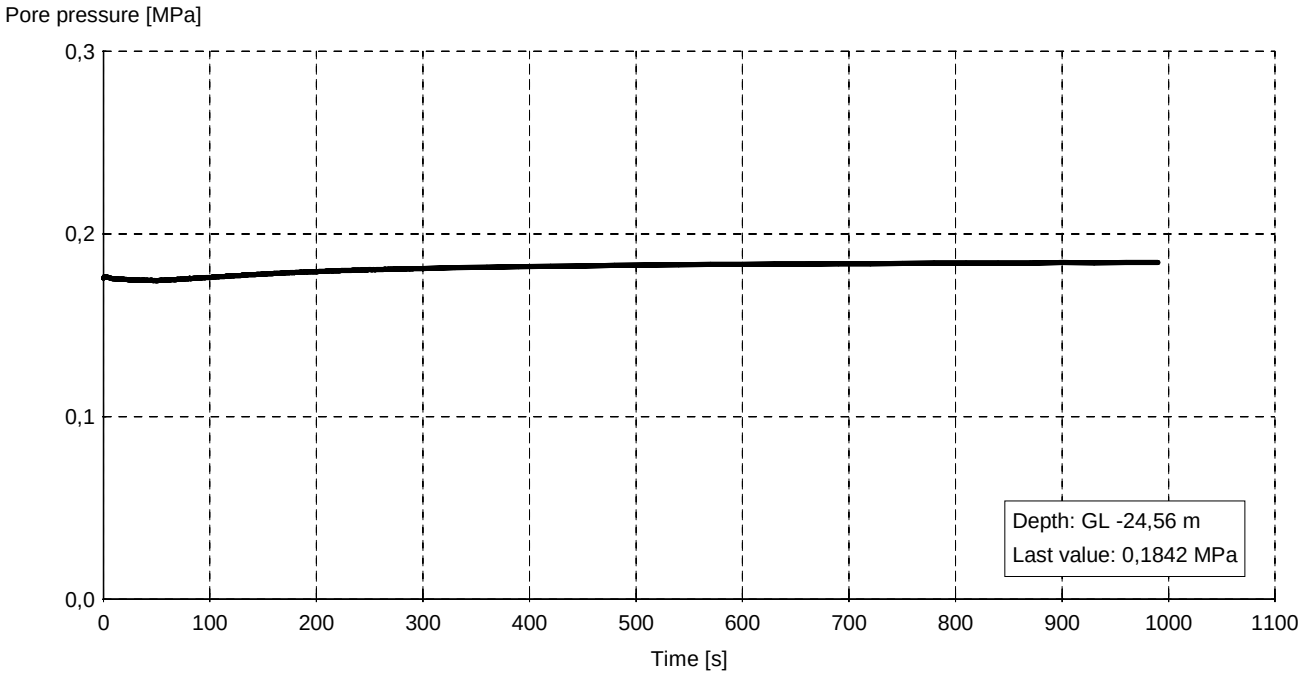
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt **: kpct5**
TestNr. : 02 X : GL : MV 0m
Date : 24-6-2011 Y :

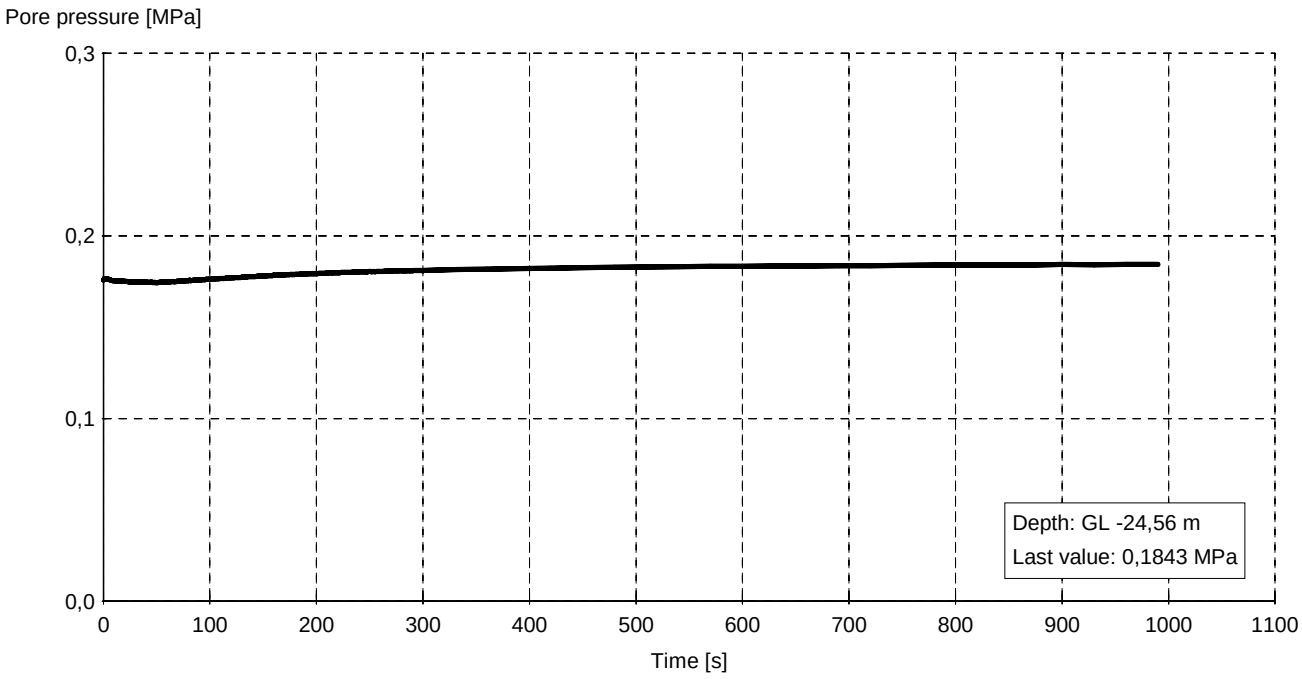


Cpt **: kpct5**
TestNr. : 3 X : GL : MV 0m
Date : 24-6-2011 Y :

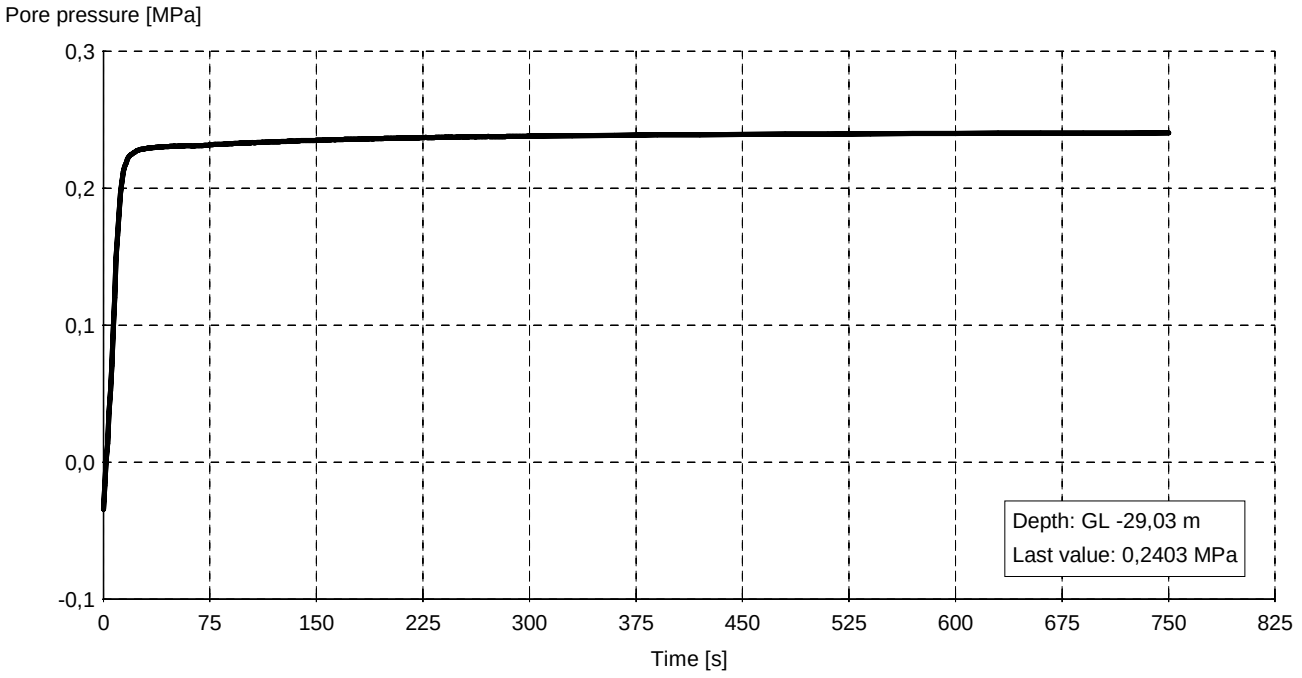


MOS GRONDMECHANICA

Cpt **: kpct5**
TestNr. : 03 X : GL : MV 0m
Date : 24-6-2011 Y :

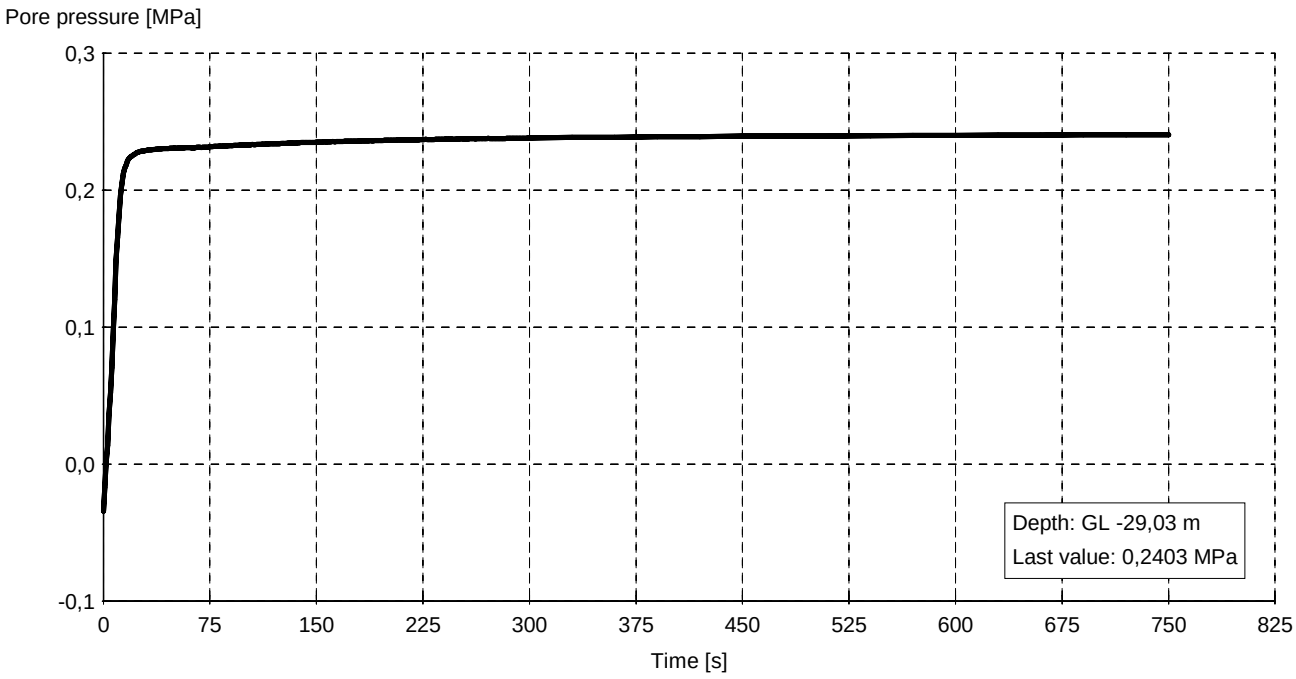


Cpt **: kpct5**
TestNr. : 4 X : GL : MV 0m
Date : 24-6-2011 Y :

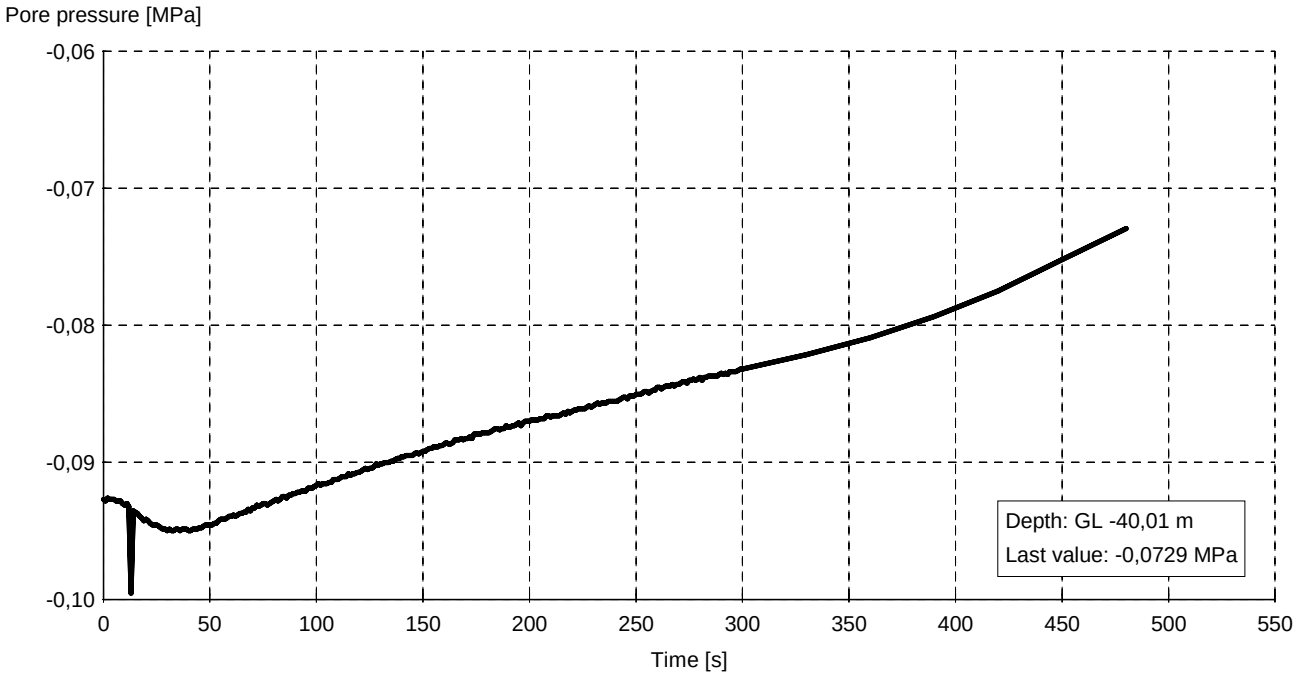


DISSIPATION TEST

Cpt **: kpct5**
TestNr. : 04 X : GL : MV 0m
Date : 24-6-2011 Y :

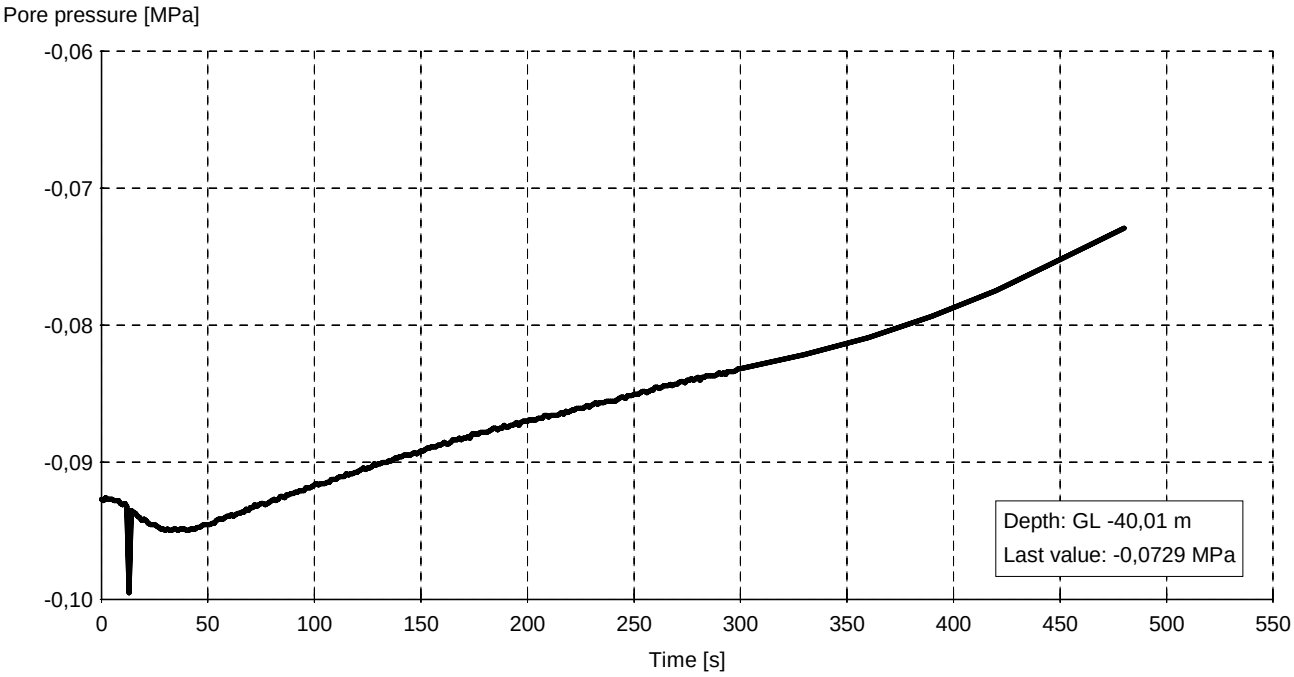


Cpt **: kpct5**
TestNr. : 5 X : GL : MV 0m
Date : 24-6-2011 Y :

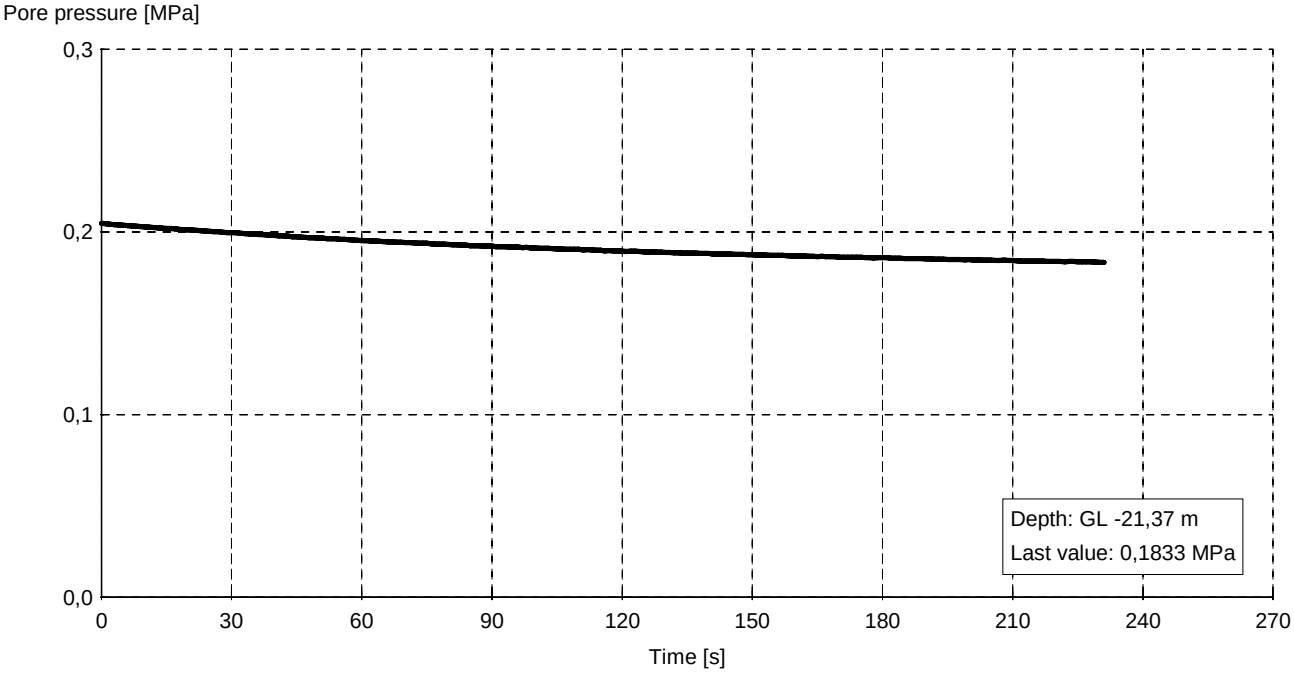


MOS GRONDMECHANICA

Cpt : **kpct5**
TestNr. : 05 X : GL : MV 0m
Date : 24-6-2011 Y :

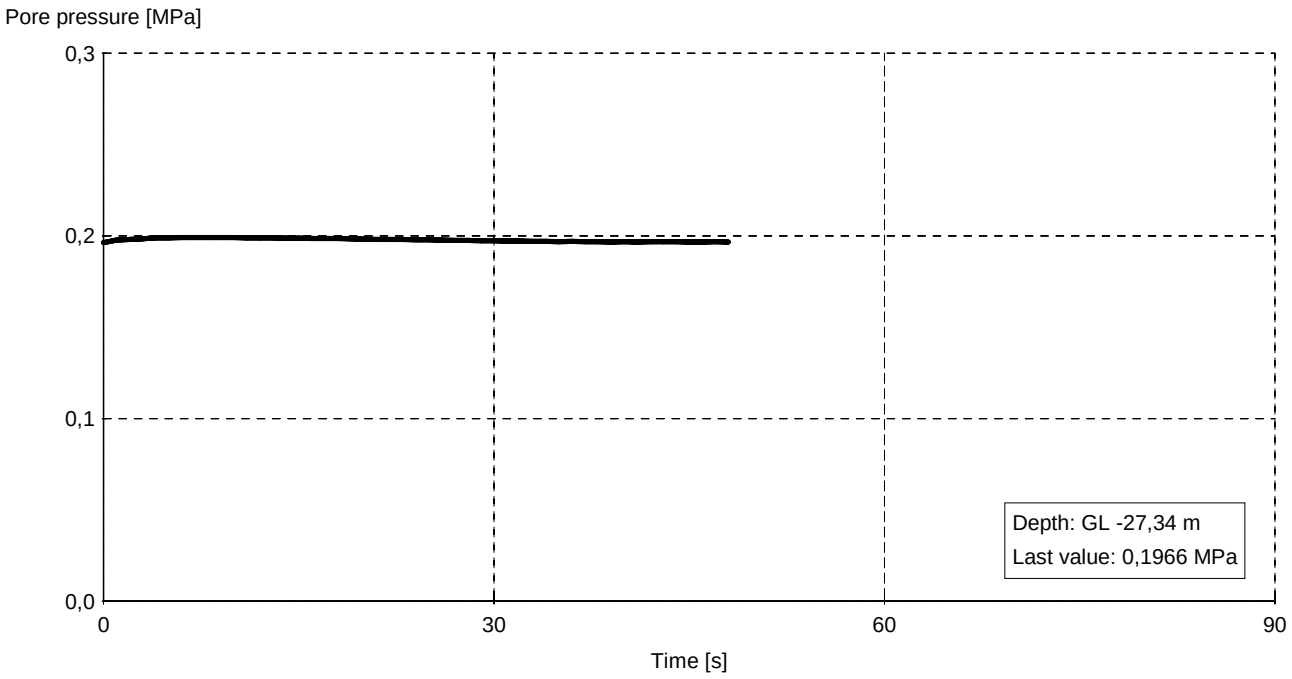


Cpt : **kcpt6**
TestNr. : 1 X : GL : MV 0m
Date : 8-7-2011 Y :

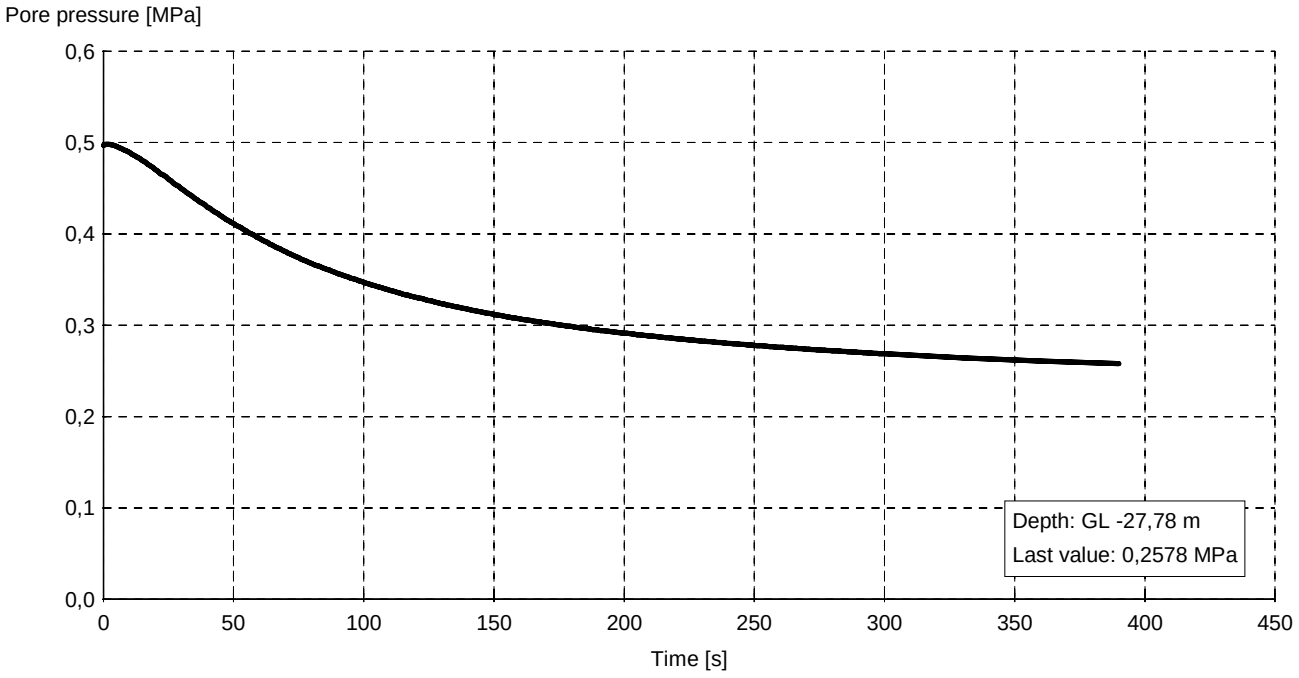


DISSIPATION TEST

Cpt **: kcpt6**
TestNr. : 2 X : GL : MV 0m
Date : 8-7-2011 Y :



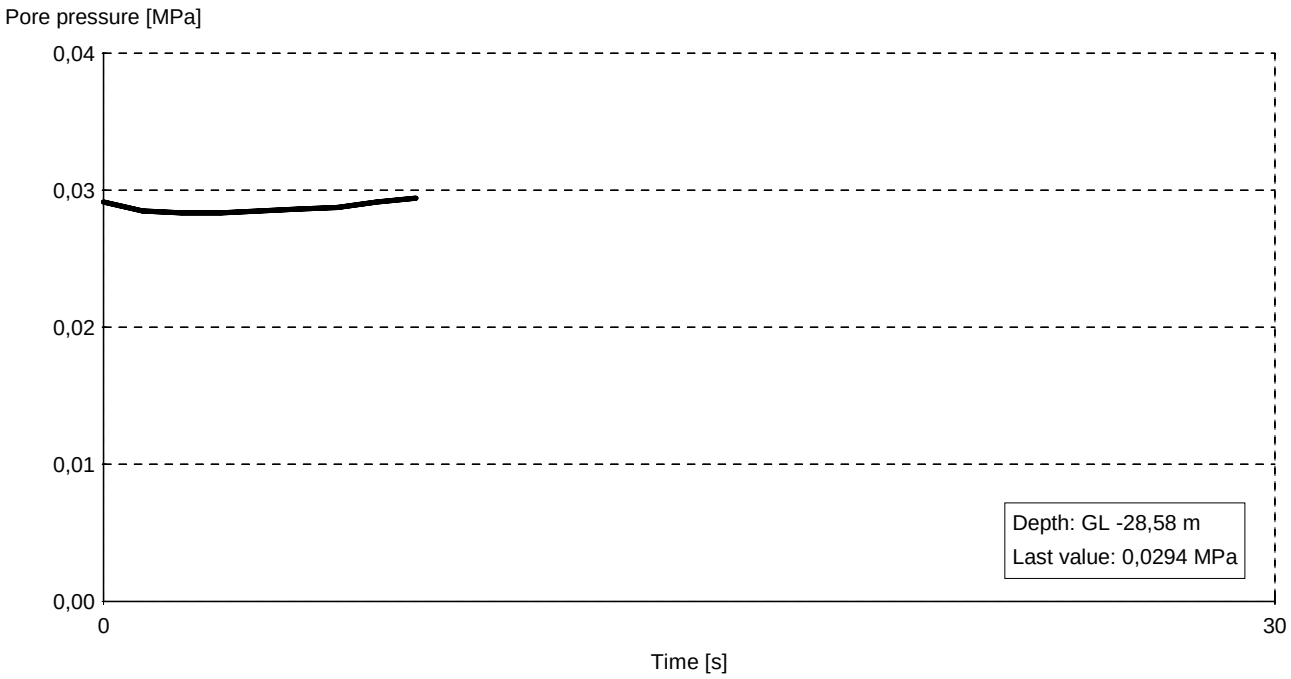
Cpt **: kcpt6**
TestNr. : 3 X : GL : MV 0m
Date : 8-7-2011 Y :



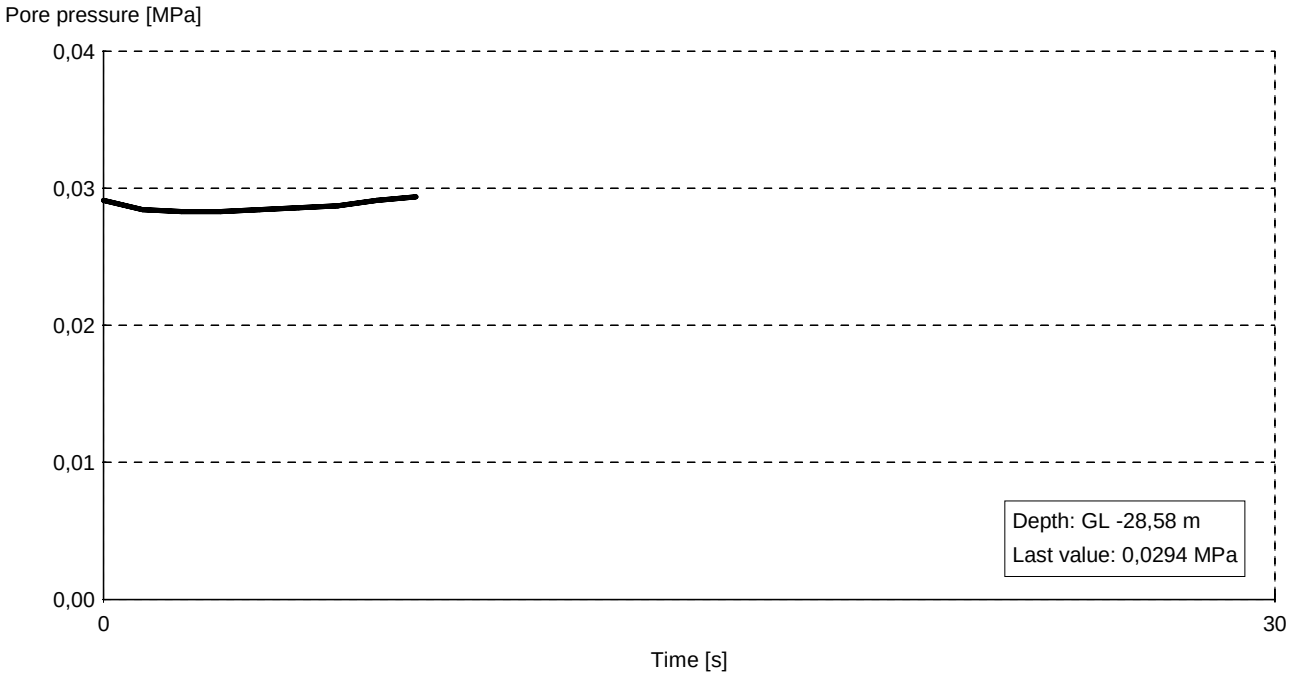
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt7
TestNr. : 01 X : GL : MV 0m
Date : 6-7-2011 Y :

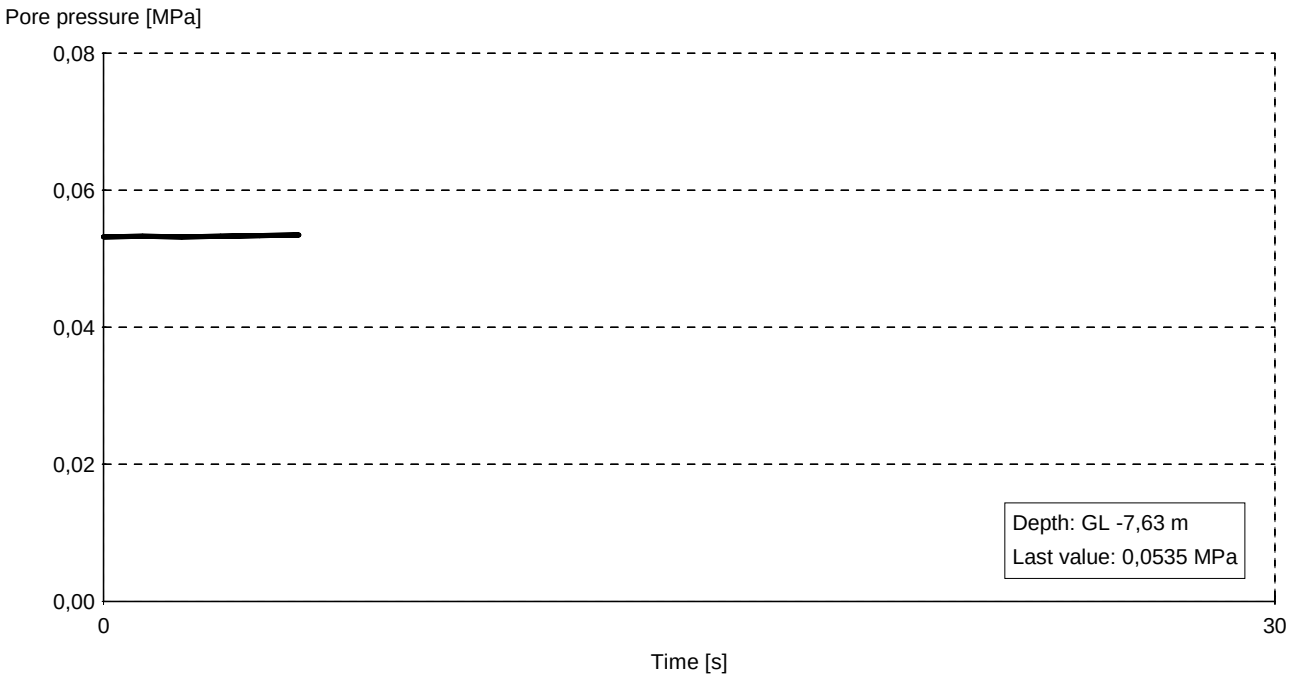


Cpt : kcpt7
TestNr. : 1 X : GL : MV 0m
Date : 6-7-2011 Y :

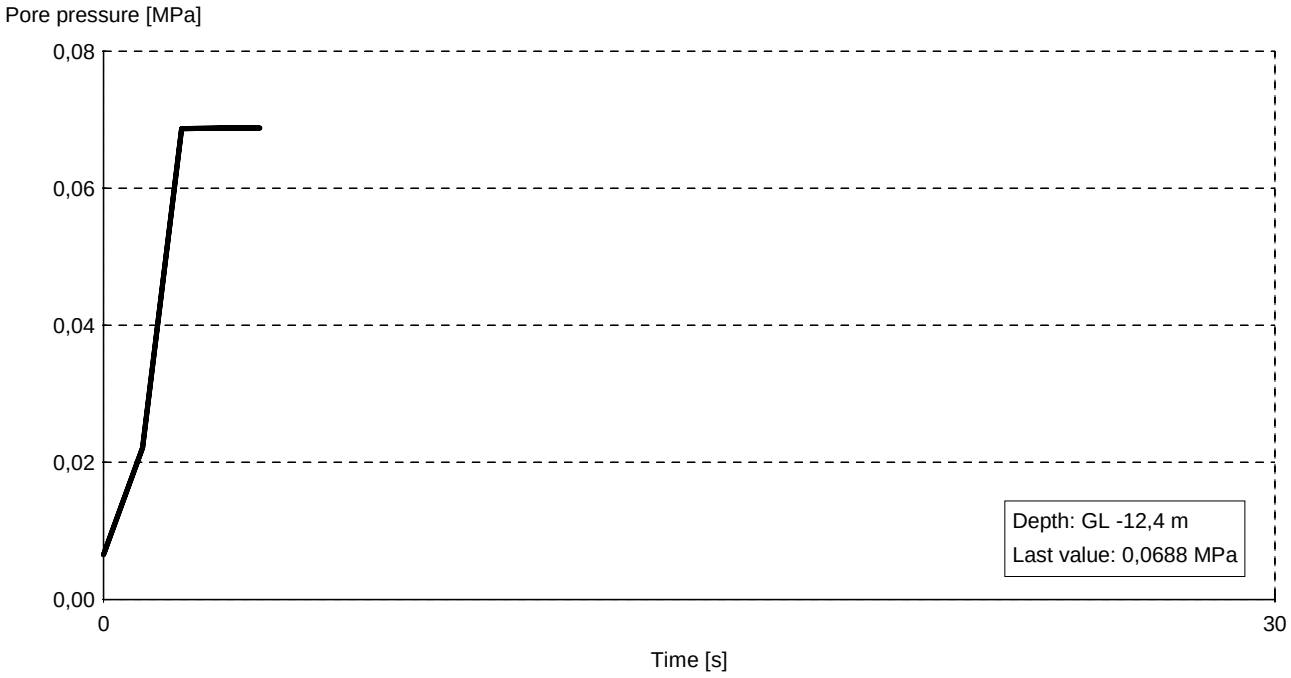


DISSIPATION TEST

Cpt : kcpt8a
TestNr. : 1 X : GL : MV 0m
Date : 27-6-2011 Y :

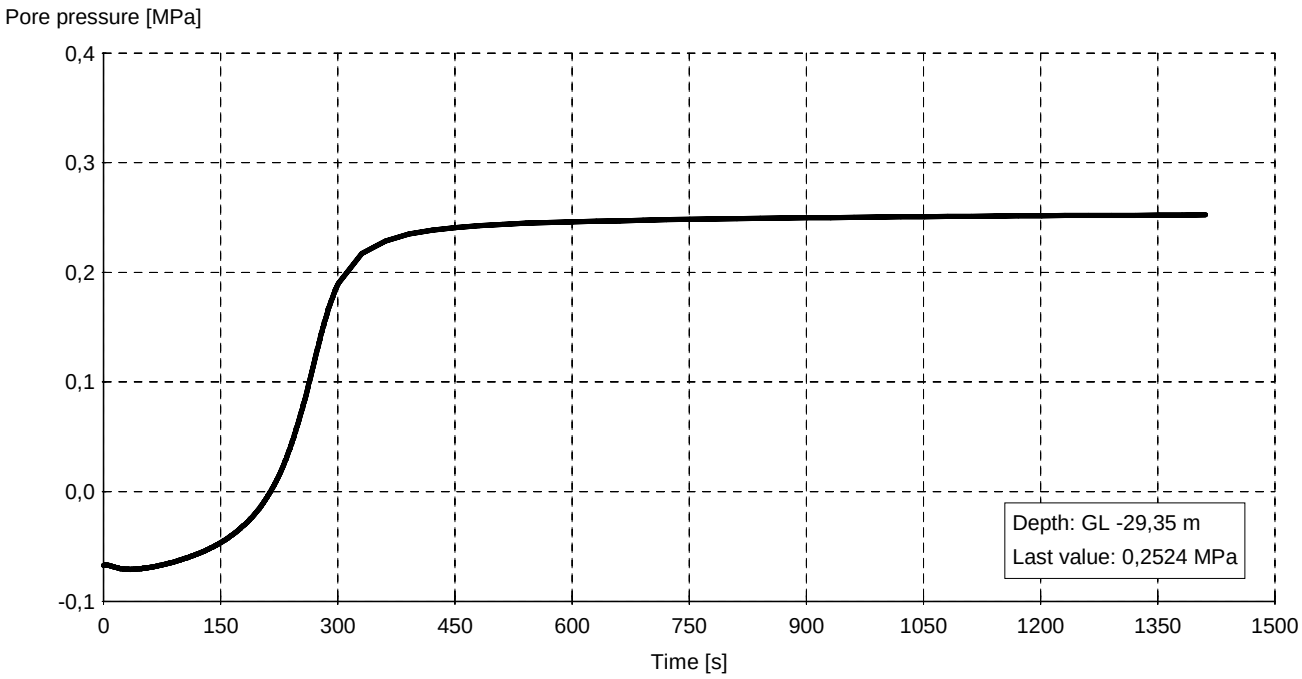


Cpt : kcpt8a
TestNr. : 2 X : GL : MV 0m
Date : 27-6-2011 Y :

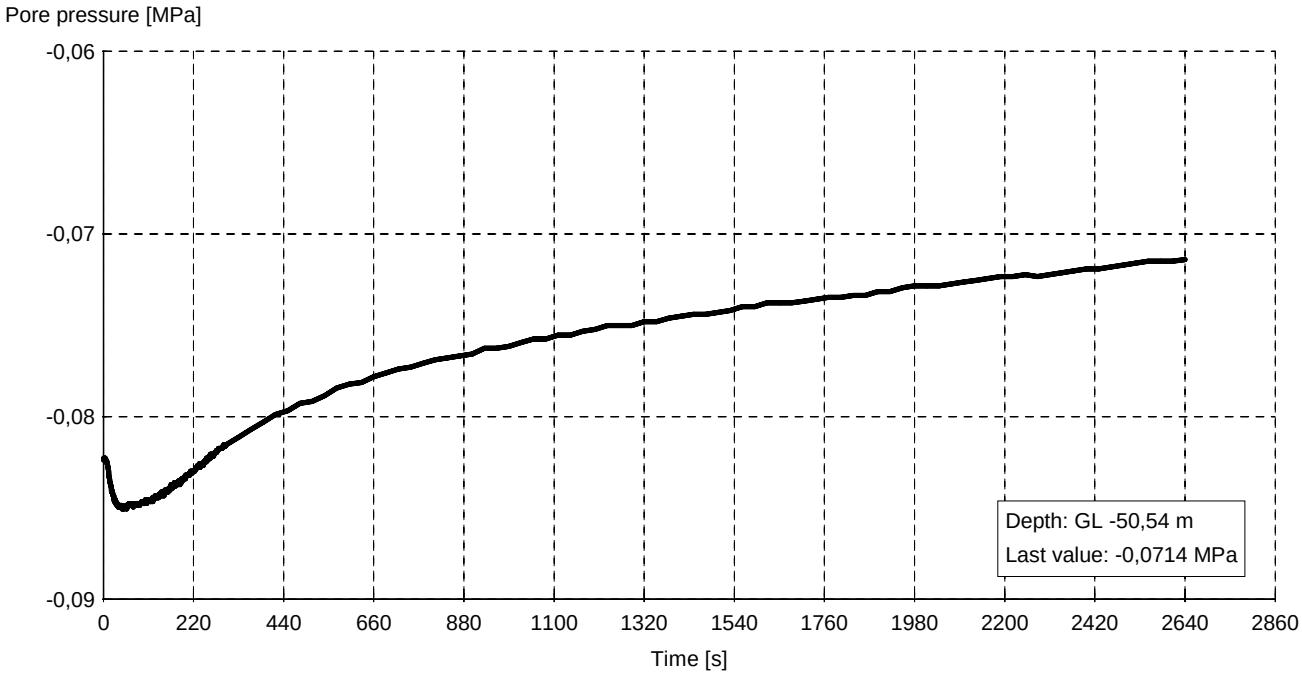


DISSIPATION TEST

Cpt **: kcpt8a**
TestNr. : 3 X : GL : MV 0m
Date : 27-6-2011 Y :



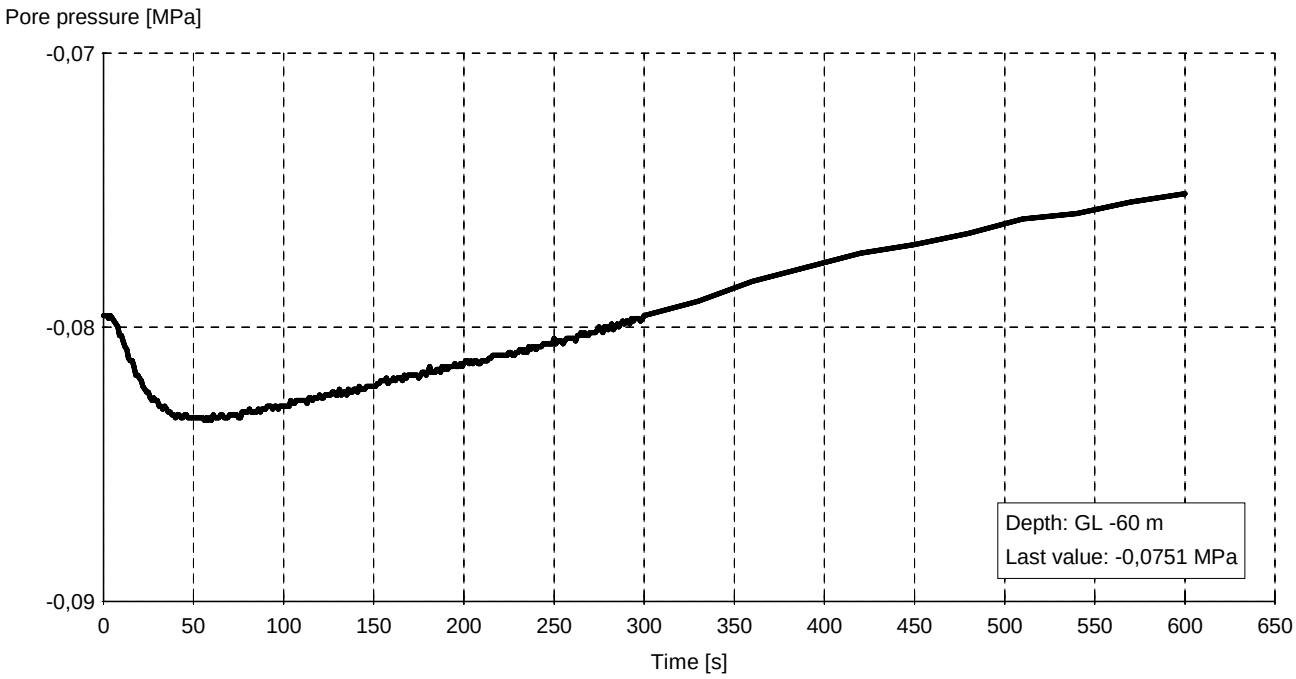
Cpt **: kcpt8a**
TestNr. : 4 X : GL : MV 0m
Date : 27-6-2011 Y :



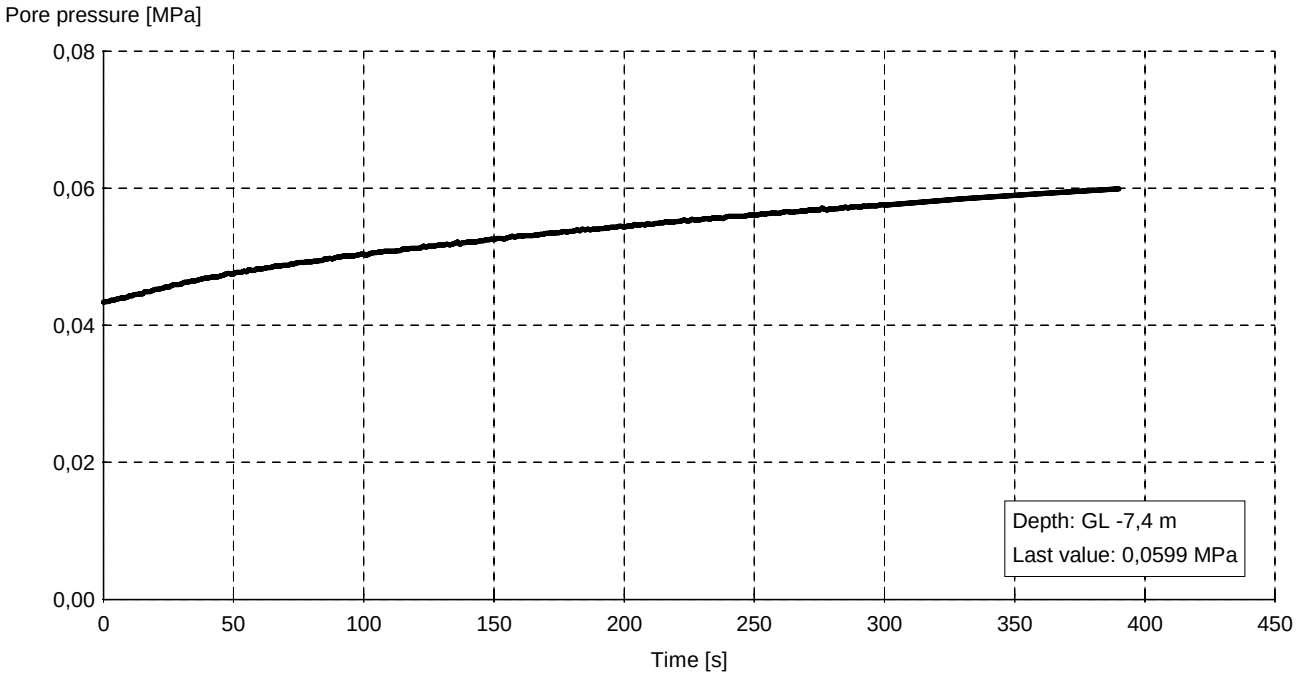
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt8a
TestNr. : 5 X :
Date : 27-6-2011 Y :
GL : MV 0m



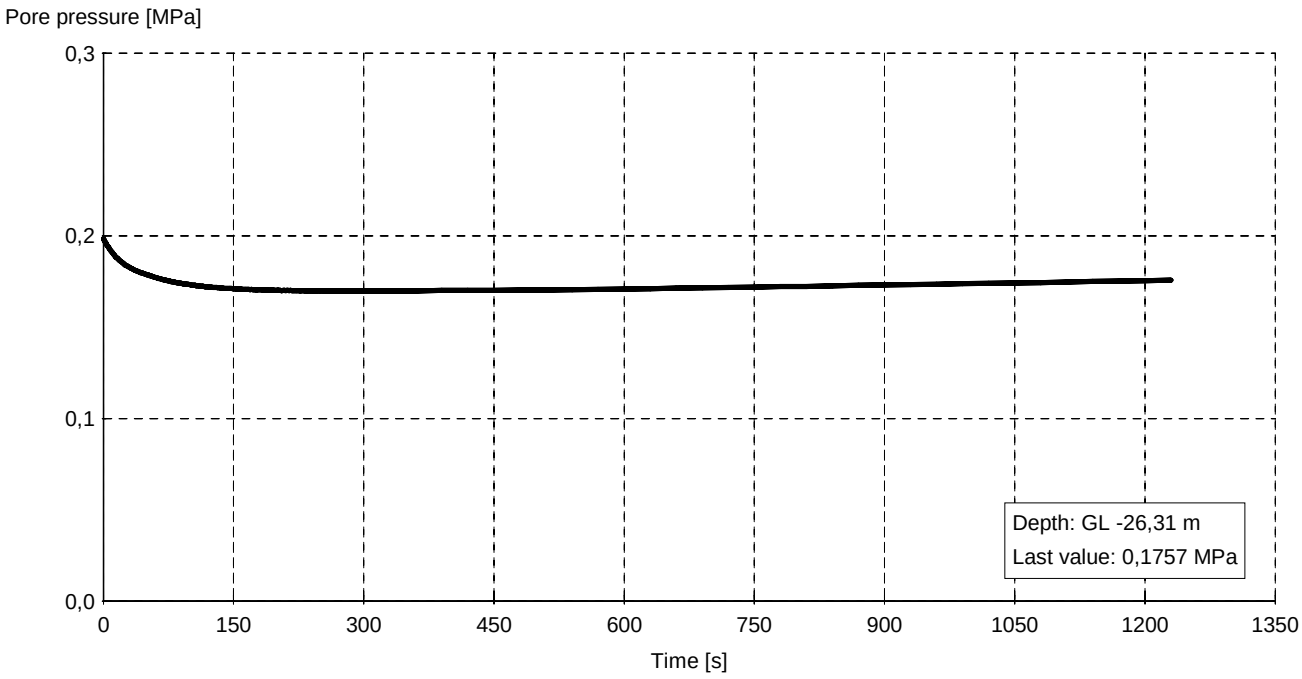
Cpt : kcpt10c
TestNr. : 1 X :
Date : 27-6-2011 Y :
GL : MV 0m



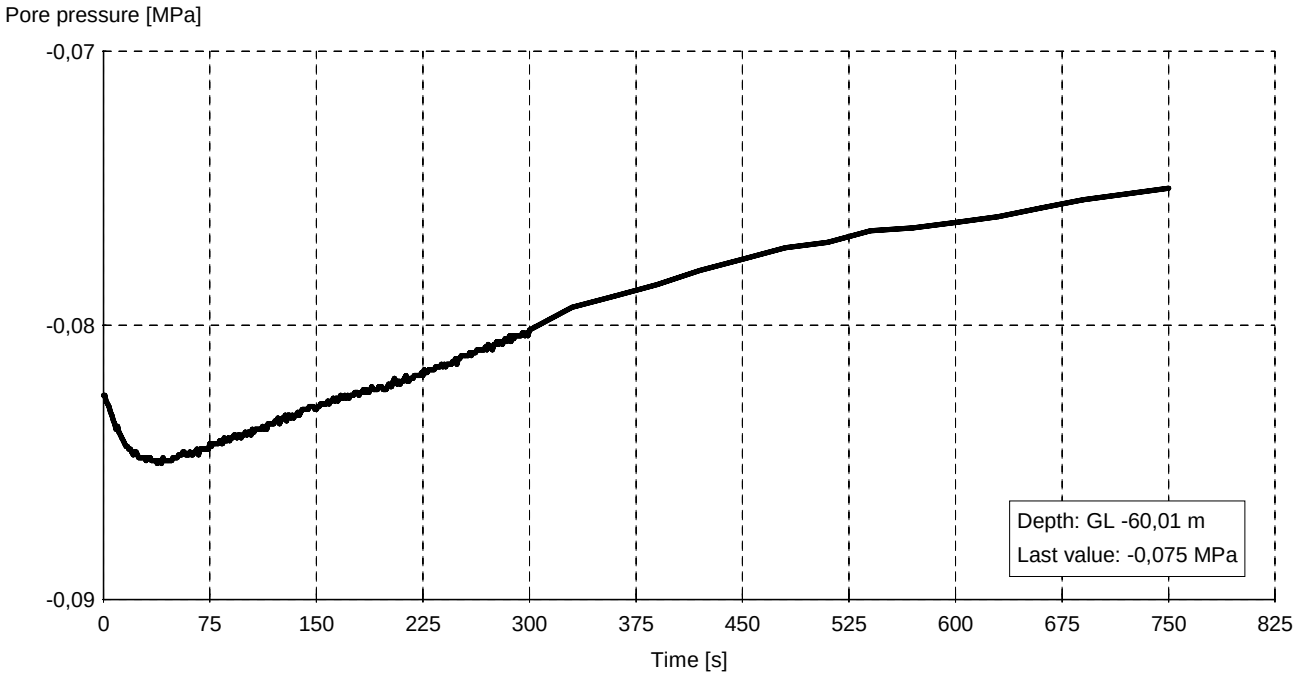
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt **: kcpt10c**
TestNr. : 2 X : GL : MV 0m
Date : 27-6-2011 Y :



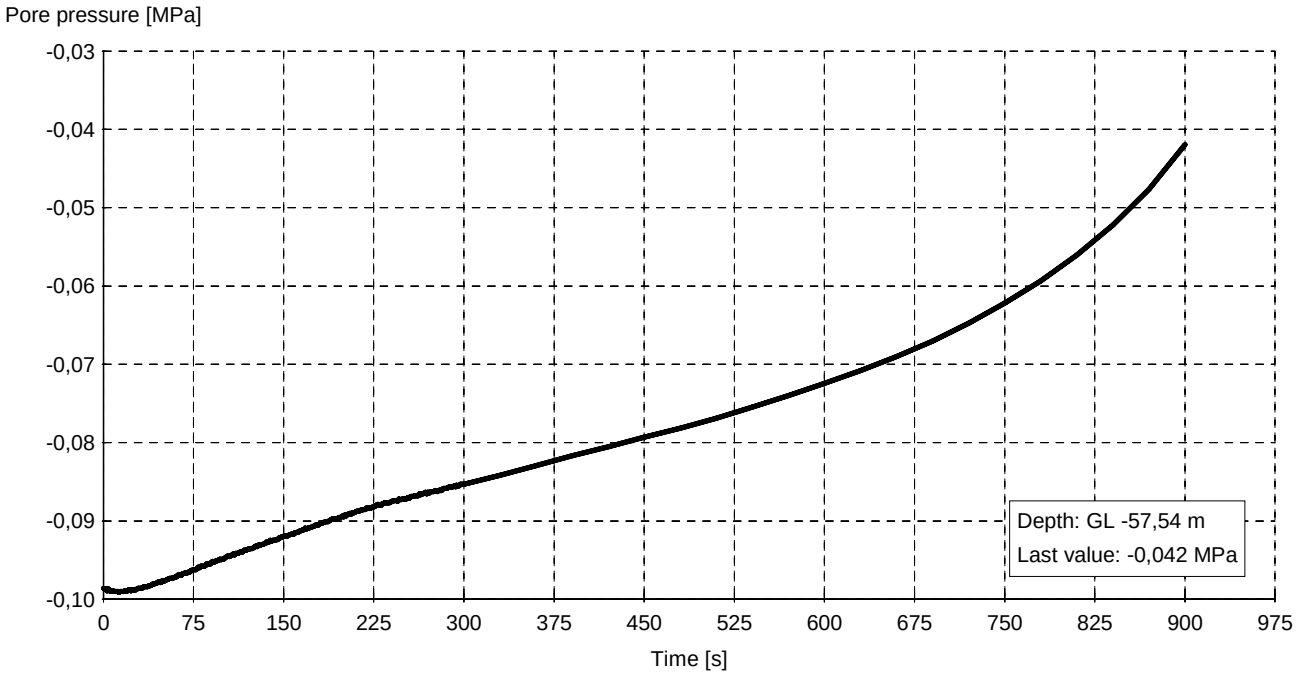
Cpt **: kcpt10c**
TestNr. : 3 X : GL : MV 0m
Date : 27-6-2011 Y :



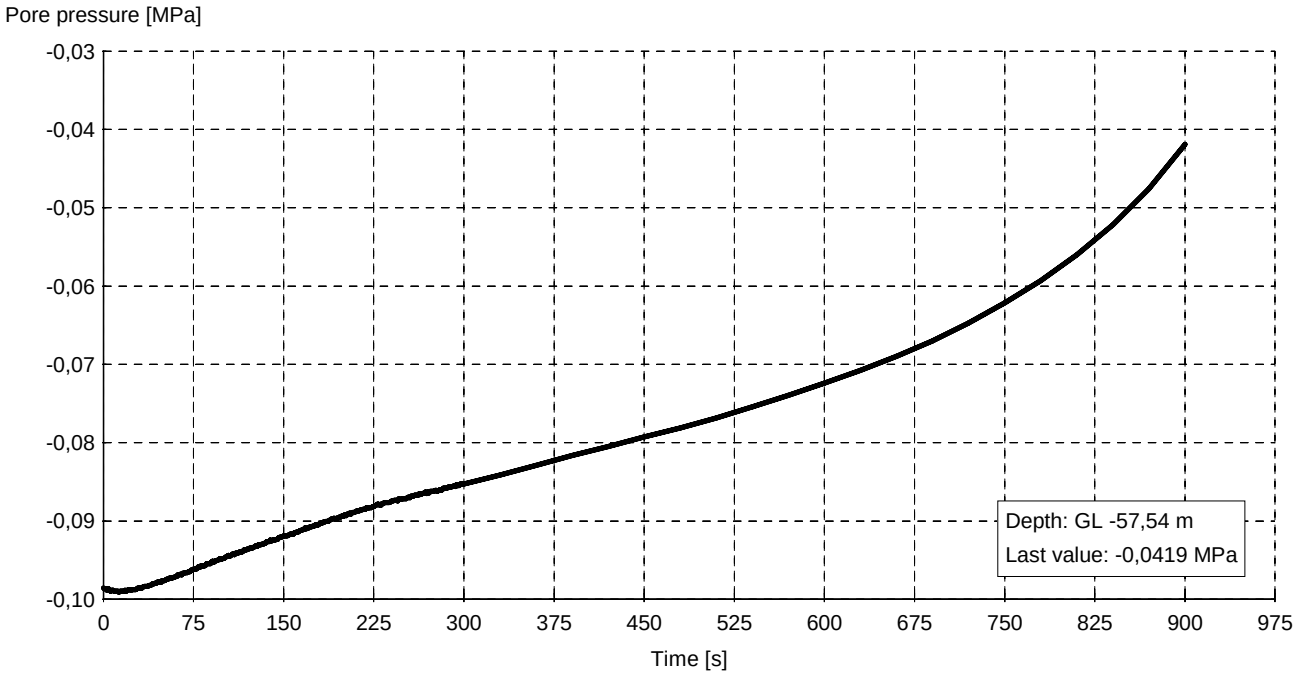
MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kctp11b
TestNr. : 1 X : GL : MV 0m
Date : 6-7-2011 Y :

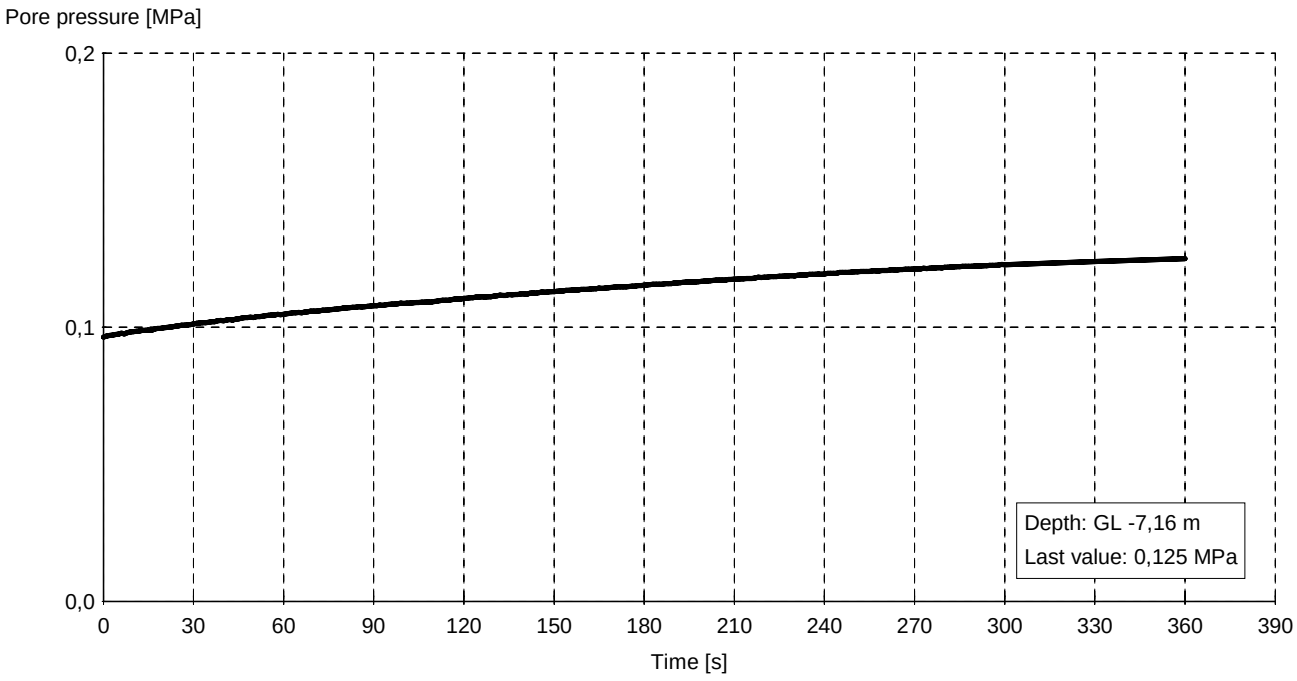


Cpt : kctp11b
TestNr. : 01 X : GL : MV 0m
Date : 6-7-2011 Y :

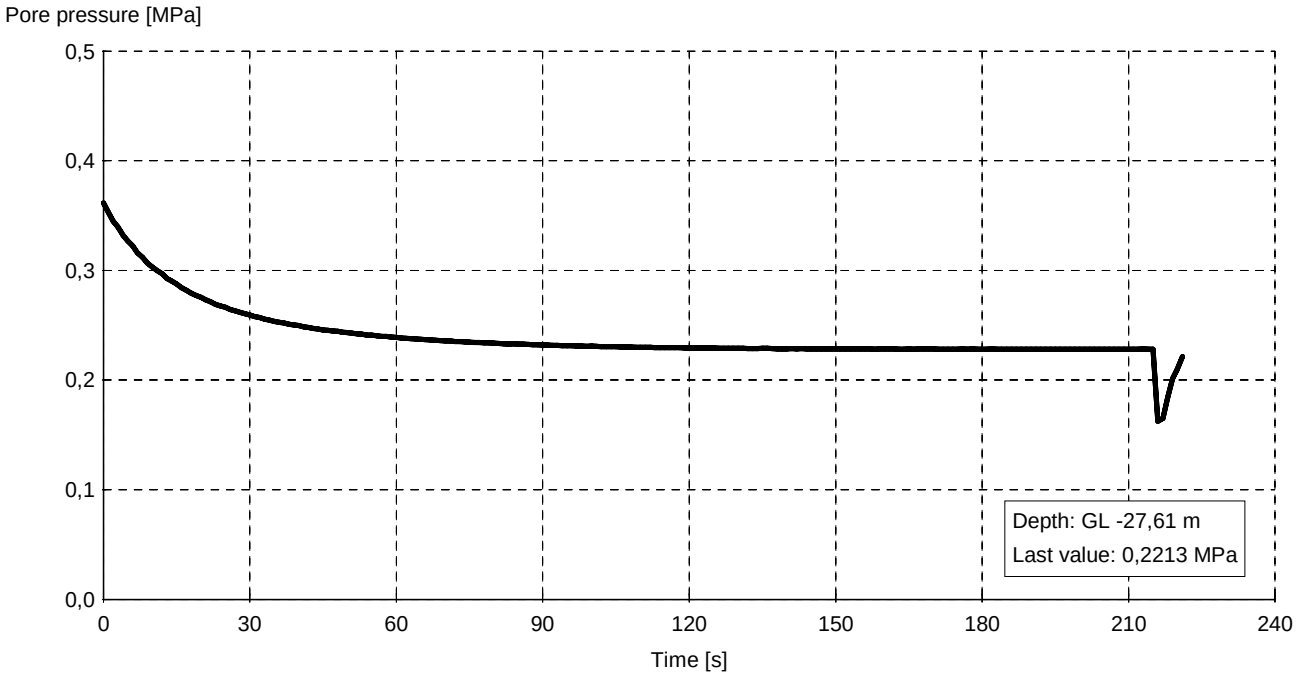


DISSIPATION TEST

Cpt : kcpt12
TestNr. : 1 X : GL : MV 0m
Date : 5-7-2011 Y :



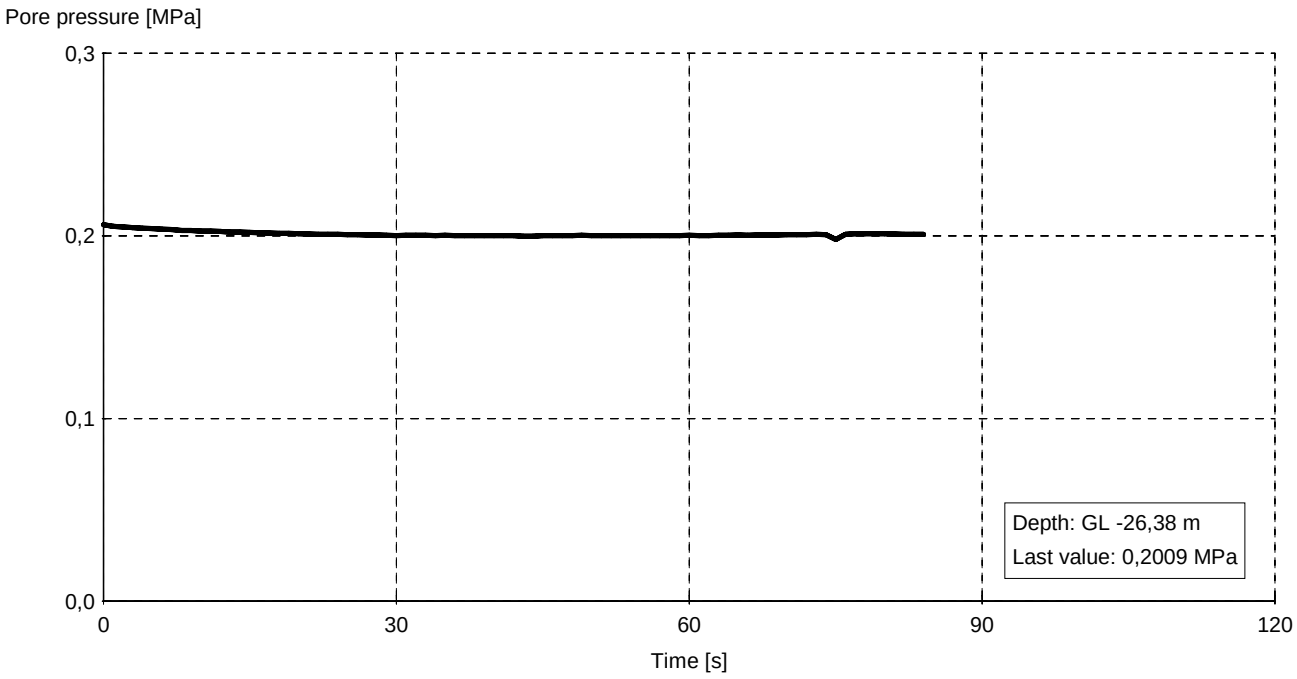
Cpt : kcpt12b
TestNr. : 1 X : GL : MV 0m
Date : 5-7-2011 Y :



MOS GRONDMECHANICA

DISSIPATION TEST

Cpt : kcpt12
TestNr. : 2 X : GL : MV 0m
Date : 5-7-2011 Y :



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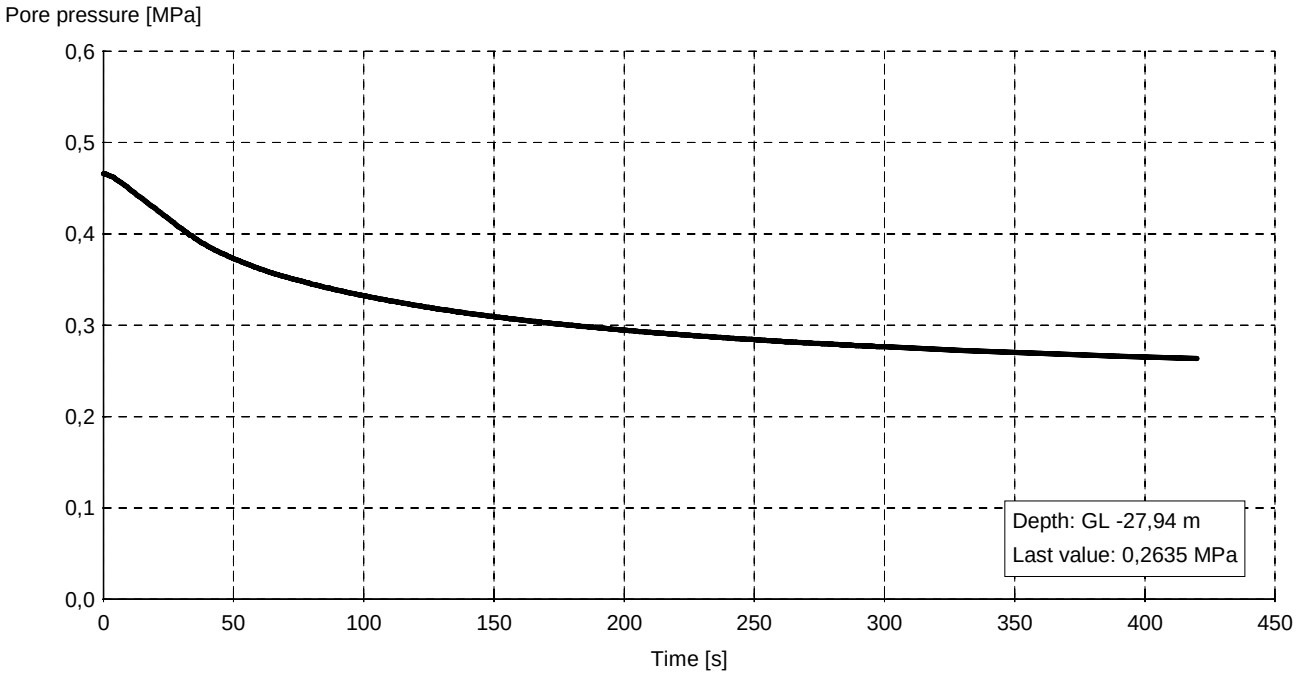
Date : 5-7-2011 Y :



DISSIPATION TEST

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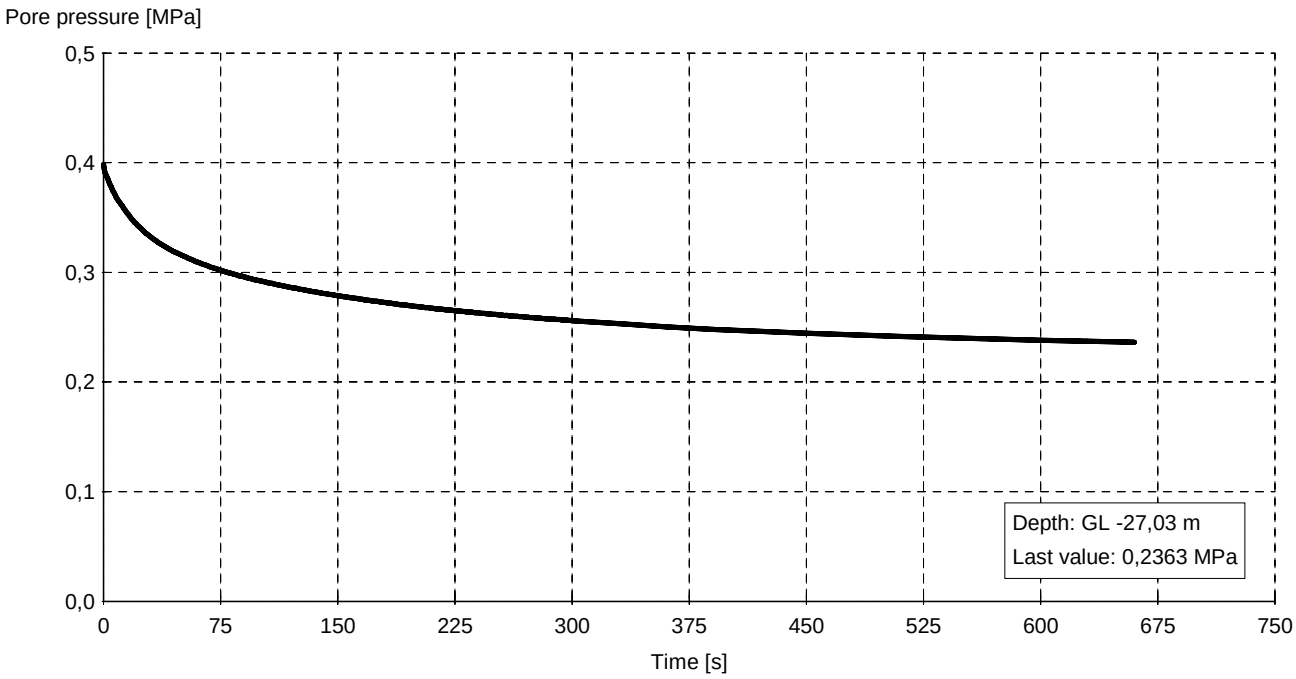

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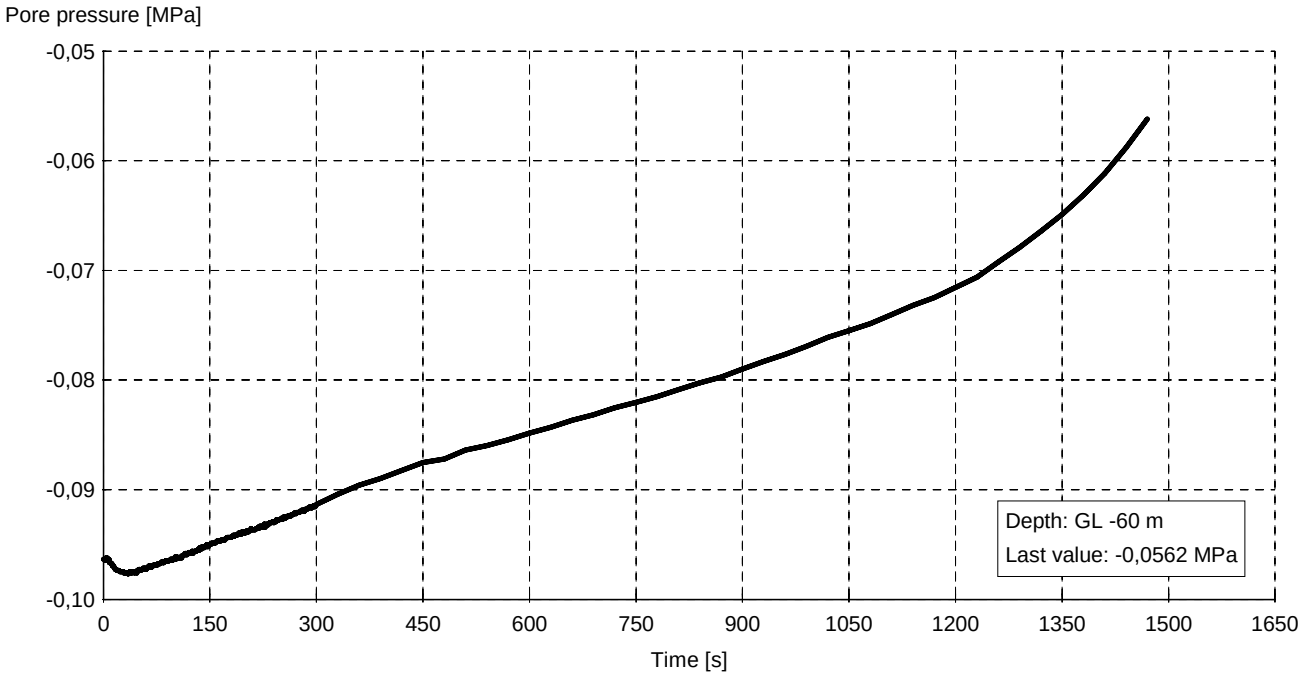

MOS GRONDMECHANICA

DISSIPATION TEST

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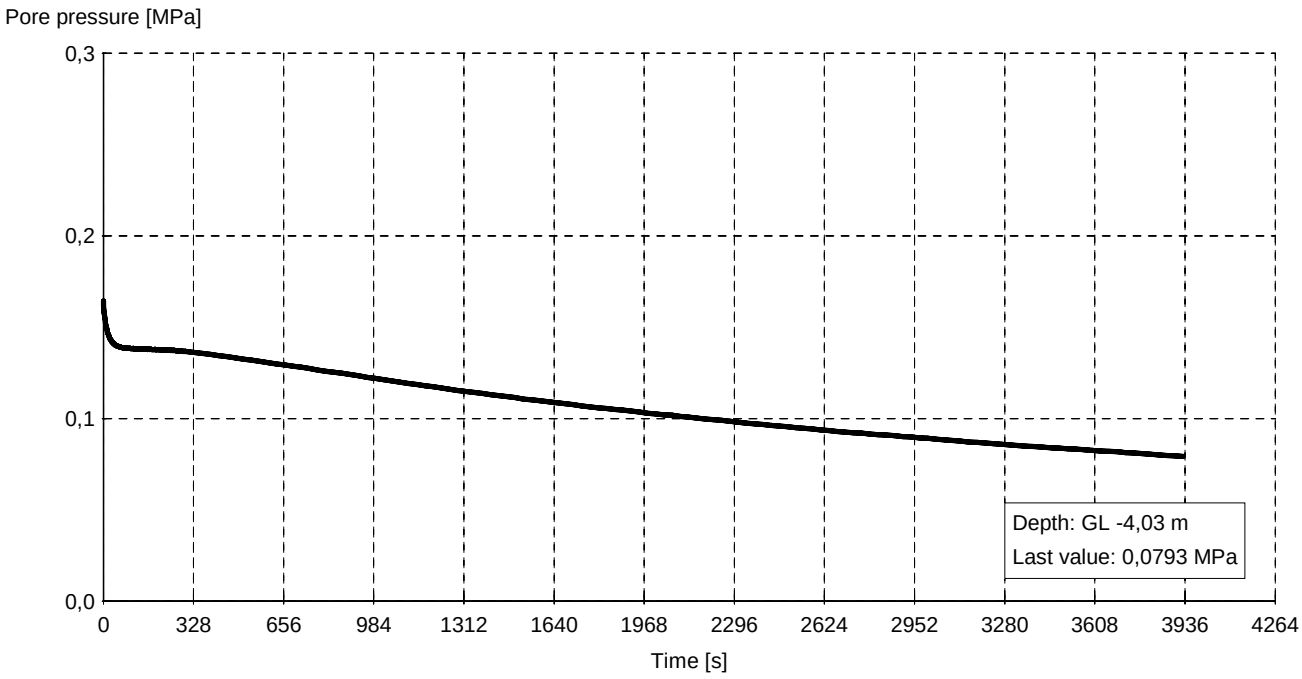

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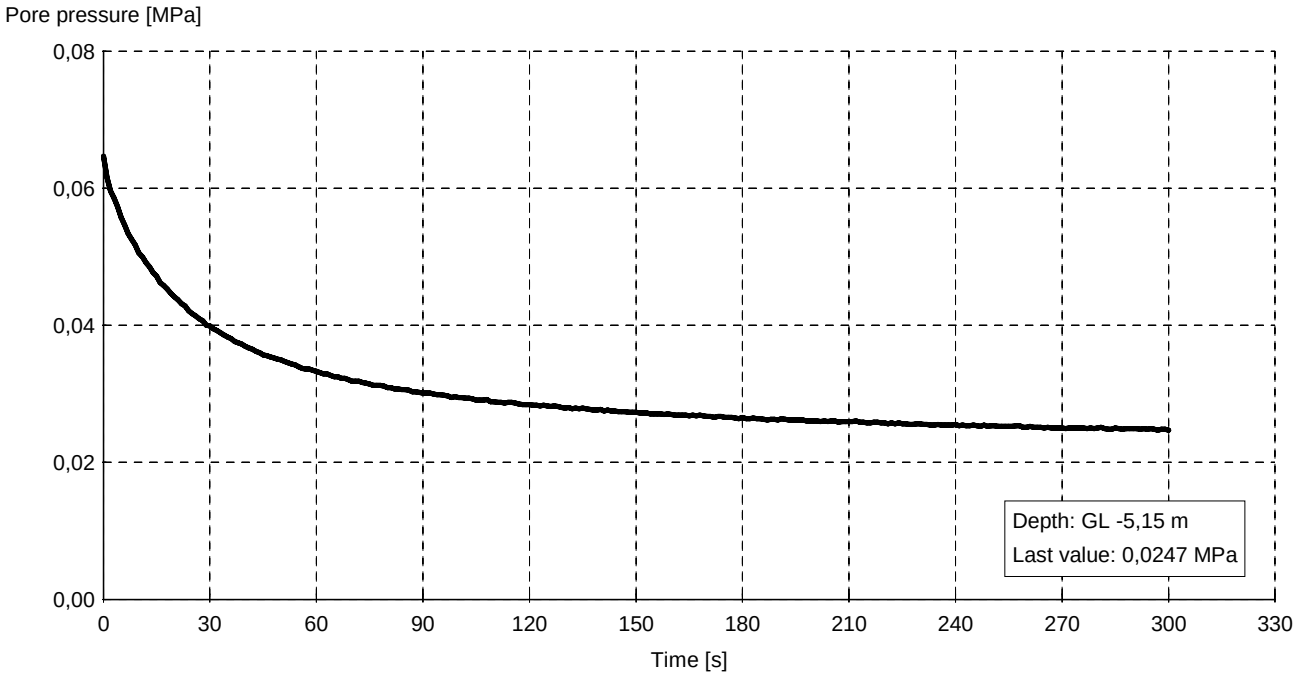

MOS GRONDMECHANICA

DISSIPATION TEST

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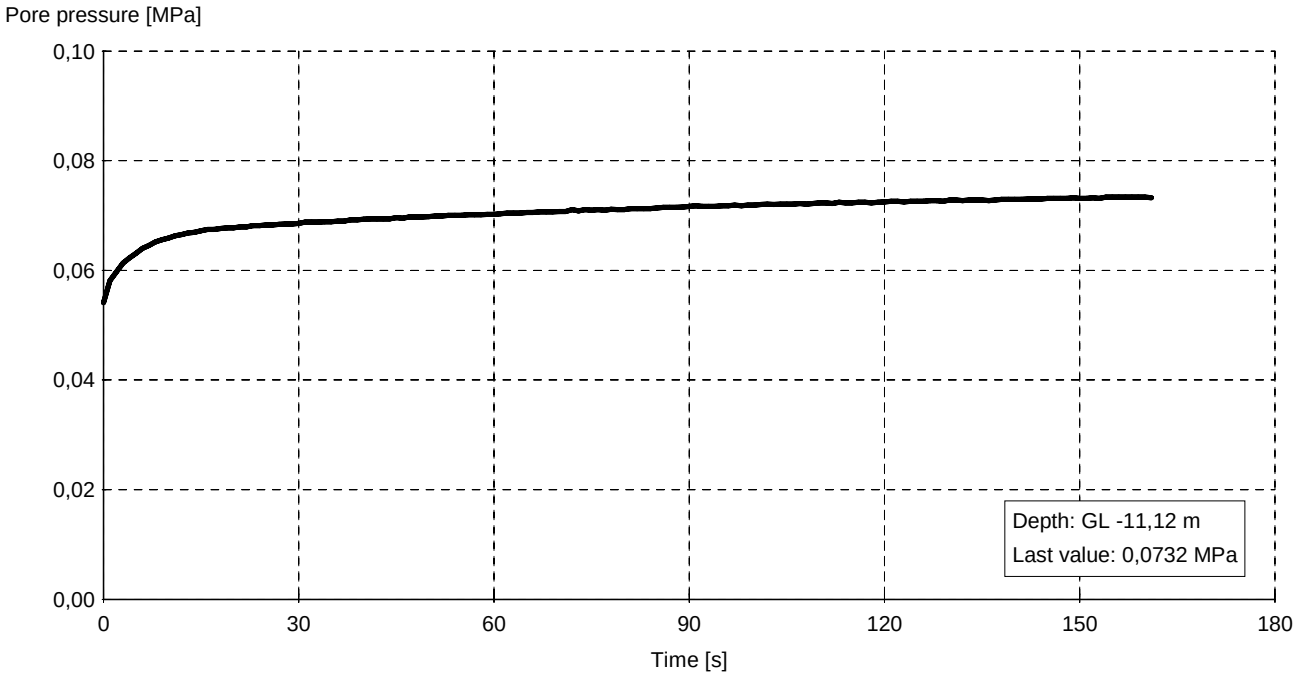

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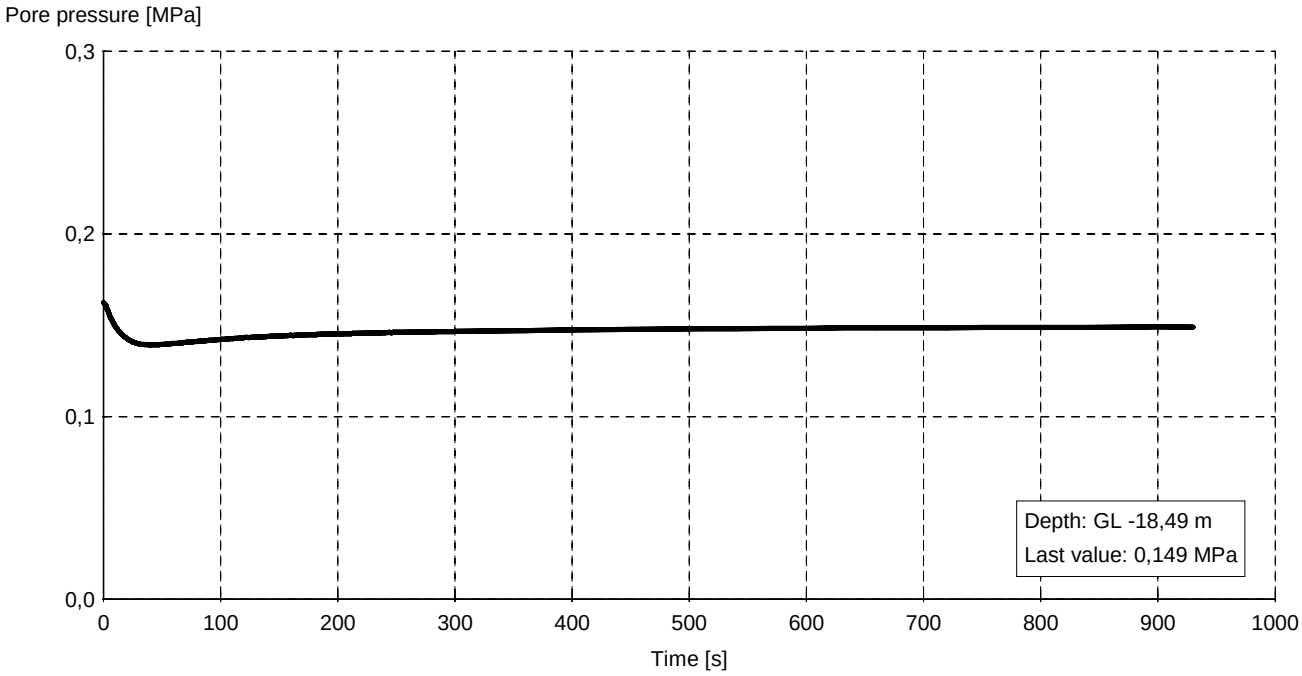

MOS GRONDMECHANICA

DISSIPATION TEST

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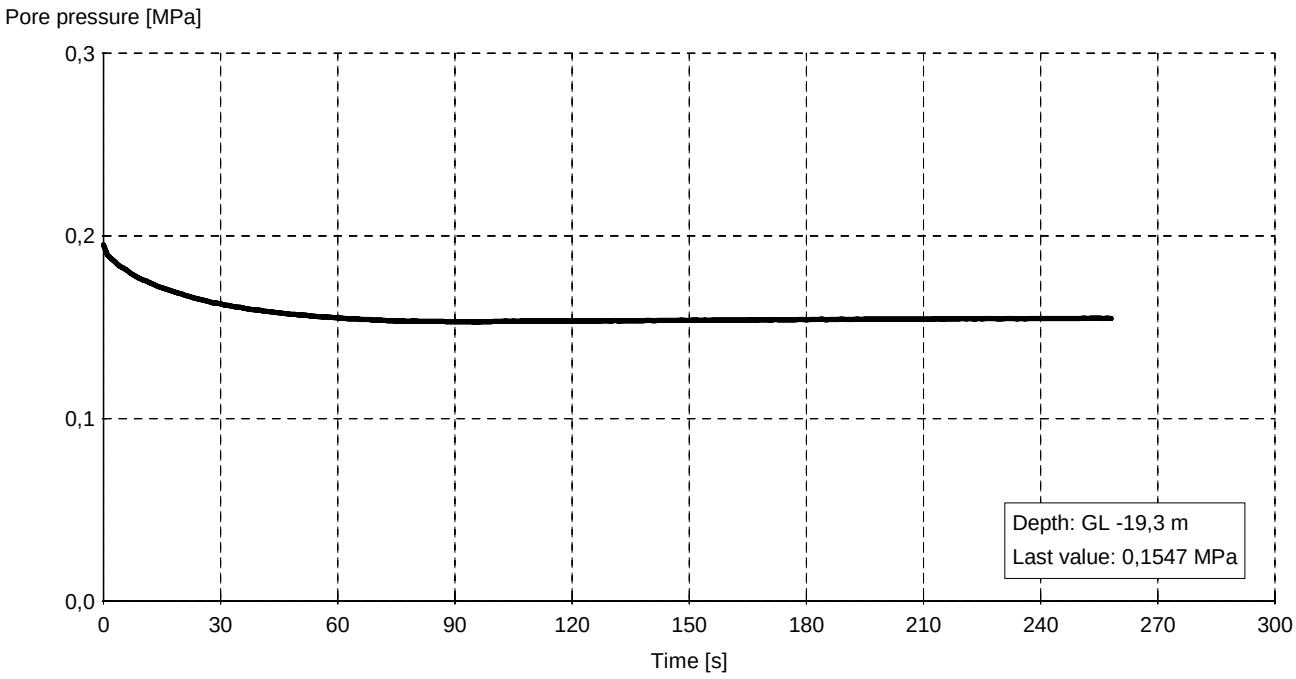
Date : 28-6-2011 Y :



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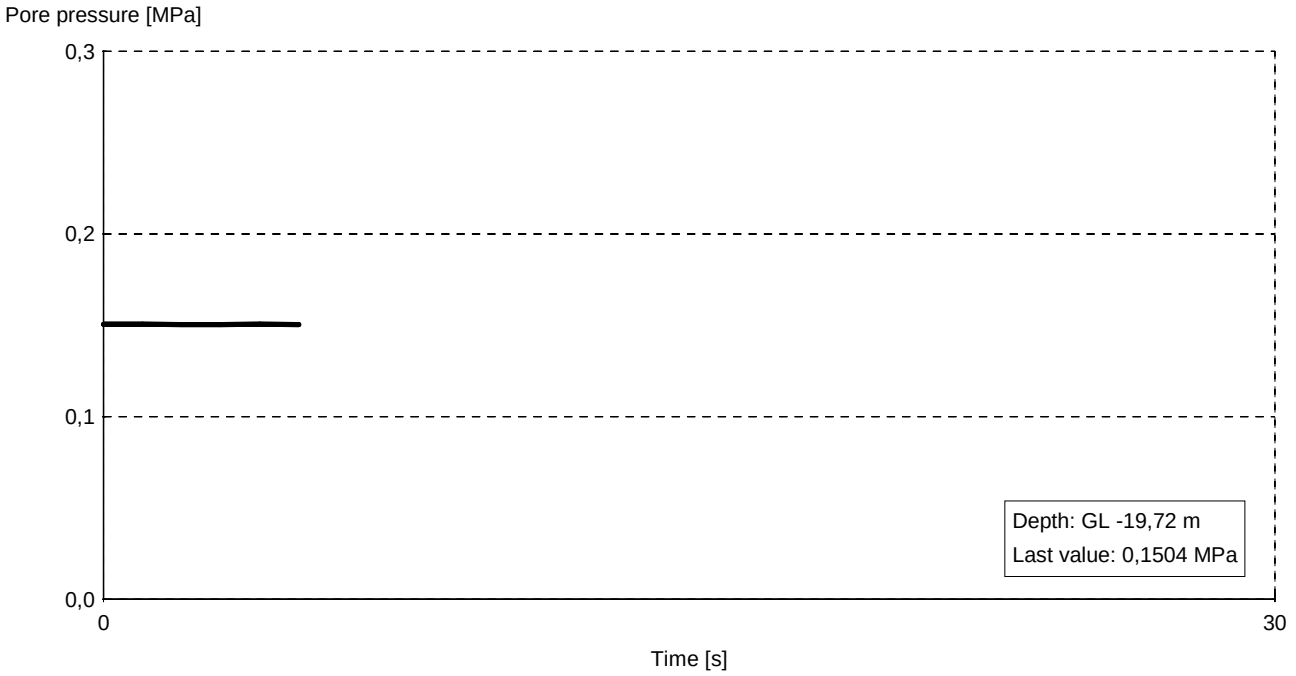
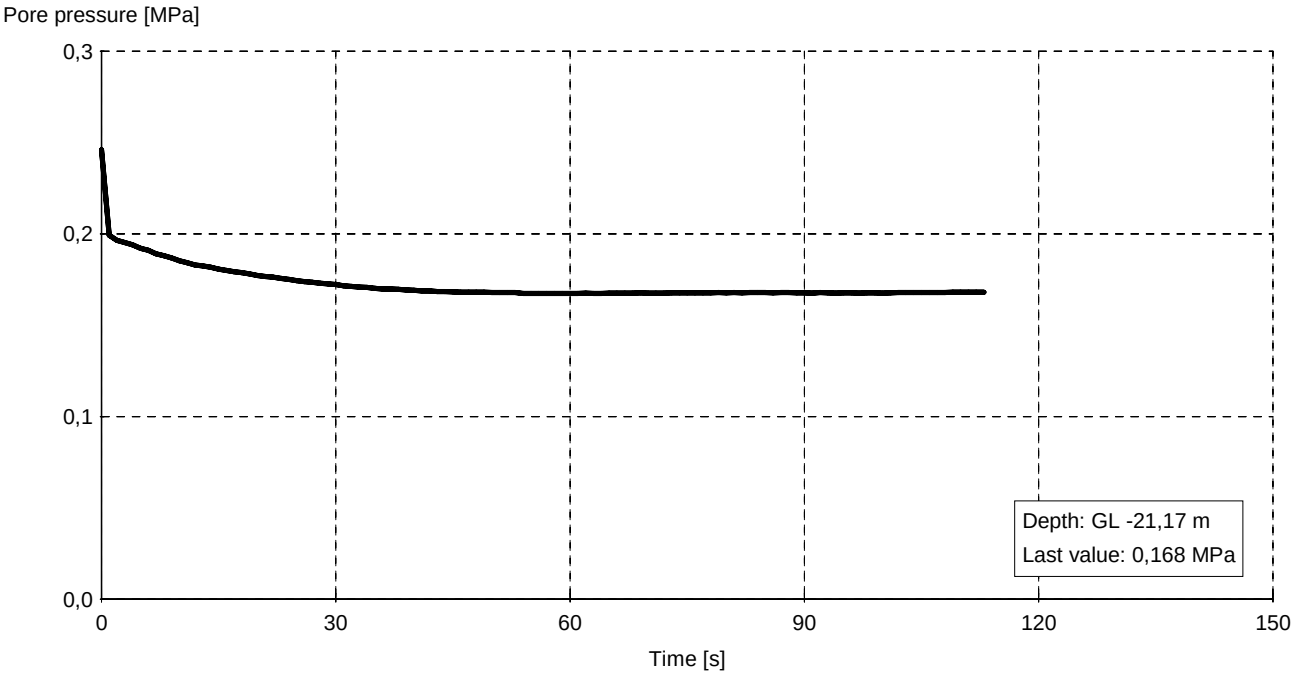
TestNr. : 6 X : GL : MV 0m
Date : 28-6-2011 Y :

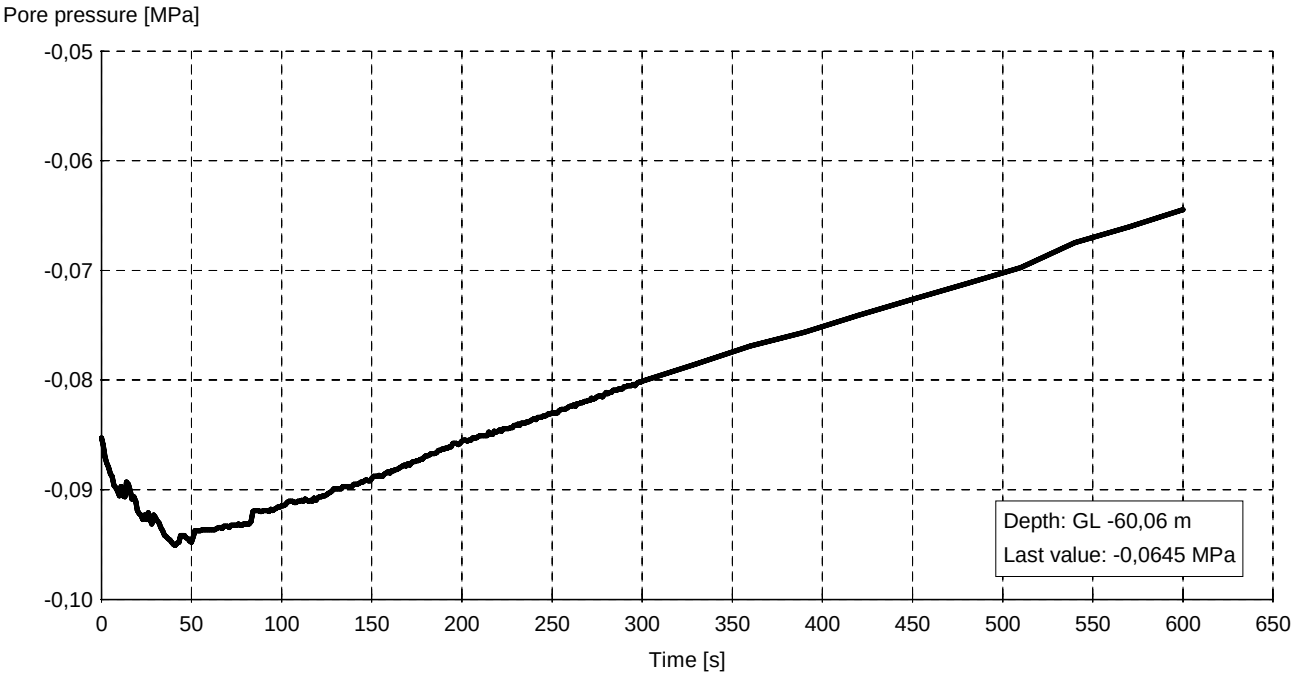


DISSIPATION TEST

Cpt : kcpt13
TestNr. : 7 X : GL : MV 0m
Date : 28-6-2011 Y :



Cpt : kcpt13
TestNr. : 8 X : GL : MV 0m
Date : 28-6-2011 Y :



Annex C
Results CPM

CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- Test :- P7T1 Test Date :- 6 Jul 11

Material :- Depth (m) :- 8.4 Water Table (m) :- 0

Arm Ave

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):

Non linear elastic exponent used	0.690	
Insitu Lateral Stress (Po)	(kPa)	142
Undrained Shear Strength (Cu)	(kPa)	63
Rigidity Index (G/Cu or Ir)		95
Limit Pressure (Pl)	(kPa)	493
Shear Modulus at yield strain (G_min)	(MPa)	6

Analysis of Shear Modulus (G) :-

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	4.34	5.93	316	1.342	116
2	5.07	14.68	368	1.201	122

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coef (MPa)
1	0.726	1.726	1.253
2	0.655	1.51	0.989

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :-
Date :- 25 Jul 11

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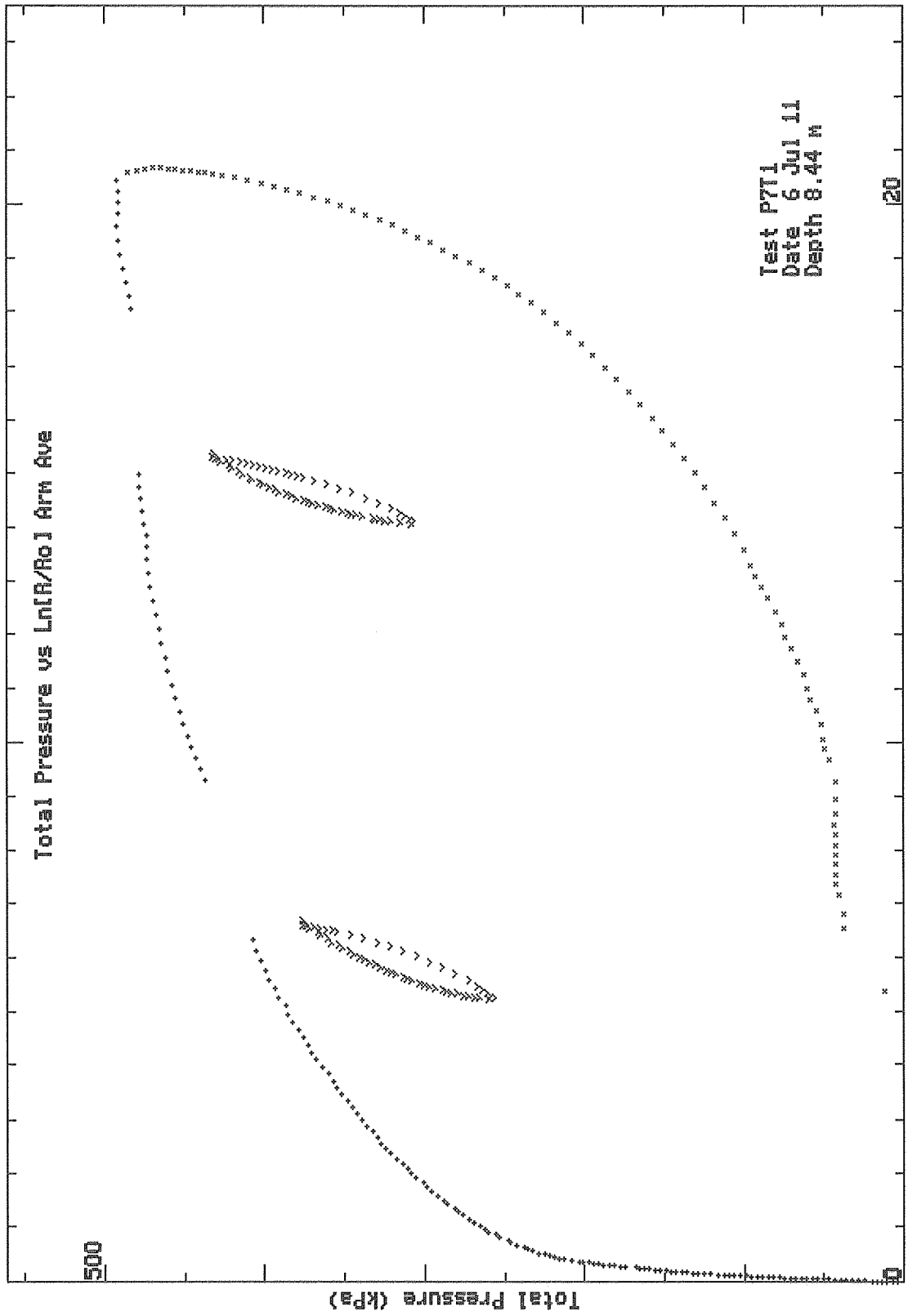

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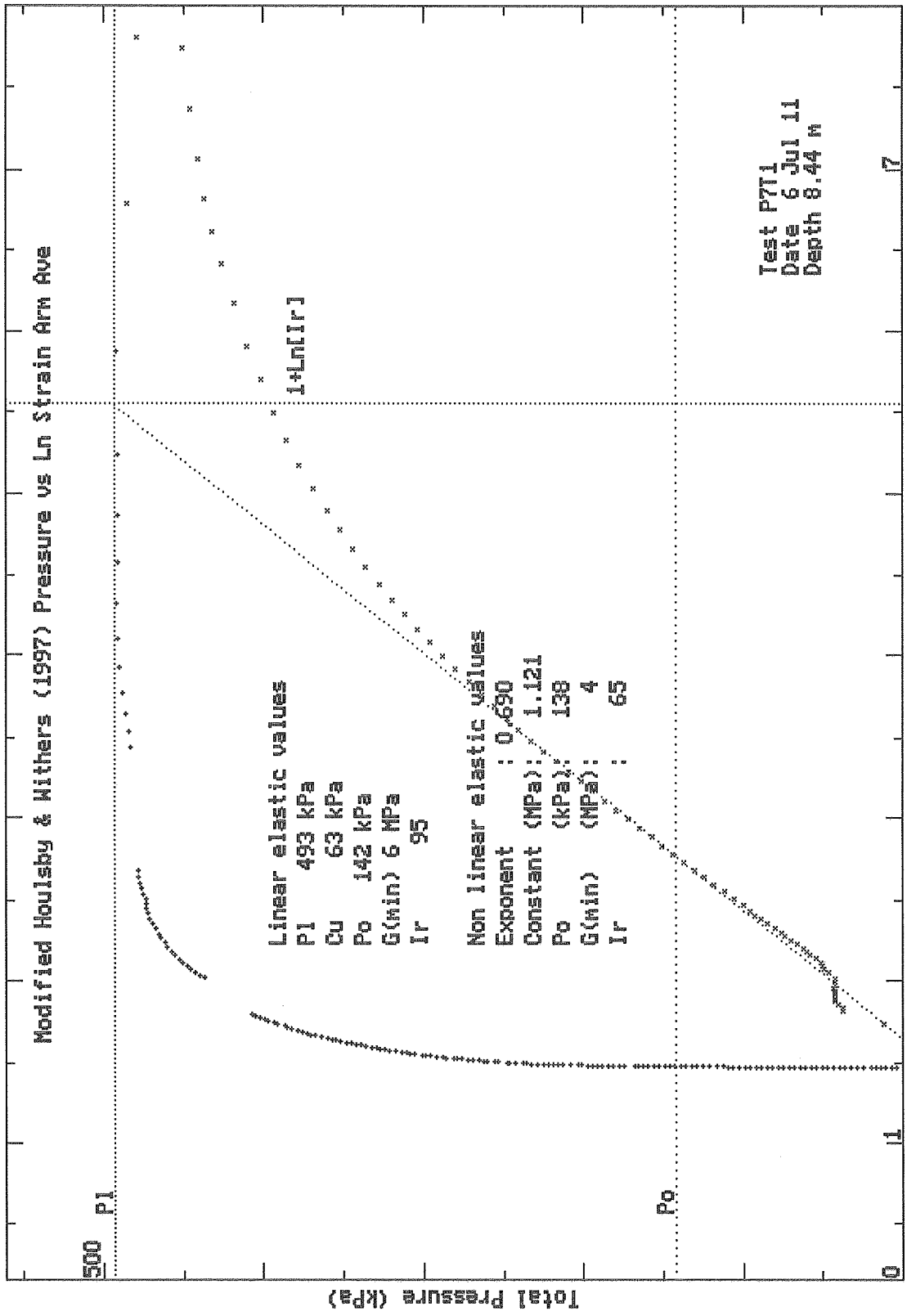

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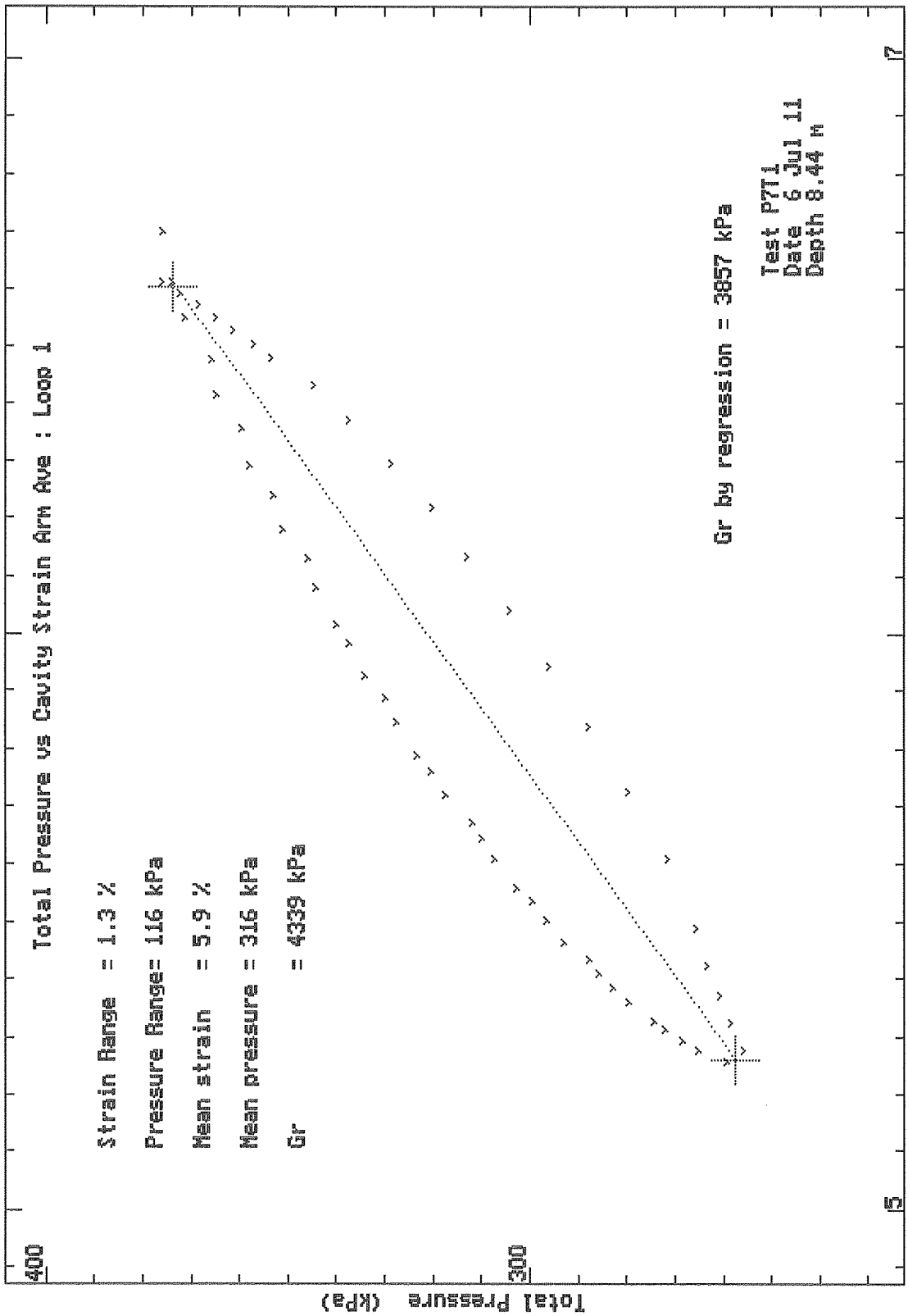

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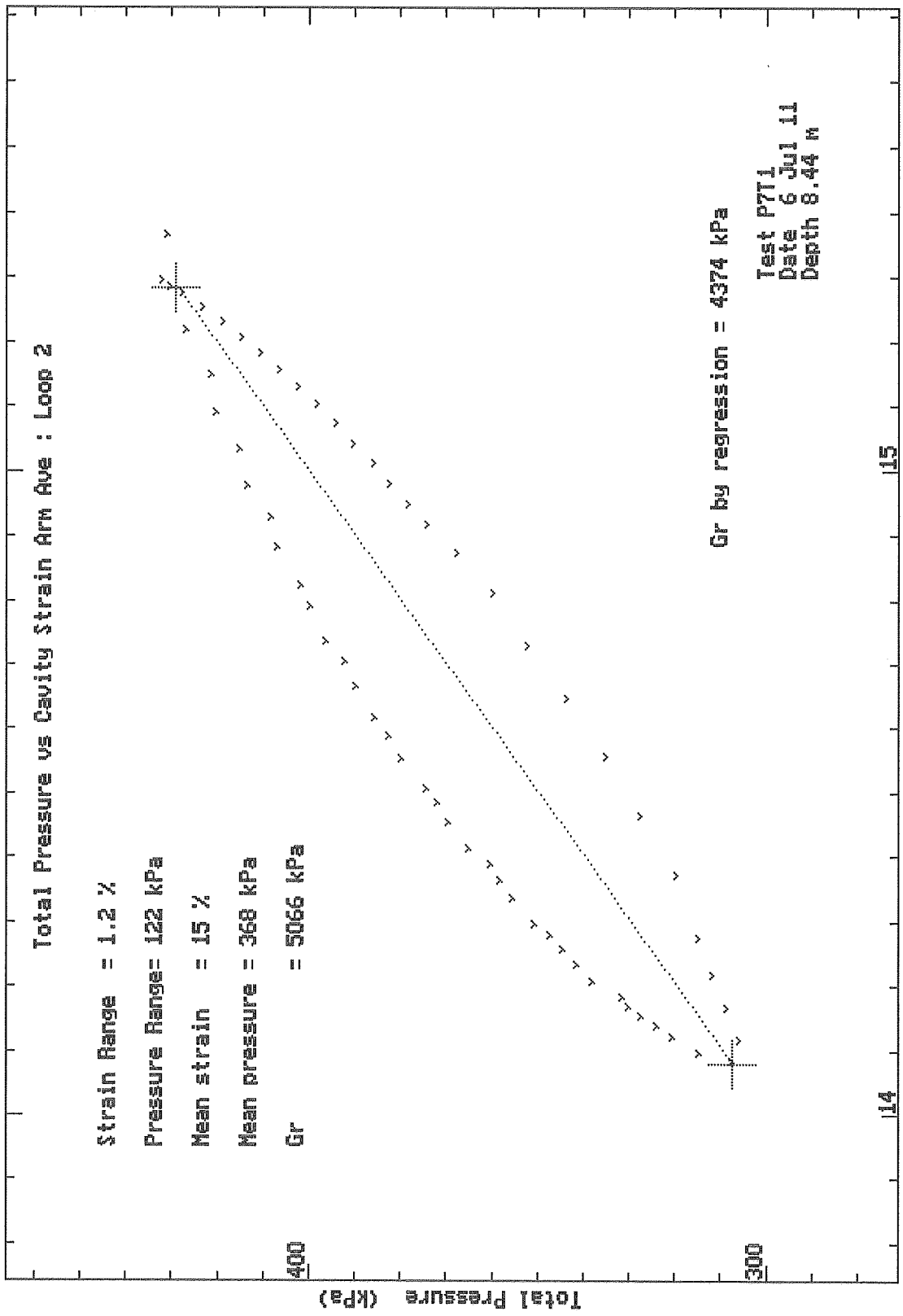

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CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- Test :- P7T2 Test Date :- 6 Jul 11

Material :- Depth (m) :- 14.5 Water Table (m) :- 0

		Arm Ave
Po (by inspection)	(kPa)	461

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):

Non linear elastic exponent used	0.813	
Insitu Lateral Stress (Po)	(kPa)	*******
Undrained Shear Strength (Cu)	(kPa)	214
Rigidity Index (G/Cu or Ir)		536
Limit Pressure (Pl)	(kPa)	1460
Shear Modulus at yield strain (G_min)	(MPa)	115

Analysis of Shear Modulus (G) :-

Graphical Analysis of Initial Modulus	(MPa)	39

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	117	2.44	1169	0.154	358

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coef (MPa)
1	0.813	42.54	34.58

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :- AM
Date :- 25 Jul 11

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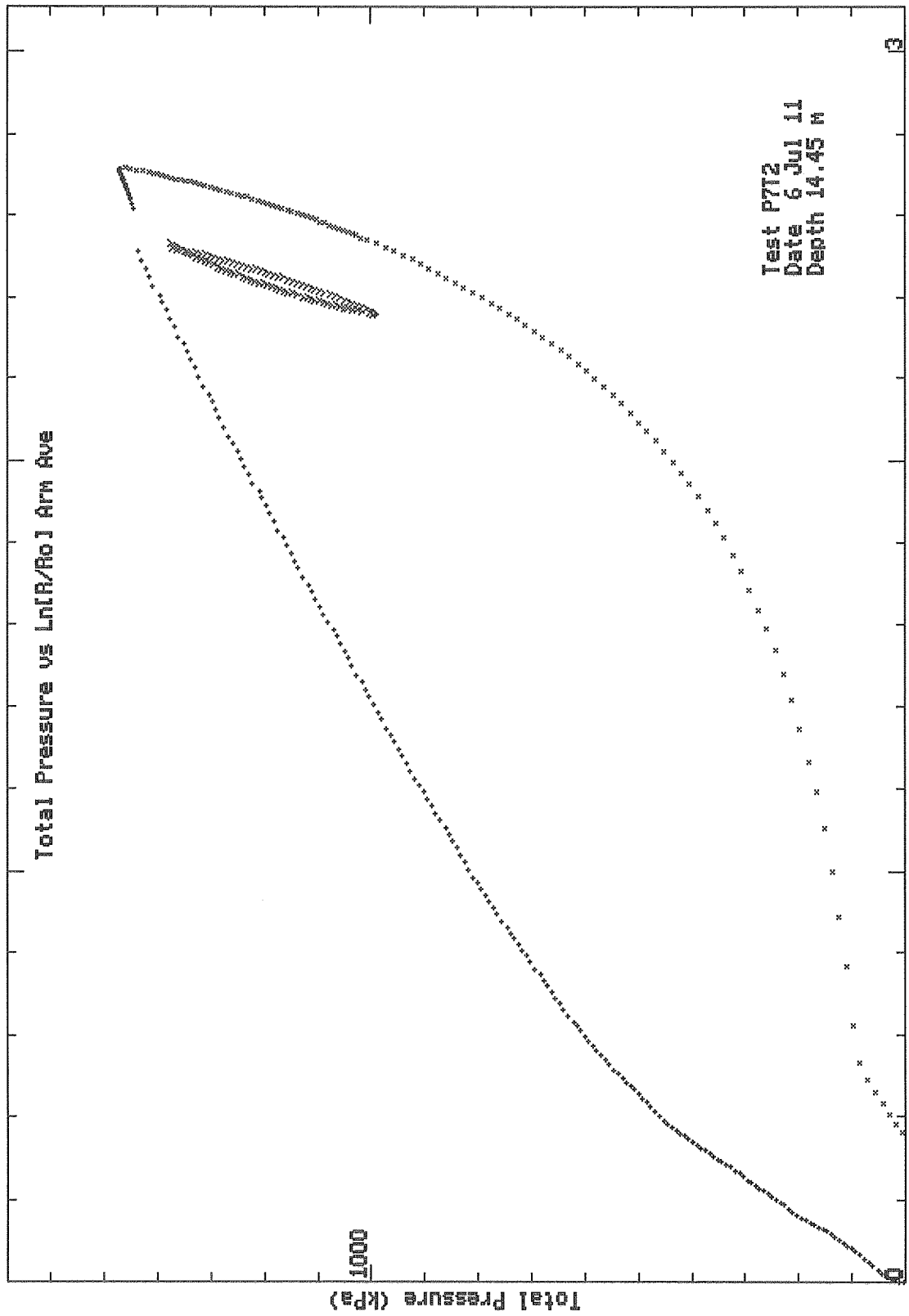

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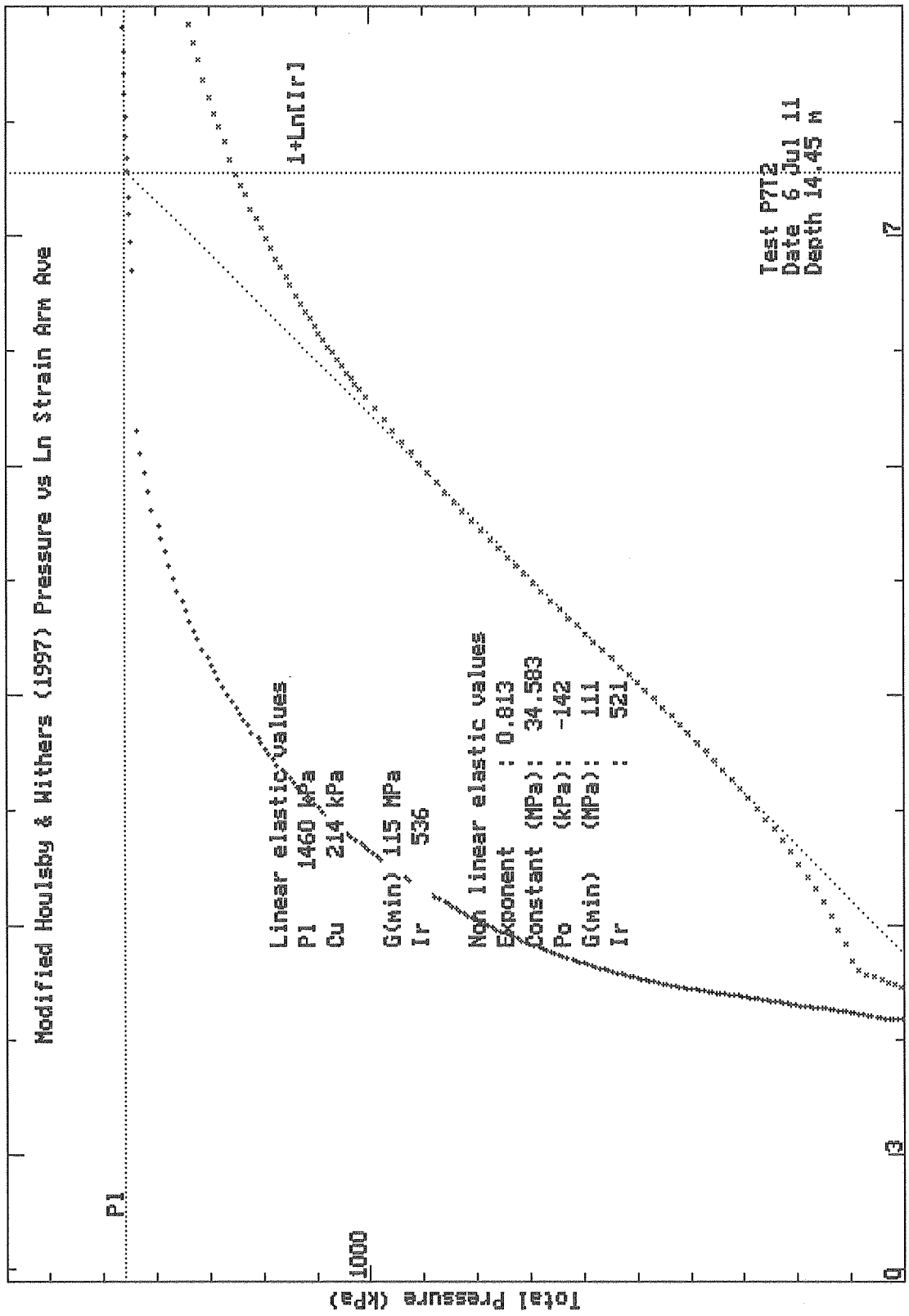

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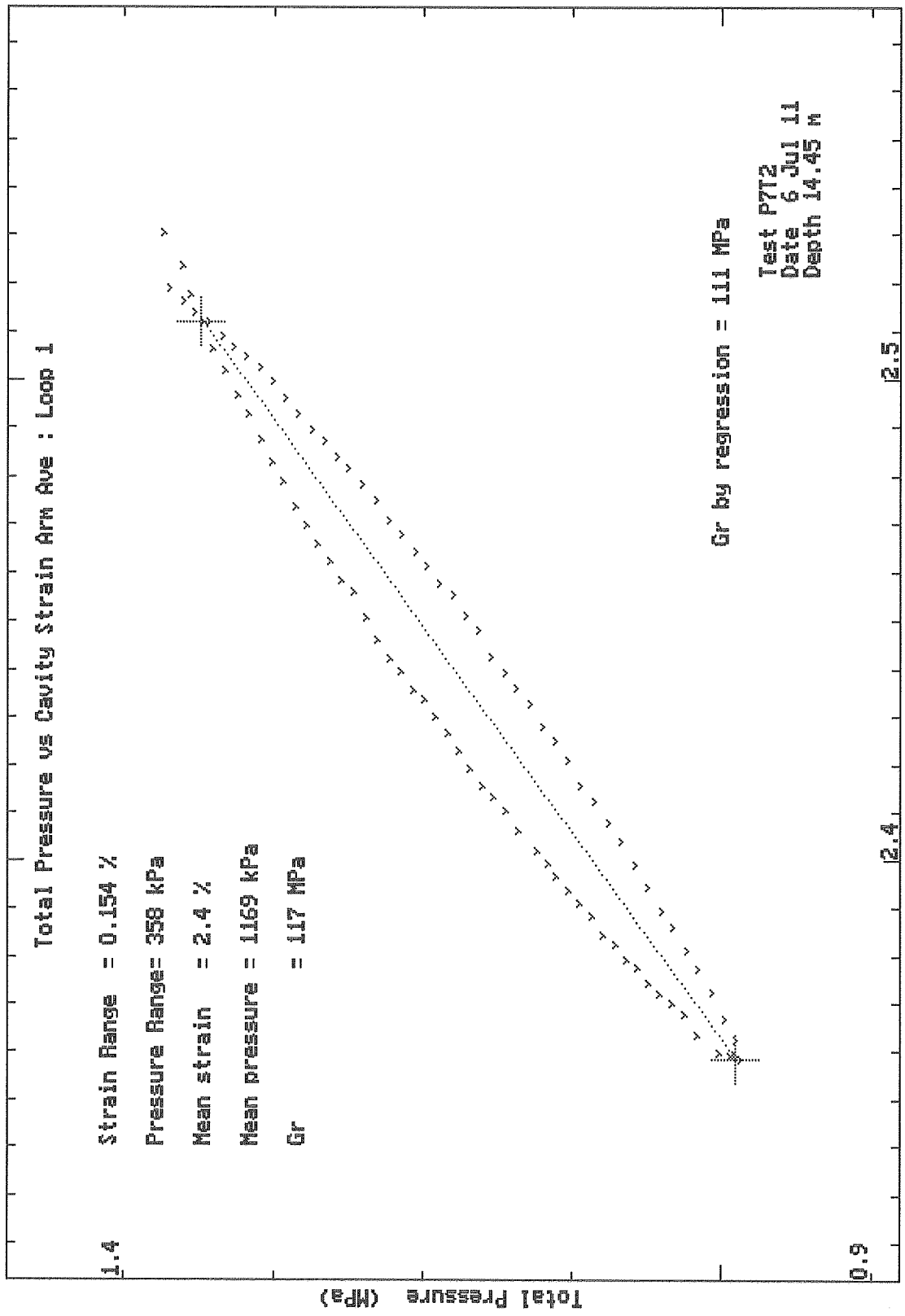

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CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- BORSSELE Test :- P7T3 Test Date :- 6 Jul 11

Material :- Depth (m) :- 27.5 Water Table (m) :- 0

Arm Ave

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):

Non linear elastic exponent used	0.630	
Insitu Lateral Stress (Po)	(kPa)	413
Undrained Shear Strength (Cu)	(kPa)	173
Rigidity Index (G/Cu or Ir)		267
Limit Pressure (Pl)	(kPa)	1552
Shear Modulus at yield strain (G_min)	(MPa)	46

Analysis of Shear Modulus (G) :-

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	29	6.97	938	0.481	279
2	34.2	14.02	1116	0.443	304

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coef (MPa)
1	0.627	5.575	3.496
2	0.633	7.011	4.438

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :- AM
Date :- 25 Jul 11

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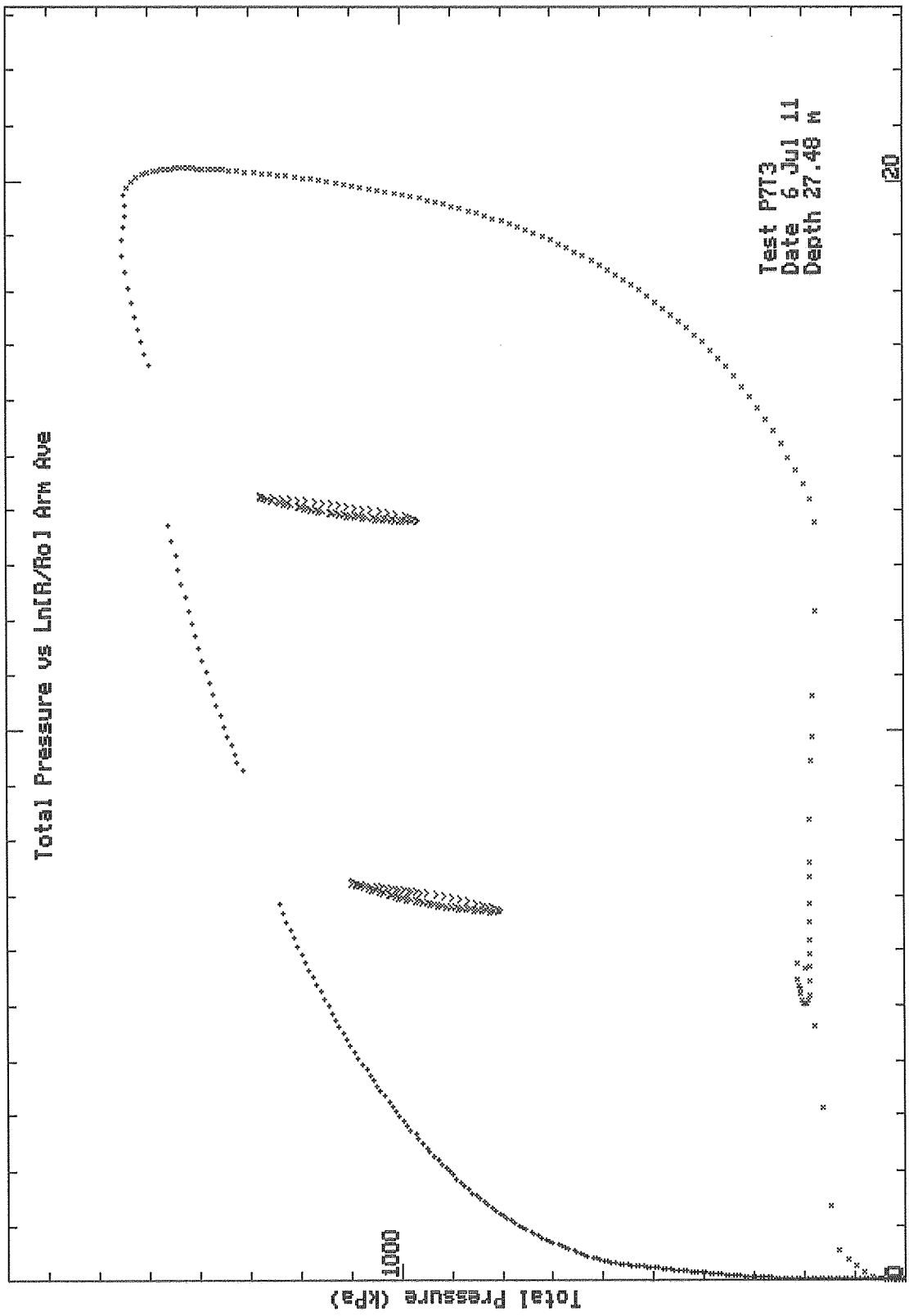

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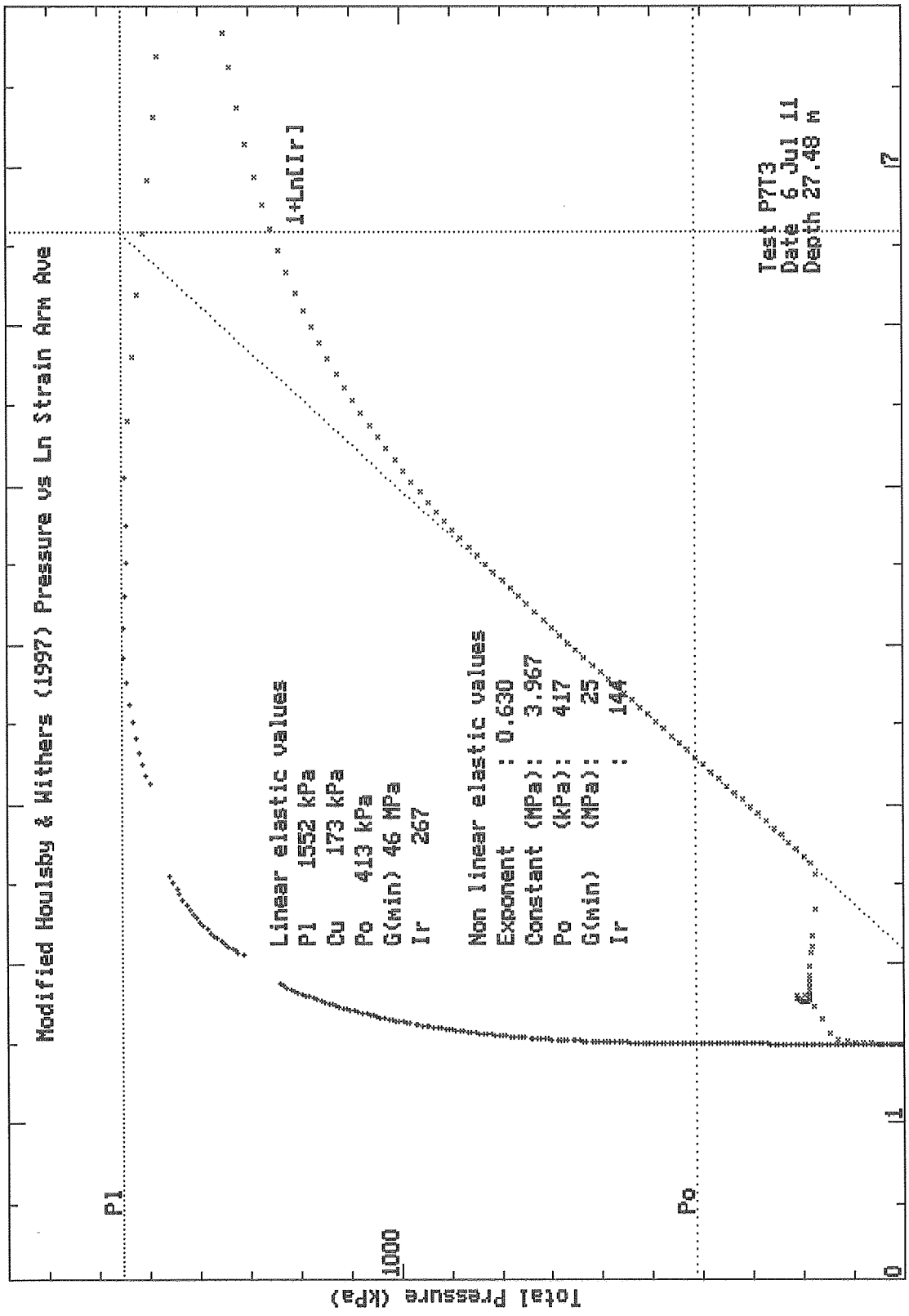

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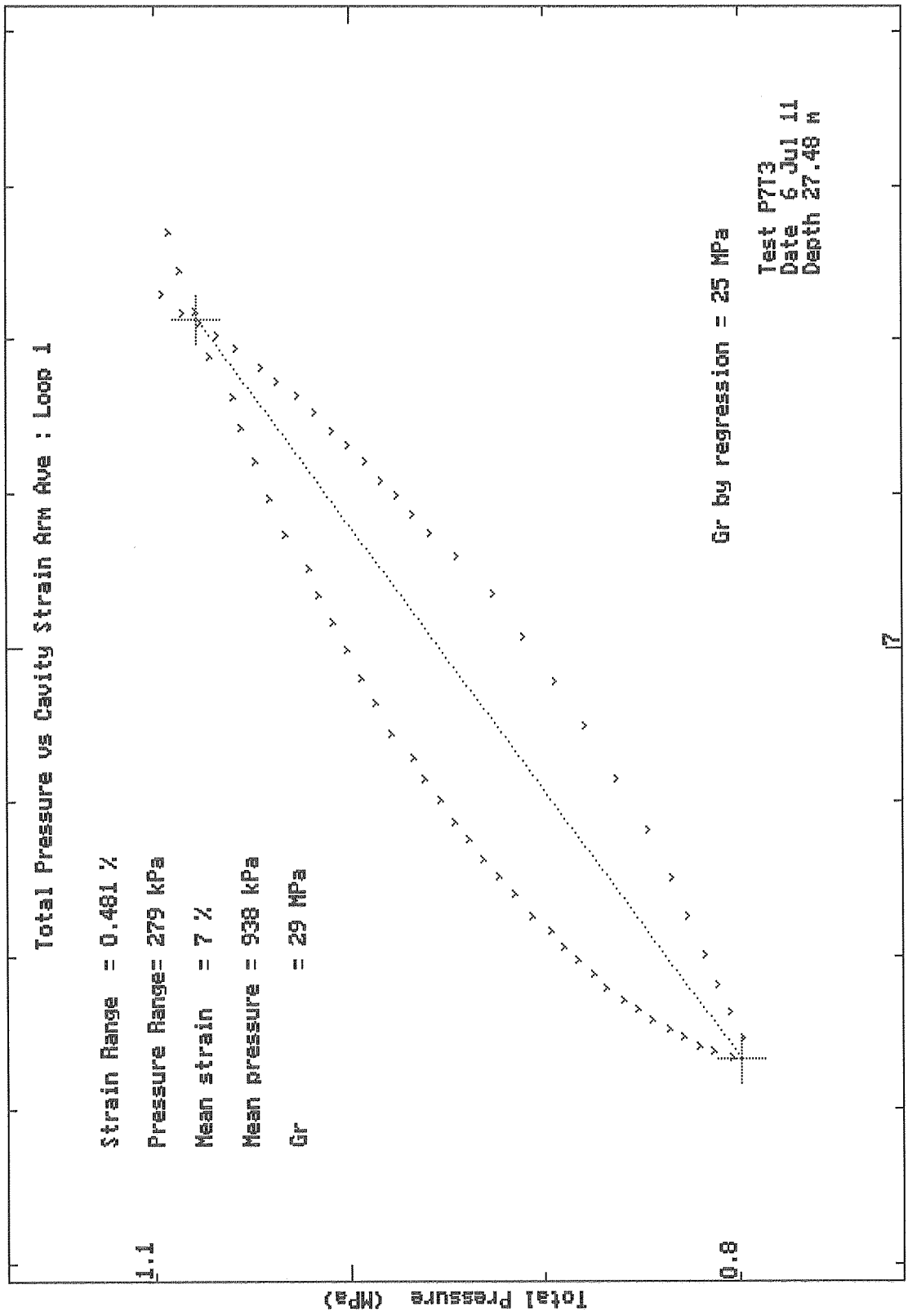

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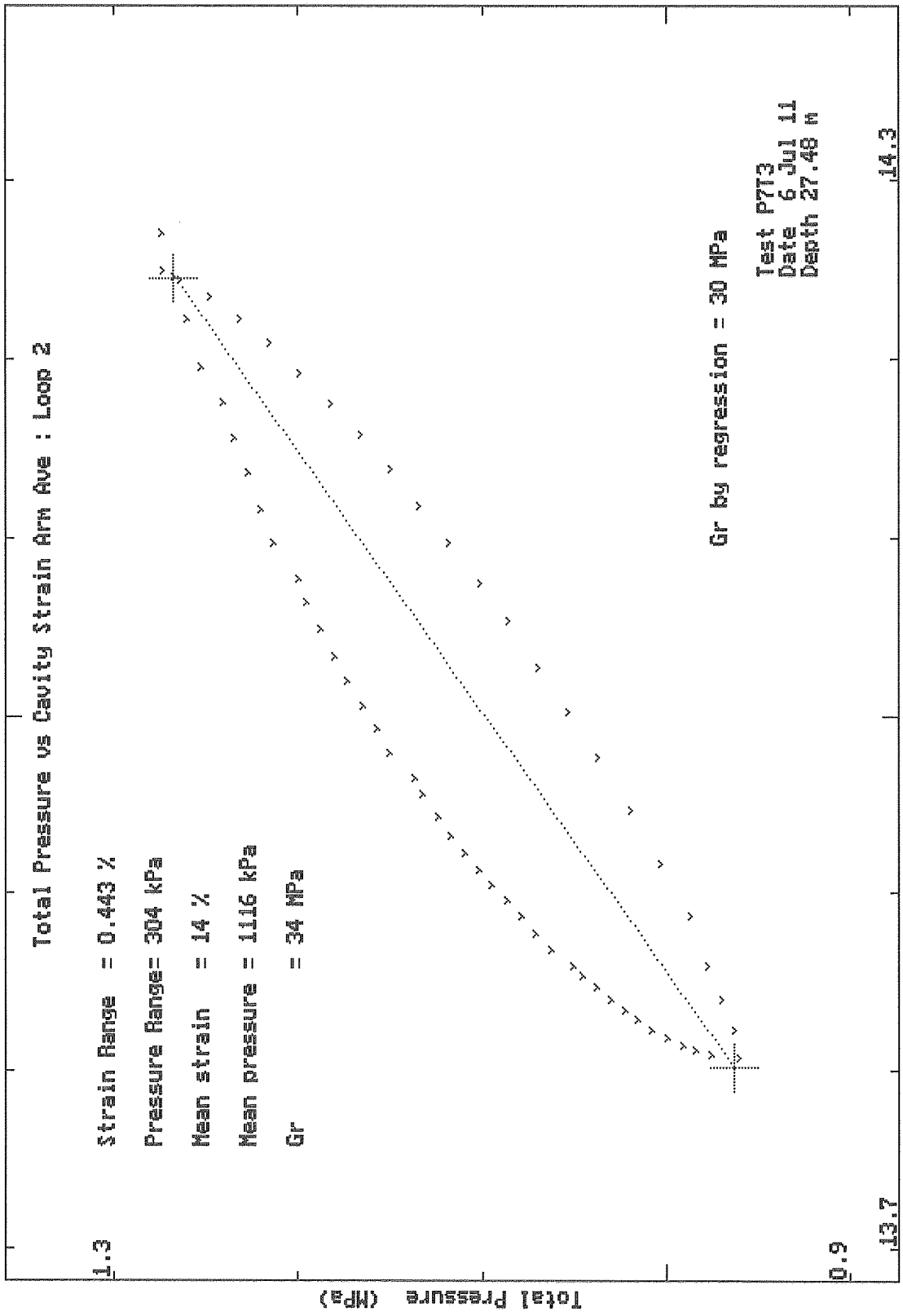

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CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- Test :- P17T1 Test Date :- 7 Jul 11

Material :- Depth (m) :- 9.3 Water Table (m) :- 0

Arm Ave

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):-

Non linear elastic exponent used	0.639	
Insitu Lateral Stress (Po)	(kPa)	172
Undrained Shear Strength (Cu)	(kPa)	22
Rigidity Index (G/Cu or Ir)		107
Limit Pressure (Pl)	(kPa)	296
Shear Modulus at yield strain (G_min)	(MPa)	2

Analysis of Shear Modulus (G) :-

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	1.16	5.19	216	3.912	91
2	1.24	13.35	233	3.358	84

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coeff (MPa)
1	0.615	0.432	0.266
2	0.662	0.531	0.352

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :- AM
Date :- 19 Jul 11

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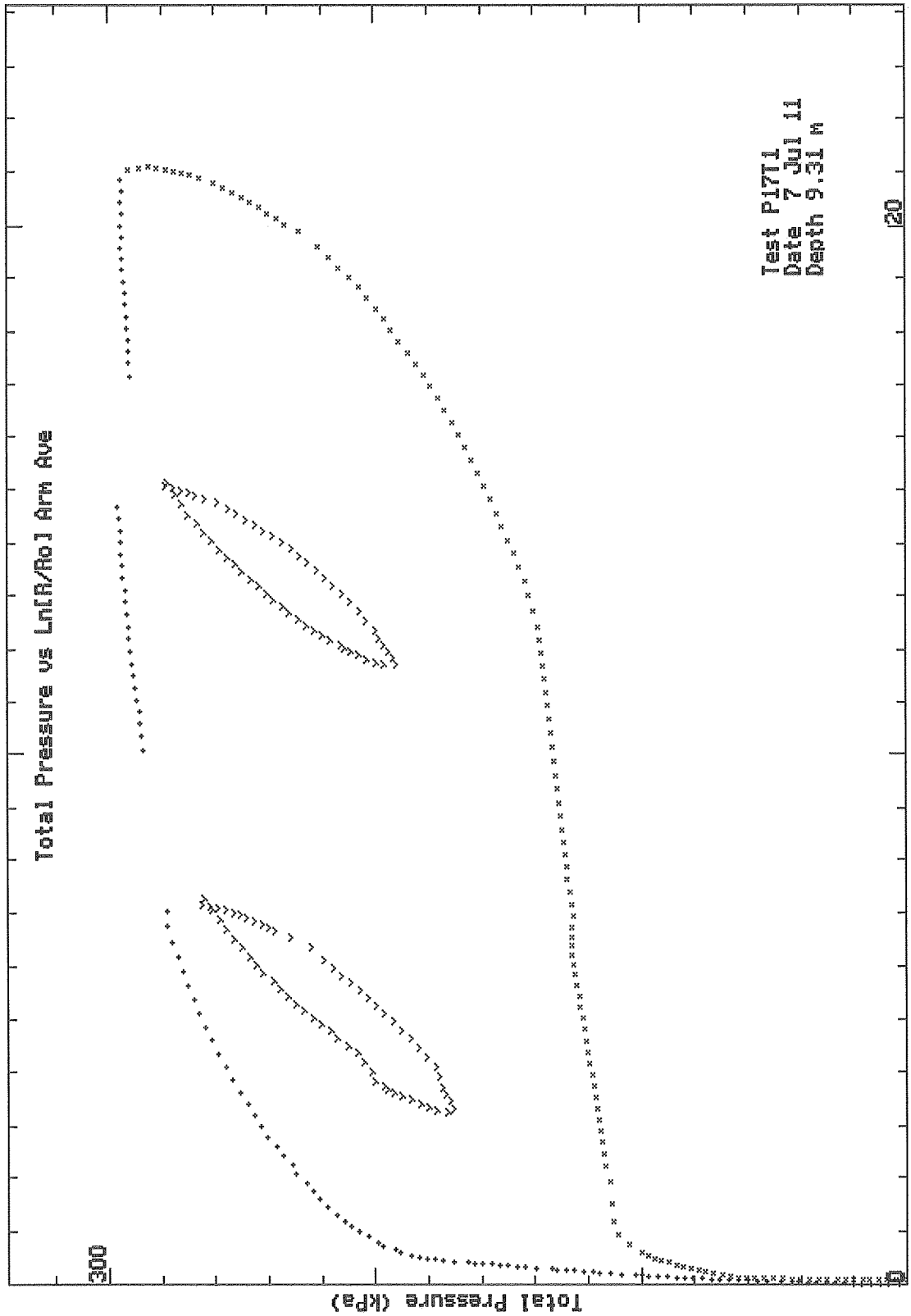

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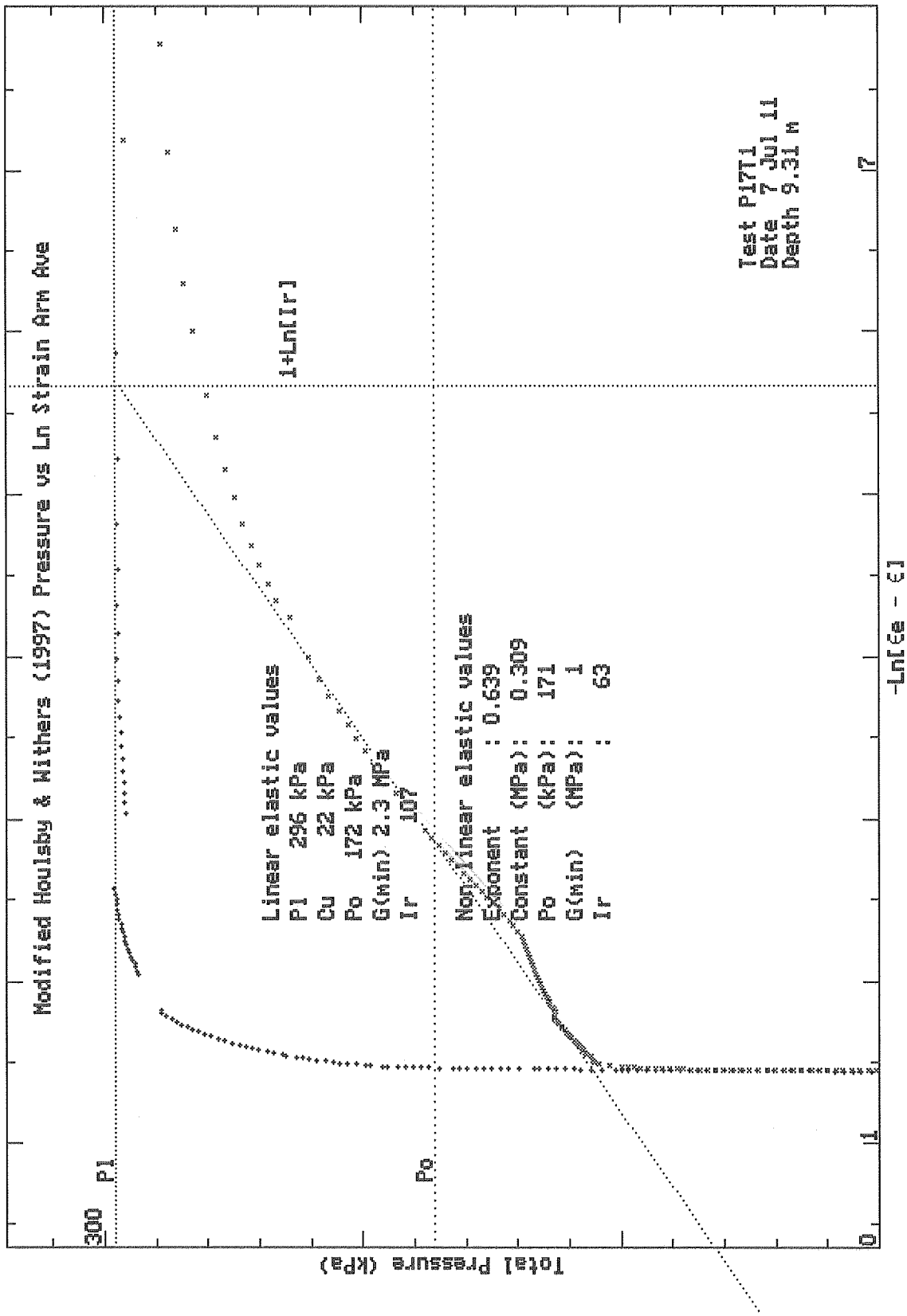

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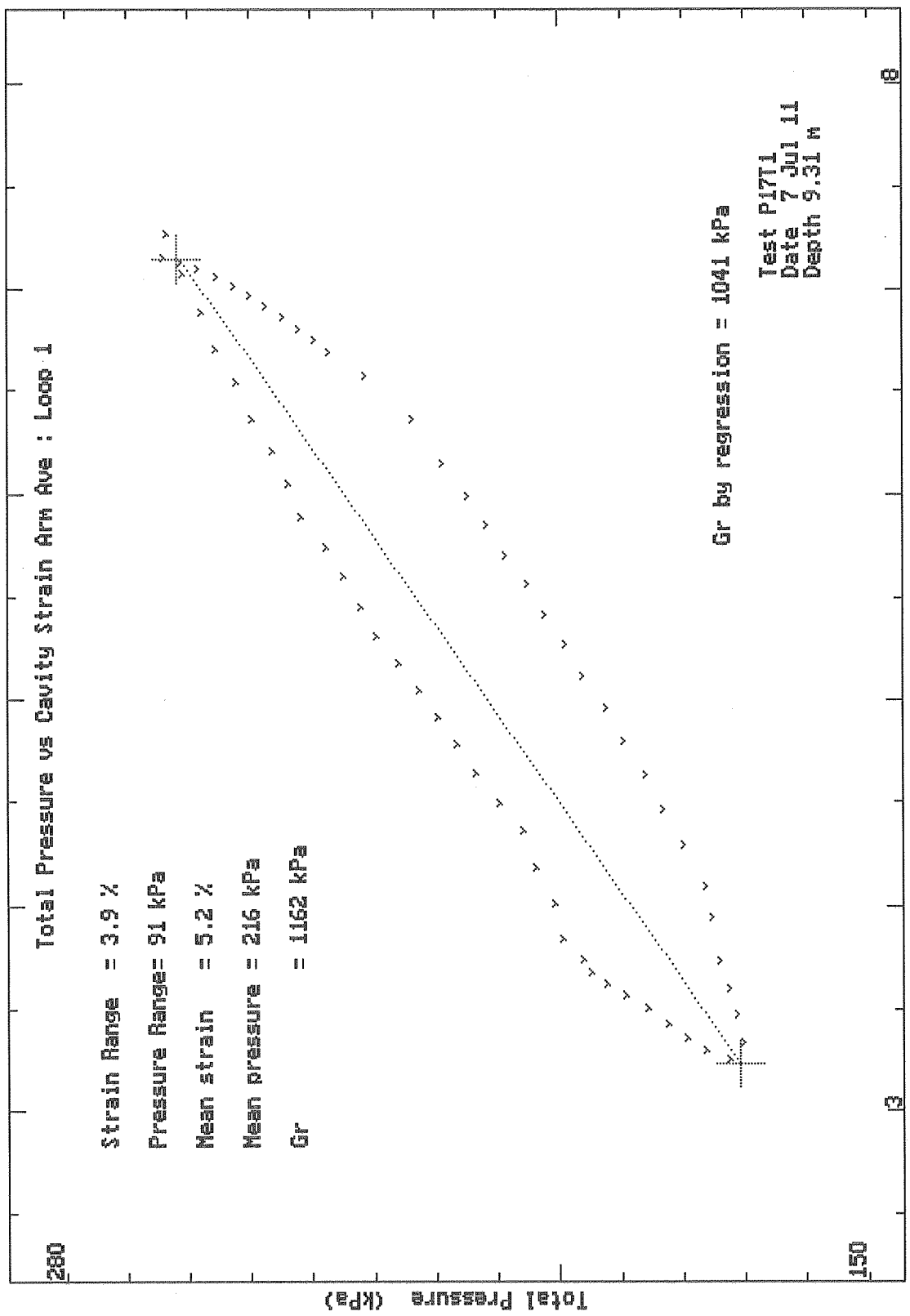

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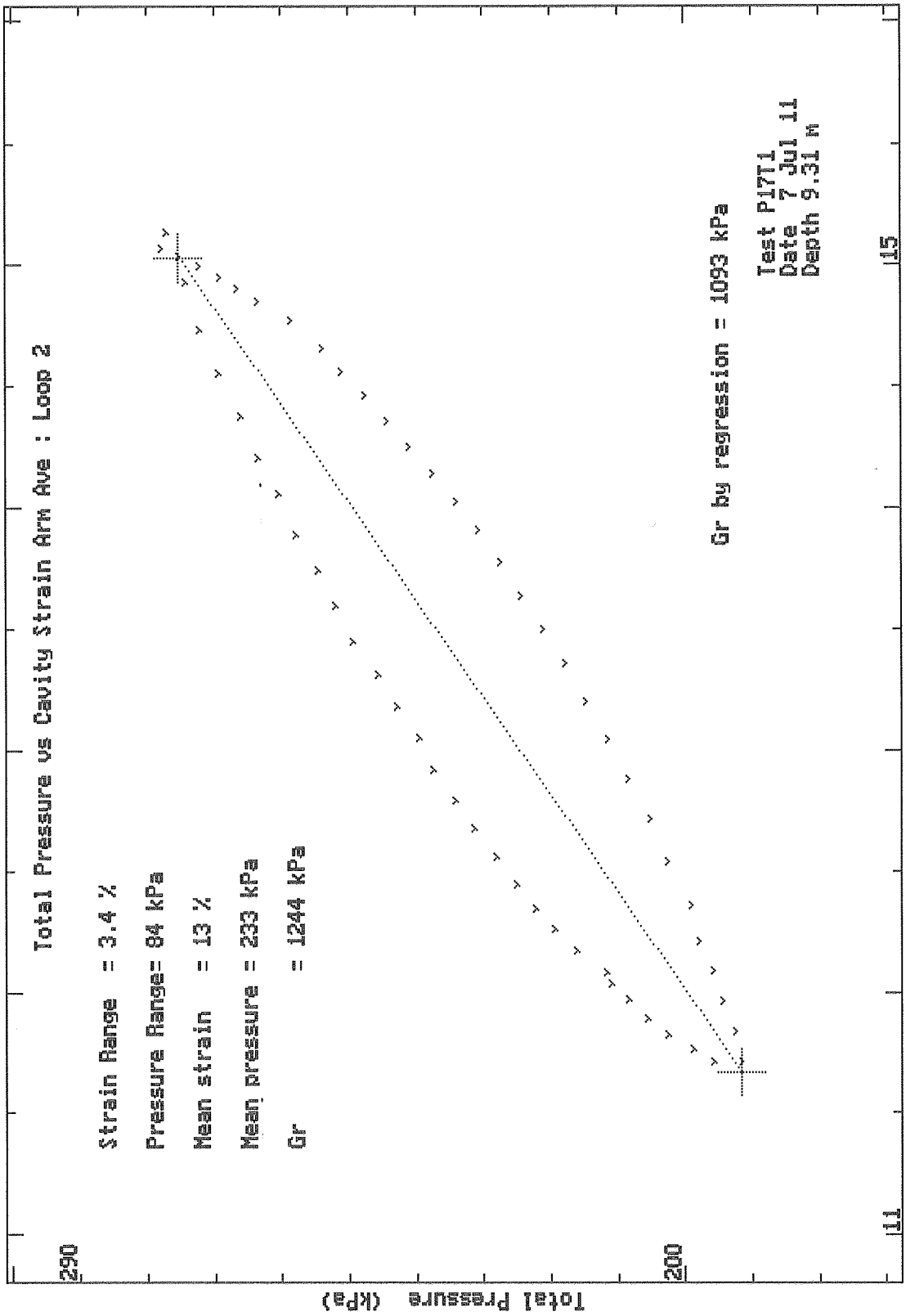

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CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- Test :- P17T2 Test Date :- 7 Jul 11

Material :- Depth (m) :- 20.8 Water Table (m) :- 0

Arm Ave

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):-

Non linear elastic exponent used	0.839	
Insitu Lateral Stress (Po)	(kPa)	127
Undrained Shear Strength (Cu)	(kPa)	209
Rigidity Index (G/Cu or Ir)		385
Limit Pressure (Pl)	(kPa)	1579
Shear Modulus at yield strain (G_min)	(MPa)	80

Analysis of Shear Modulus (G) :-

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	69.9	6.56	1012	0.237	331
2	75	9.88	1226	0.227	341
3	74.8	10.58	1242	0.248	370

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coeff (MPa)
1	0.846	34.1	28.83
2	0.835	34.99	29.2
3	0.836	35.84	29.98

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :- AM
Date :- 19 Jul 11

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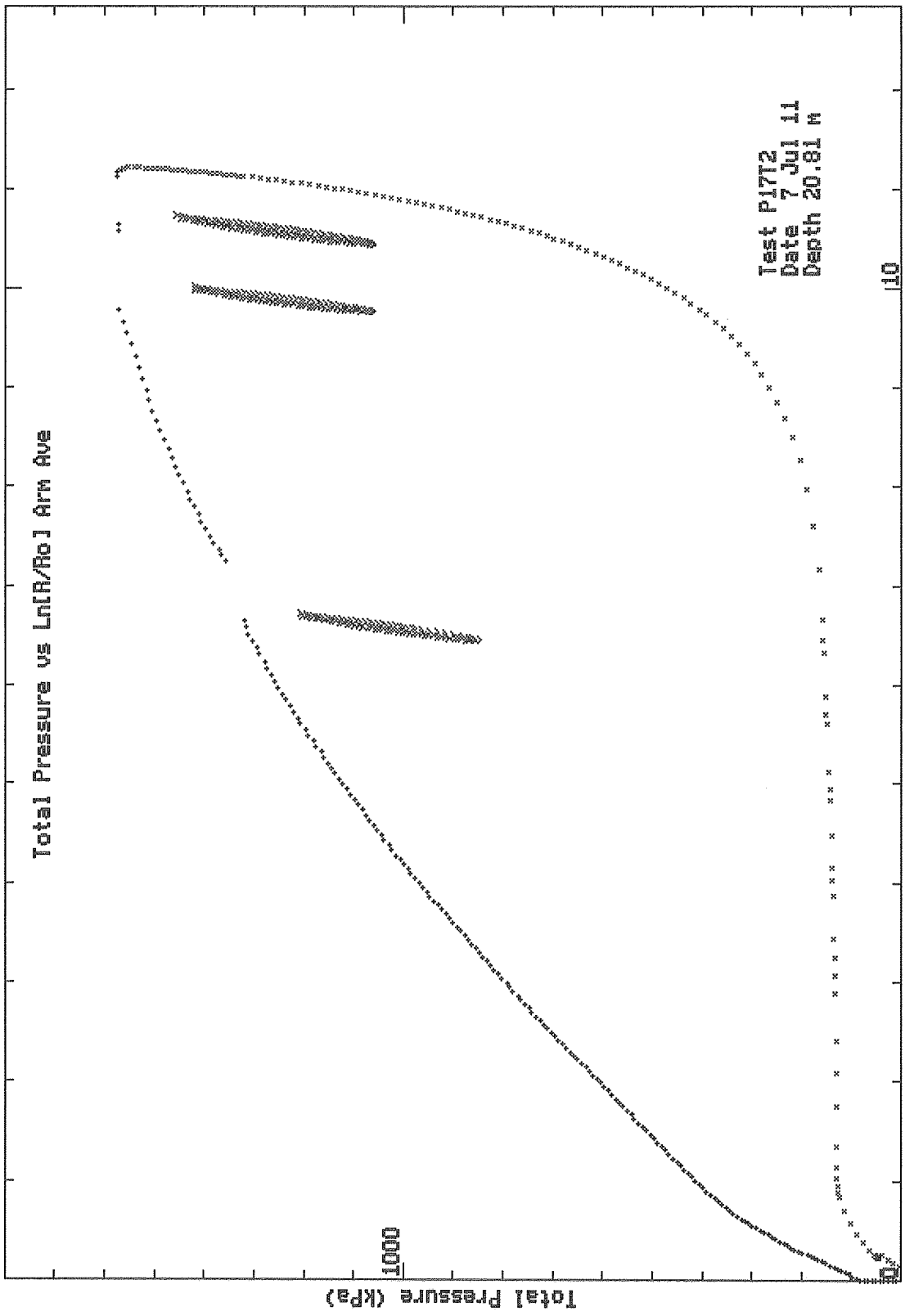

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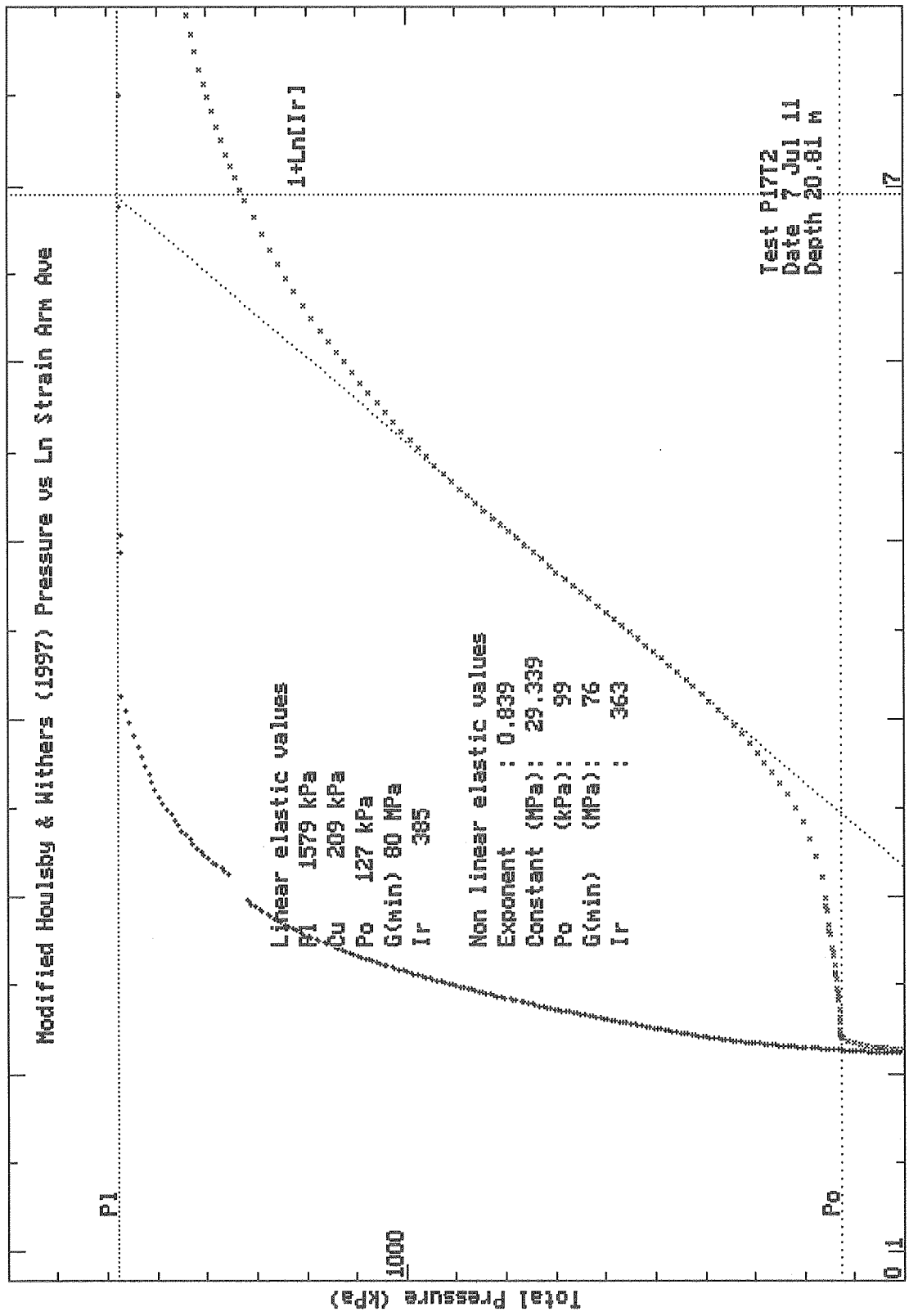

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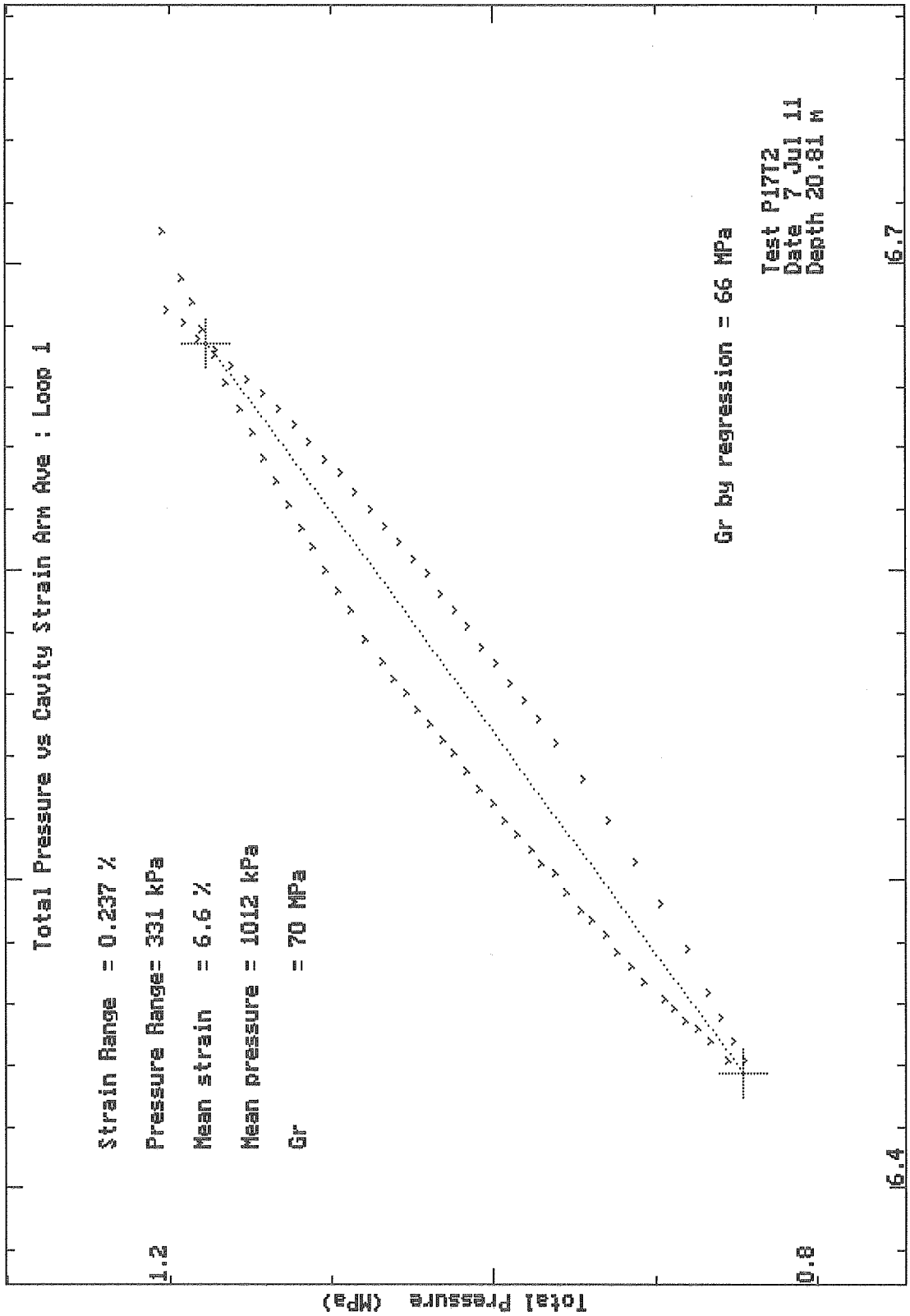

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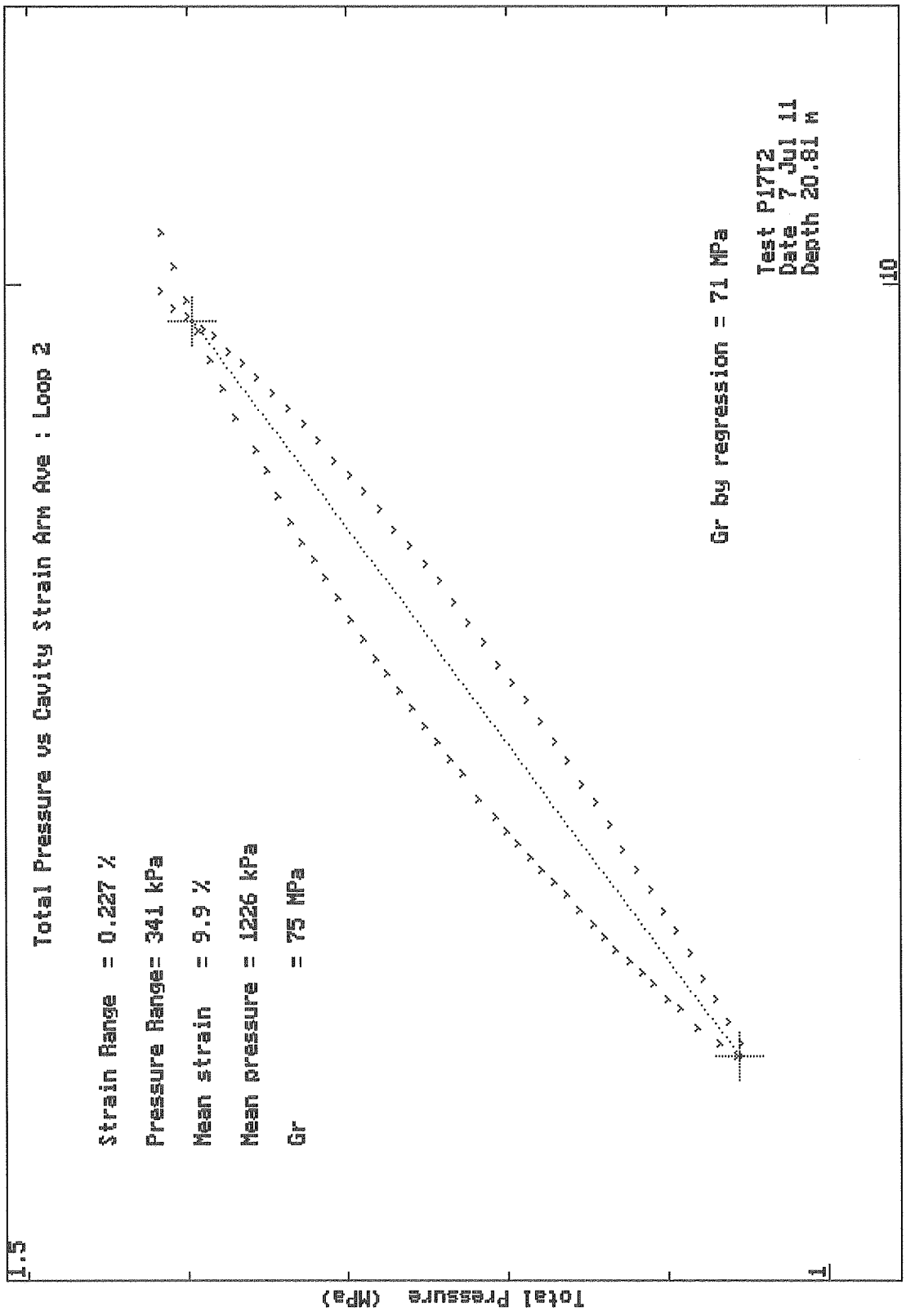

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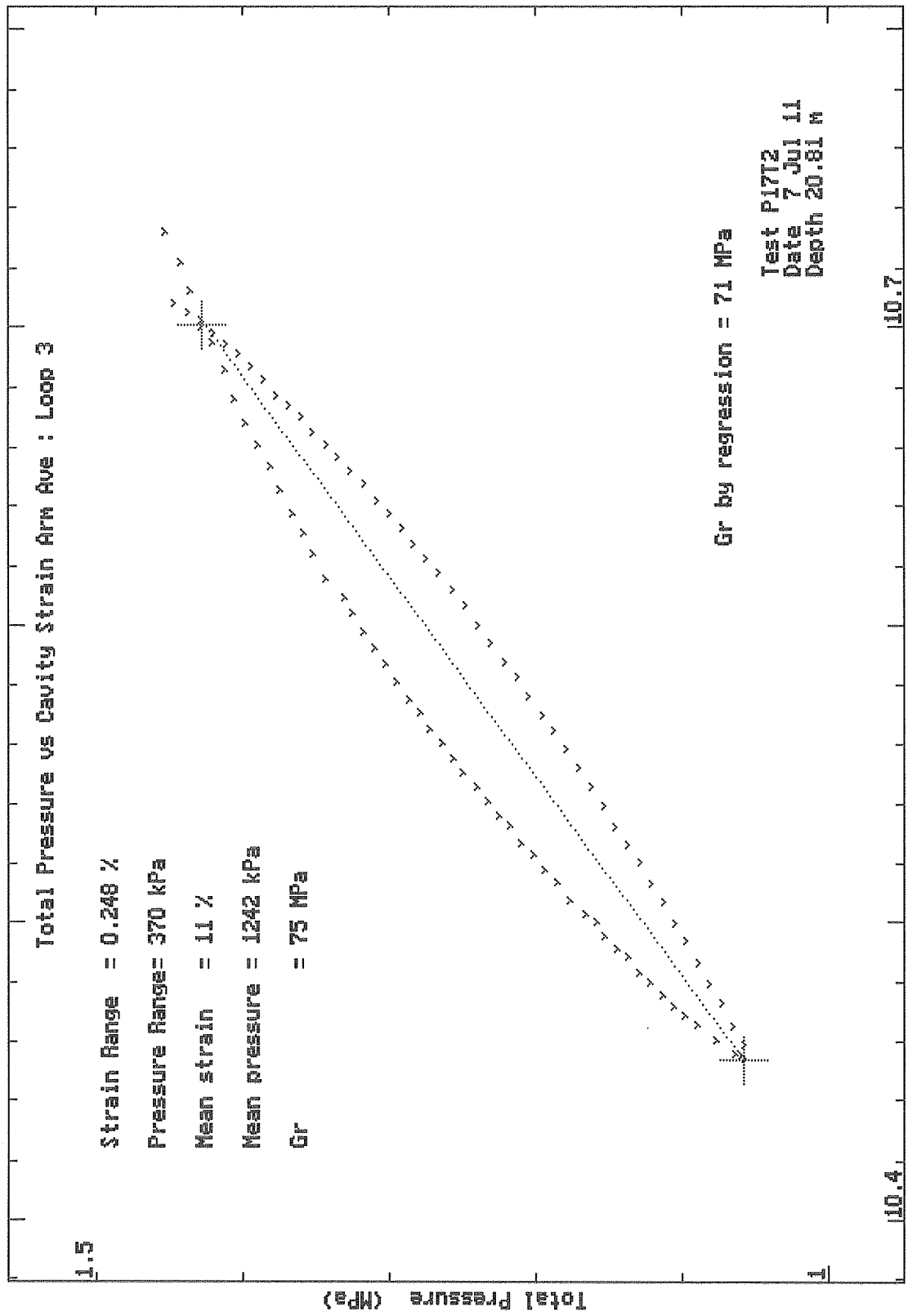

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MOS

CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- Test :- P17T3 Test Date :- 7 Jul 11

Material :- Depth (m) :- 25.7 Water Table (m) :- (

Arm Ave

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):

Non linear elastic exponent used	0.779	
Insitu Lateral Stress (Po)	(kPa)	282
Undrained Shear Strength (Cu)	(kPa)	213
Rigidity Index (G/Cu or Ir)		371
Limit Pressure (Pl)	(kPa)	1756
Shear Modulus at yield strain (G_min)	(MPa)	79

Analysis of Shear Modulus (G) :-

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	62.2	4.71	1280	0.37	460
2	65.1	5.45	1387	0.386	502

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coef (MPa)
1	0.808	30.24	24.45
2	0.75	22.87	17.16

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :- AM
Date :- 25 Jul 11

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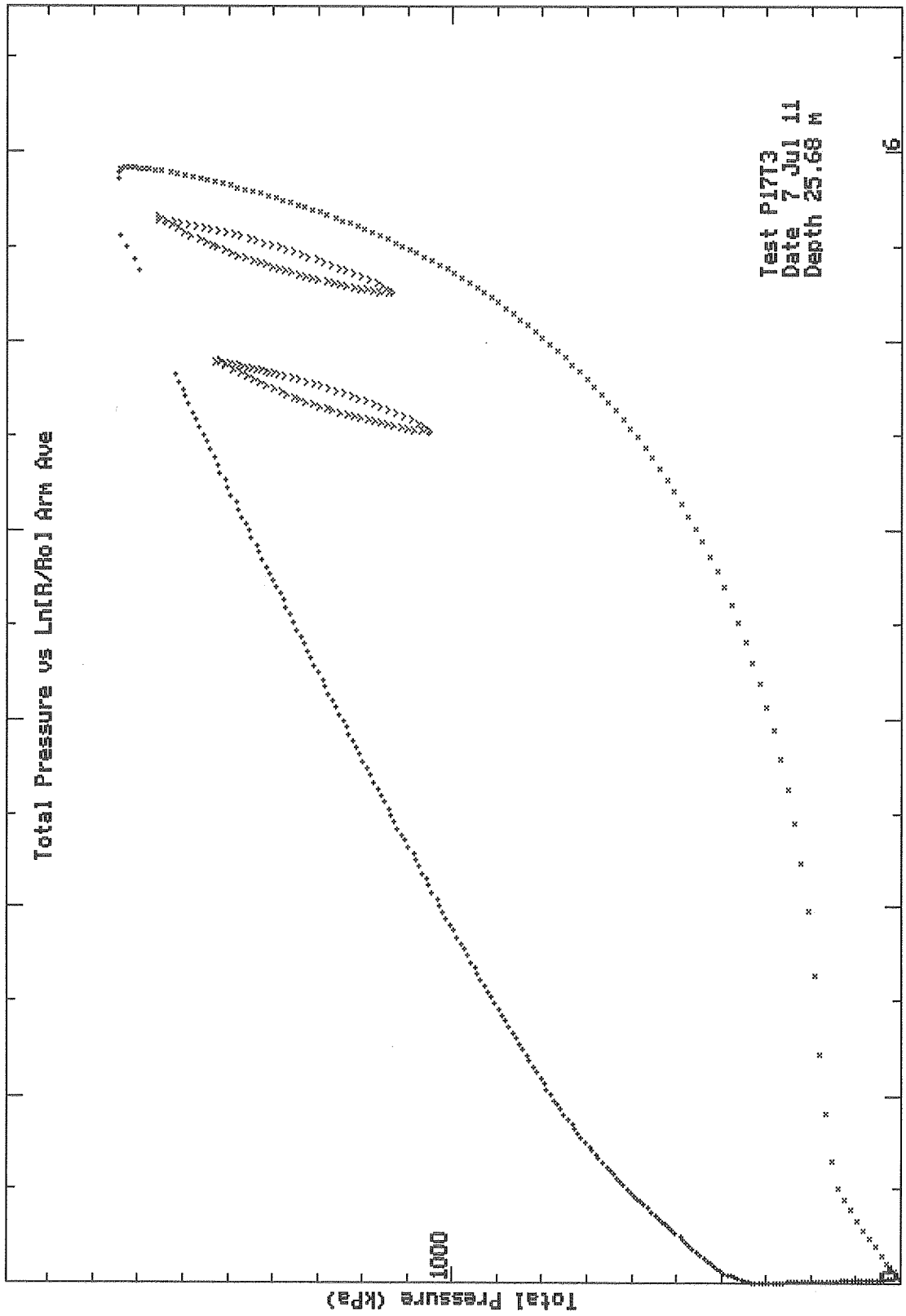

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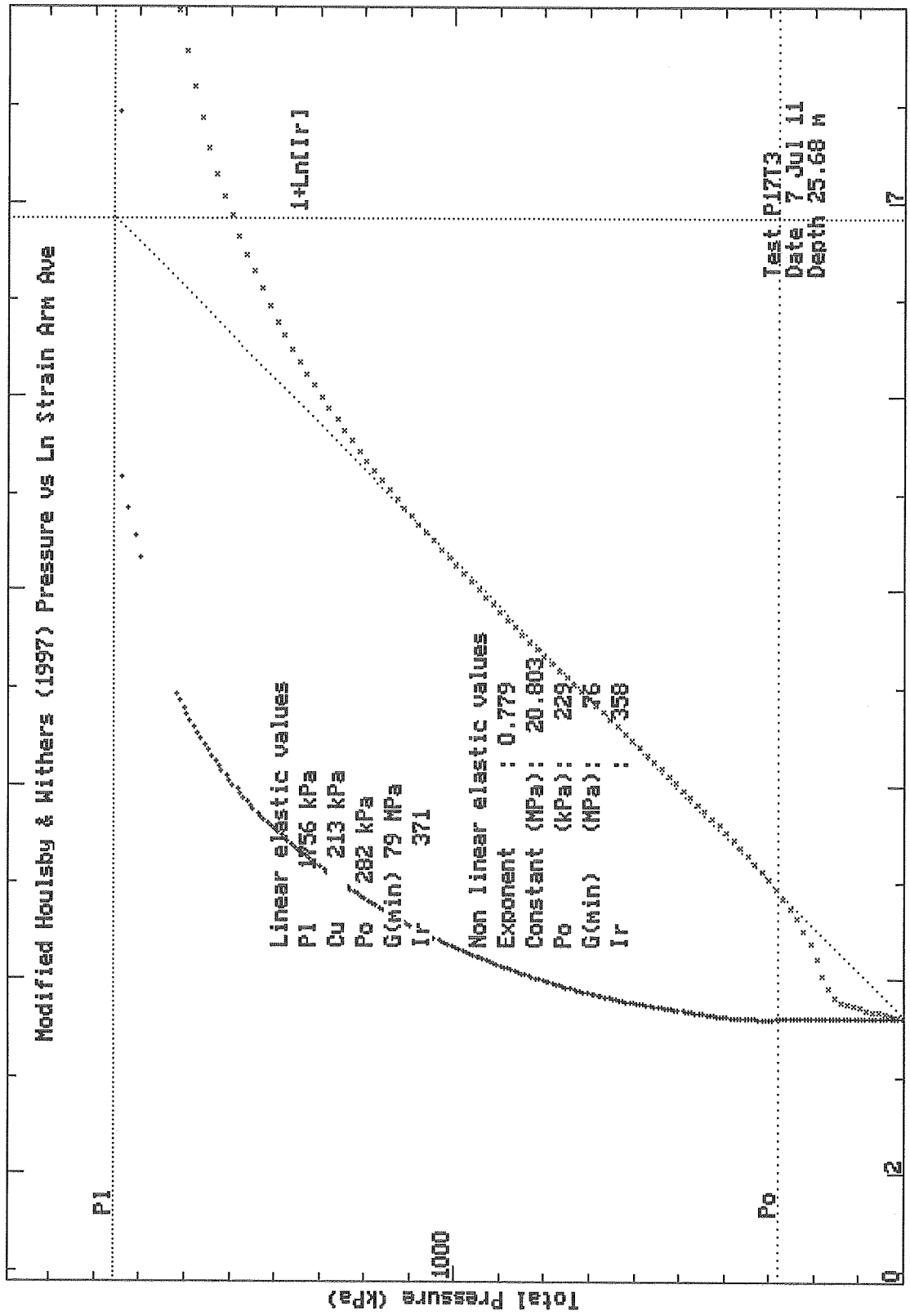

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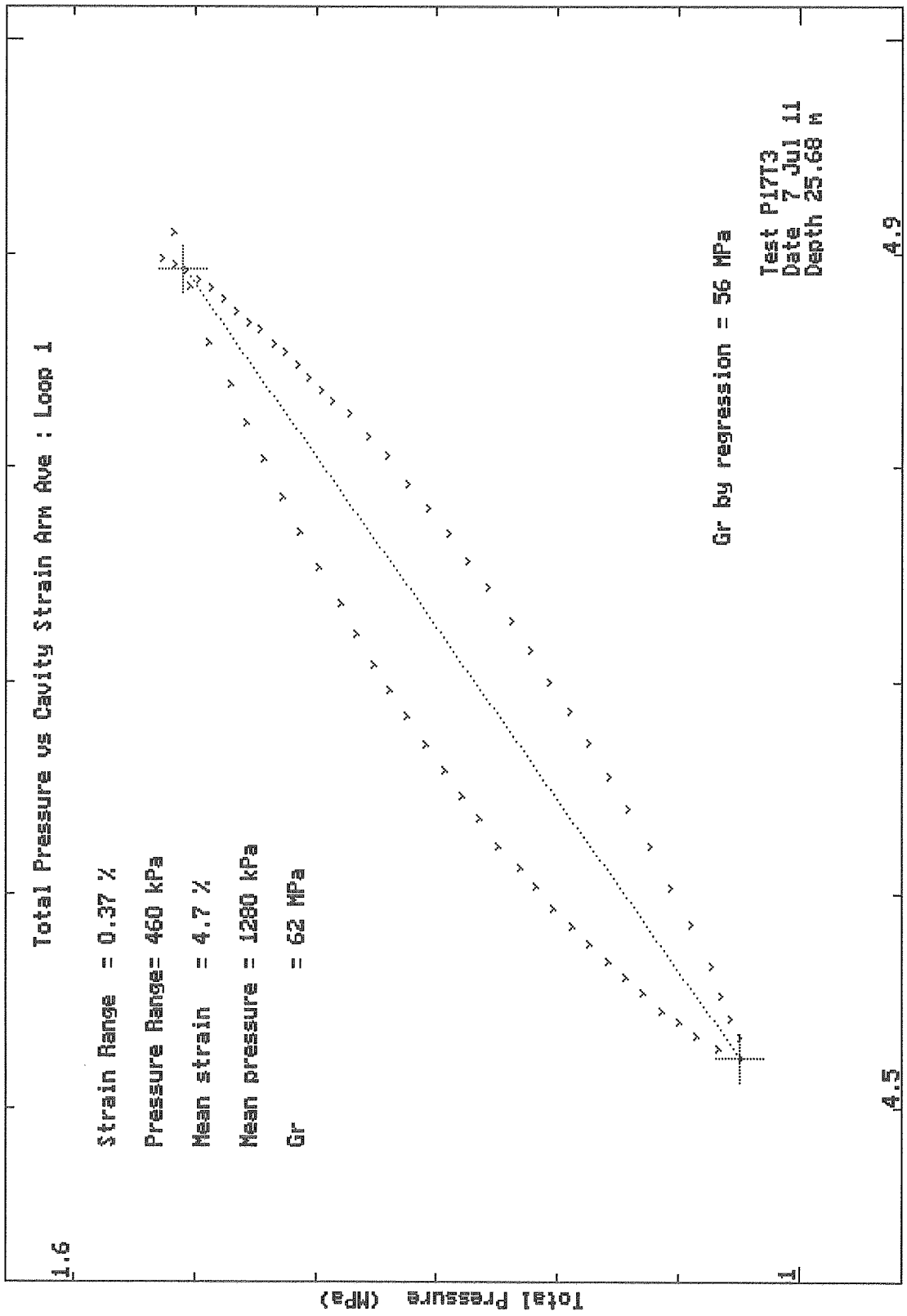

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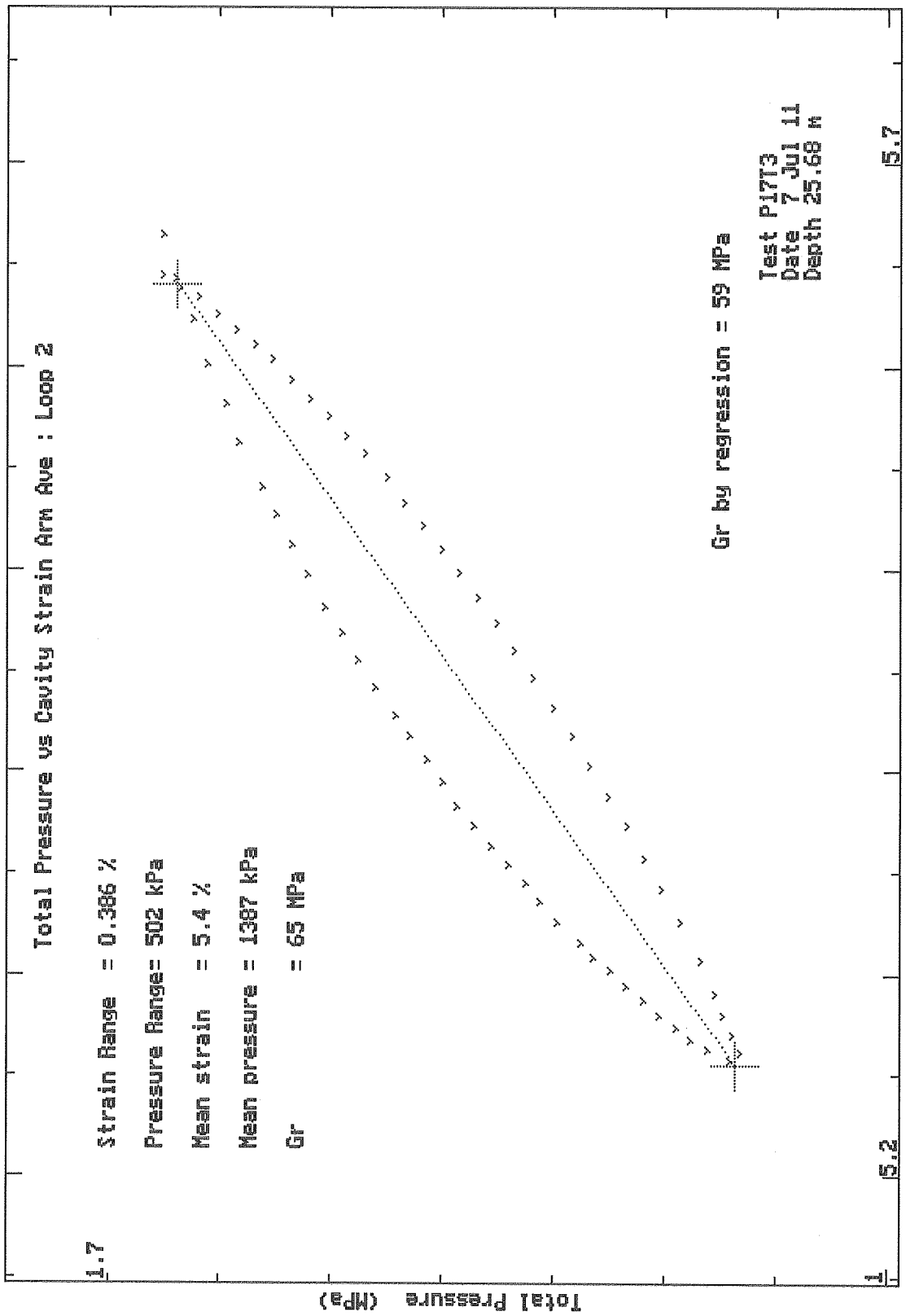

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CONE PRESSUREMETER RESULTS SUMMARY SHEET

Site:- BORSSELE Test :- P17T4 Test Date :- 7 Jul 11

Material :- Depth (m) :- 33.7 Water Table (m) :- 0

Arm Ave

Undrained Analysis, Houlsby & Withers (1988) modified Whittle (1997):-

Non linear elastic exponent used	0.771	
Insitu Lateral Stress (Po)	(kPa)	30
Undrained Shear Strength (Cu)	(kPa)	226
Rigidity Index (G/Cu or Ir)		970
Limit Pressure (Pl)	(kPa)	1809
Shear Modulus at yield strain (G_min)	(MPa)	219

Analysis of Shear Modulus (G) :-

Linear Analysis of Reload Loops :-

Loop No.	Value (MPa)	Co-ordinate Strain %	Co-ordinate Pressure(kPa)	Amplitude Strain %	Amplitude Pressure(kPa)
1	184	0.85	1407	0.114	420
2	186	0.93	1441	0.134	497

Non Linear Analysis of Reloading Data :-

Loop No.	Non linear exponent	Radial Stress Coeff. (MPa)	Shear Stress Coeff (MPa)
1	0.782	51.28	40.11
2	0.759	48.11	36.53

Comments:-

Depth refers to the centre of the membrane

Test Analysed By :- AM
Date :- 19 Jul 11

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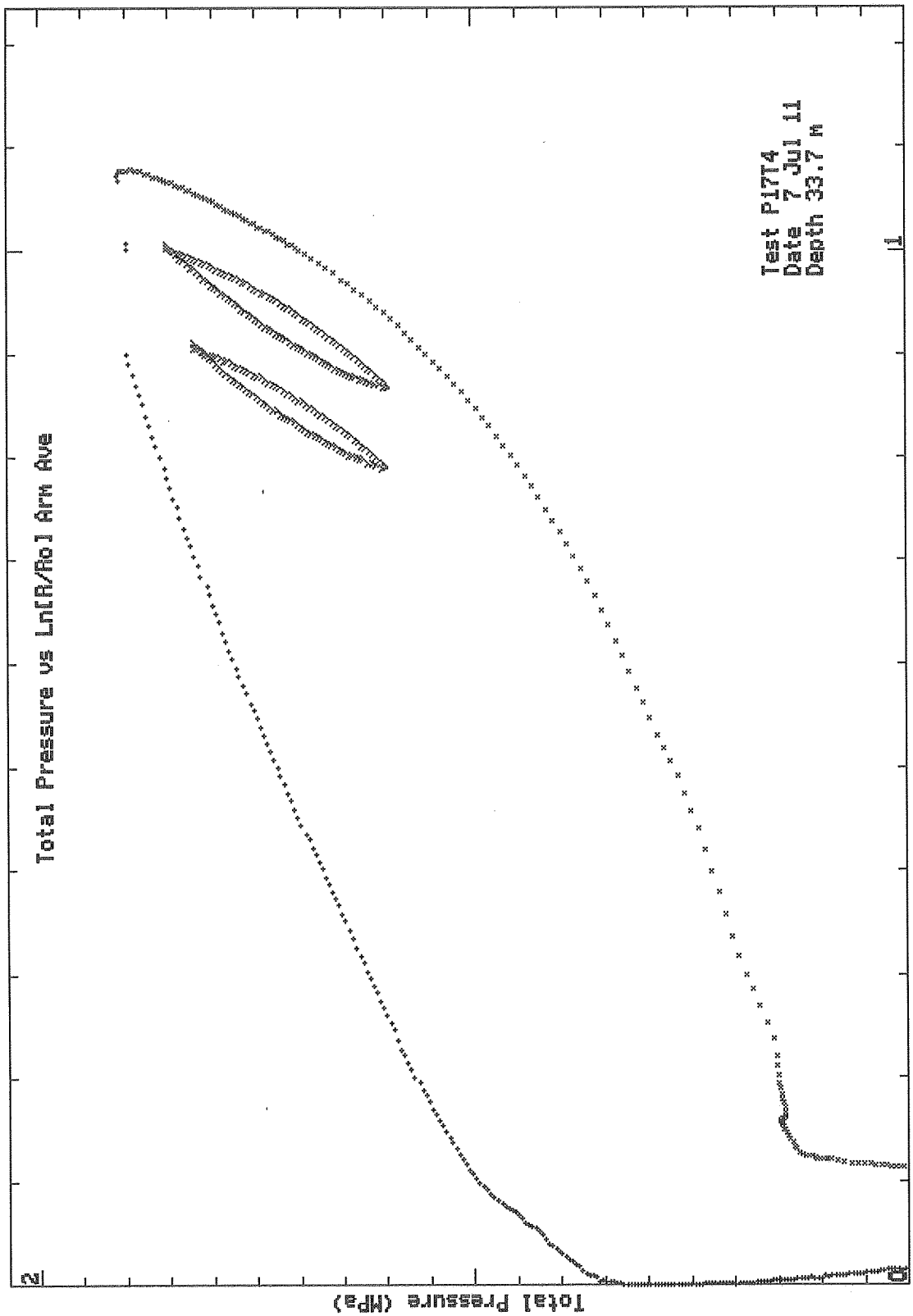

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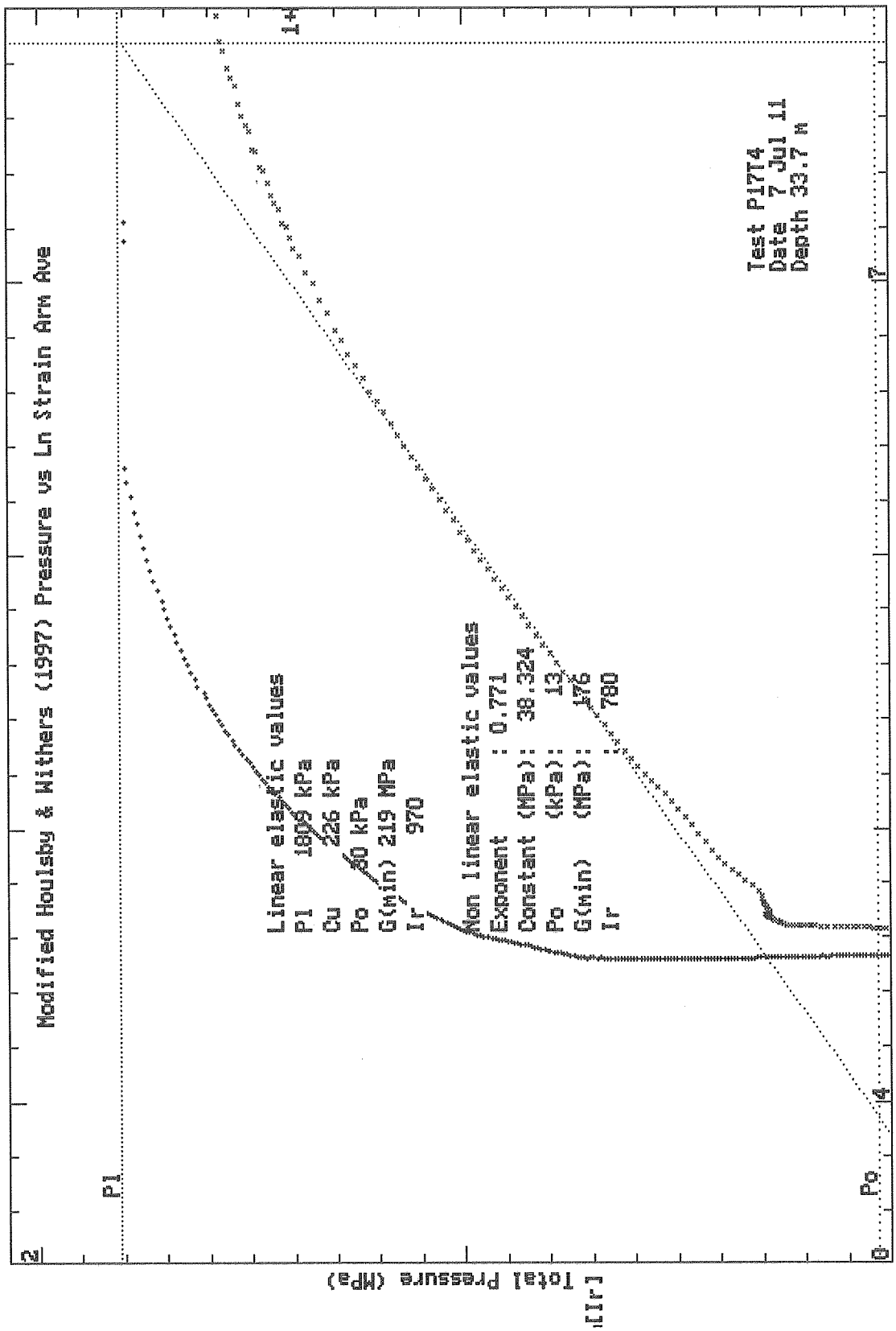

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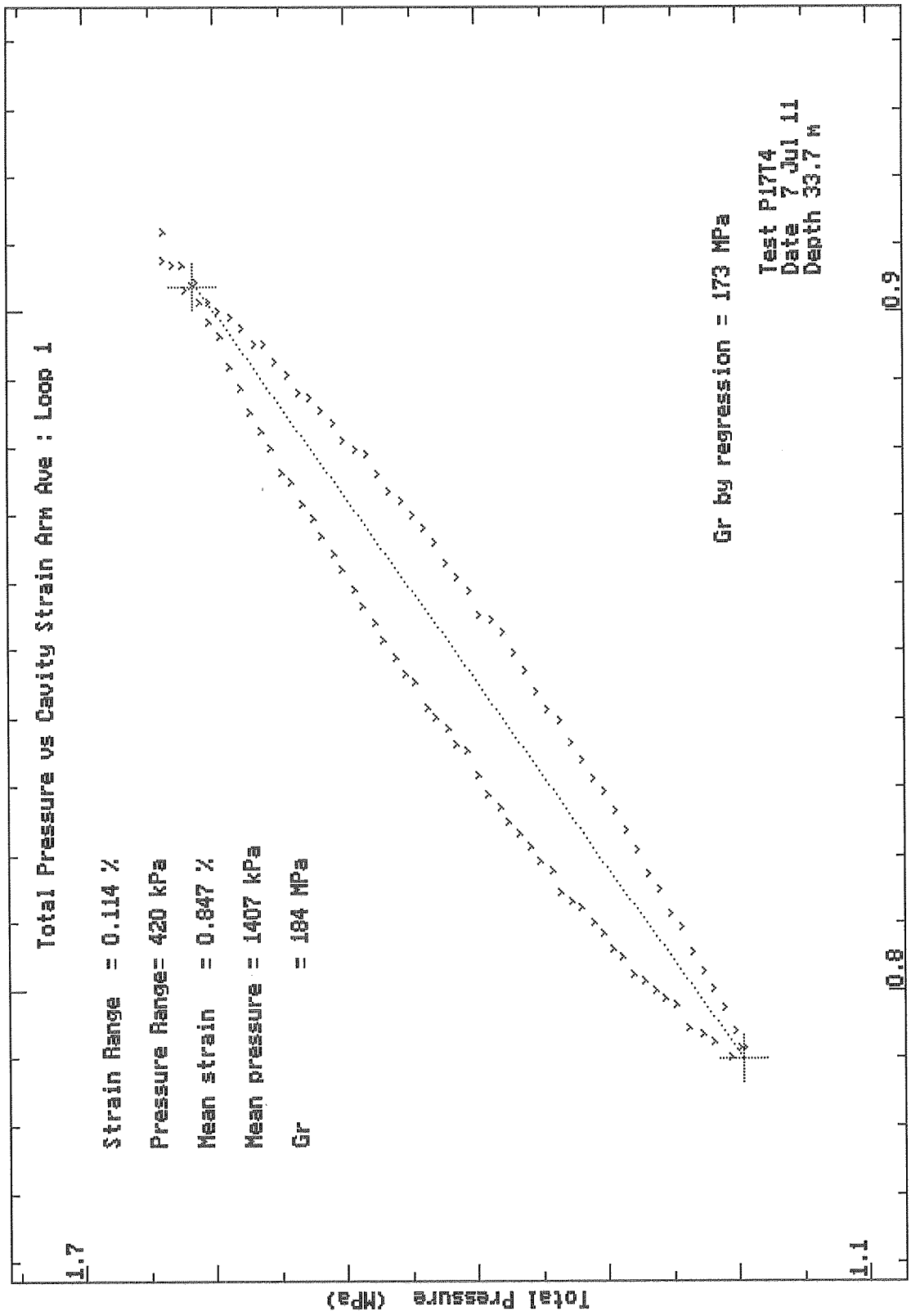

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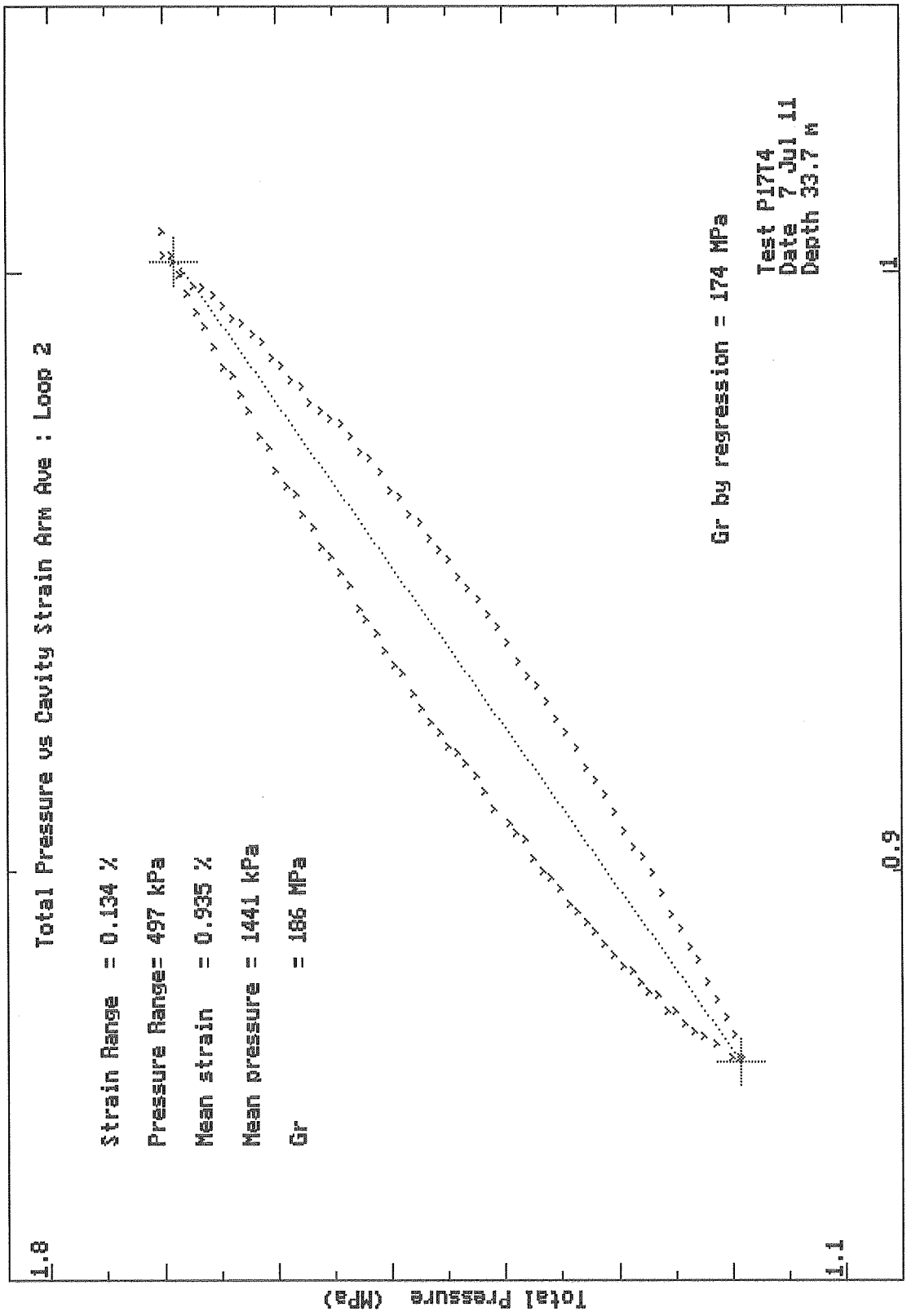

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APPENDIX C

LABORATORY TESTING REPORT

Deltares

Project Middelburg

Laboratory Testing Project KCB2

1205088-001

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Deltares

Title
Project Middelburg

Client	Project	Reference	Pages
Paul C. Rizzo Associates, Inc.	1205088-001	1205088-001-GEO-0002	17

Keywords
Laboratory testing
Over consolidated clay

Summary
Paul C. Rizzo Associates has commissioned Deltares to carry out the project 'Laboratory Testing Project KCB2', Deltares project name 'Project Middelburg'. The project consisted of the execution of several lab tests following ASTM and CEN standards on samples delivered by the client. The client assigned the tests and samples which have to be executed together with the stresses to be applied. Sometimes tests were not possible due to shortage of material or due to the fact that the test was not possible on the selected material, for instance plasticity indexes on sandy material.

Version	Date	Author	Initials	Review	Initials	Approval	Initials
001	July. 2011	Harry van Essen				Harm Aantjes	
002	Aug. 2011	Harry van Essen				Harm Aantjes	
009	Oct. 2011	Harry van Essen		Gert Greeuw		Leo Voogt	

State
final

Contents

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2 Description of activities **3**
2.1 Introduction 3
2.2 Sample treatment and handling 3
2.3 Execution of the tests 3

3 Results **5**

Appendices

A Chain of Custody **A-1**

B Testing pressures for Triaxial and Oedometer Testing **B-1**

C Results classification tests **C-1**

D Results one-dimensional consolidation tests **D-1**

E Results one-dimensional swell tests **E-1**

F Results Triaxial tests **F-1**

1 Introduction

Paul C. Rizzo Associates has commissioned Deltares to carry out the project 'Laboratory Testing Project KCB2', Deltares project name 'Project Middelburg'. The project consists of the execution of several lab tests following ASTM and CEN standards on samples delivered by the client.
This report describes the procedure of sample handling and execution of the tests, together with stresses applied (when applicable). In chapter 3 some remarks about the results of the tests are made. The specific reports of the tests are added in the appendices.

2 Description of activities

2.1 Introduction

In this paragraph the activities are described which are executed in the framework of this project. These activities cover sample (tube) treatment, sample handling and execution and reporting of the laboratory tests.
All activities are executed by the Unit Geo-Engineering, located on the Stieltjesweg in Delft.

2.2 Sample treatment and handling

The client delivered the tubes in two batches accompanied by the Chain of Custody (appendix A), which identifies the samples and the tests which are planned on that specific tube. The samples were directly after reception, stored in the temperature controlled (at 11 °C Celsius) storage facility with a high relative humidity (95%-100%). The temperature and humidity are monitored and registered constantly. After checking the Chain of Custody with the actual samples, the samples were registered in the central database.

The extrusion of the samples was performed in the opposite direction of sampling in the field (e.g. the samples were pushed from the bottom of the tube to the top). After extrusion the samples were put in a PVC tube cut in half with an inner diameter corresponding to that of the sample. Subsequently, the tubes and samples were sealed with plastic foil and placed back in the storage facility until further trimming and testing. All samples are identified by the original sample number of the client from reception to reporting.

Trimming was done either by cutting slices in a special trimming instrument (triaxial) or by gently pushing a cutting ring into the sample.

2.3 Execution of the tests

The following tests were executed:

Test	Standard
Atterberg limits	ASTM D4318-05
Moisture content	ISO/TS 17892-1
Unit weight	ISO/TS 17892-2
Specific gravity of soil solids	ASTM D5550-06
Organic content	ASTM D2974-07a
Minimum density	ASTM D4254-00(2006)e1
Maximum density	ASTM D4253-00(2006)
Isotropically consolidated undrained triaxial test (CU) with pore pressure measurements	ISO/TS 17892-9
Isotropically consolidated drained triaxial test (CD)	ISO/TS 17892-9
One-dimensional consolidation	ISO/TS 17892-5
One-dimensional swell	ISO/TS 17892-5
Permeability	ISO/TS 17892-11

Table 2.1 Executed test and applied standards

The stresses to apply on the samples during the tests were deduced from the list provided by the client (Appendix B). This list contains the maximum vertical and horizontal stress. For the tests they were divided by a factor two for each step. Therefore, with respect to the triaxial tests the following stresses were applied:

Step	Vertical stress	Horizontal stress
1	$\sigma_{v;max}/4$	$\sigma_{h;max}/4$
2	$\sigma_{v;max}/2$	$\sigma_{h;max}/2$
3	$\sigma_{v;max}$	$\sigma_{h;max}$

With regard to the one-dimensional swell test the following schedule was followed:

Step	Vertical stress
1	$\sigma_{v;max}/16$
2	$\sigma_{v;max}/8$
3	$\sigma_{v;max}/4$
4	$\sigma_{v;max}/2$
5	$\sigma_{v;max}$
6	$\sigma_{v;max}/2$
7	$\sigma_{v;max}$

The stresses which are applied for the one-dimensional swell and permeability tests were supplied by the client. The permeability tests were executed either as a falling head test with a confining ring or as a flexible wall test in a triaxial set up.

3 Results

The results of the test are presented in the appendices. All tests are reported per type of test. With respect to the one-dimensional consolidation tests the following remarks can be made:

- The test on sample ST-5 of boring KB-104 showed a swelling tendency during the first step. Due to this swelling, the sample height at the end of step 1 was somewhat more than the initial height, about 0.5% larger. This first point is not shown in the graph, but used as the first point in the determination of the pre-consolidation stress.
- The specific gravity of the particles was not always ordered. In that cases the specific gravity from samples nearby or from samples in other borings at the same depth were chosen. That is probably related to the fact that the saturation is sometimes higher than 1. Another reason is that this measurement has not a high accuracy, values of more than 1.0 for the degree of saturation are not uncommon.
- Of the following samples it was not possible to determine the min max density:
  - KB-101_R-14 (empty sampler)
  - KB-101_R-7 (clay)
  - KB-101_R-25 (clay)
- Of the following samples it was not possible to determine the Atterberg limits:
  - KB-101_R-28 (sand with shells)
  - KB-101_ST-1 (sand)
  - KB-102_ST-1 (sand silty)
  - KB-103_ST-3 (sand)
  - KB-104_ST-2 (sand silty)
  - KB-103A_ST-1 (sand silty)
  - KB-103A_ST-9 (sand)
  - KB-104_R-2 (too small clay pieces)
  - KB-104A_ST-5 (sand silty)
- The following samples were not tested due to end of contract:
  - KB-103_ST-6 (Atterberg limits)
  - KB-104_ST-5 (CU Triaxial)
  - KB-104_ST-8 (CU Triaxial)
  - KB-101_ST-5 (CU Triaxial)
  - KB-101_ST-14 (CU Triaxial)

A Chain of Custody

120508-P.001. 5+ 102 104

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Paul C. Rizzo Associates, Inc.

CHAIN OF CUSTODY RECORD

Sheet 1 of 3.

PROJECT NO.: 10A472

PROJECT NAME: KCB-2 Delta

SAMPLER(S) (SIGNATURE): Onfile with original COC Record

	SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED	NO. OF CONTAINERS	Sieve & Hydrometer	Specific Gravity	Oedometer	CU Triaxial	Unit weight	Atterberg Limit	Permeability	Direct Shear	Max. Min Density	Moisture Content	Organic Content	COMMENTS
9	KB-103 ST-1	24/6/11	1615	S	8.32-8.92 m	N/A	1	X	X	X								X	Upper part is organic soil Test clay part should be tested for oedometer.
3	KB-103 S-16	24/6/11	1720	S	9.37-9.97 m	N/A	1	X	X								X	X	
8	KB-103 ST-3	25/6/11	1030	S	12.37-12.97 m	N/A	1			X	X		X				X		
	KB-103 S-28	27/6/11	1400	S	18.27-18.87 m	N/A	1	X	X								X	X	
8	KB-103 ST-5	27/6/11	1430	S	18.87-19.47 m	N/A	1			X	X						X	X	57% recovery. AMOUNT NOGED DUE TO OF WATER.
9	KB-103 ST-6	28/6/11	1515	S	26.67-27.27m	N/A	1		X	X	X		X				X	X	
8	KB-103 S-41	28/6/11	1600	S	27.27-27.87 m	N/A	1	X					X						
1	KB-103A ST-4	30/6/11	14:50	S	74.80-75.34 m	N/A	1		X	X	X		X				X		
5	KB-103A ST-6	30/6/11	15:55	S	78.17-78.72 m	N/A	1		X	X	X		X				X		
8	KB-103A ST-9	30/6/11	18:35	S	84.76-85.31 m	N/A	1		X	X	X		X				X		
5	KB-103A ST-10	30/6/11	03:30	S	93.73-94.14 m	N/A	1	X			X			X			X		PERM REPLACED BY UBIOL ST-5
8	KB-102A S-21	4/7/11	0900	S	13.6-14.2 m	N/A	1	X									X		
8	KB-102A S-30	4/7/11	1510	S	19.6-20.2 m	N/A	1	X									X		

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CJE Chad Ellsworth	5/7/11 1600	MMD
MMD	6/7/11 11:20	HJE

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CHAIN OF CUSTODY RECORD

Sheet 2 of 3.

PROJECT NO.: 10-4472

PROJECT NAME: KCB2-Delta

SAMPLER(S) (SIGNATURE): On file with original COC Record

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED	NO. OF CONTAINERS	Sieve & Hydrometer	Specific Gravity	Oedometer	CU Triaxial	Unit Weight	Atterberg Limit	Permeability	Direct Shear	Max. Dry Density	Moisture Content	Organic Content	COMMENTS
KB-102 R-A	27/6/11	1840	S	31.79-32.68 m	N/A	1	X	X										Use only enough for testing.
KB-102 R-32	28/6/11	0950	S	59.39-60.36 m	N/A	1	X	X										Use only enough to test
KB-102 ST-1	28/6/11	1030	S	60.36-60.91 m	N/A	1				X		X		X				
KB-102 ST-2	28/6/11	1600	S	75.69-76.24 m	N/A	1			X	X								
KB-102 ST-6	29/6/11	0325	S	98.31-98.86 m	N/A	1		X	X	X	X			X		X		
KB-104A S-5	29/6/11	1730	S	4.80-5.40 m	N/A	1	X	X										
KB-104A ST-3	30/6/11	0930	S	9.00-9.60 m	N/A	1		X	X		X	X				X		DEPTH: 9.40-10.20 HvE 8/11/2011 DO NOT USE
KB-104A ST-6	1/7/11	1220	S	27.00-27.60 m	N/A	1		X	X	X		X				X		
KB-104A ST-5	1/7/11	0740	S	20.40-21.00 m	N/A	1			X			X	X			X		
KB-104A S-28	1/7/11	0800	S	21.60-21.60 m	N/A	1	X	X									X	
KB-104 R-2	23/6/11	1325	S	30.80-31.55 m	N/A	1	X					X			X			Use only enough to test
KB-104 ST-2	24/6/11	0335	S	54.34-54.84 m	N/A	1				X		X	X	X		X		
KB-104 ST-5	24/6/11	1700	S	78.91-79.46 m	N/A	1			X	X		X				X		

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MMD	6/7/11 1120	HvE

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

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LABORATORY: Deltares

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CHAIN OF CUSTODY RECORD

Sheet 3 of 3.

PROJECT NO.: 10-A472

PROJECT NAME: KCB-2 Delta

SAMPLER(S) (SIGNATURE): Onfile with Original COC Record

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED	NO. OF CONTAINERS	Sieve & Hydrometer	Specific Gravity	Oedometer	CU Triaxial	Unit Weight	Atterberg Limit	Permeability	Direct Shear	Max. Min Density	Moisture Content	Organic Content	COMMENTS
8 KB-104 ST-7	24/6/11	2210	S	88.44-88.94 m	N/A	1				X	X		X			X		
9 KB-104 ST-8	25/6/11	0320	S	97.90-98.40 m	N/A	1			X	X	X	X	X					CU on clay part

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
CJE Chad Ellsworth	5/7/11 1600	MMD [signature]			
MMD [signature]	6/7/11 1120	HUE [signature]			

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LABORATORY: Deltares

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B Testing pressures for Triaxial and Oedometer Testing

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CHAIN OF CUSTODY RECORD

Sheet 2 of 3.

PROJECT NO.: 10-4172

PROJECT NAME: KCB-2 Delta

SAMPLER(S) (SIGNATURE): On file with original COC Record

	SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED	NO. OF CONTAINERS	Sieve & Hydrometer	Specific Gravity	Oedometer-Consolidation	Triaxial	Unit Weight	Atterberg Limits	Permeability	Direct-Shear	Mon-Min Density	Moisture Content	Organic Content	COMMENTS
①	KB-101 ST-9	4/7/11	0235	S	136.80-137.35	NA	1				X								
②	KB-101 ST-10	4/7/11	0605	S	145.25-145.80	NA	1						X						
③	KB-101 ST-11	4/7/11	1050	S	155.81-156.36	NA	1				X	X	X						
④	KB-101 R-159	4/7/11	1500	S	162.30-163.30	NA	1	X					X						Two types of soil multiple test may be required.
⑤	KB-101 ST-14	5/7/11	0455	S	184.81-185.31m	NA	1				X	X	X						
⑥	KB-103A R-38	30/6/11	1045	S	65.80-66.85m	NA	1	X								X			
⑦	KB-103A ST-1	29/6/11	2035	S	31.74-32.27m	NA	1				X		X						
⑧	KB-105 S-18	15/6/11	Not recorded	S	~~11.52~~ ~~6.05~~ - 11.97m	NA	1	X					X						
⑨	KB-105 ST-4	15/6/11	1545	S	12.42-13.04m	NA	1				X								
⑩	KB-105 ST-7	16/6/11	Not recorded	S	19.15-19.65m	NA	1				X								
⑪	KB-105 ST-8	16/6/11	Not recorded	S	21.50-22.00m	NA	1				X								
⑫	KB-105 S-43	16/6/11	1250	S	25.74-26.34m	NA	1	X											
⑬	KB-105A ST-1	20/6/11	2310	S	38.89-34.44m	NA	1				X			X					

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
A. Michel Pellet	11/7/11 1230	MMD
MMD	11/7/11 1513	

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LABORATORY: Deltares

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SAMPLE TYPE: W—WATER, S—SOLID, A—AIR, O—OTHER

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CHAIN OF CUSTODY RECORD

Sheet 1 of 3.

PROJECT NO.: 10-4472

PROJECT NAME: KCB2 - Delta

SAMPLER(S) (SIGNATURE): Onfile with original COC Record

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED	NO. OF CONTAINERS	Sieve & Hydrometer	Specific Gravity	Oedometer-Consolidation	Triaxial	Unit weight	Atterberg Limits	Permeability	Direct Shear	Max/Min Density	Moisture Content	Organic Content	COMMENTS
KB-101 ST-1	1/7/11	1940	S	10.27-10.82 m	NA	1				X		X				X		
KB-101 R-11	1/7/11	2045	S	12.97-14.00 m	NA	1	X									X		
KB-101 R-12	1/7/11	2100	S	14.00-14.91 m	NA	1									X			
KB-101 R-14	1/7/11	2130	S	15.97-17.08 m	NA	1									X			
KB-101 R-19	1/7/11	2245	S	20.96-21.94 m	NA	1	X								X			
KB-101 R-66	2/7/11	1720	S	66.47-67.44 m	NA	1	X								X			
KB-101 ST-3	2/7/11	2100	S	72.90-73.41 m	NA	1						X	X					
KB-101 R-79	3/7/11	0025	S	80.99-81.86 m	NA	1	X					X						
KB-101 ST-5	3/7/11	1020	S	97.18-97.23 m	NA	1	X			X		X						
KB-101 ST-6	3/7/11	1200 ~~1425~~	S	102.70-103.25 m	NA	1				X	X							
KB-101 ST-7	3/7/11	1425	S	108.26-108.81 m	NA	1	X			X								
KB-101 ST-8	3/7/11	1715	S	115.76-116.33 m	NA	1				X								
KB-101 R-119	3/7/11	1830	S	121.24-122.21	NA	1									X			

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
[signature]	11/7/11 1230	MWD [signature]			
MWD [signature]	12/7/11 1513	[signature]			

REMARKS:

NOTE: ALL SAMPLES ARE TO BE INSPECTED FOR PHYSICAL INTEGRITY UPON RECEIPT BY THE ANALYTICAL LABORATORY.

Distribution—Original accompanies shipment, copy to project files.

SAMPLE TYPE: W—WATER, S—SOLID, A—AIR, O—OTHER

LABORATORY: Deltares

Rev. June 2007

F—129

ENGINEERS & CONSULTANTS
Paul C. Rizzo Associates, Inc.

CHAIN OF CUSTODY RECORD

Sheet 3 of 3.

PROJECT NO.: 10-4472

PROJECT NAME: KCB-2 Delta

SAMPLER(S) (SIGNATURE): On file with original COC Record

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED	NO. OF CONTAINERS	Sieve & Hydrometer	Specific Gravity	Oedometer - Consolidation	Triaxial	Unit weight	Atterberg limits	Permeability	Direct Shear	Max-Min Density	Moisture Content	Organic Content	COMMENTS
KB-105A ST-2	21/6/11	5:45	S	42.56 - 43.04m	NA	1				X								
KB-105A ST-3	21/6/11	20:30	S	69.89 - 70.43m	NA	1				X								
KB-105A ST-5	21/6/11	0440	S	84.57 - 85.12m	NA	1				X								
KB-105A ST-6	22/6/11	1100	S	95.74 - 96.29	NA	1				X		X						
KB-101 R-7	1/7/11	1840	S	8.27 - 9.27m	NA	1									X			
KB-101 R-25	2/7/11	0110	S	26.98 - 27.91m	NA	1	X					X			X			
KB-101 R-28	2/7/11	0200	S	29.69 - 30.51m	NA	1	X					X			X			
KB-101 R-40	2/7/11	0440	S	40.81 - 41.74m	NA	1	X								X			
KB-101 R-5	1/7/11	1650	S	6.19 - 7.19m	NA	1	X								X			

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
A Mehul Patel	11/7/11 1230	MMD
MMD	11/7/11	

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):

Distribution—Original accompanies shipment, copy to project files.

SAMPLE TYPE: W—WATER, S—SOLID, A—AIR, O—OTHER

REMARKS:

LABORATORY: Deltares

NOTE: ALL SAMPLES ARE TO BE INSPECTED FOR PHYSICAL INTEGRITY UPON RECEIPT BY THE ANALYTICAL LABORATORY.

Rev. June 2007

F—129

C Results classification tests

AA1: water content
AA2: min/max density
AA3: specific gravity
AA4: organic material and carbonate content
AA5: permeability
AA6: Atterberg limits
KB-104_ST-2: constant head, permeability in triaxial cell
KB-104A_ST-5: constant head, permeability in triaxial cell
KB-105_ST-1: constant head, permeability in triaxial cell

KCB-2 Laboratory Investigation

Testing Pressures for Triaxial and Oedometer Testing

6/7/2011 Sample Set 1

Boring No.	Sample ID	Sample Top Depth [m]	Sample Bottom Depth [m]	Max. Vertical Pressure [kPa]	Max. Confining Pressure [kPa]
KB 103	ST-1	8.32	8.92	276	185
KB 104A	ST-3	9	9.6	282	188
KB 103	ST-3	12.37	12.97	313	209
KB 103	ST-5	18.87	19.47	884	590
KB 103	ST-6	26.67	27.27	963	642
KB 104A	ST-6	27	27.6	963	642
KB 104	*ST-2*	*54.34*	*54.84*	*1062*	*708*
KB 102	*ST-1*	*60.36*	*60.91*	*1071*	*714*
KB 103A	ST-4	74.8	75.34	1094	730
KB 102	ST-2	75.69	76.24	1094	730
KB 103A	ST-6	78.17	78.72	1104	736
KB 104	ST-5	78.91	79.46	1104	736
KB 103A	ST-9	84.76	85.31	1116	744
KB 104	ST-7	88.44	88.94	1129	753
KB 103A	ST-10	93.73	94.14	1145	763
KB 104	ST-8	97.9	98.4	1162	775
KB 102	ST-6	98.31	98.86	1162	775
					11/7/2011 Sample Set 2
KB 101	ST-1	10.27	10.82	839	559
KB 101	ST-3	72.9	73.41	1094	730
KB 101	ST-5	97.18	97.23	1162	775
KB 101	ST-6	102.7	103.25	1182	788
KB 101	ST-7	108.26	108.81	1203	802
KB 101	ST-8	115.76	116.33	1251	834
KB 101	ST-9	136.8	137.35	1366	911
KB 101	ST-10	145.25	145.8	1398	932
KB 101	ST-11	155.81	156.36	1499	999
KB 101	ST-14	184.81	185.31	1682	1121
KB 103A	ST-1	31.74	32.27	994	663
KB 105	ST-4	12.42	13.04	839	559
KB 105	ST-7	19.15	19.65	884	589
KB 105	ST-8	21.5	22	926	617
KB 105A	ST-1	33.99	34.44	994	663
KB 105A	ST-2	42.56	43.04	1038	692
KB 105A	ST-3	69.89	70.43	1086	724
KB 105A	ST-5	84.57	85.12	1116	744
KB 105A	ST-6	95.74	96.29	1162	775
KB 104A	ST-5	20.4	21	884	589
KB 101	ST-3	72.9	73.41	1094	730

Max. Vertical Pressures can be increased with respect to Pre-Consolidation Pressures

Permeability

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According to ISO/TS 17892−1
TABLAB [page 1/1]

Bore code	Sample code	Depth		Soil description	w
		from [m − MV]	to [m − MV]		[% ds]
KB−101	KB−101_R−11	−12.97	−14.00	Loam, very sandy, (Sandy silt (ML)).	21.9[A]
KB−102A	KB−102A_S−21	−13.60	−14.20	Sand, slightly silty, (Silty sand (SM)).	25.1[A]
	KB−102A_S−30	−19.60	−20.20	Sand, slightly silty, (Silty sand (SM)).	25.6[A]
KB−103	KB−103_S−16	−9.37	−9.97	Clay, moderately silty, (Silty clay (CL−ML)).	43.6[A]
	KB−103_S−28	−18.27	−18.87	Sand, clayey, (Clayey sand (SC)).	30.8[A]

A: Accreditated

signed	date
Bjl	2011−07−29
seen	project
*)	1205088.001
type	appendix
A4	AA1

*) Vrijgegeven door Ess op 2011-07-29 16:22

Project Middelburg

.

Table laboratory results minimum and maximum density

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300-P-XC2-F8
2008.0001

Boring number	Sample number	Remarks	Depth from [m - GL]	Depth to [m -GL]	Soil description ASTM D2487-06	γdr min. loose [kN/m³]	γdr max. dense [kN/m³]	γdr max. dense with surcharge [kN/m³]
					DRY			
KB-101	R-5	ASTM D4253/BS1377	6.19	7.19	Silty sand (SM)	13.6	15.5	16.6
	R-12		14.00	14.91	Silty sand (SM)	15.0	17.7	18.8
	R-19		20.96	21.94	Silty sand (SM)	12.9	14.4	14.6
	R-28		29.69	30.51	Silty sand (SM), lots of shell remnants	12.3	14.8	15.9
	R-40		40.81	41.71	Silty sand (SM)	13.3	15.6	16.8
	R-66		66.47	67.44	Silty sand (SM) Glauconite	13.8	14.9	16.1
	R-119		121.44	122.21	Silty sand (SM)	12.5	15.2	16.2
KB-103A	R-38		65.80	66.80	Silty sand (SM)	12.9	15.9	17.0
KB-104	R-2		30.80	31.55	Silty sand (SM)	13.5	15.4	16.4
					Saturated			
KB-101	R-5	ASTM D4253/BS1377	6.19	7.19	Silty sand (SM)	14.2	16.6	17.6
	R-12		14.00	14.91	Silty sand (SM)	16.0	19.2	20.5
	R-19		20.96	21.94	Silty sand (SM)	13.4	15.1	15.9
	R-28		29.69	30.51	Silty sand (SM), lots of shell remnants	13.5	15.7	17.0
	R-40		40.81	41.71	Silty sand (SM)	14.5	17.2	18.2
	R-66		66.47	67.44	Silty sand (SM) Glauconite	13.8	17.6	20.3
	R-119		121.44	122.21	Silty sand (SM)	12.6	16.0	17.5
KB-103A	R-38		65.80	66.80	Silty sand (SM)	13.2	19.5	20.0
KB-104	R-2		30.80	31.55	Silty sand (SM)	12.9	16.0	16.7

Annex AA2

1205088-001

Date 2011-07-14

form. A4

ctr. *)

drw. Bjl

*) Vrijgegeven door Ess op 2011-07-29 16:24

Bore code	Sample code	Depth		Soil description	γ_s
		from [m − MV]	to [m − MV]		[kN/m^3]
KB−102	KB−102_R−4	−31.79	−32.68	Sand, slightly silty, (Silty sand (SM)).	26.45
	KB−102_R−32	−59.39	−60.36	Sand, slightly silty, (Silty sand (SM)).	26.68
	KB−102_ST−6	−98.31	−98.86	Clay, moderately silty, (Silty clay (CL−ML)).	26.28
KB−103	KB−103_ST−1C	−8.40	−8.42	Peat, low−mineral content, (Peat).	14.23
	KB−103_ST−1E	−8.90	−8.92	Clay, moderately silty, (Silty clay (CL−ML)).	25.51
	KB−103_S−16	−9.37	−9.97	Clay, moderately silty, (Silty clay (CL−ML)).	26.18
	KB−103_S−28	−18.27	−18.87	Sand, clayey, (Clayey sand (SC)).	26.07
	KB−103_ST−6	−26.67	−27.27	Clay, very sandy, (Sandy fat clay (CH)).	26.18
KB−103A	KB−103A_ST−4	−74.80	−75.34	Clay, moderately silty, Silty clay (CL−ML)).	25.86
	KB−103A_ST−6	−78.17	−78.72	Clay, moderately silty, (Silty clay (CL−ML)).	25.62
	KB−103A_ST−9	−84.76	−85.31	Sand, slightly silty, (Silty sand (SM)).	26.29
KB−104A	KB−104A_S−5	−4.80	−5.40	Sand, slightly silty, (Silty sand (SM)).	25.98
	KB−104A_ST−3	−9.00	−9.60	Clay, very silty, (Silty clay (CL−ML))	25.78
	KB−104A_S−28	−21.00	−21.60	Sand, slightly silty, (Silty sand (SM)).	25.77
	KB−104A_ST−6	−27.00	−27.60	Clay, moderately sandy, (Sandy fat clay (CH)).	26.45

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Project Middelburg
According to ASTM 5550−06
TABLAB [page 1/1]

signed	date
Bjl	2011−07−29
seen	project
*)	1205088.001
type	appendix
A4	AA3

) Vrijgegeven door Ess op 2011-07-29 16:22

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According to ASTM D 2974-07a

Table laboratory results

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300-P-XC2-F7
2008.0002

Boring number	Sample number	Depth from [m - GL]	Depth to [m - GL]	Soil description (ASTM D2487-06)	γ [kN/m³]	γdr [kN/m³]	w [% dm]	γs [kN/m³]	Loss on ignition Org.mat. [%]	Loss on ignition $CaCO_3$ [%]
KB-103	ST-1	8.32	8.92	Peat					84.1	6.0
	S-16	9.37	9.97	Silty clay (CL-ML)					3.6	12.2
	S-28	18.27	18.87	Clayey sand (SC)					1.3	3.6
	ST-5	18.87	19.47	Silty sand (SM)					1.4	3.2
	ST-6	26.67	27.27	Sandy fat clay (CH)					2.6	2.7
KB-104A	S-28	21.00	21.60	Silty sand (SM)					2.8	3.1
KB-101	R14A	17.05	17.08	Silty sand (SM),organic					5.8	10.9

form. A4	ctr. *)	1205088-001	Annex AA4
drw. Bjl		Date 2011-08-10	

) Vrijgegeven door Dui op 2011-08-10 12:01

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Project Middelburg

Permeability conform CEN ISO/TS 17892−11

TABLAB [page 1/1]

Bore code	Sample code	Depth		Soil description	Permeability (FH) (1)					Permeab. (TX)	
		from [m − MV]	to [m − MV]		pressure [kPa]	k [m/s]	var k [−]	var k <10%	qual. code	k [m/s]	st. dev. k [m/s]
KB−101	KB−101_ST−3B	−73.31	−73.63	Clay, very silty, (Silty clay (CL−ML)).	1094.0	1.2e−11	0.08	OK			
	KB−101_ST−5D	−97.60	−97.65	Clay, moderately sandy, (Sandy fat clay (CH)).	1162.0	4.6e−08	0.01	OK			
KB−103	KB−103_ST−6D	−26.96	−27.00	Clay, moderately silty, (SIlty clay (CL−ML)).	963.0	9.6e−07	0.01	OK			
KB−104	KB−104_ST−2D	−54.74	−54.84	Gravel, silty, (Silty Sand (SM))						1.1e−06	1.8e−07
	KB−104_ST−7D	−88.90	−88.94	Sand, slightly silty, (Silty sand (SM)).	1129.6	2.5e−07	0.01	OK			
	KB−104_ST−8E	−97.28	−98.32	Clay, slightly sandy, (Sandy silty clay (CL−ML)).	1162.0	2.7e−10	0.01	OK			
KB−104A	KB−104A_ST−5	−20.40	−21.00	Sand, slightly silty, (Silty sand (SM)).						4.4e−07	1.7e−08
KB−105A	KB−105A_ST−1D	−33.94	−34.04	Gravel, silty, (Clayey Sand (SC))						4.9e−09	4.8e−09

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ess	2011−08−26	
seen	project	
*)	1205088.001	
type	appendix	
A4	AA5	

*) Vrijgegeven door Grw op 2011-08-26 14:23

Project Middelburg

According to ASTM D 4318−05

TABLAB [page 1/1]

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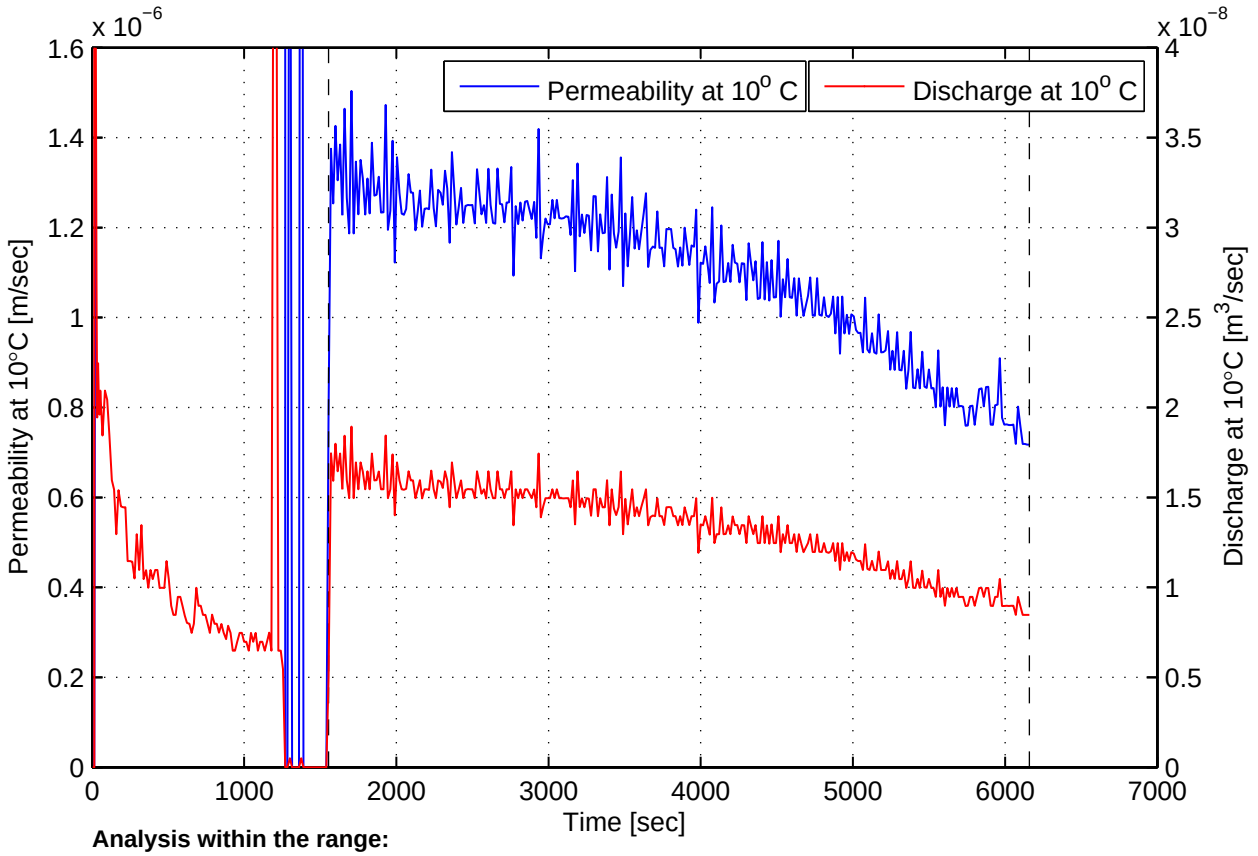
Bore code	Sample code	Depth		Soil description	I_P, w_L en w_P conform ASTM D 4318		
		from [m − MV]	to [m − MV]		w_L [%]	w_P [%]	I_P [%]
KB−101	KB−101_R−25A	−27.38	−27.58	Clay, moderately silty, (Silty clay (CL−ML)).	31	16	16
	KB−101_ST−3A	−73.37	−73.41	Clay, moderately silty, (Silty clay (CL−ML)).	78	47	31
	KB−101_R−79A	−81.29	−81.39	Clay, slightly sandy, (Sandy fat clay)).	65	18	47
	KB−101_ST−5C	−97.69	−97.73	Clay, moderately sandy, (Sandy fat clay (CH)).	61	18	42
	KB−101_ST−10A	−145.76	−145.80	Clay, moderately silty, (Silty clay (CL−ML)).	188	33	154
	KB−101_ST−11C	−156.32	−156.36	Clay, moderately silty, (Silty clay (CL−ML)).	119	28	91
	KB−101_R−159A	−163.06	−163.18	Clay, moderately silty, (Silty clay (CL−ML)).	141	35	106
	KB−101_ST−14C	−185.27	−185.31	Clay, moderately silty, (Silty clay (CL−ML)).	110	24	85
KB−103	KB−103_S−41	−27.27	−27.87	Clay, very sandy, (Sandy fat clay (CH)).	25	14	11
KB−103A	KB−103A_ST−4D	−75.30	−75.34	Clay, moderately silty, (Silty clay (CL−ML)).	78	24	55
	KB−103A_ST−6D	−78.68	−78.72	Clay, extremely silty, (Silty clay (CL−ML)).	80	20	61
KB−104	KB−104_ST−5	−79.42	−79.46	Clay, moderately silty, (Silty clay (CL−ML)).	102	30	71
	KB−104_ST−8D	−98.36	−98.40	Clay, very silty, Silty clay (CL−ML)).	51	26	25
KB−104A	KB−104A_ST−3A	−9.10	−9.20	Clay, slightly silty, (Silty clay (CL−ML)).	52	32	20
	KB−104A_ST−6	−27.00	−27.60	Clay, moderately sandy, (Sandy fat clay (CH)).	26	16	10
KB−105	KB−105_S−18	−11.52	−11.97	Clay, very silty, (Silty clay (CL−ML)).	38	29	9
KB−105A	KB−105A_ST−6C	−96.25	−96.29	Clay, moderately sandy, (Sandy fat clay (CH)).	54	23	31

signed	date		
Bjl	2011−08−01		
seen	project		
*)	1205088.001		
type	appendix		
A4	AA6		

) Vrijgegeven door Dui op 2011-08-03 16:19



Analysis within the range:

Minimum k_{10} [m/sec]	7.2e−007	Minimum Q_{10} [m^3/sec]	5.0e−009	δ_t [sec]	15
Maximum k_{10} [m/sec]	1.5e−006	Maximum Q_{10} [m^3/sec]	1.9e−008	h_{avg} [m]	0.61
Average k_{10} [m/sec]	1.1e−006	Average Q_{10} [m^3/sec]	1.3e−008	i_{avg} [−]	6.16
Standard dev. of k_{10} [m/sec]	1.8e−007	Standard dev. of Q_{10} [m^3/sec]	2.4e−009		

Description of soil sample:

Description	Silty sand (SM)				
Initial area	1.963e−003	m^2	ρ_s	2650	kg/m^3
Initial height	100.000	mm	Flow direction	downwards	−
Temperature	21.3	°C			
Type of sample	undisturbed	−			
Back pressure	300	kPa			
ρ (initial)	2065	kg/m^3			
ρ (final)	−	kg/m^3			
e (initial)	0.58	−			
e (final)	−	−			
w (intial)	22.95	%			
w (final)	23.09	%			
Sr (initial)	105.29	%	Bor. no.	KB−104	−
Sr (final)	−	%	Lab. no.	KB−104_ST−2D	−

NOTE(S): **Setup: WF−A**

− ρ_s was assumed.

− The sample was consolidated with σ'_1 = 1060 kPa and σ'_3 = 700 kPa prior to permeability test.

− A range of constant permeability values can not be found during the test.

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date	signed
2011−08−17	setiawan

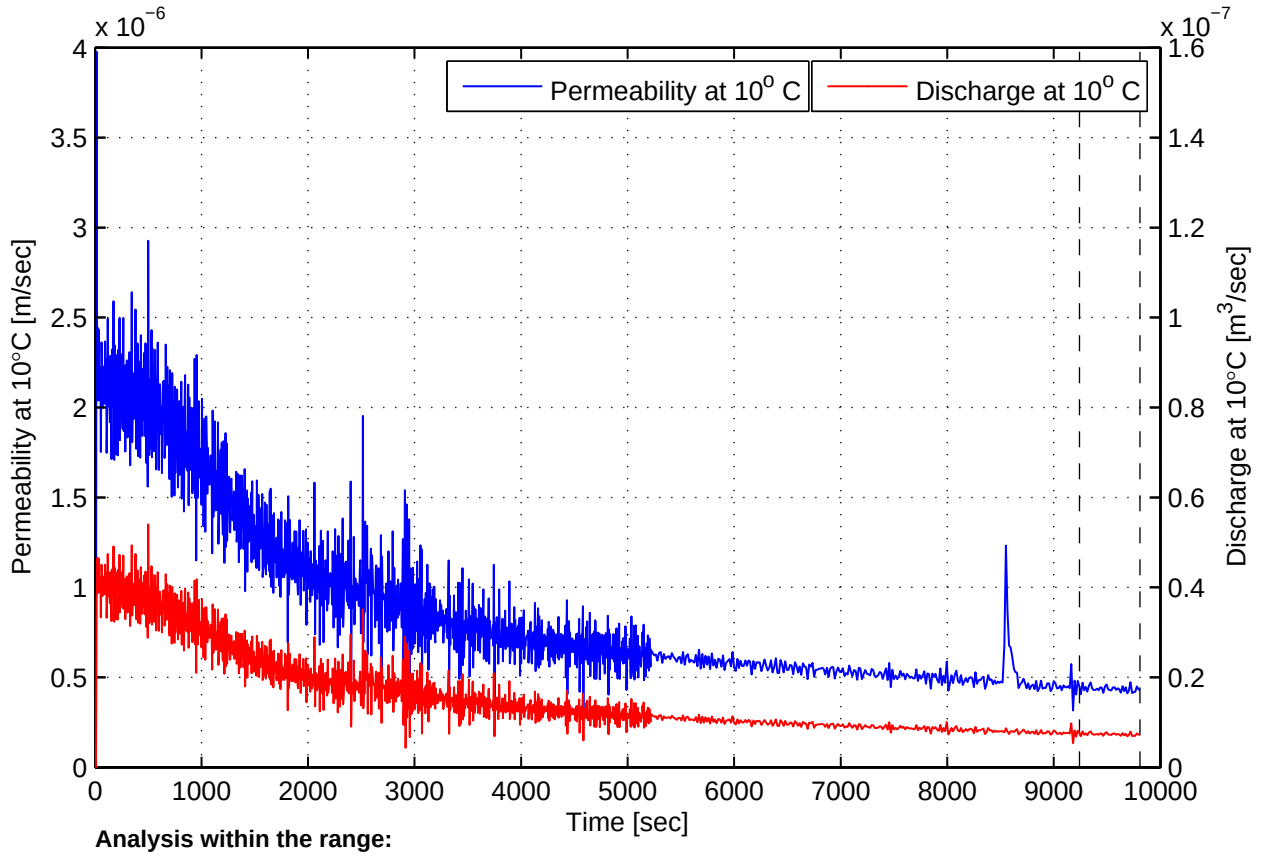
Project Middelburg

Boring KB−104_Sample_KB−104_ST−2D, depth −49.74 till −49.84 NAP

Permeability constant head test CEN ISO/TS 17892−11

project	seen
1205088.1	Dui
appendix	page
KB−104_ST−2	1

) Vrijgegeven door Dui op 2011-08-19 17:13



Analysis within the range:

Minimum k_{10} [m/sec]	4.1e−007	Minimum Q_{10} [m^3/sec]	6.9e−009	δ_t [sec]	15
Maximum k_{10} [m/sec]	4.7e−007	Maximum Q_{10} [m^3/sec]	8.0e−009	h_{avg} [m]	0.65
Average k_{10} [m/sec]	4.4e−007	Average Q_{10} [m^3/sec]	7.3e−009	i_{avg} [−]	4.87
Standard dev. of k_{10} [m/sec]	1.7e−008	Standard dev. of Q_{10} [m^3/sec]	2.9e−010		

Description of soil sample:

Description	Silty sand (SM)				
Initial area	3.461e−003	m^2	ρ_s	2650	kg/m^3
Initial height	132.608	mm	Flow direction	downwards	−
Temperature	21.3	°C			
Type of sample	undisturbed	−			
Back pressure	300	kPa			
ρ (initial)	2008	kg/m^3			
ρ (final)	−	kg/m^3			
e (initial)	0.62	−			
e (final)	−	−			
w (intial)	23.03	%			
w (final)	−	%			
Sr (initial)	97.92	%	Bor. no.	KB−104A	−
Sr (final)	−	%	Lab. no.	KB−104A_ST−5	−

NOTE(S): **Setup: ELE−B**

− ρ_s was assumed.

− The sample was consolidated with σ'_1 = 884 kPa and σ'_3 = 589 kPa prior to permeability test.

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2011−08−05	setiawan

Project Middelburg

Boring KB−104A, Sample KB−104A_ST−5, depth −20.40 till −21.00 NAP

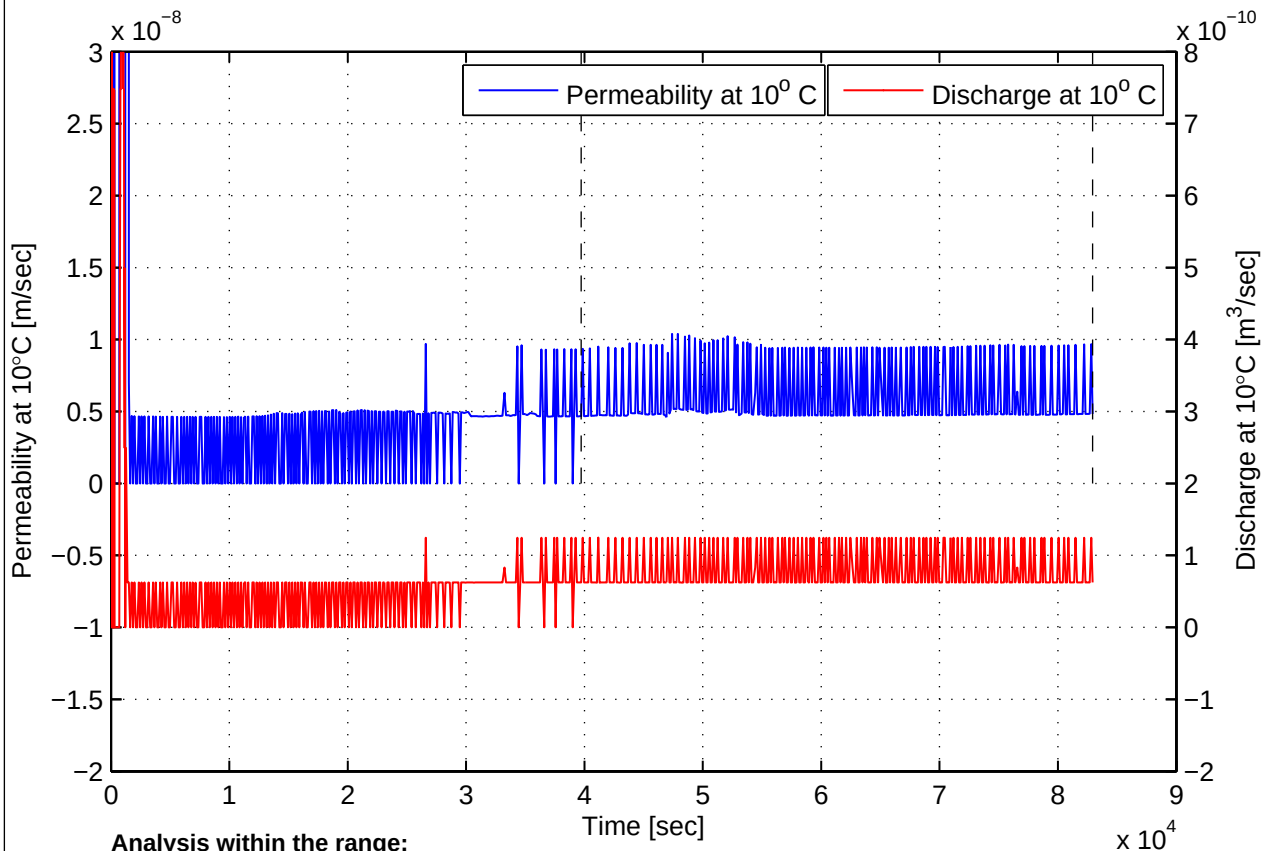
Permeability constant head test CEN ISO/TS 17892−11

project	seen
1205088.1	Dui
appendix	page
KB−104A_ST−5	1

) Vrijgegeven door Dui op 2011-08-08 14:27

D Results one-dimensional consolidation tests

KB-102_ST-2
KB-102_ST-6
KB-103_ST-1
KB-103_ST-3
KB-103A_ST-4
KB-103A_ST-6
KB-103A_ST-9
KB-104_ST-5
KB-104_ST-8
KB-104A_ST-3
KB-104A_ST-5
KB-104A_ST-6



Analysis within the range:

Minimum k_{10} [m/sec]	4.6e−009	Minimum Q_{10} [m^3/sec]	6.2e−011	δ_t [sec]	121
Maximum k_{10} [m/sec]	1.0e−008	Maximum Q_{10} [m^3/sec]	1.2e−010	h_{avg} [m]	0.65
Average k_{10} [m/sec]	6.2e−009	Average Q_{10} [m^3/sec]	8.1e−011	i_{avg} [−]	6.62
Standard dev. of k_{10} [m/sec]	2.2e−009	Standard dev. of Q_{10} [m^3/sec]	2.8e−011		

Description of soil sample:

Description	Clayey sand (SC)				
Initial area	1.963e−003	m^2	ρ_s	2650	kg/m^3
Initial height	99.900	mm	Flow direction	downwards	−
Temperature	21.3	°C			
Type of sample	undisturbed	−			
Back pressure	300	kPa			
ρ (initial)	2134	kg/m^3			
ρ (final)	2177	kg/m^3			
e (initial)	0.41	−			
e (final)	0.38	−			
w (intial)	13.82	%			
w (final)	13.76	%			
Sr (initial)	88.59	%	Bor. no.	KB−105A	−
Sr (final)	94.84	%	Lab. no.	KB−105A_ST−1D	−

NOTE(S): **Setup: WF−C**

− ρ_s was assumed.

− The sample was consolidated with σ'_1 = 994 kPa and σ'_3 = 663 kPa prior to permeability test.

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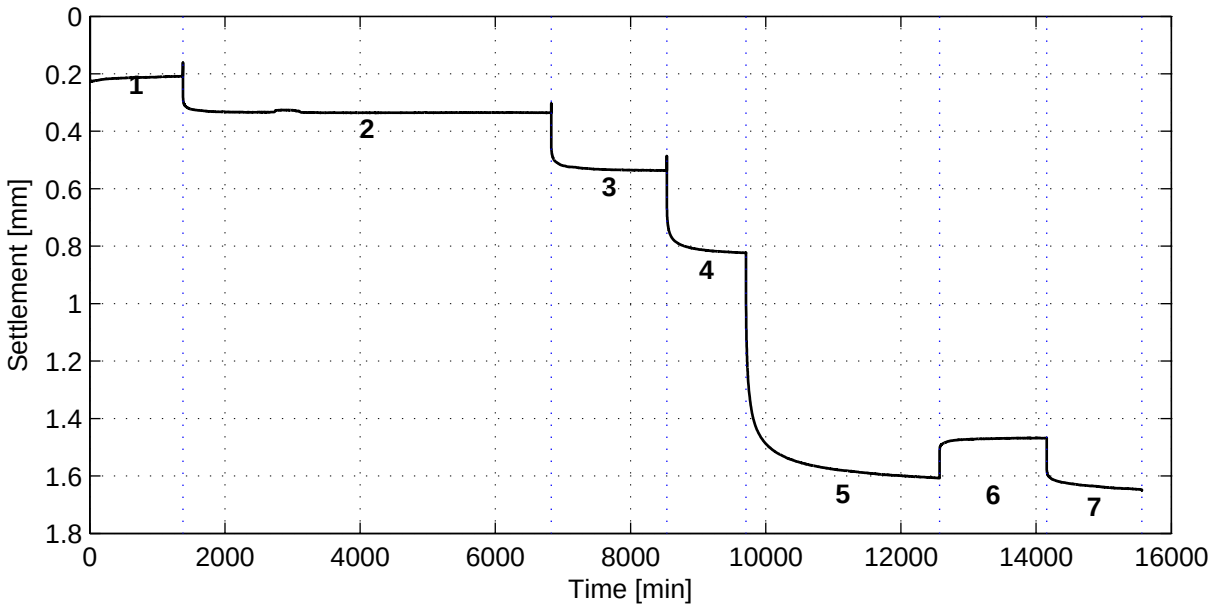
Project Middelburg

Boring KB−105A Sample KB−105A_ST−1D, depth −33.94 till −34.04 NAP

Permeability constant head test CEN ISO/TS 17892−11

project	seen
1205088.1	Dui
appendix	page
KB−105A_ST−1D	1

) Vrijgegeven door Dui op 2011-08-19 17:15



General soil and test parameters

Soil description	Silty Clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	19.6
Initial volumetric weight − dry [kN/m^3]	15.8
Volumetric weight particles [kN/m^3]	25.9
Initial water content [%]	23.6
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.0
Final volumetric weight − wet [kN/m^3]	21.0
Final volumetric weight − dry [kN/m^3]	17.3
Final water content [%]	21.2
Final saturation [−]	1.1
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−13
Enddate	2011−07−25
Sample disturbance index	–
Lab temperature [° C]	20.2
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	188
2	375
3	750
4	1501
5	3001
6	1501
7	3001

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

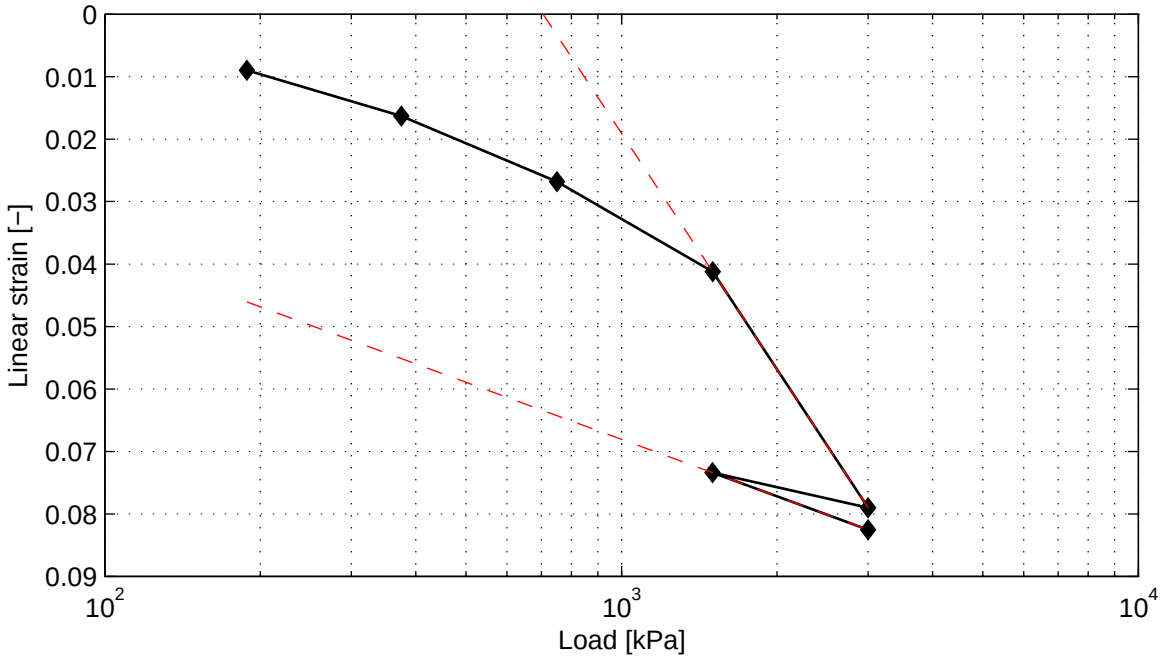
Boring KB−102, sample KB−102_ST−2, depth −70.69 m till −71.24 m NAP

Oedometer test conform CEN ISO/TS 17892−5

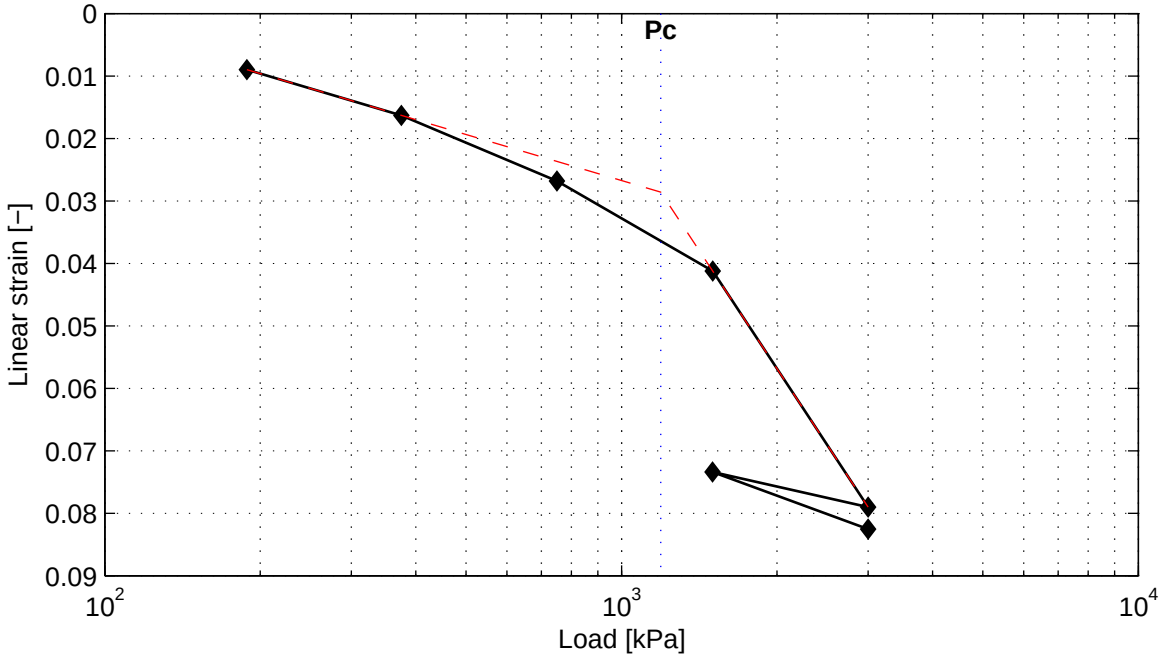
project	seen
1205088.1	–
appendix	page
SAKB−102_ST−2	1

) Vrijgegeven door wb op 2011-07-29 16:12

Bjerrum method



Cr = 5.0e−002 Ca = 5.5e−003 Vo = 1.63
Cc = 2.1e−001

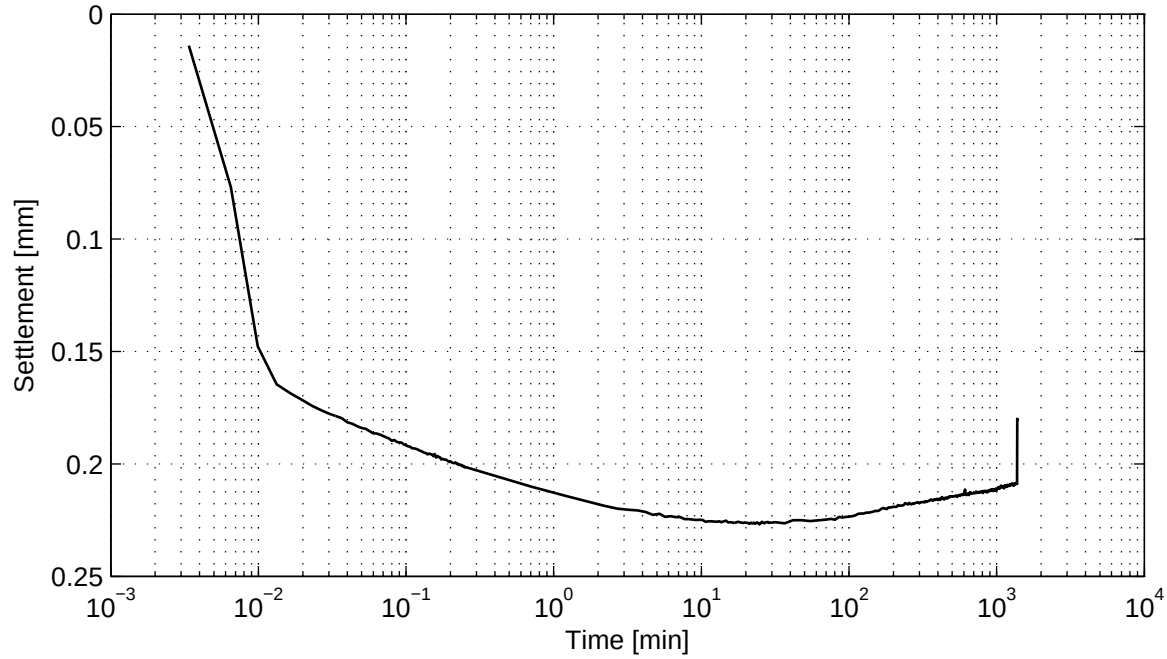


Pc = 1190.5 kPa

) Vrijgegeven door wb op 2011-07-29 16:12

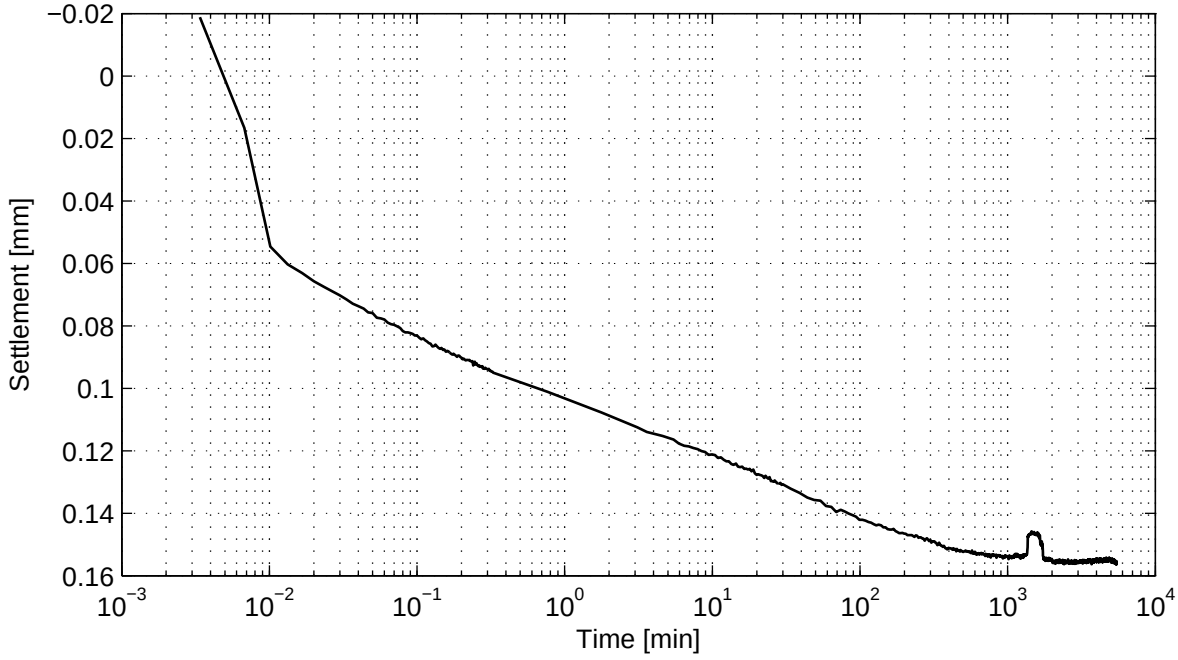
Casagrande method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 375 kPa

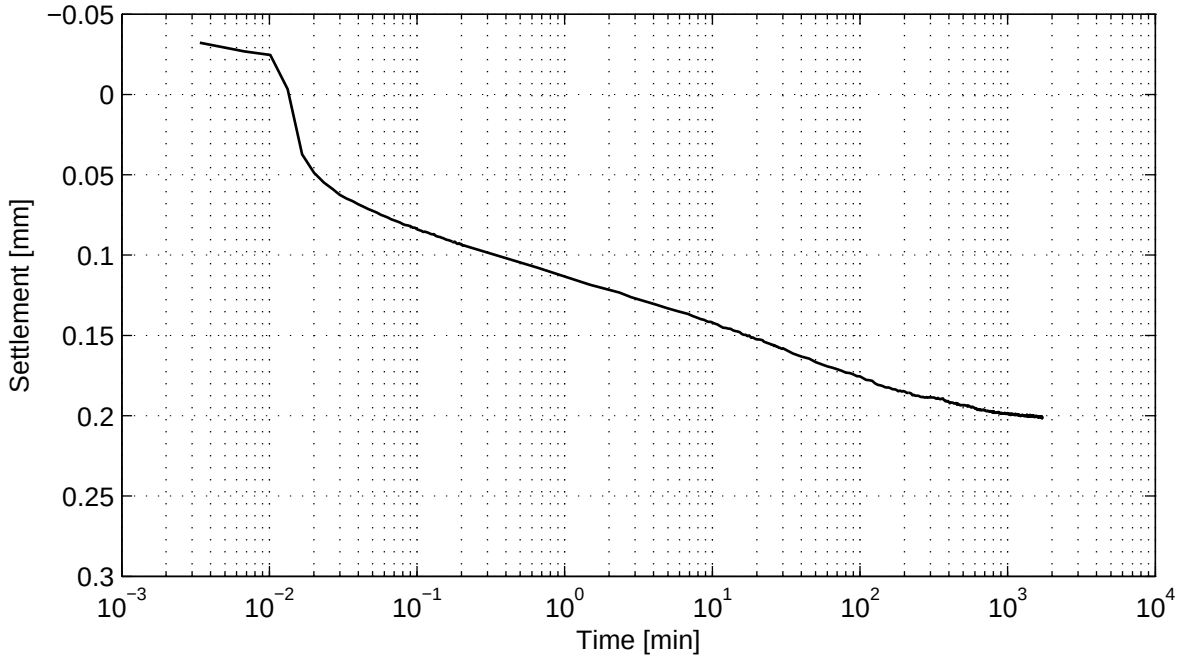


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 16:12

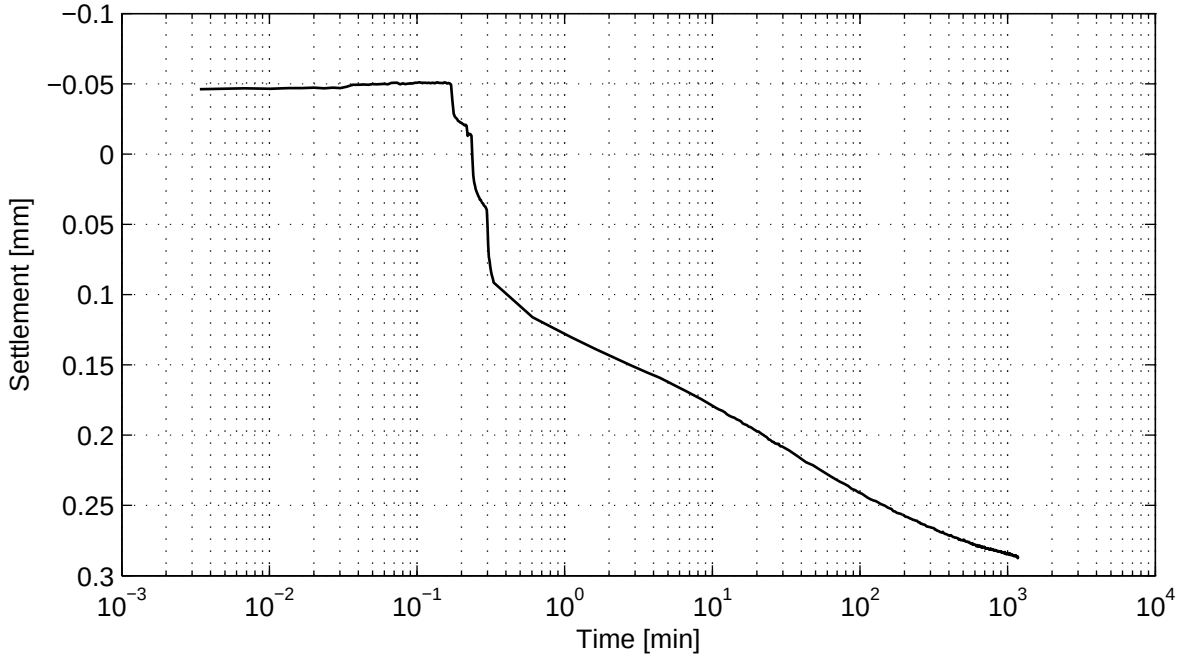
Casagrande method (page 2/4)

Load step 750 kPa



No calculation performed.

Load step 1501 kPa

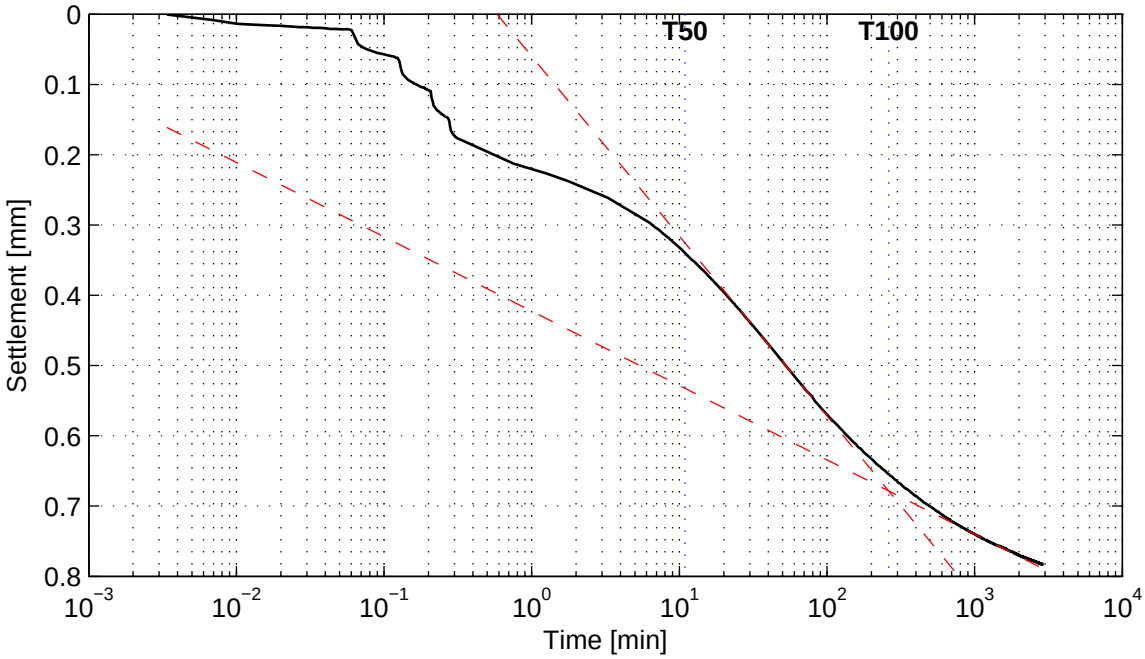


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 16:12

Casagrande method (page 3/4)

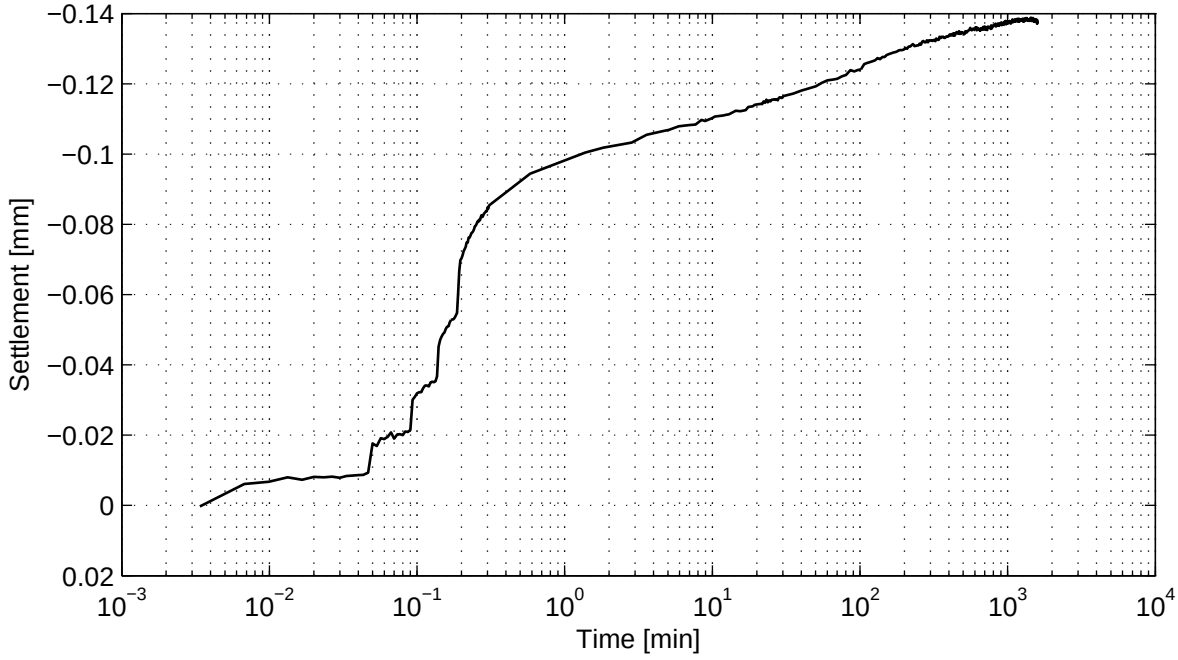
Load step 3001 kPa



Cv = 2.1e−008 m^2/s
Ca = 5.5e−003

Mv = 2.4e−005 m^2/kN
K = 4.7e−012 m/s

Load step 1501 kPa



No calculation performed.

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Project Middelburg

Boring KB−102, sample KB−102_ST−2, depth −70.69 m till −71.24 m NAP

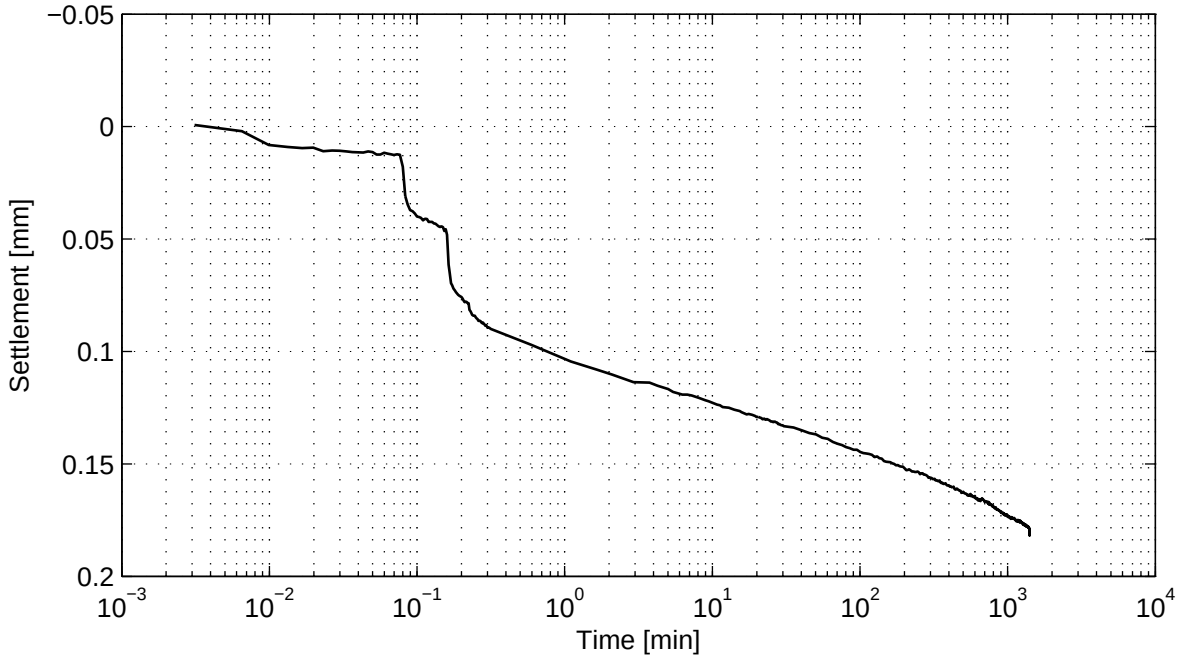
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−102_ST−2	5

) Vrijgegeven door wb op 2011-07-29 16:12

Casagrande method (page 4/4)

Load step 3001 kPa



No calculation performed.

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Project Middelburg

Boring KB−102, sample KB−102_ST−2, depth −70.69 m till −71.24 m NAP

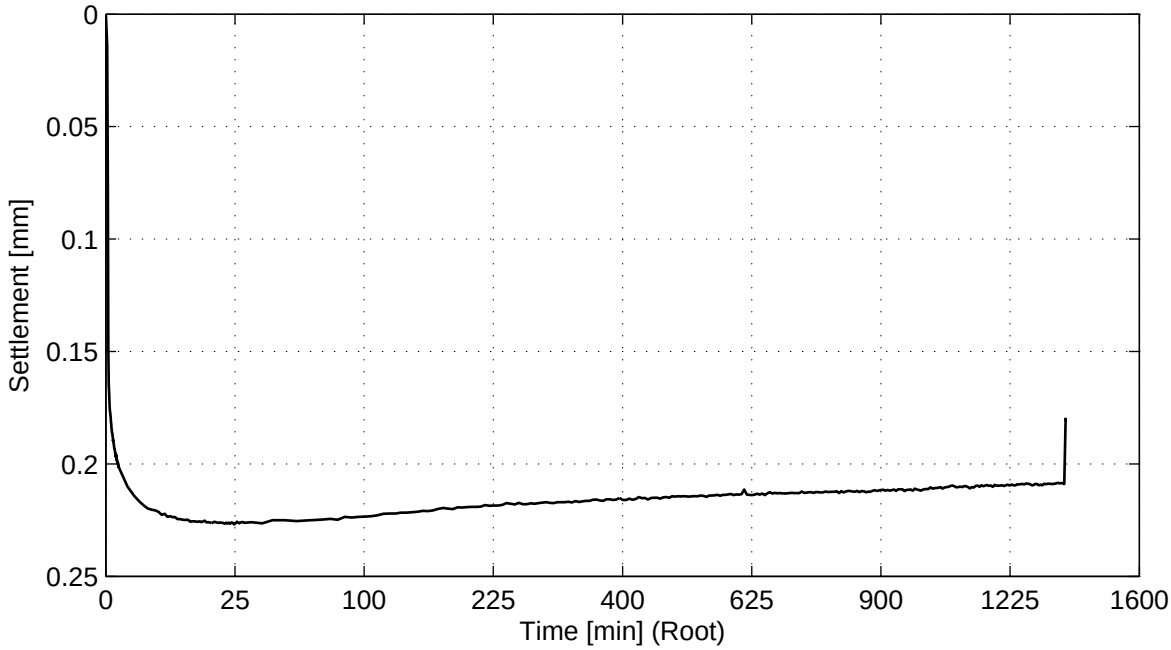
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−102_ST−2	6

) Vrijgegeven door wb op 2011-07-29 16:12

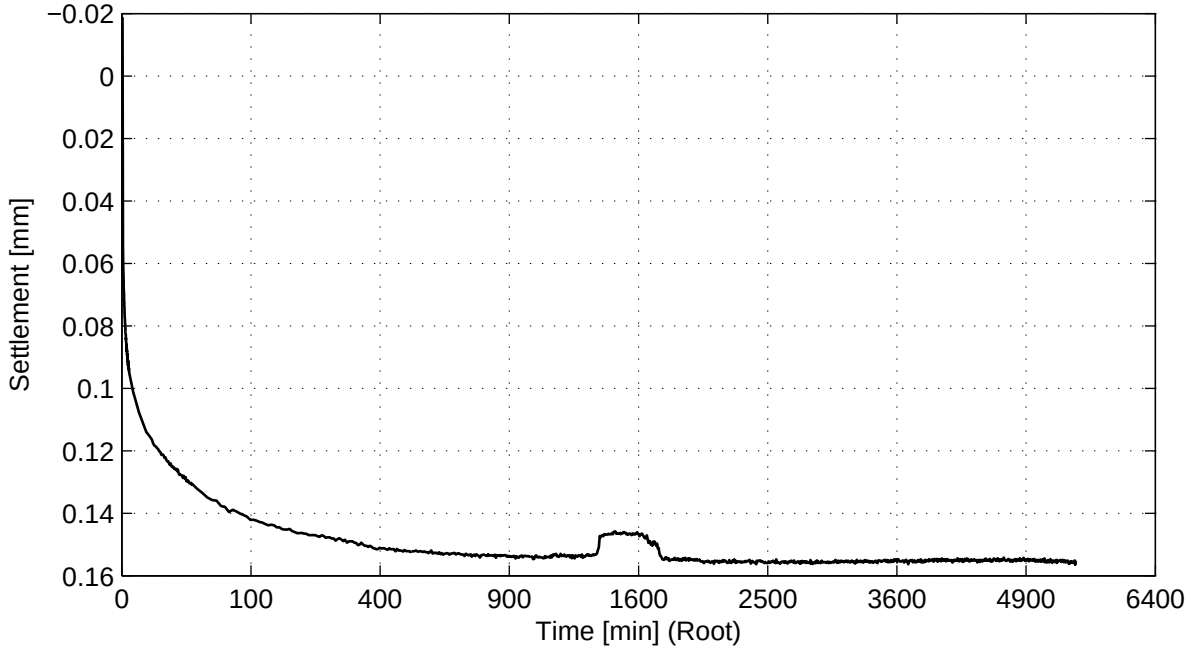
Taylor method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 375 kPa

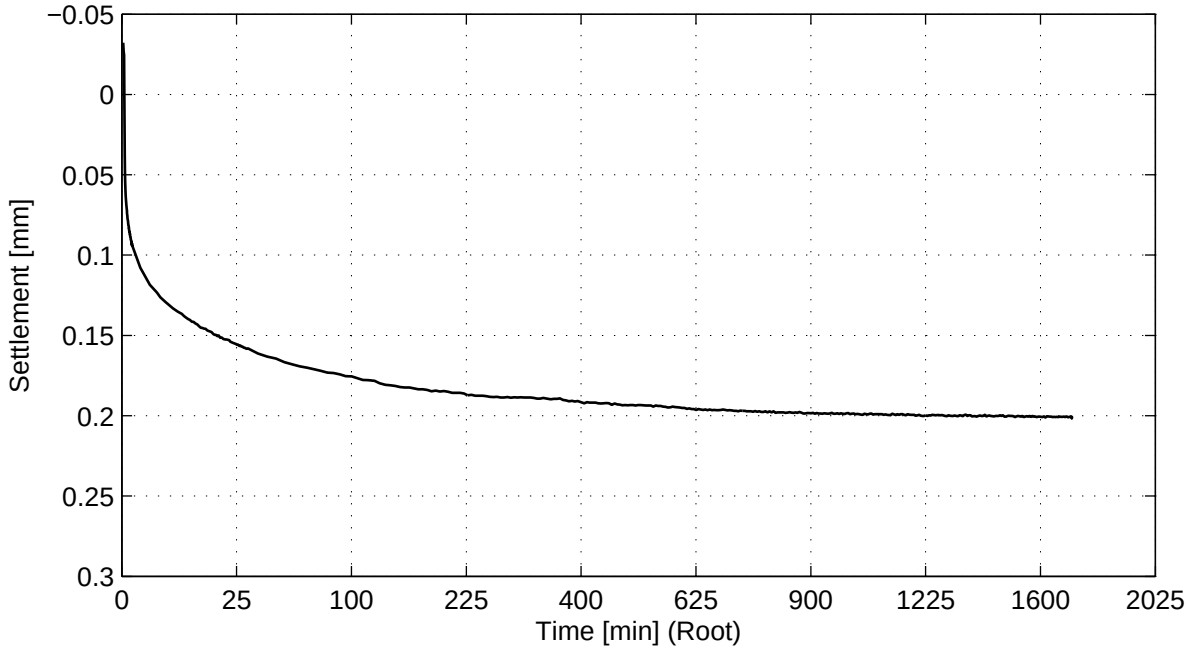


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 16:12

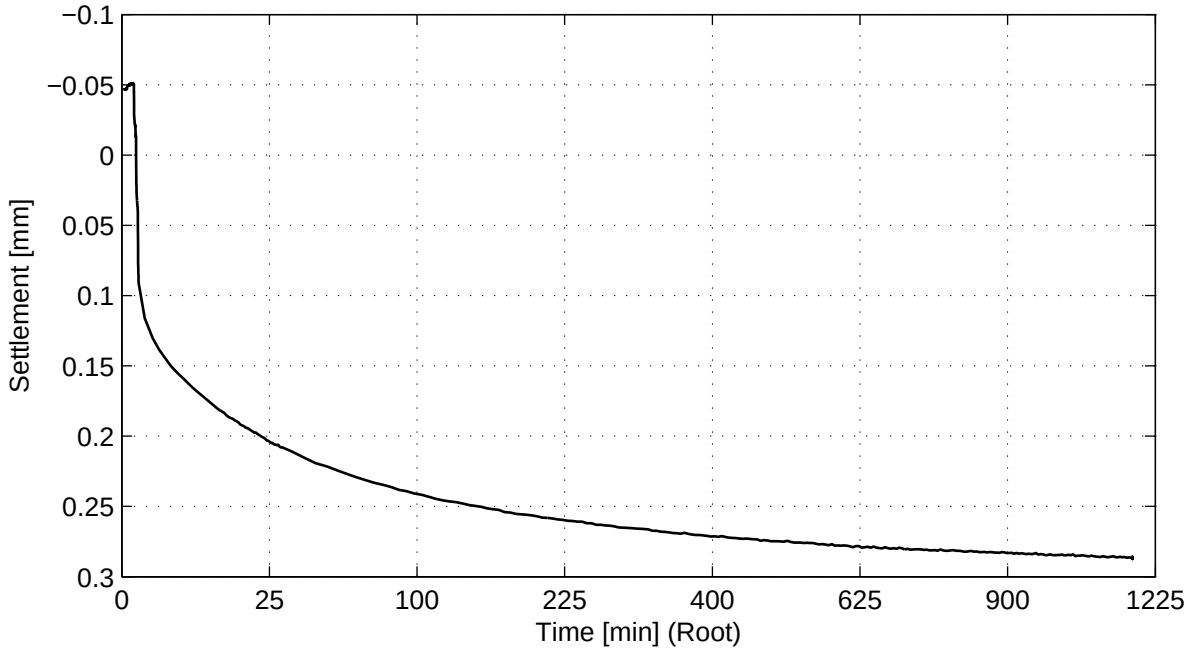
Taylor method (page 2/4)

Load step 750 kPa



No calculation performed.

Load step 1501 kPa

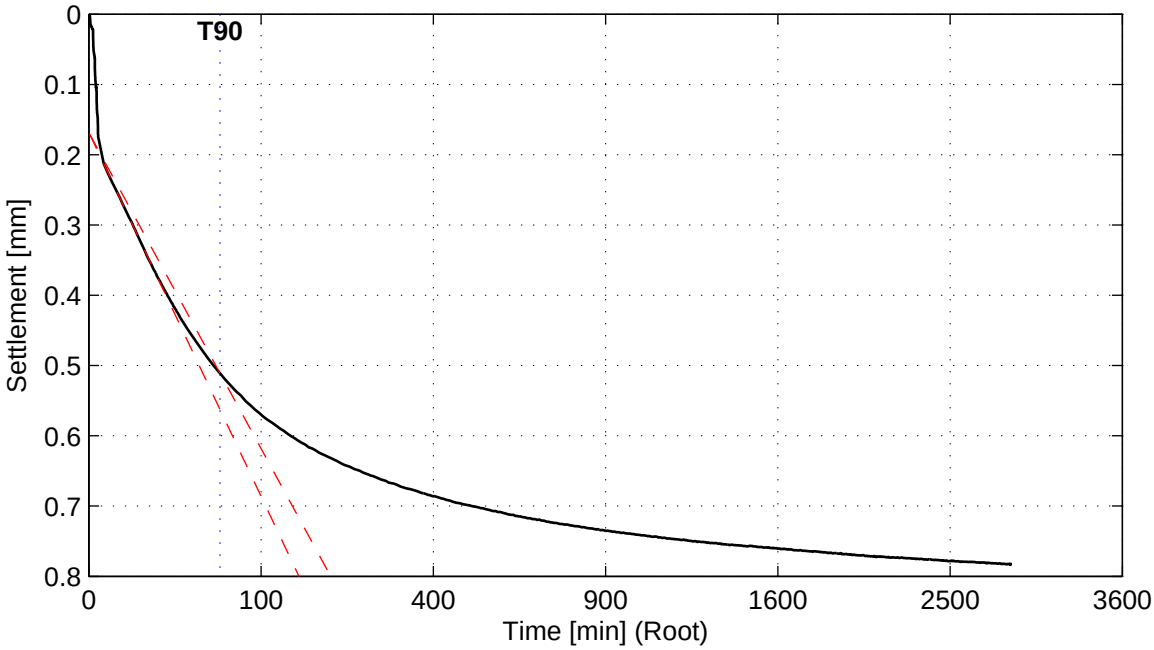


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 16:12

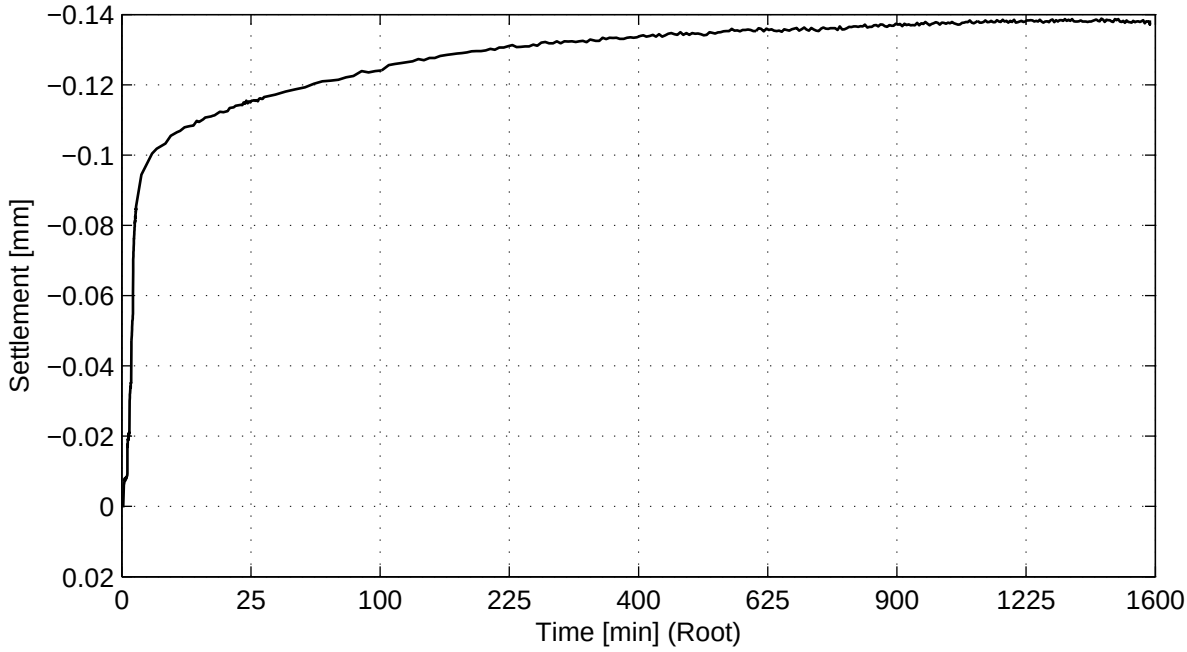
Taylor method (page 3/4)

Load step 3001 kPa



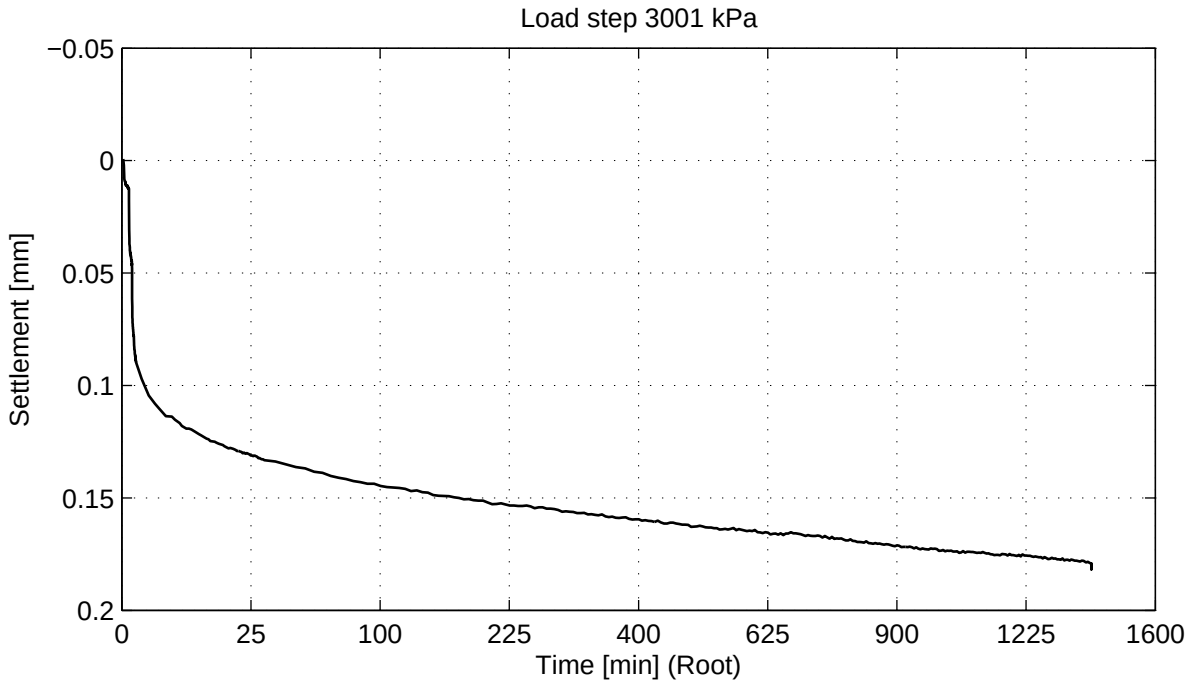
Cv = 1.6e−008 m^2/s

Load step 1501 kPa



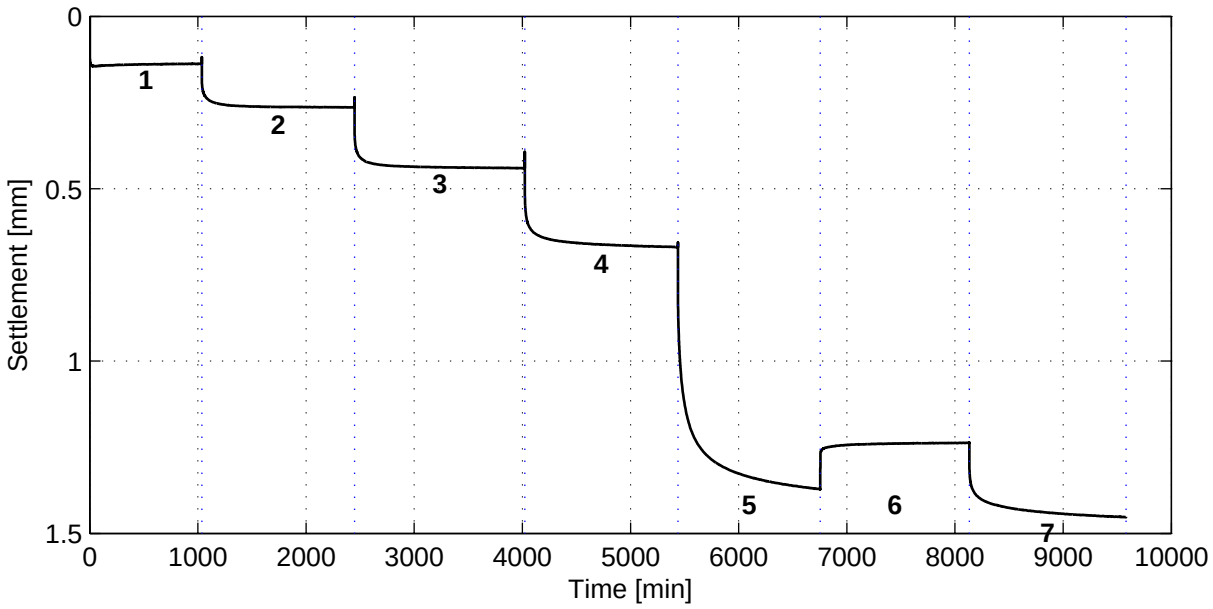
No calculation performed.

Taylor method (page 4/4)



No calculation performed.

) Vrijgegeven door wb op 2011-07-29 16:12



General soil and test parameters

Soil description	Silty Clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	19.6
Initial volumetric weight − dry [kN/m^3]	15.7
Volumetric weight particles [kN/m^3]	26.3
Initial water content [%]	24.8
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.0
Final volumetric weight − wet [kN/m^3]	20.2
Final volumetric weight − dry [kN/m^3]	16.6
Final water content [%]	21.7
Final saturation [−]	1.0
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	20.3
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	188
2	375
3	750
4	1501
5	3001
6	1500
7	3001

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

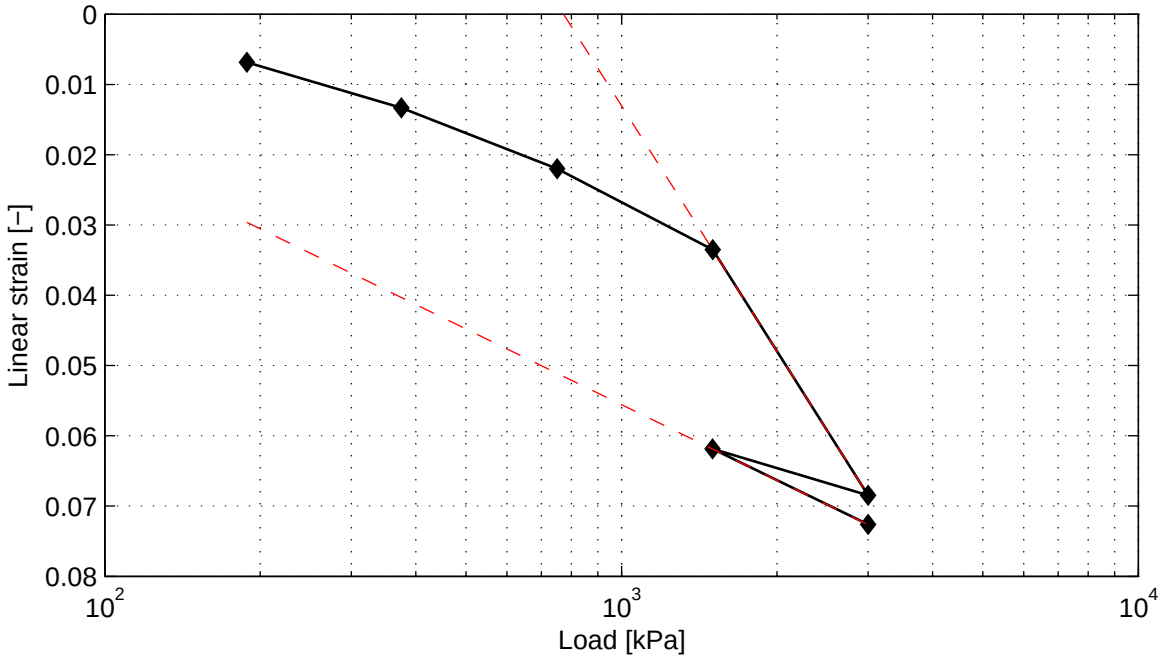
Boring KB−102, sample KB−102_ST−6, depth −93.31 m till −93.86 m NAP

Oedometer test conform CEN ISO/TS 17892−5

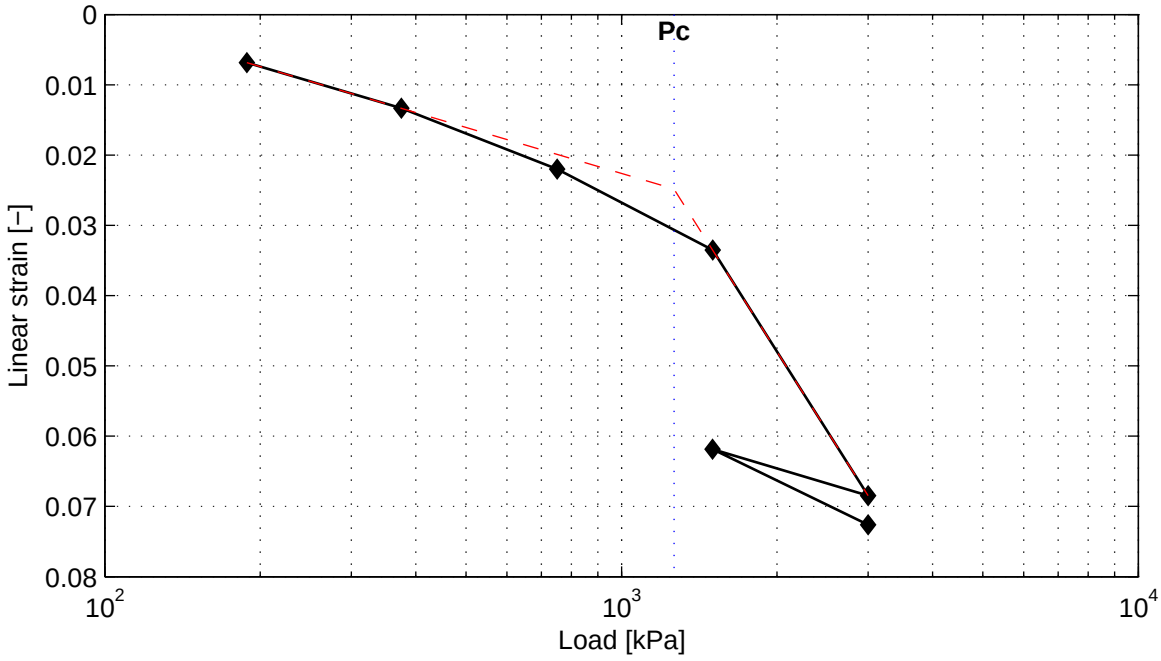
project	seen
1205088.1	–
appendix	page
SAKB−102_ST−6	1

) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method



Cr = 6.0e−002 Ca = 5.4e−003 Vo = 1.67
Cc = 1.9e−001

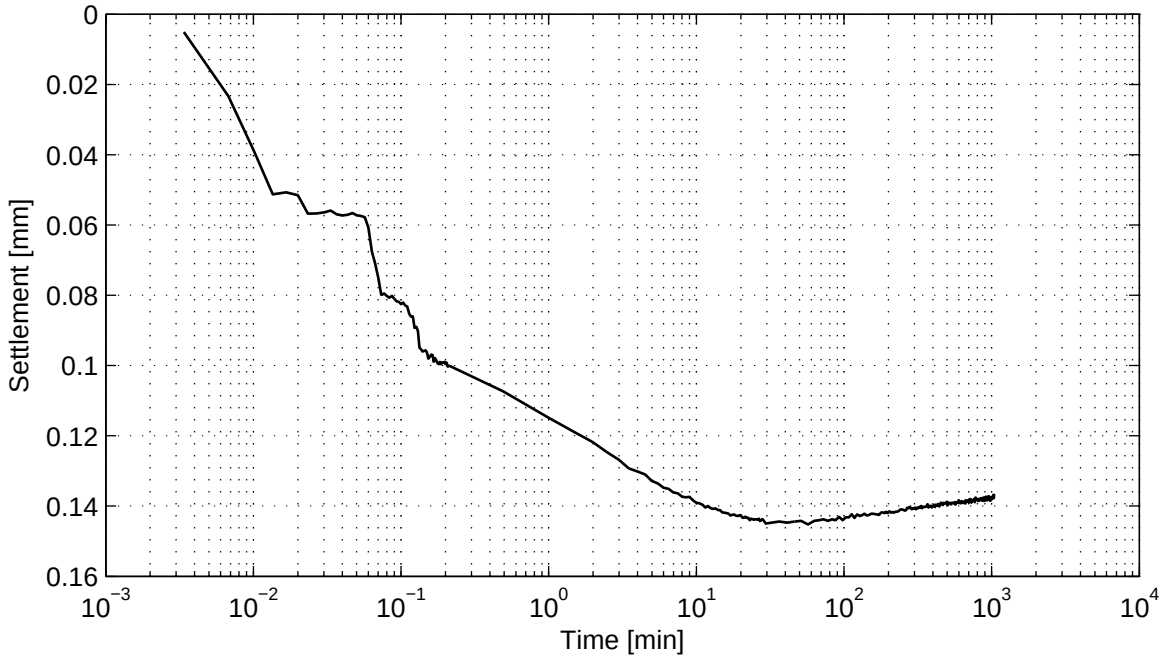


Pc = 1263.4 kPa

) Vrijgegeven door wb op 2011-07-29 15:47

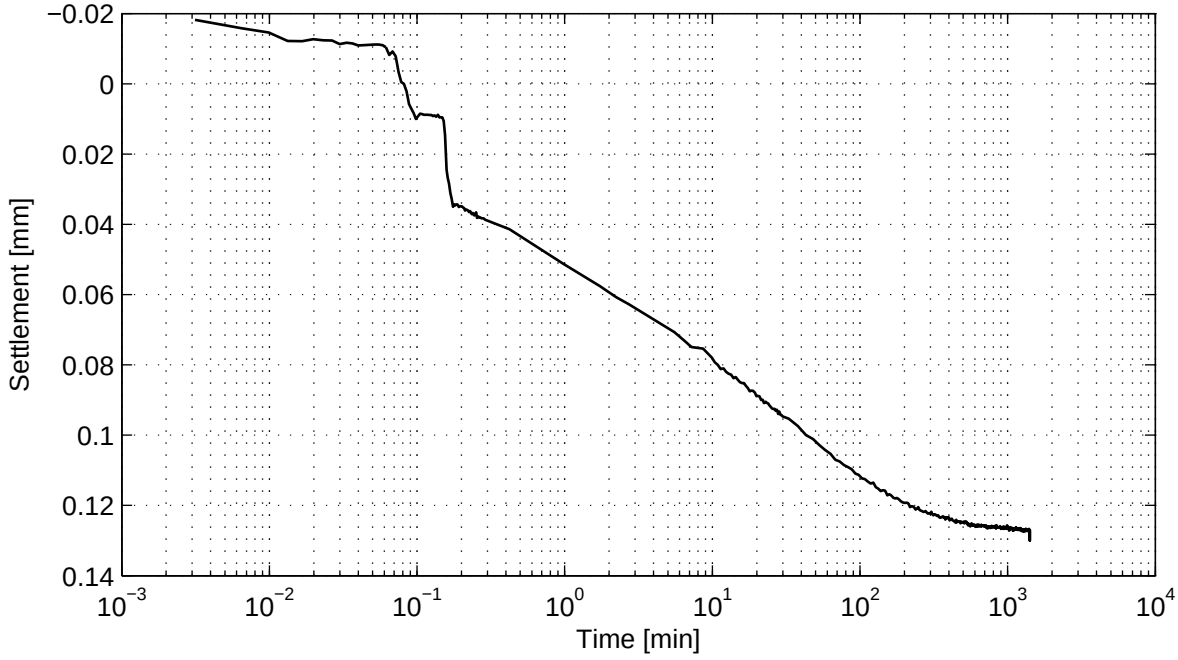
Casagrande method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 375 kPa

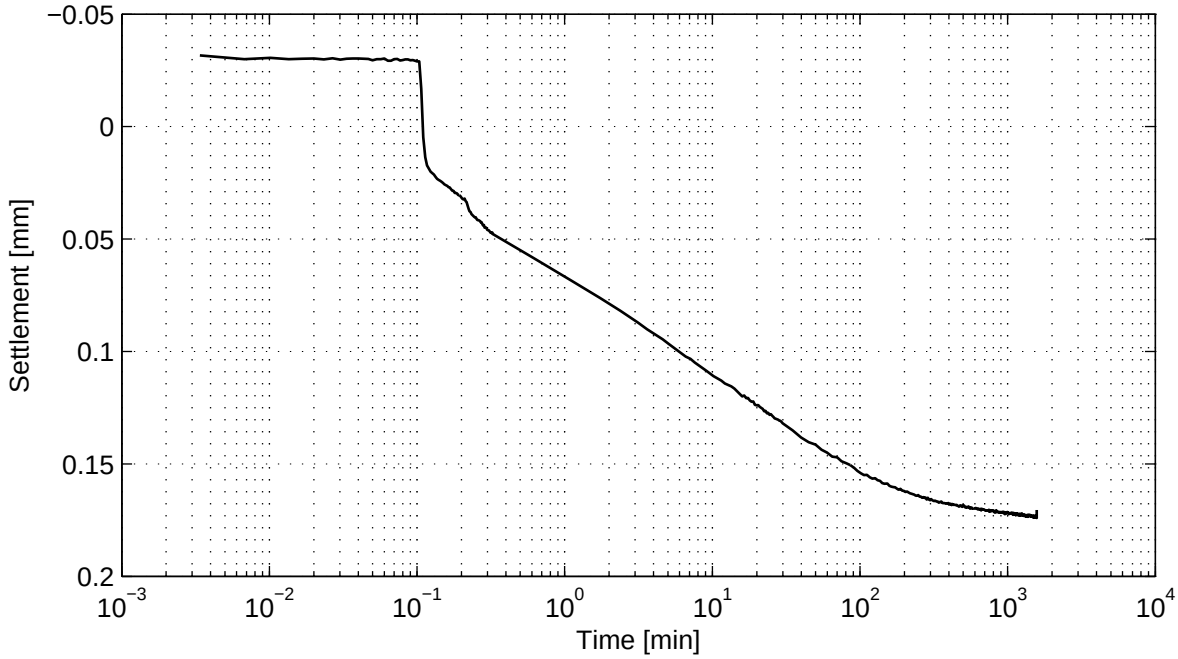


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

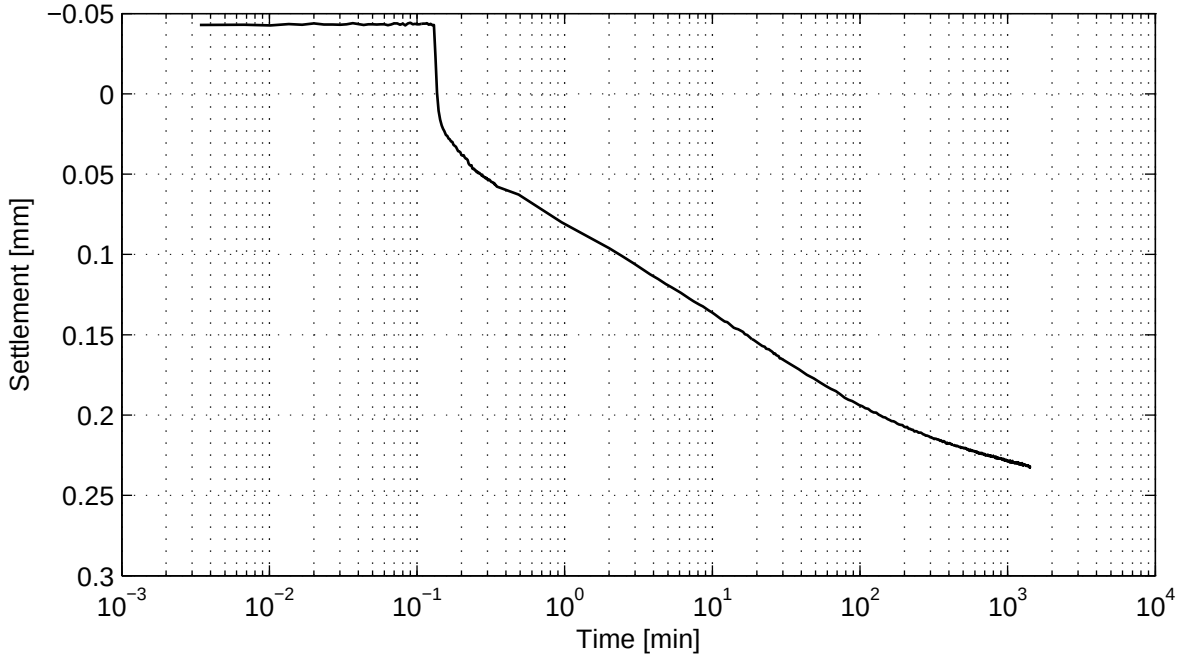
Casagrande method (page 2/4)

Load step 750 kPa



No calculation performed.

Load step 1501 kPa

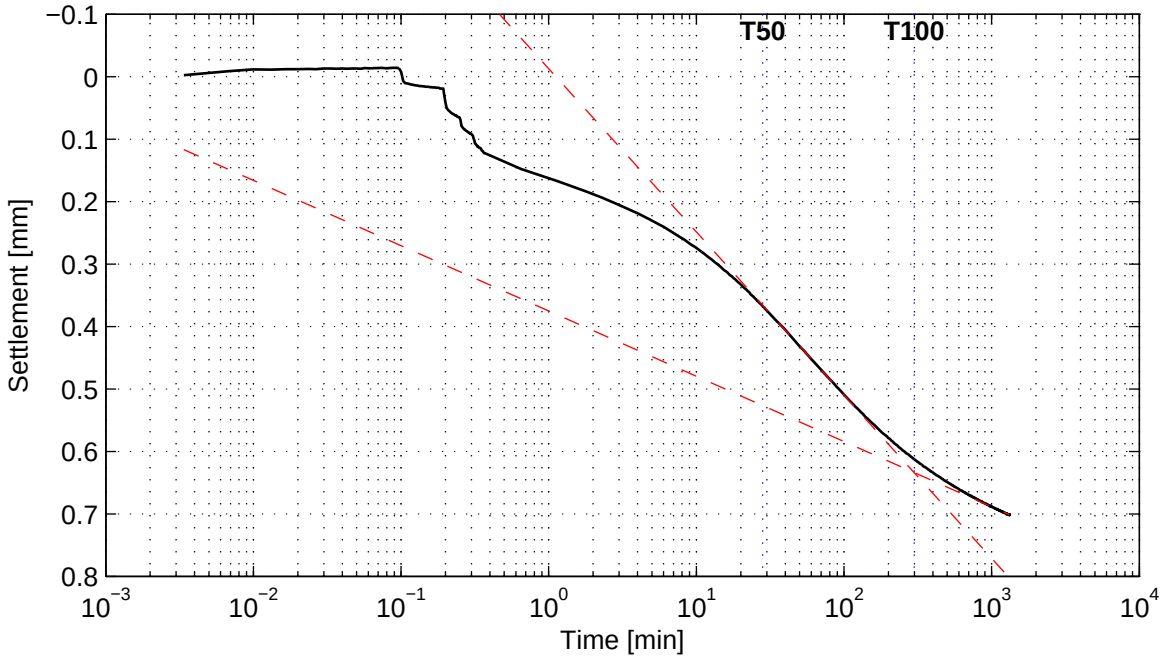


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 3/4)

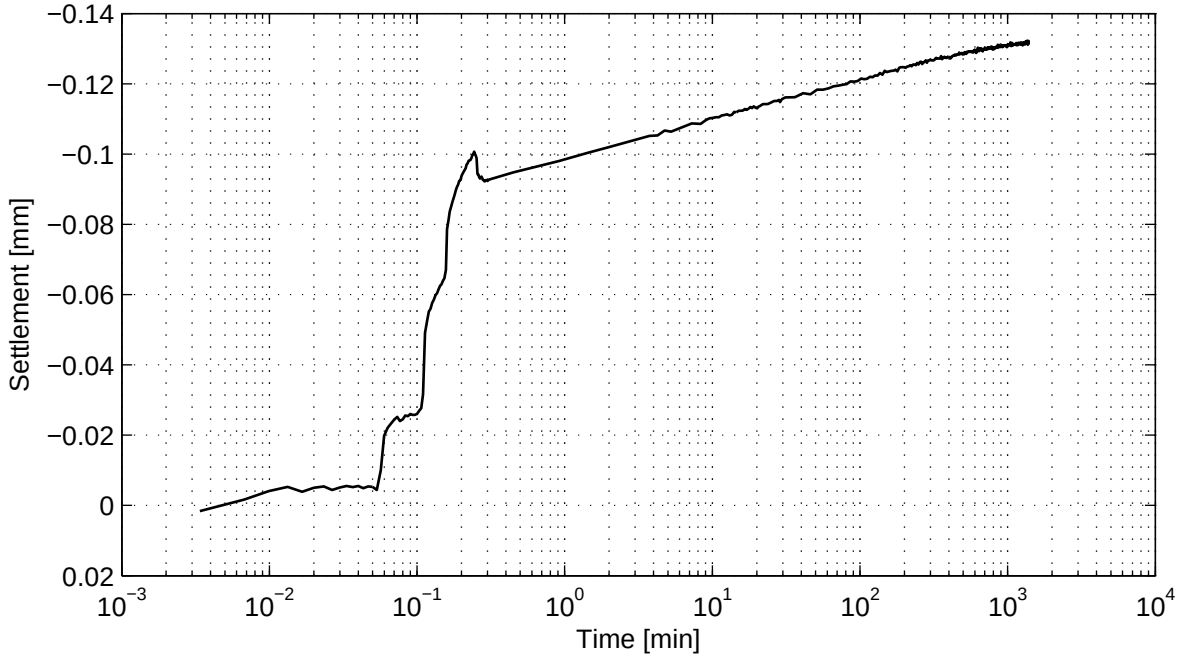
Load step 3001 kPa



Cv = 8.0e−009 m^2/s
Ca = 5.4e−003

Mv = 1.8e−005 m^2/kN
K = 1.5e−012 m/s

Load step 1500 kPa

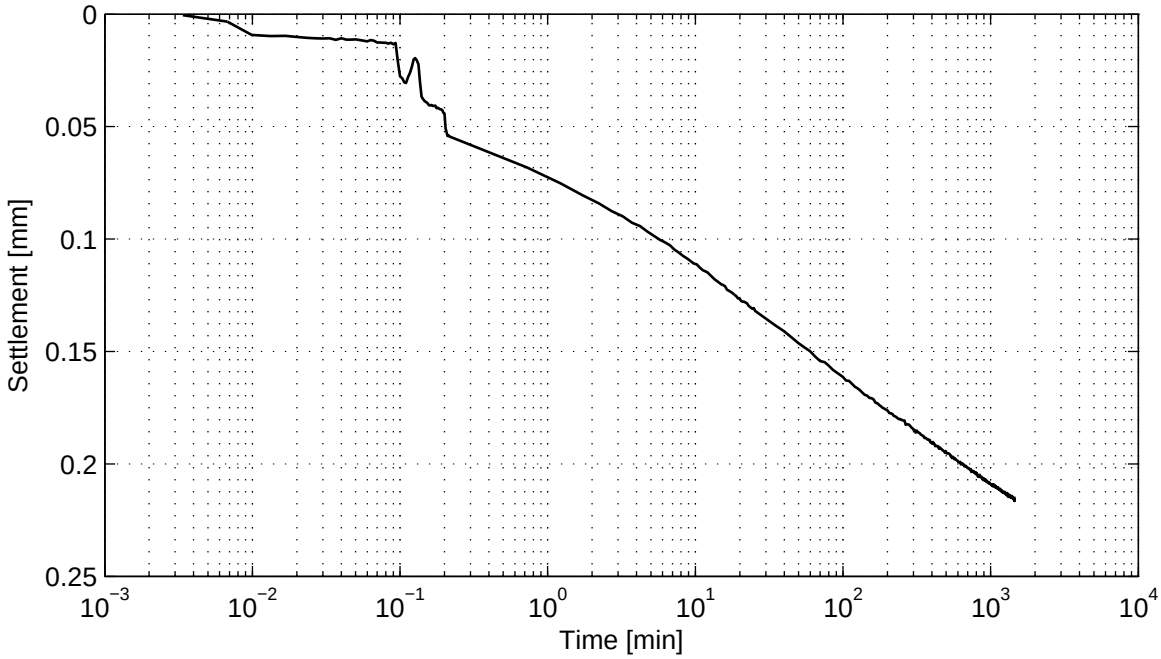


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 4/4)

Load step 3001 kPa



No calculation performed.

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Project Middelburg

Boring KB−102, sample KB−102_ST−6, depth −93.31 m till −93.86 m NAP

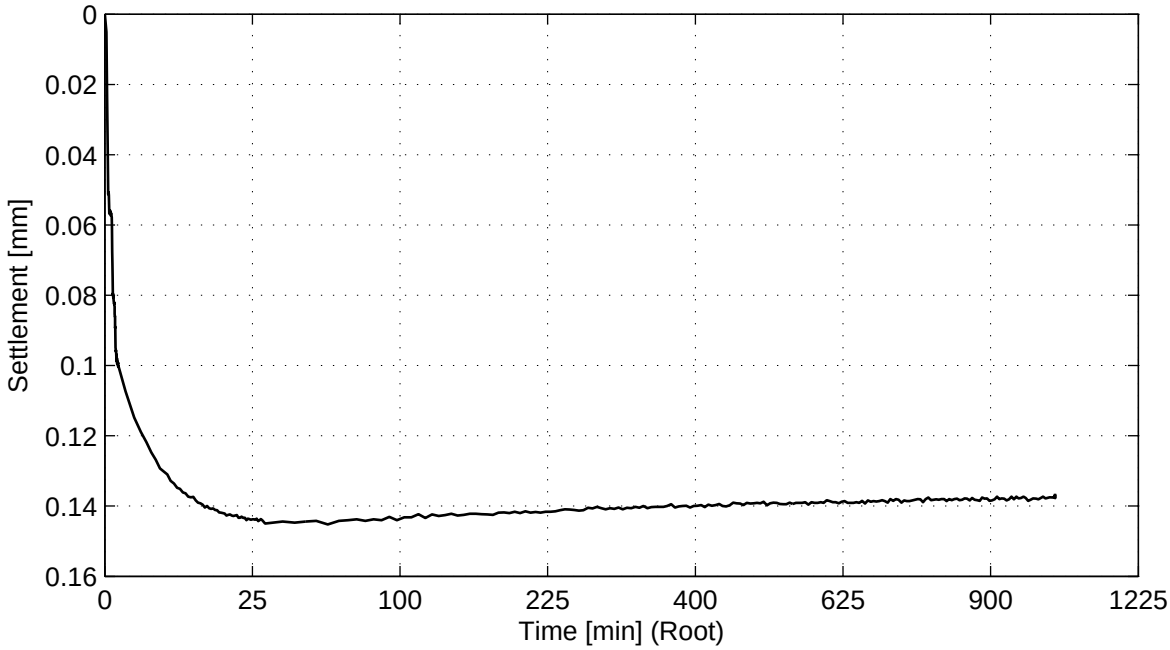
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−102_ST−6	6

) Vrijgegeven door wb op 2011-07-29 15:47

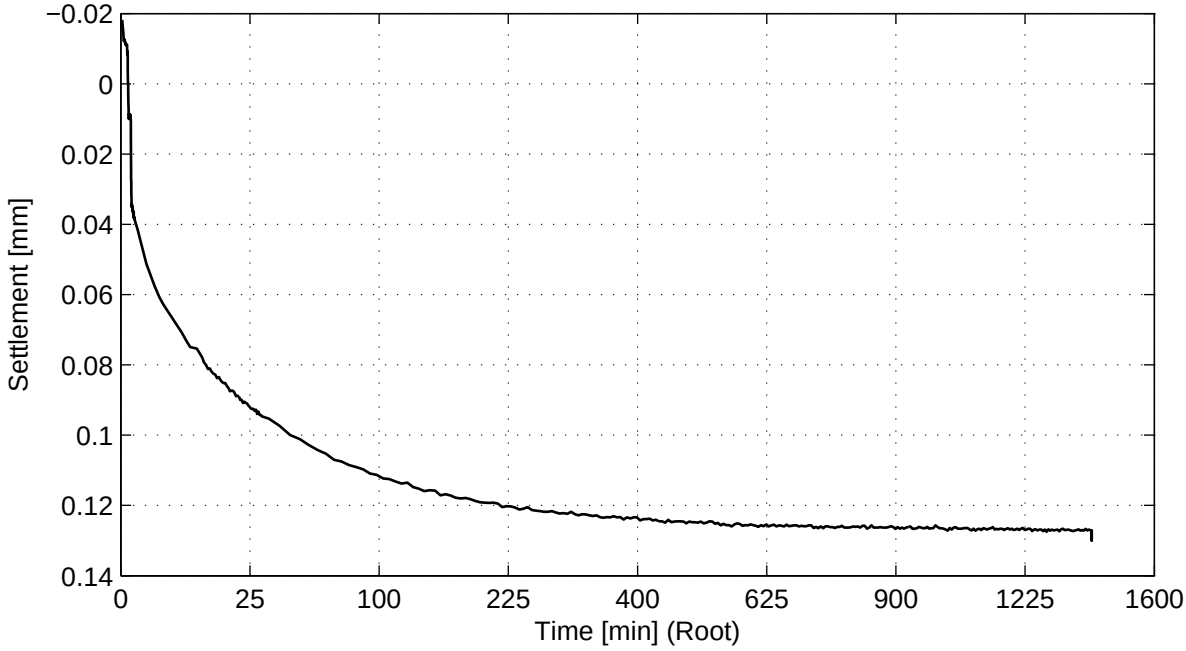
Taylor method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 375 kPa

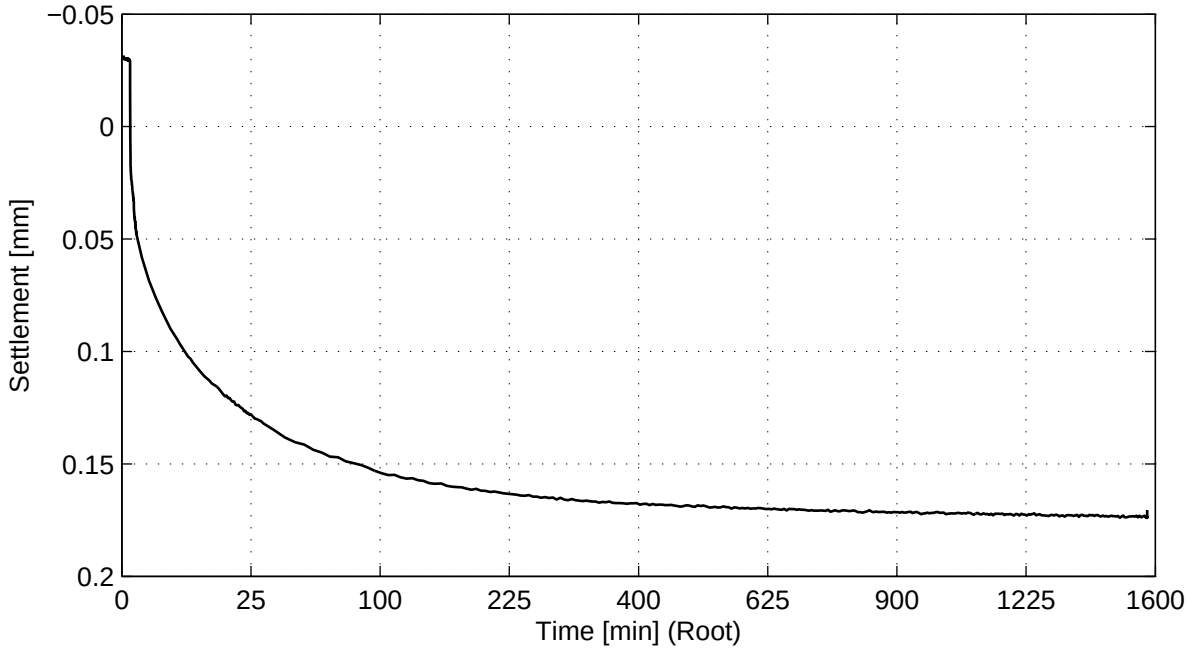


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

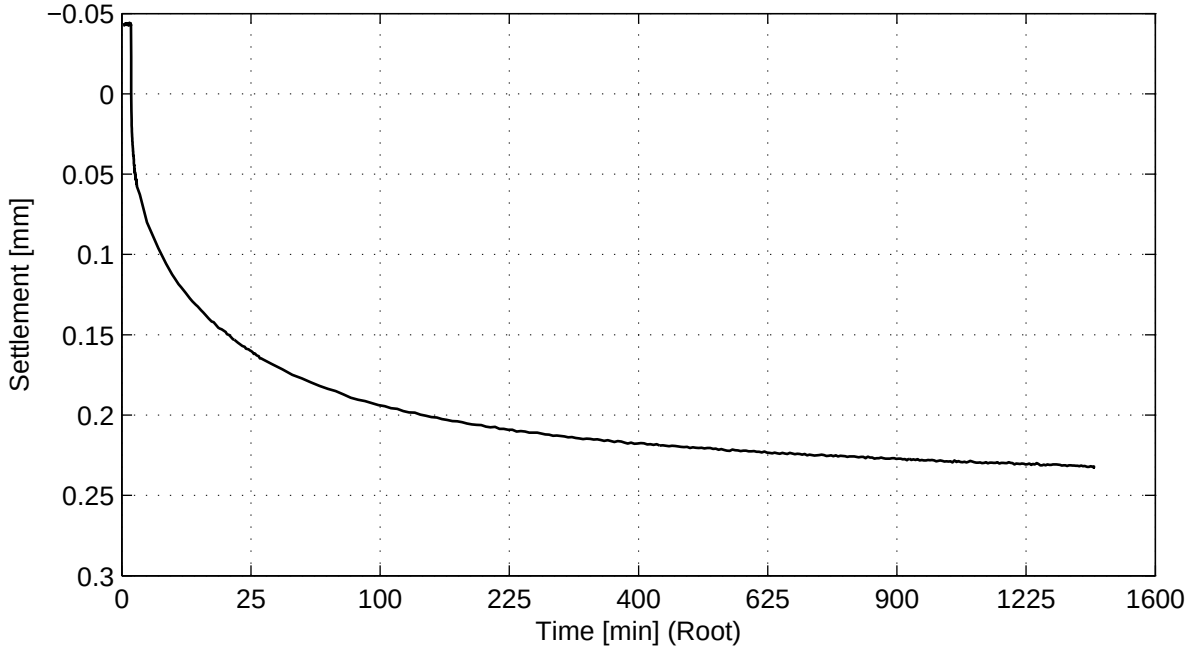
Taylor method (page 2/4)

Load step 750 kPa



No calculation performed.

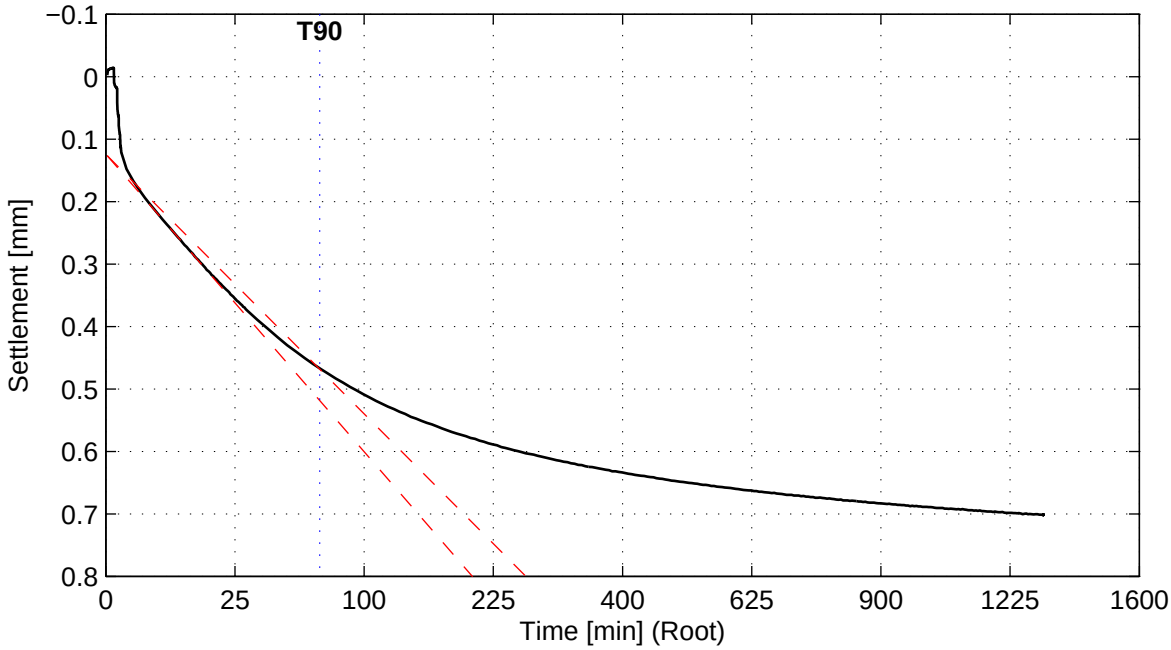
Load step 1501 kPa



No calculation performed.

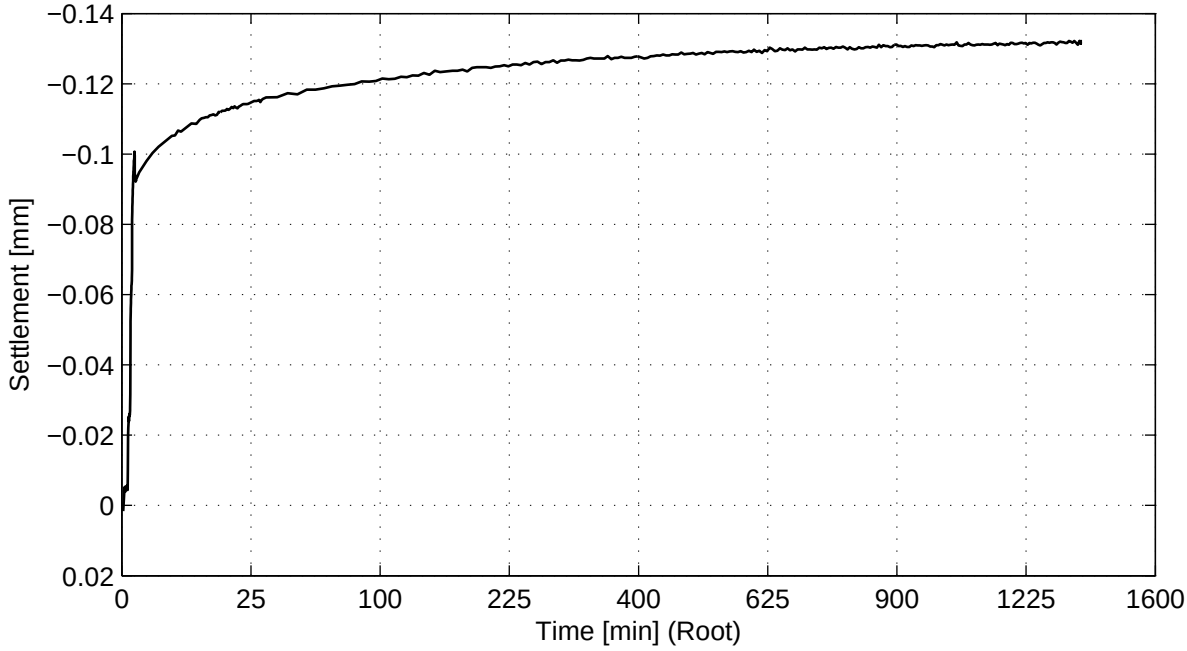
Taylor method (page 3/4)

Load step 3001 kPa



Cv = 1.4e−008 m^2/s

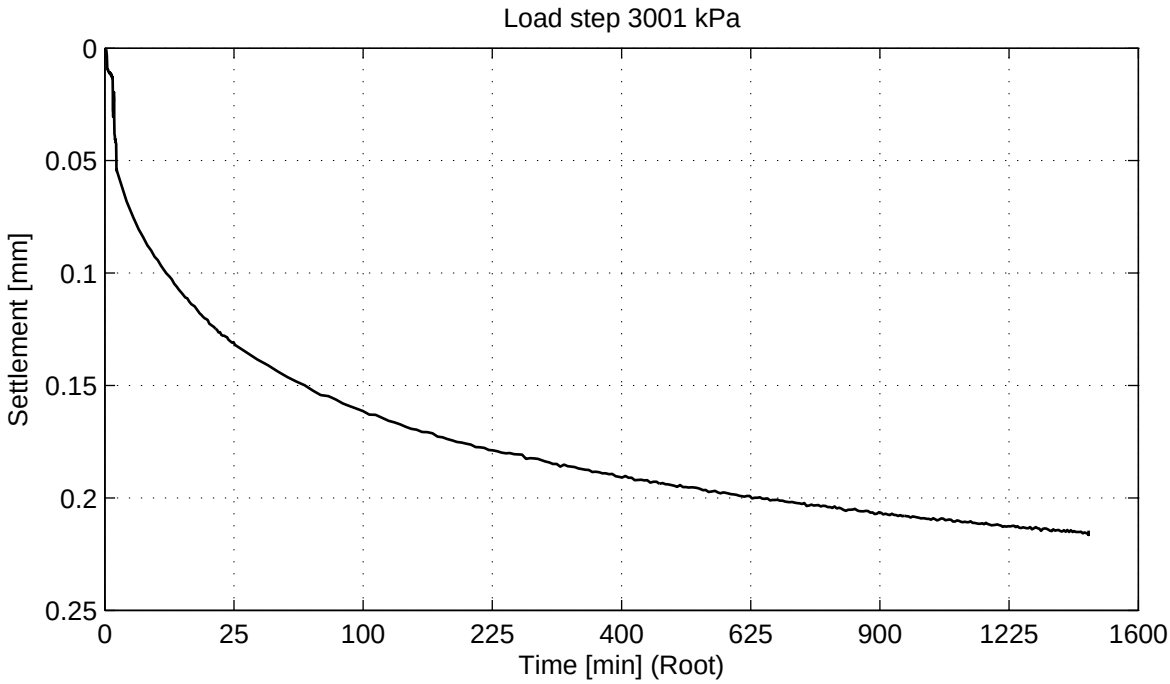
Load step 1500 kPa



No calculation performed.

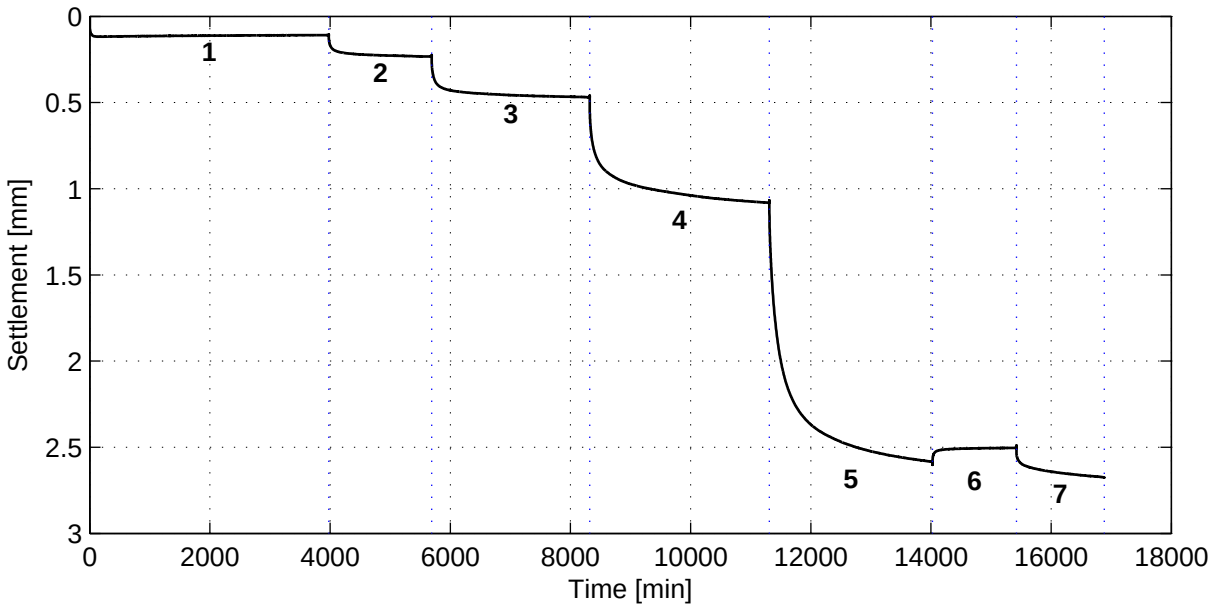
) Vrijgegeven door wb op 2011-07-29 15:47

Taylor method (page 4/4)



No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47



General soil and test parameters

Soil description	Organic Clay, silty (OH)
Initial volumetric weight − wet [kN/m^3]	16.1
Initial volumetric weight − dry [kN/m^3]	10.9
Volumetric weight particles [kN/m^3]	25.5
Initial water content [%]	48.3
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	0.9
Final volumetric weight − wet [kN/m^3]	17.3
Final volumetric weight − dry [kN/m^3]	12.1
Final water content [%]	42.7
Final saturation [−]	1.0
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−15
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	20.2
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	17
2	35
3	69
4	139
5	276
6	137
7	276

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

Boring KB−103, sample KB−103_ST−1D, depth −8.51 m till −8.58 m GL

Oedometer test conform CEN ISO/TS 17892−5

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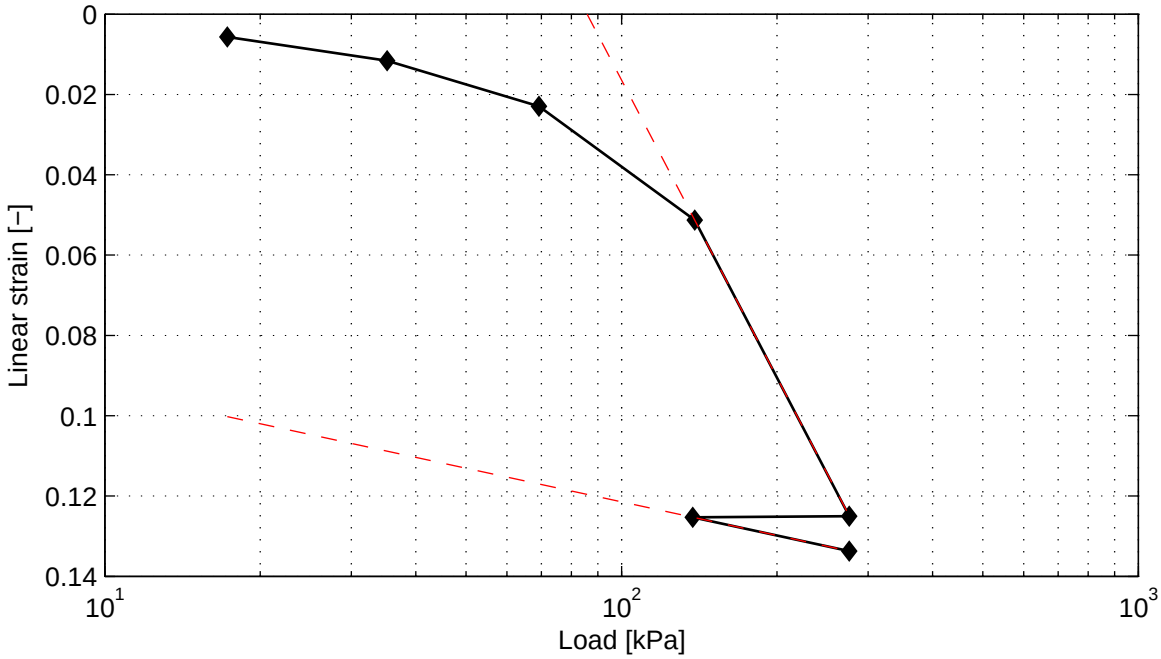
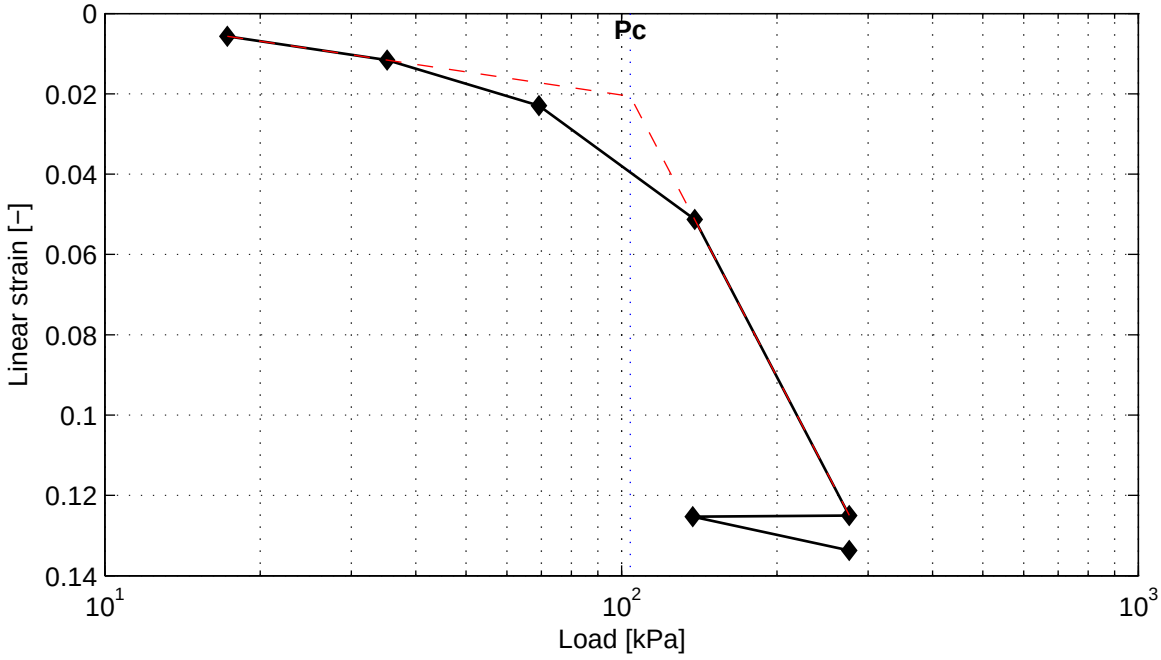
) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method



Cr = 6.5e−002 Ca = 1.3e−002 Vo = 2.35
Cc = 5.8e−001

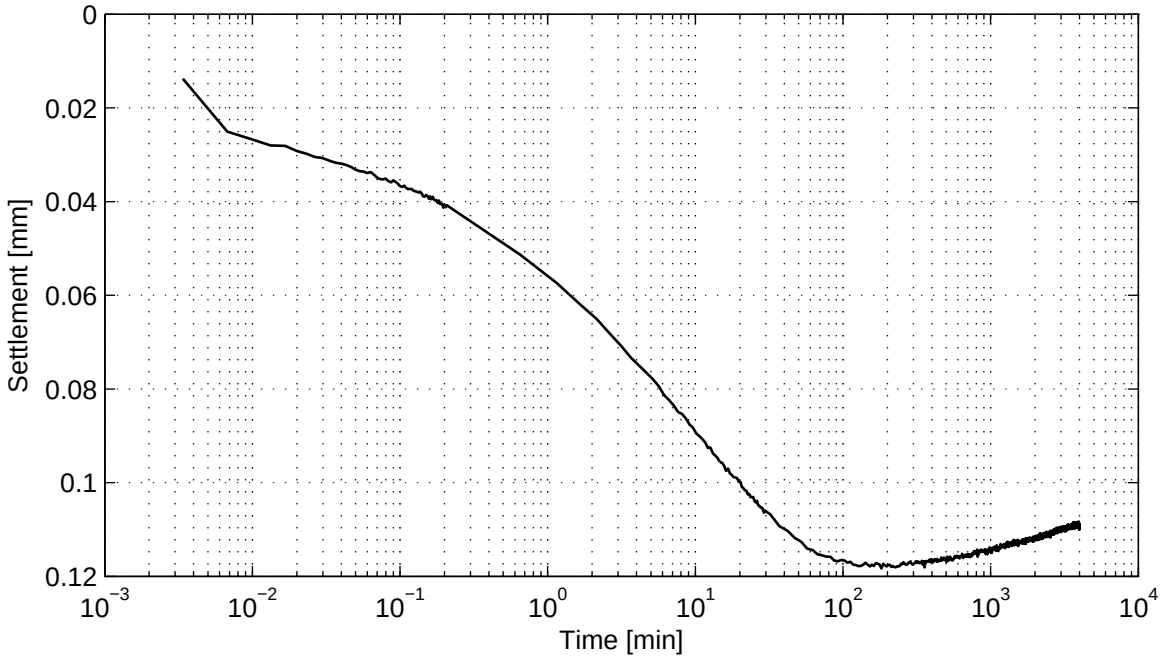


Pc = 104.0 kPa

) Vrijgegeven door wb op 2011-07-29 15:47

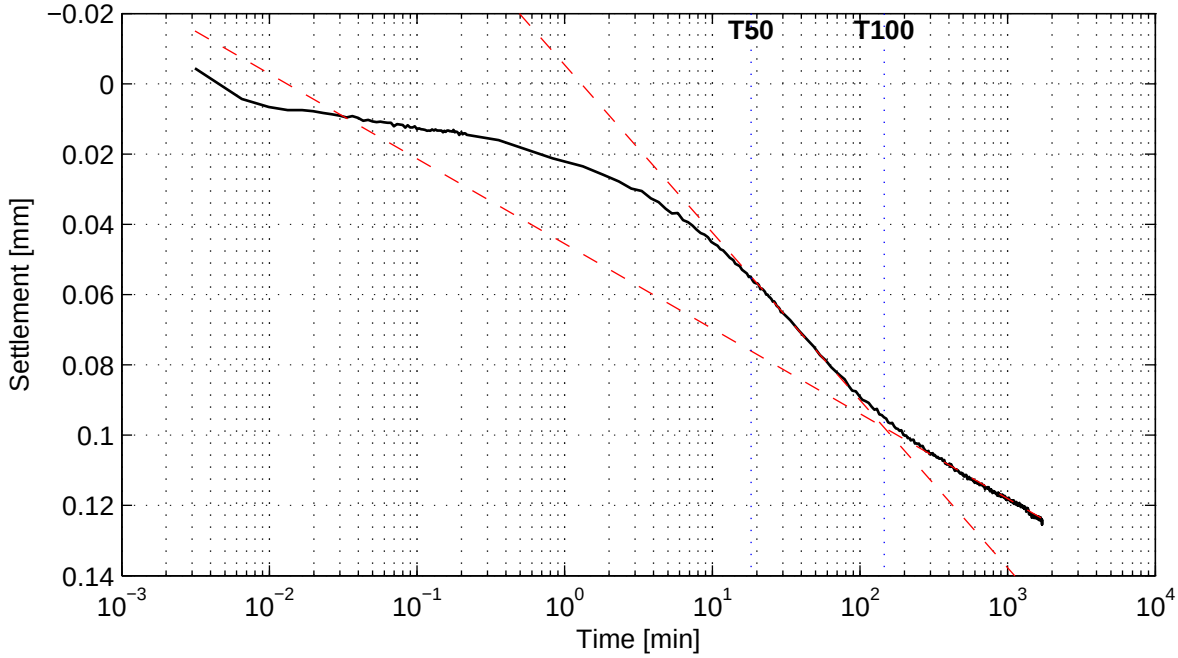
Casagrande method (page 1/4)

Load step 17 kPa



No calculation performed.

Load step 35 kPa



Cv = 1.4e−008 m^2/s Mv = 2.4e−004 m^2/kN
Ca = − K = 3.2e−011 m/s

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Oedometer test conform CEN ISO/TS 17892−5

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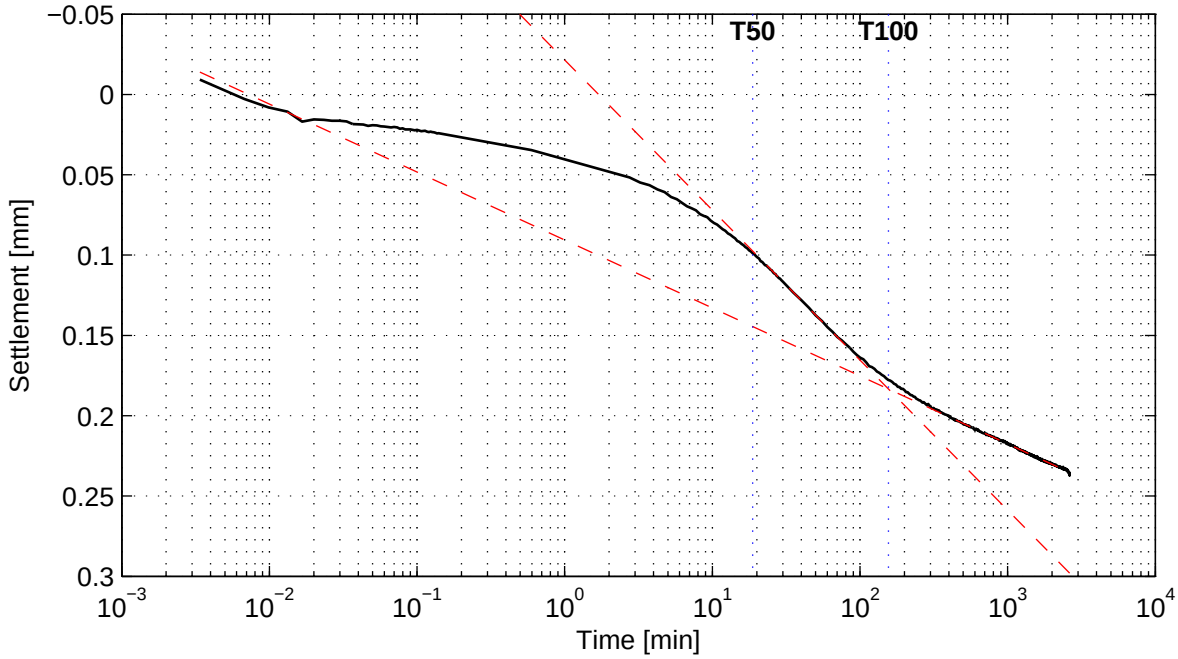
) Vrijgegeven door wb op 2011-07-29 15:47

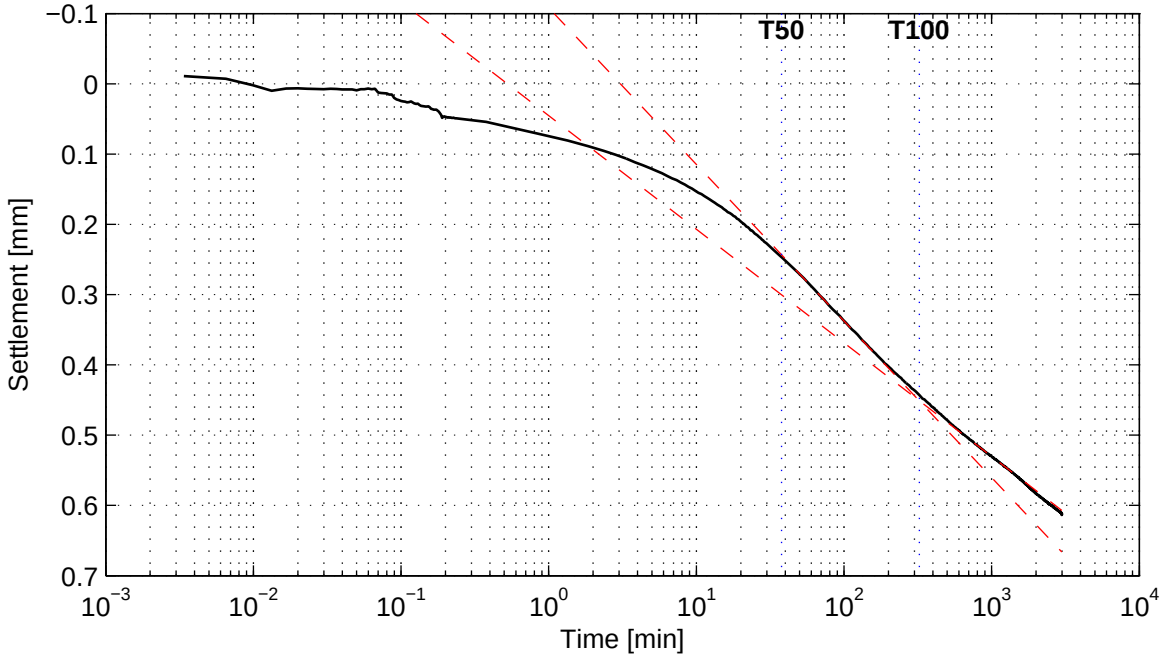
Casagrande method (page 2/4)

Load step 69 kPa



Cv = 1.3e−008 m^2/s Mv = 2.5e−004 m^2/kN
Ca = − K = 3.2e−011 m/s

Load step 139 kPa

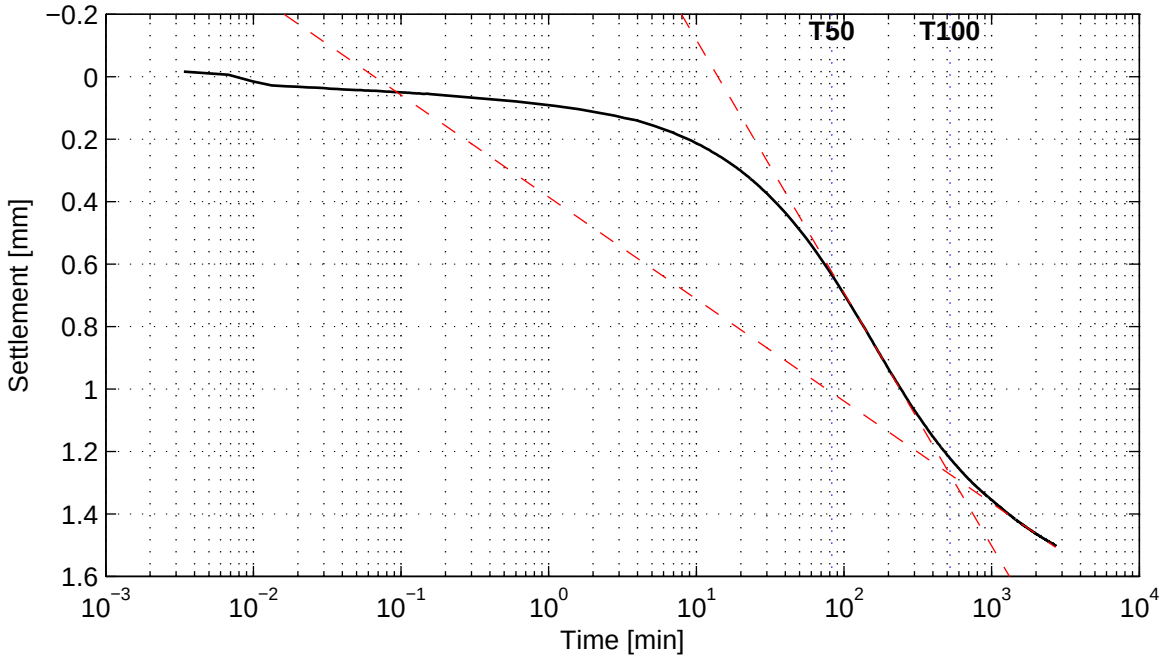


Cv = 6.2e−009 m^2/s Mv = 3.0e−004 m^2/kN
Ca = 8.3e−003 K = 1.8e−011 m/s

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 3/4)

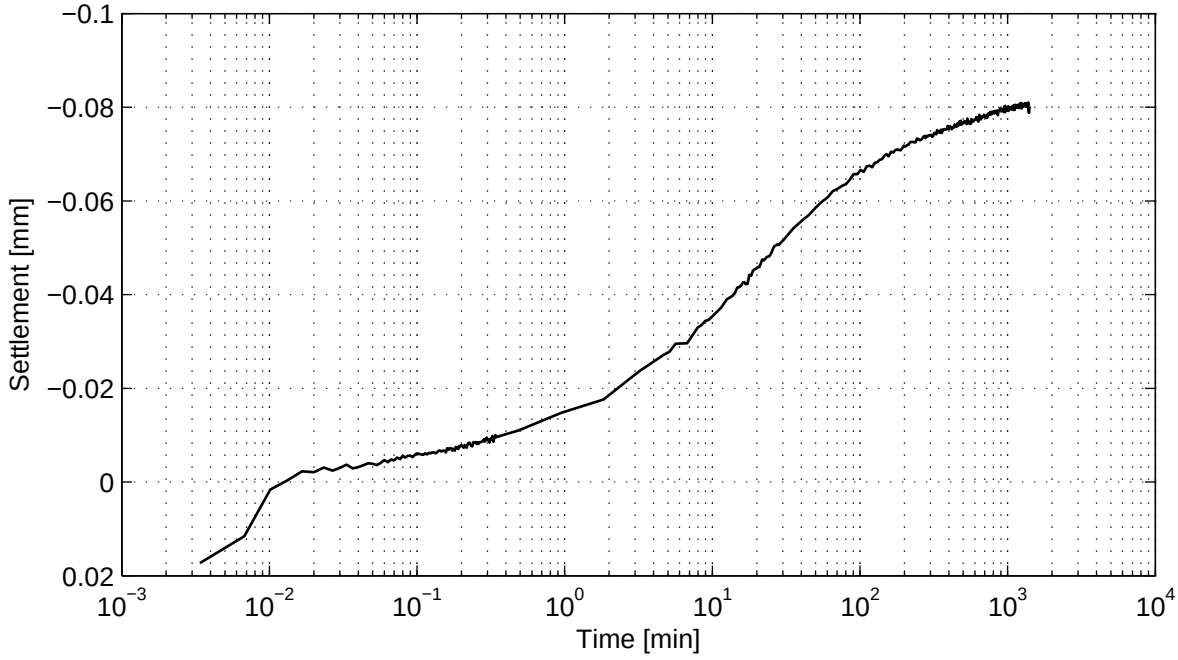
Load step 276 kPa



Cv = 2.5e−009 m^2/s
Ca = 1.7e−002

Mv = 4.9e−004 m^2/kN
K = 1.2e−011 m/s

Load step 137 kPa

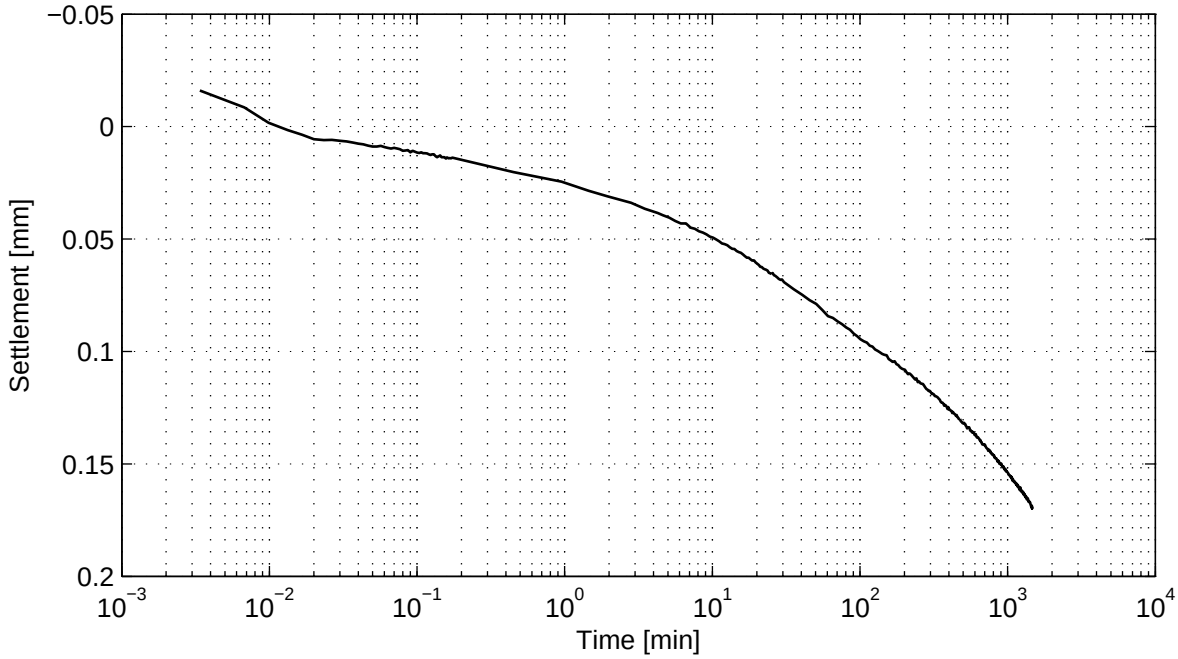


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 4/4)

Load step 276 kPa

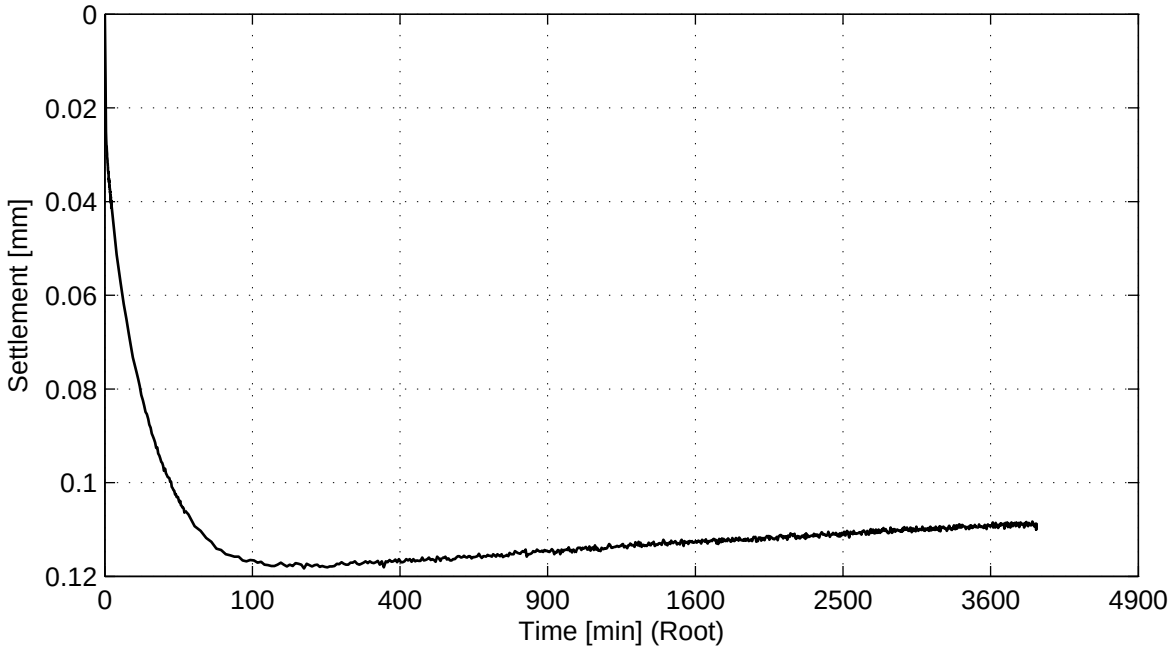


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

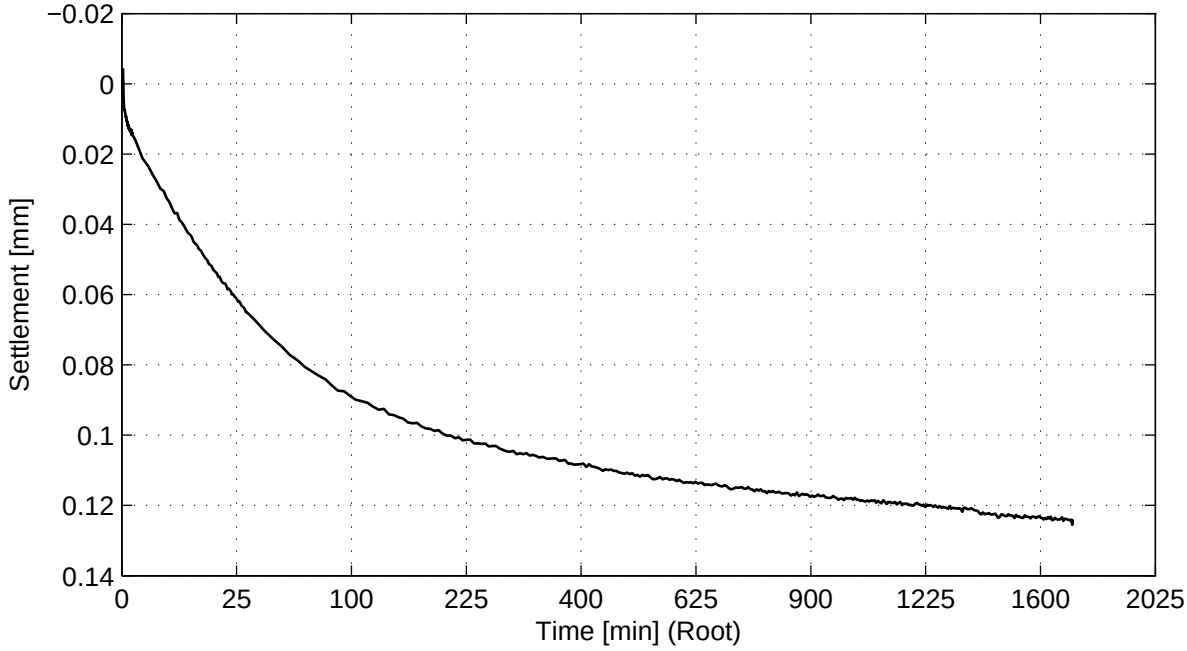
Taylor method (page 1/4)

Load step 17 kPa



No calculation performed.

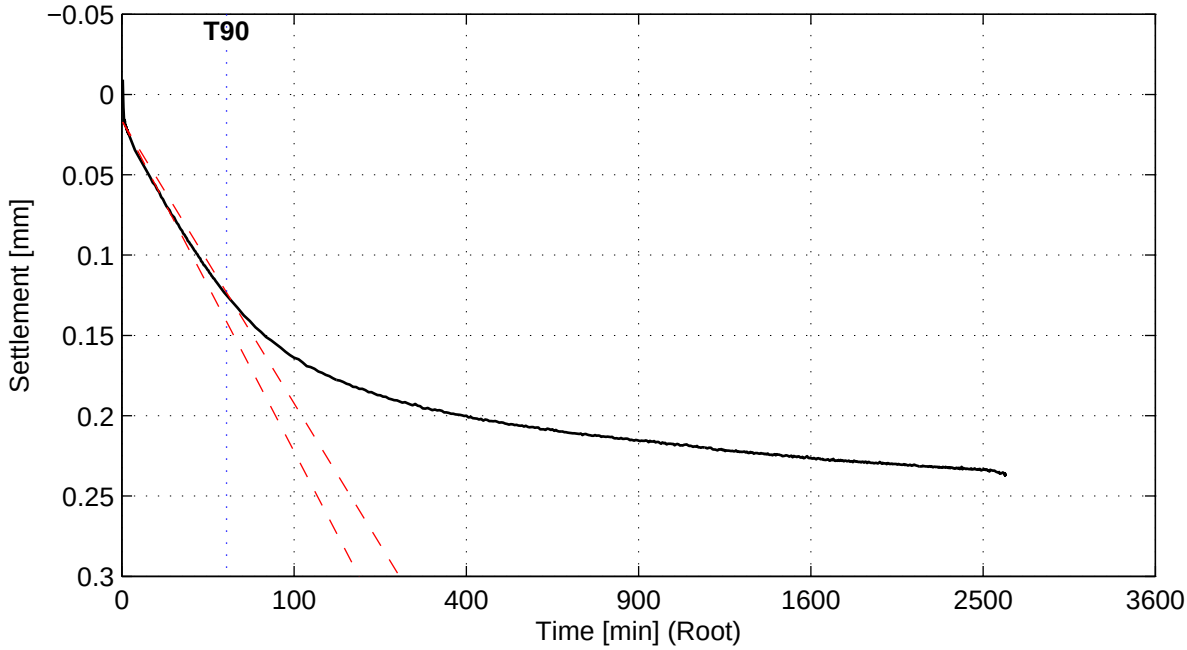
Load step 35 kPa



No calculation performed.

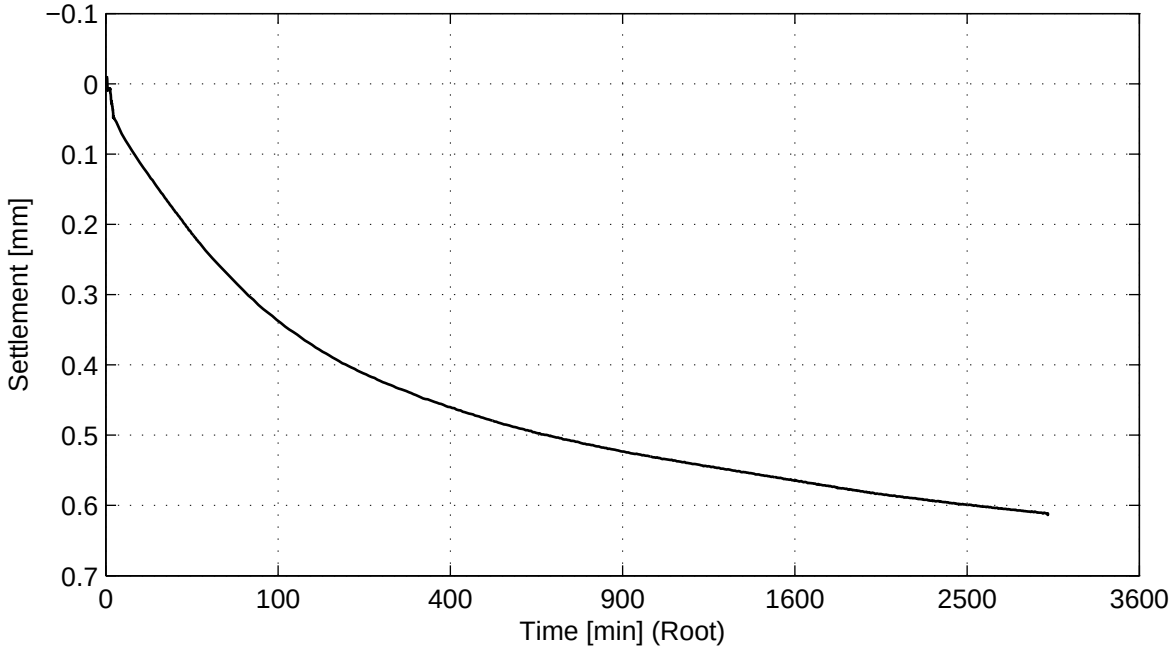
Taylor method (page 2/4)

Load step 69 kPa



Cv = 2.8e−008 m^2/s

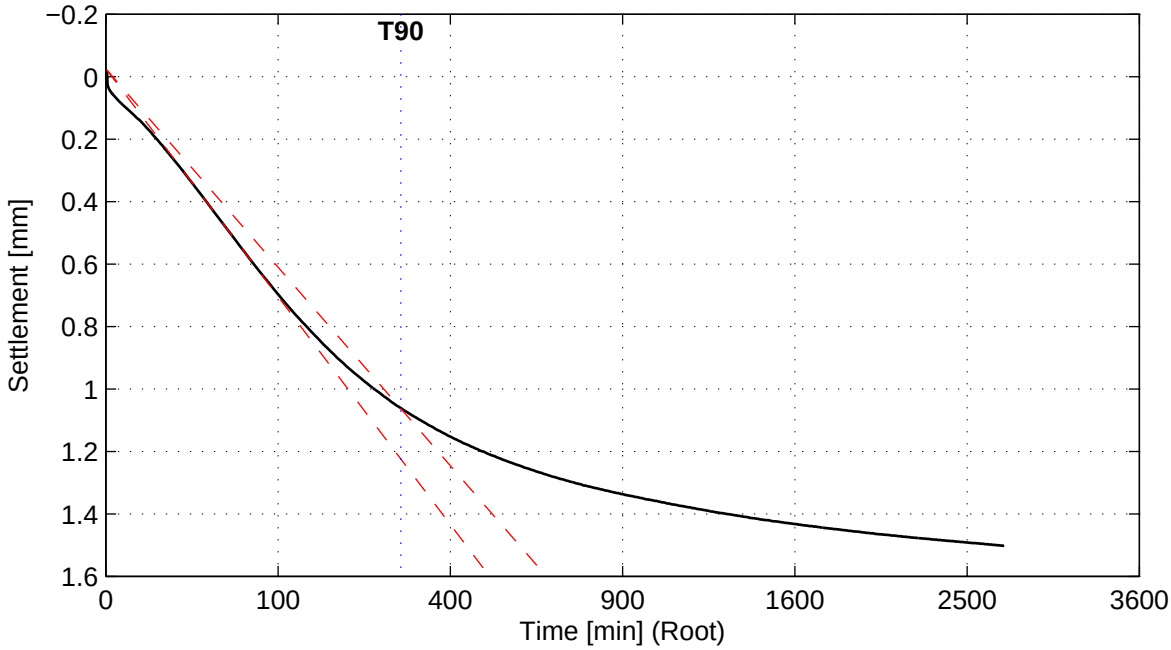
Load step 139 kPa



No calculation performed.

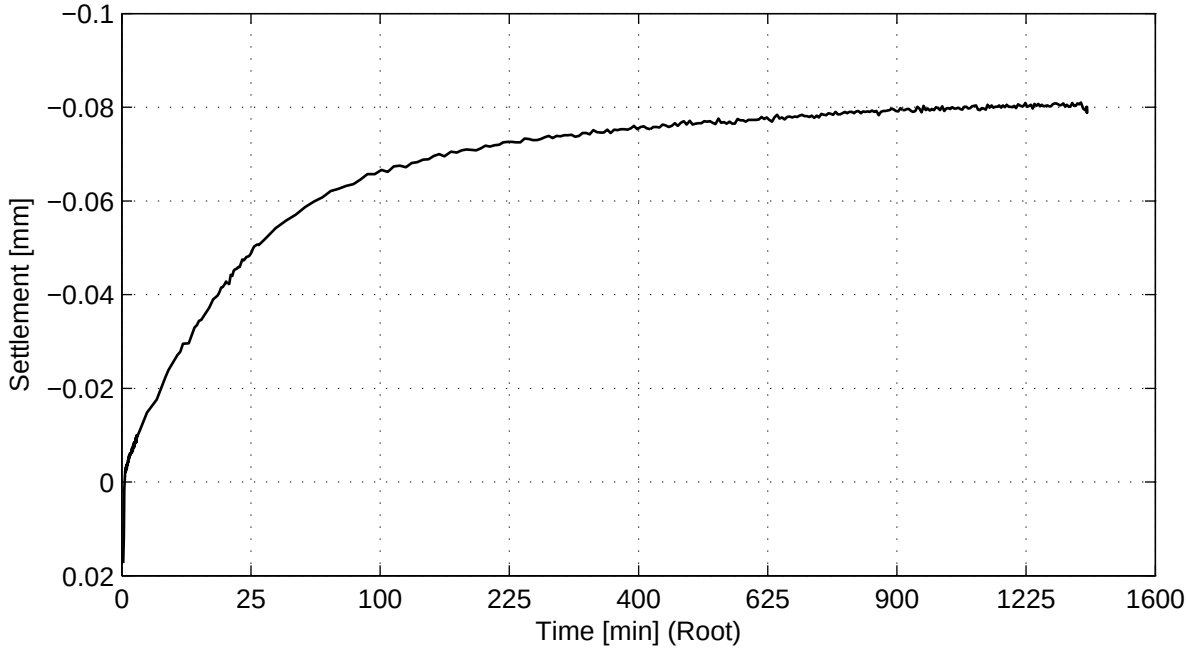
Taylor method (page 3/4)

Load step 276 kPa



Cv = 2.9e−009 m^2/s

Load step 137 kPa



No calculation performed.

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Oedometer test conform CEN ISO/TS 17892−5

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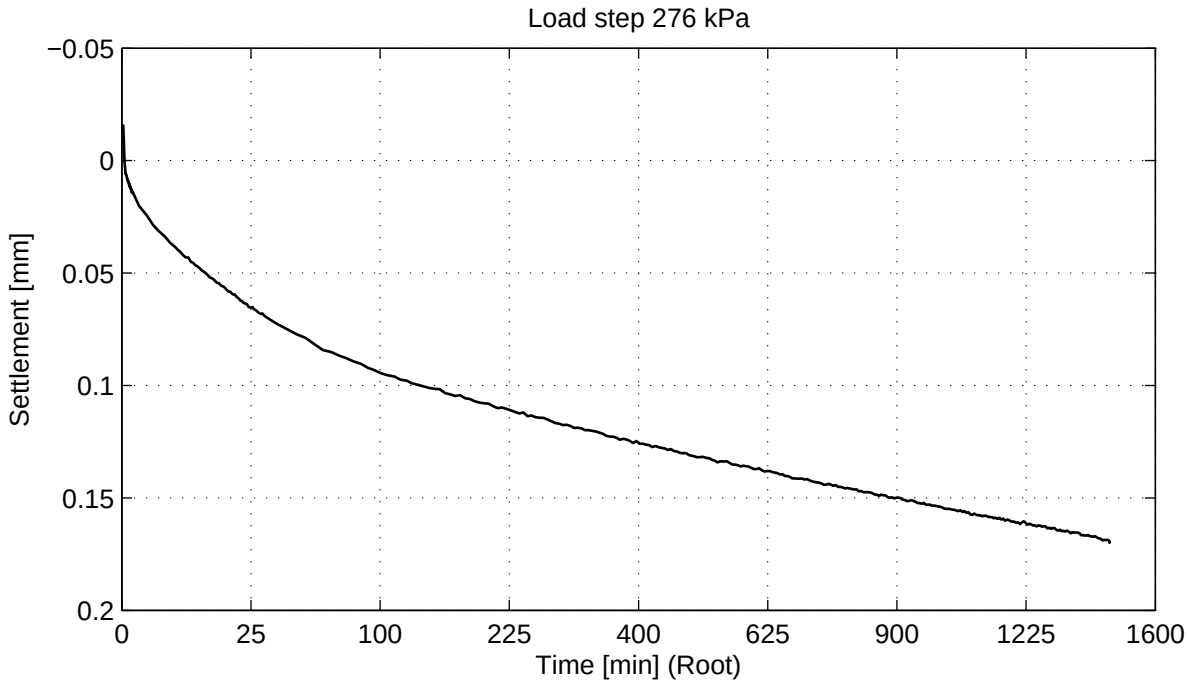
) Vrijgegeven door wb op 2011-07-29 15:47

Taylor method (page 4/4)



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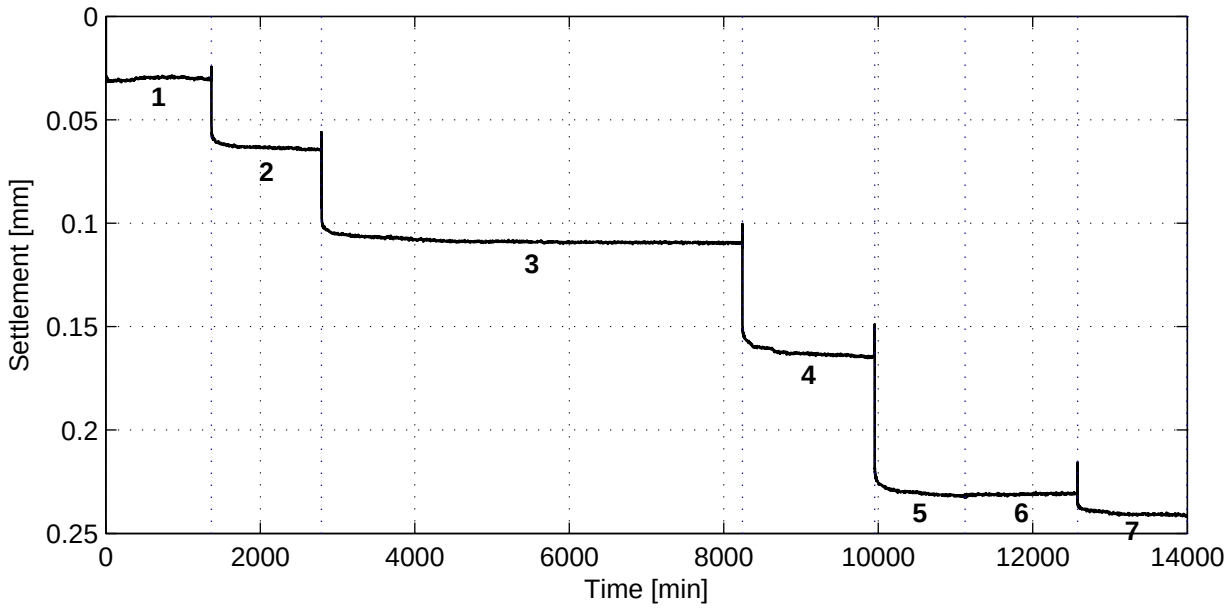

General soil and test parameters

Soil description	Silty Sand (SM)
Initial volumetric weight − wet [kN/m^3]	19.9
Initial volumetric weight − dry [kN/m^3]	16.7
Volumetric weight particles [kN/m^3]	26.2
Initial water content [%]	19.6
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	0.9
Final volumetric weight − wet [kN/m^3]	19.3
Final volumetric weight − dry [kN/m^3]	15.9
Final water content [%]	21.0
Final saturation [−]	0.9
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−12
Enddate	2011−07−22
Sample disturbance index	–
Lab temperature [° C]	20.5
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	19
2	39
3	78
4	158
5	313
6	158
7	313

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Boring KB−103, sample KB−103_ST−3A, depth −12.55 m till −12.60 m GL

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	–
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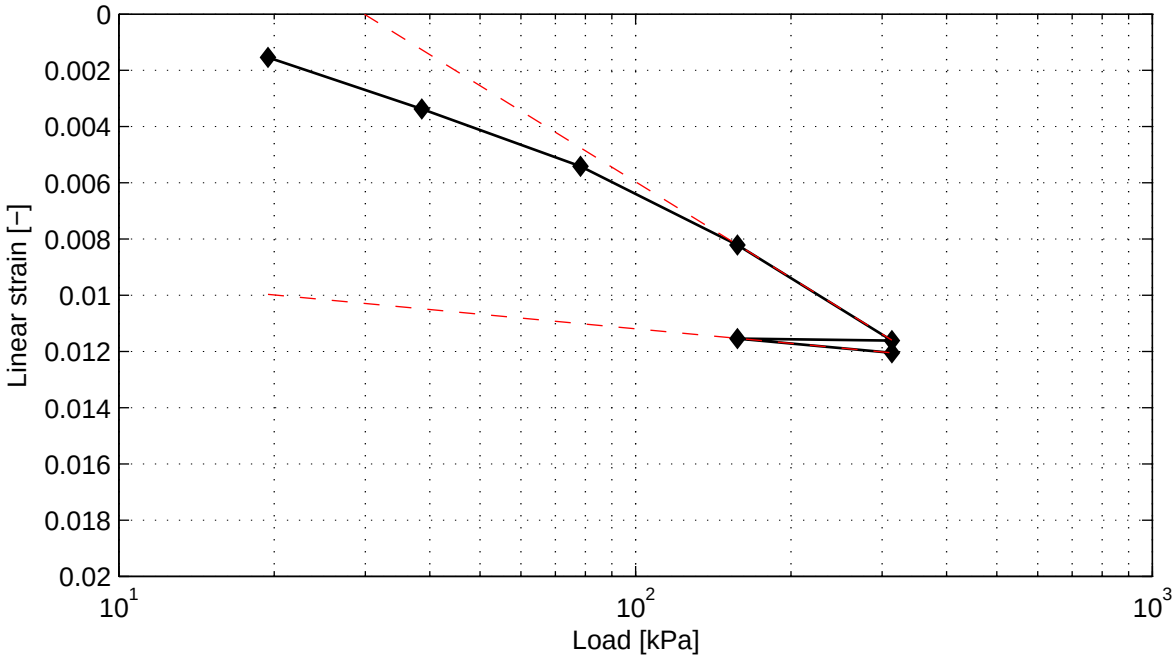
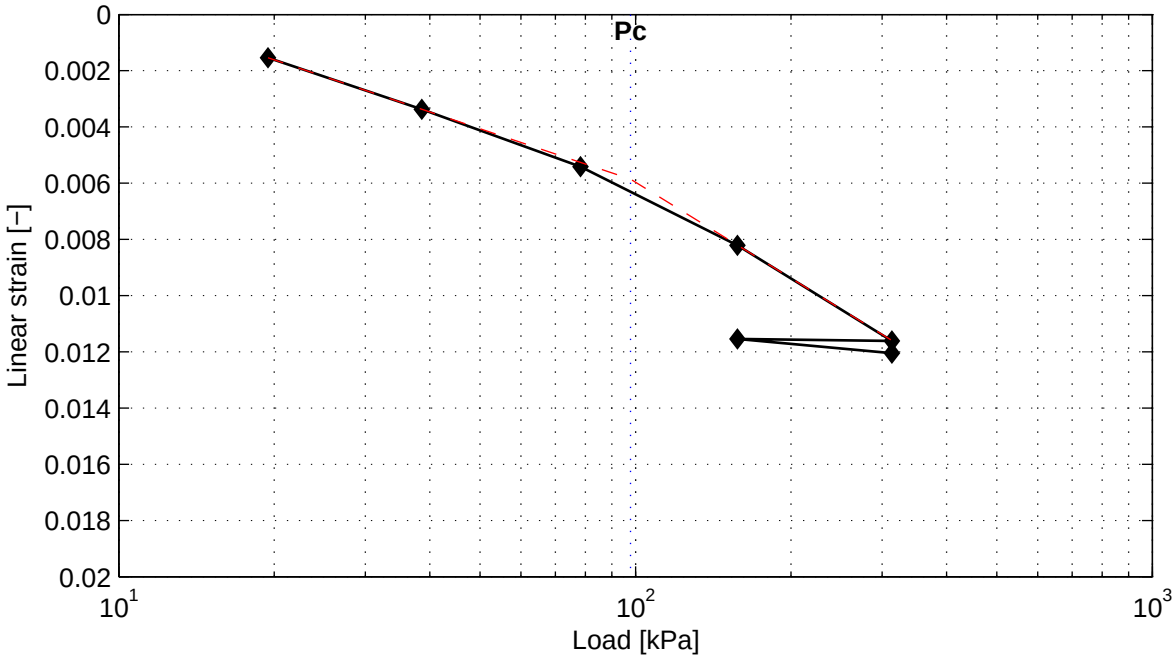
) Vrijgegeven door wb op 2011-07-29 15:46

Bjerrum method



Cr = 2.7e−003 Ca = 2.5e−004 Vo = 1.57
Cc = 1.8e−002

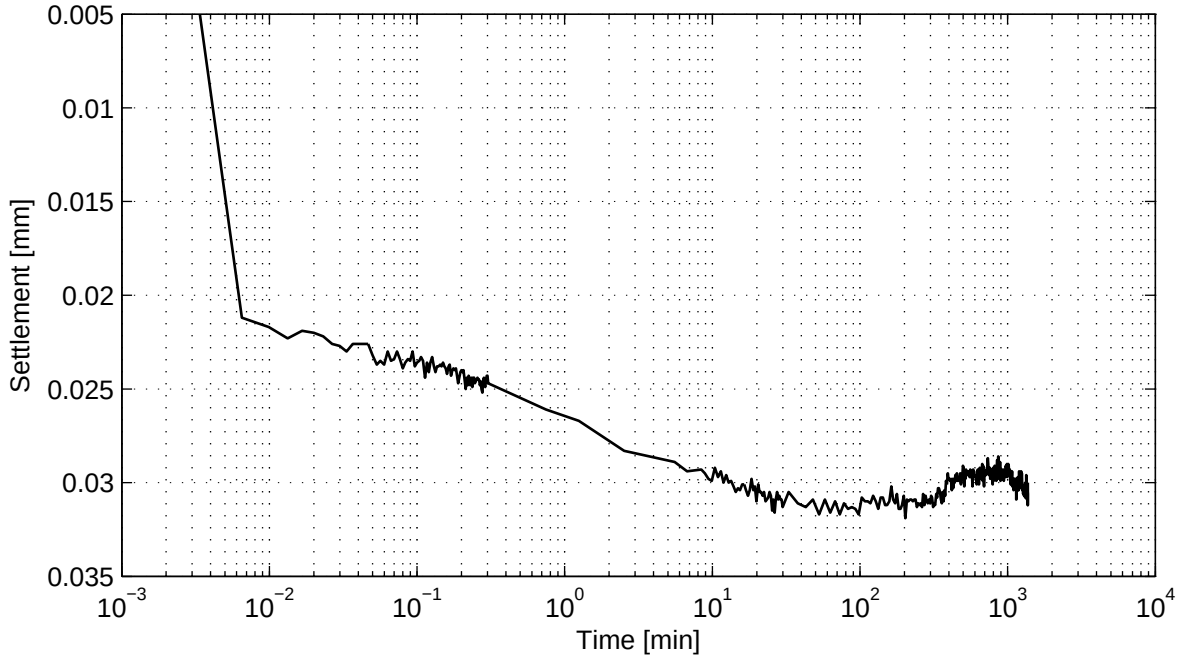


Pc = 97.8 kPa

) Vrijgegeven door wb op 2011-07-29 15:46

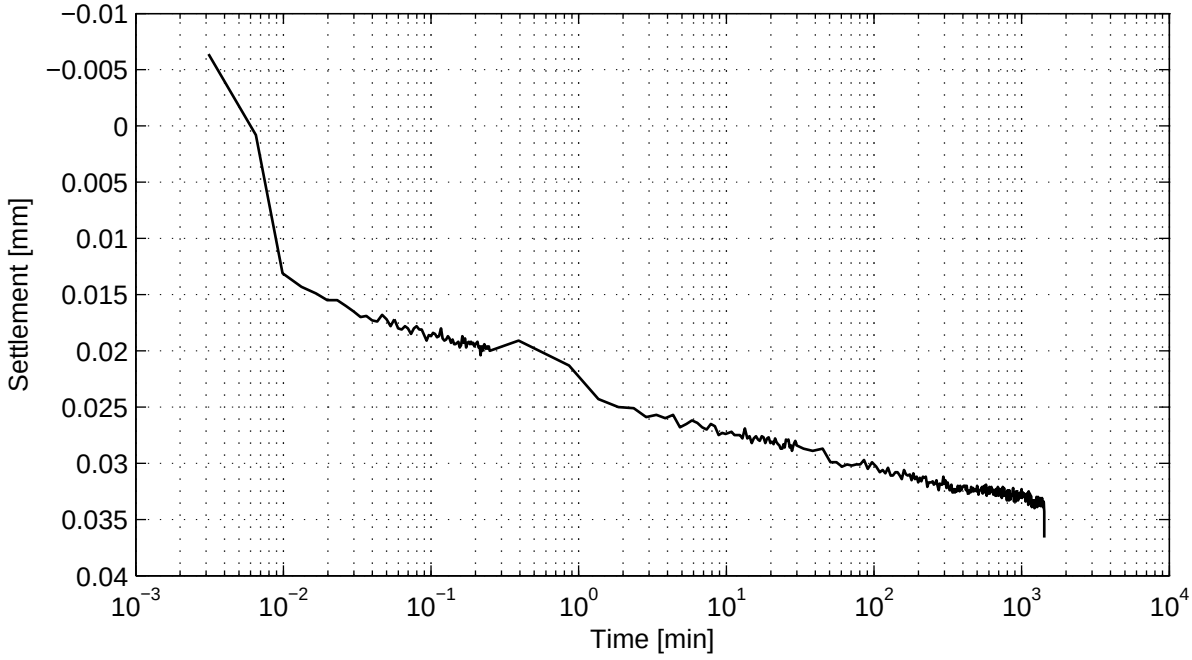
Casagrande method (page 1/4)

Load step 19 kPa



No calculation performed.

Load step 39 kPa

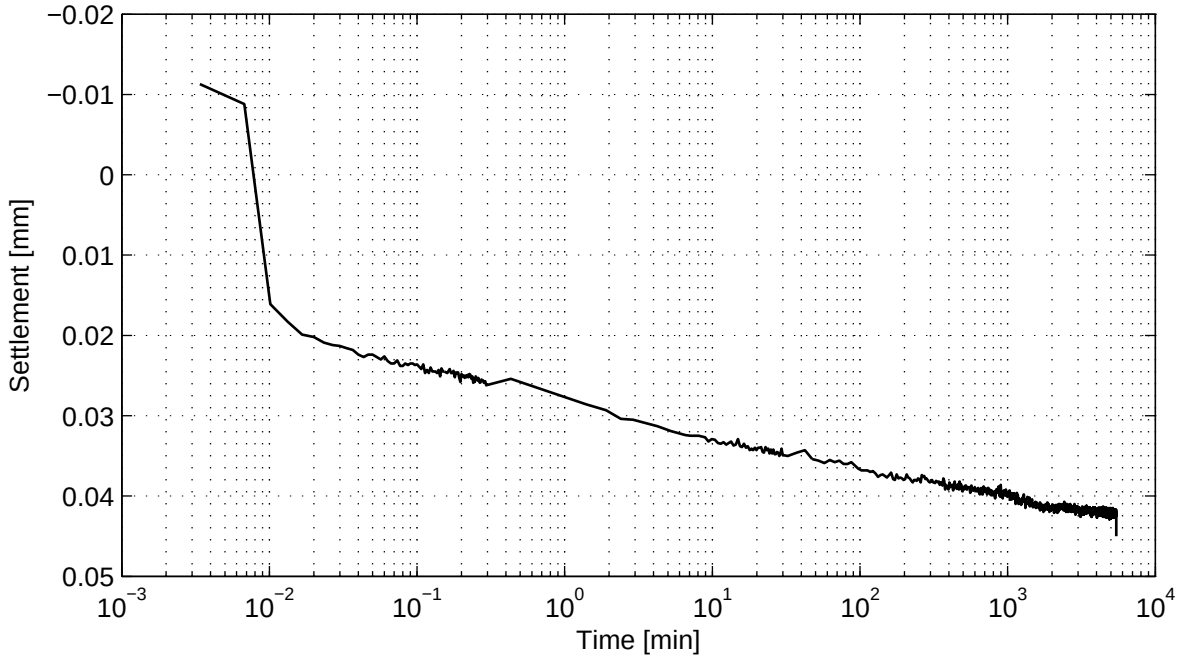


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:46

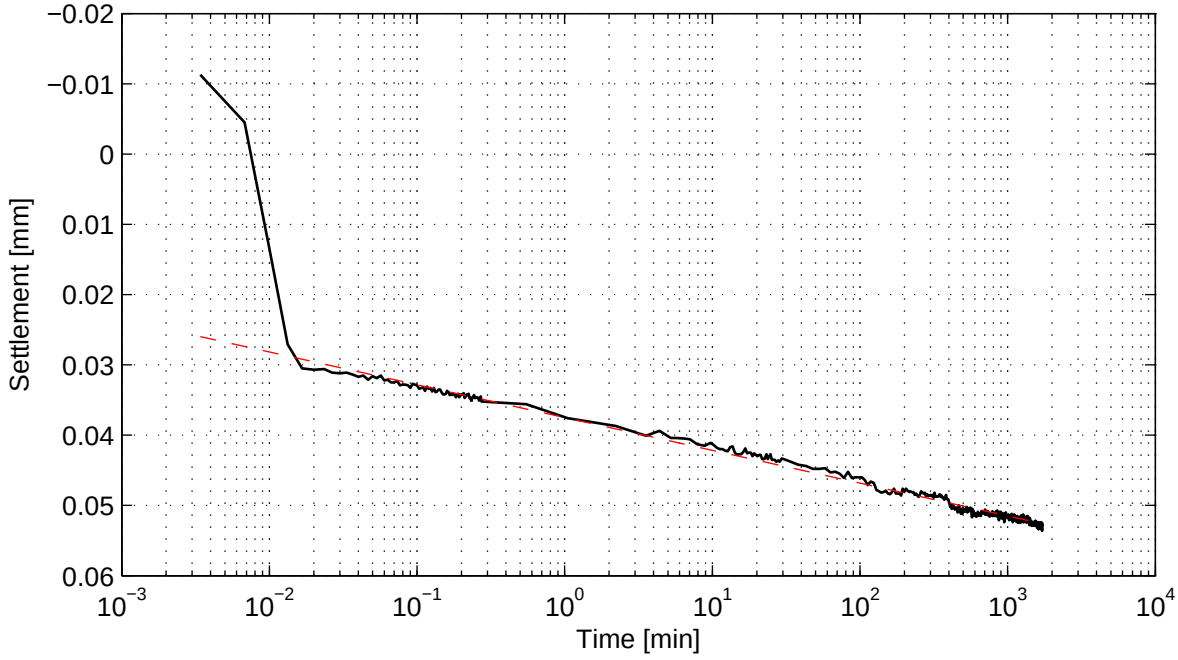
Casagrande method (page 2/4)

Load step 78 kPa



No calculation performed.

Load step 158 kPa

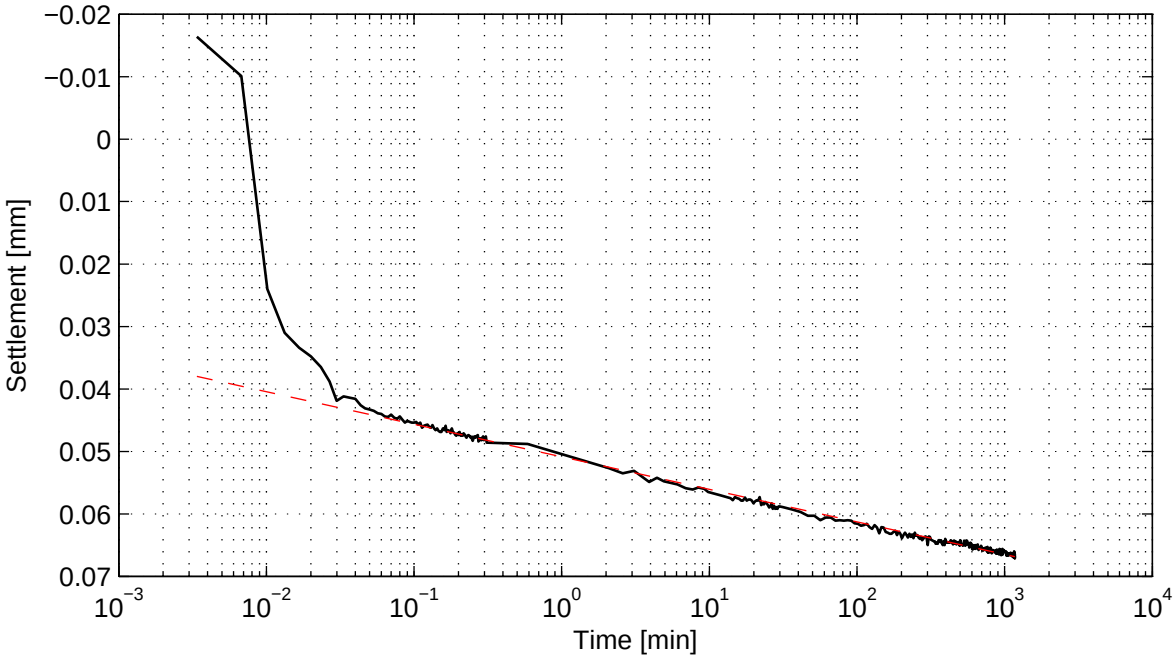


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:46

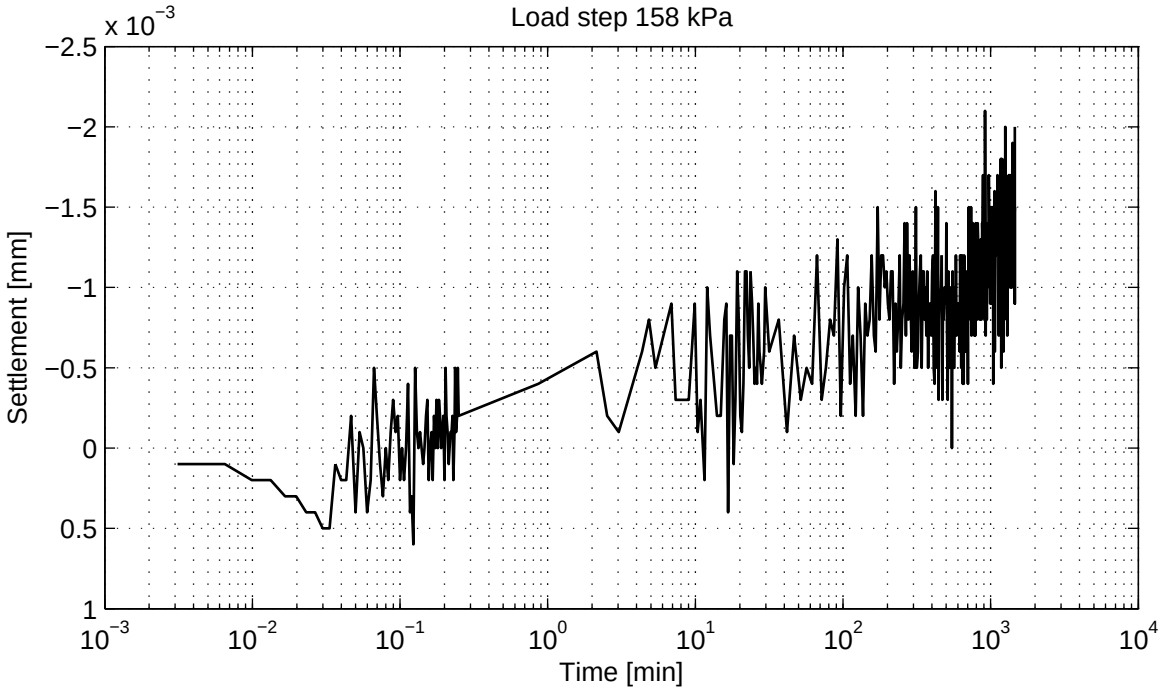
Casagrande method (page 3/4)

Load step 313 kPa



No calculation performed.

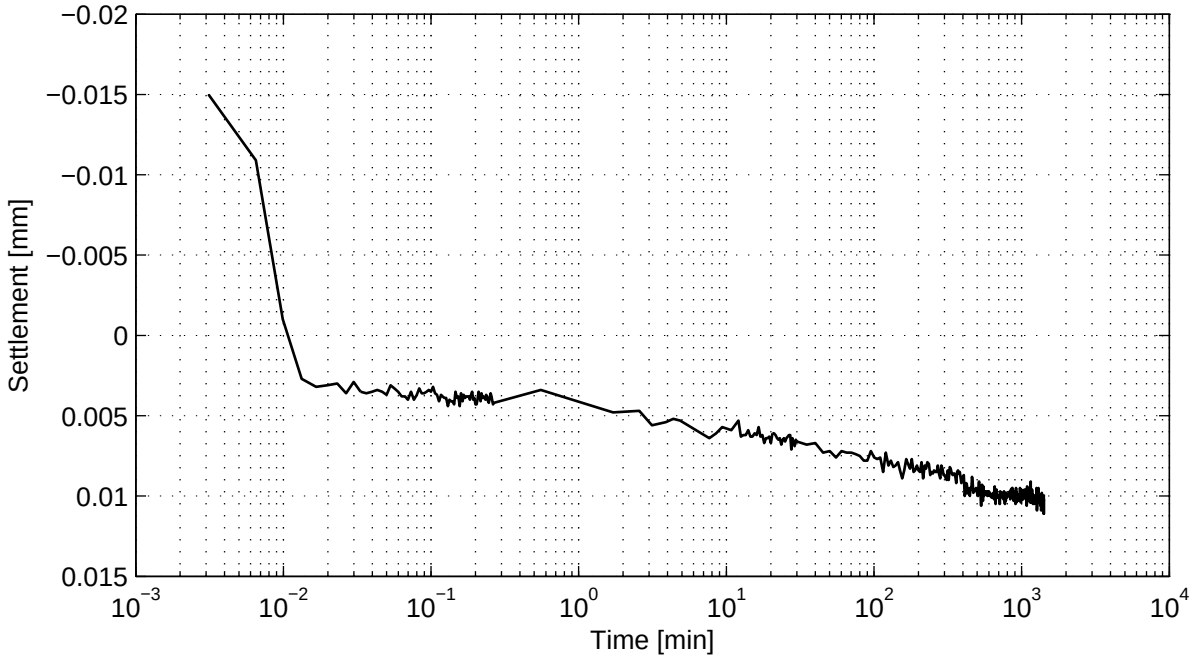
Load step 158 kPa



No calculation performed.

Casagrande method (page 4/4)

Load step 313 kPa



No calculation performed.

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Boring KB−103, sample KB−103_ST−3A, depth −12.55 m till −12.60 m GL

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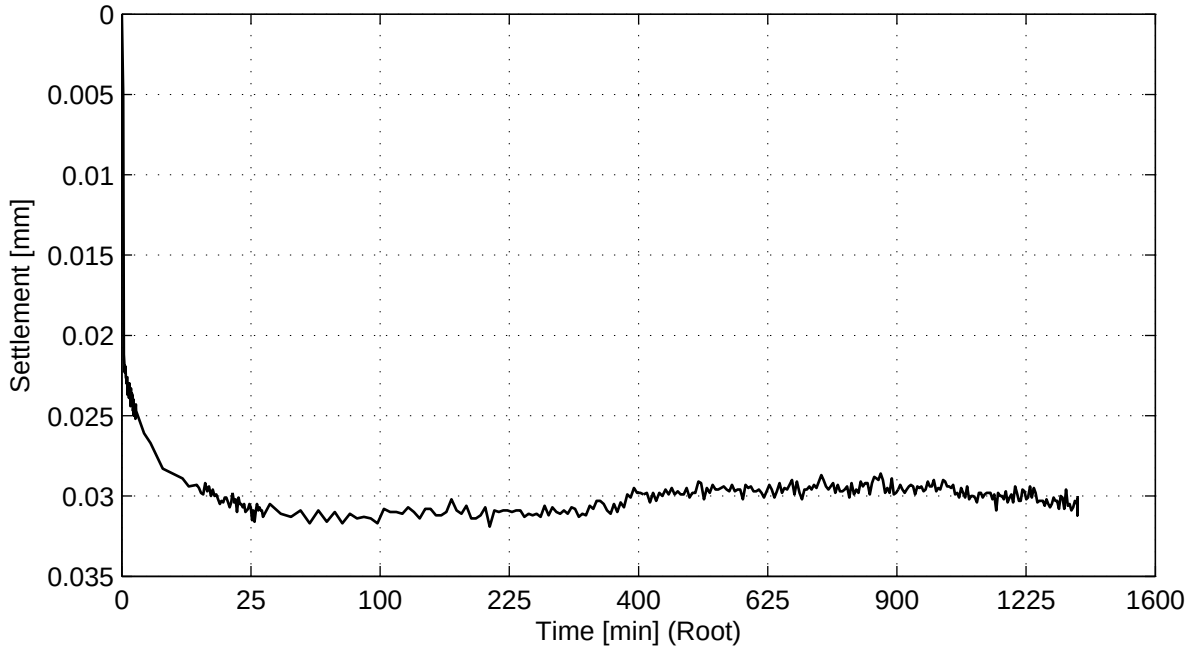
) Vrijgegeven door wb op 2011-07-29 15:46

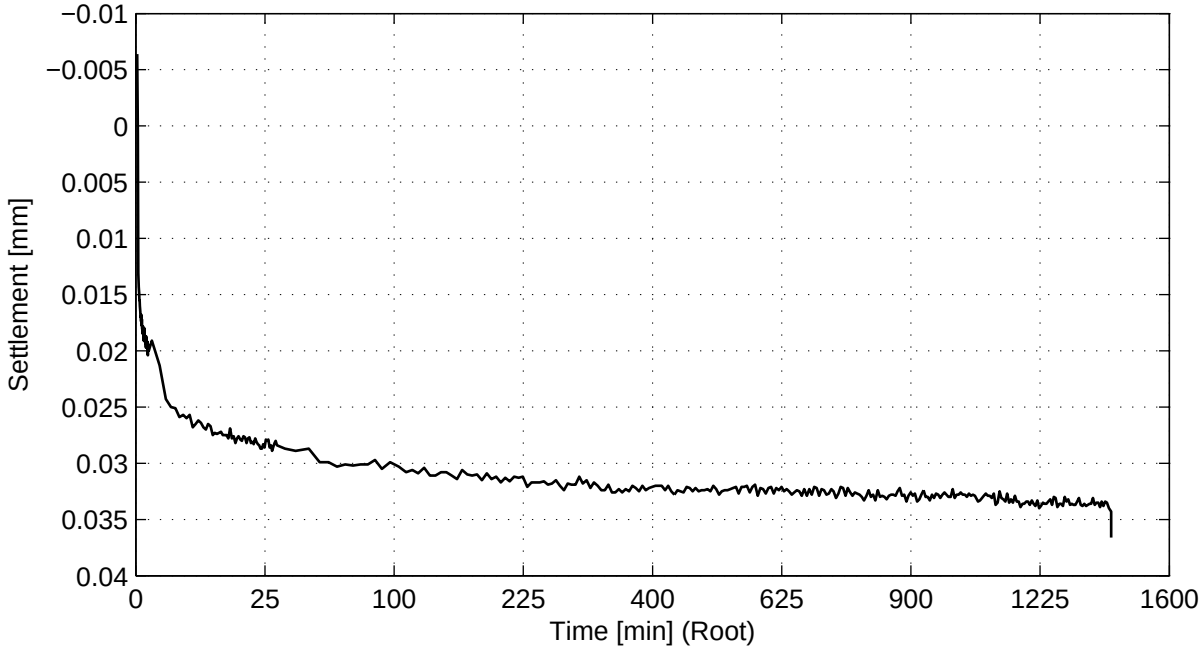
Taylor method (page 1/4)

Load step 19 kPa



No calculation performed.

Load step 39 kPa

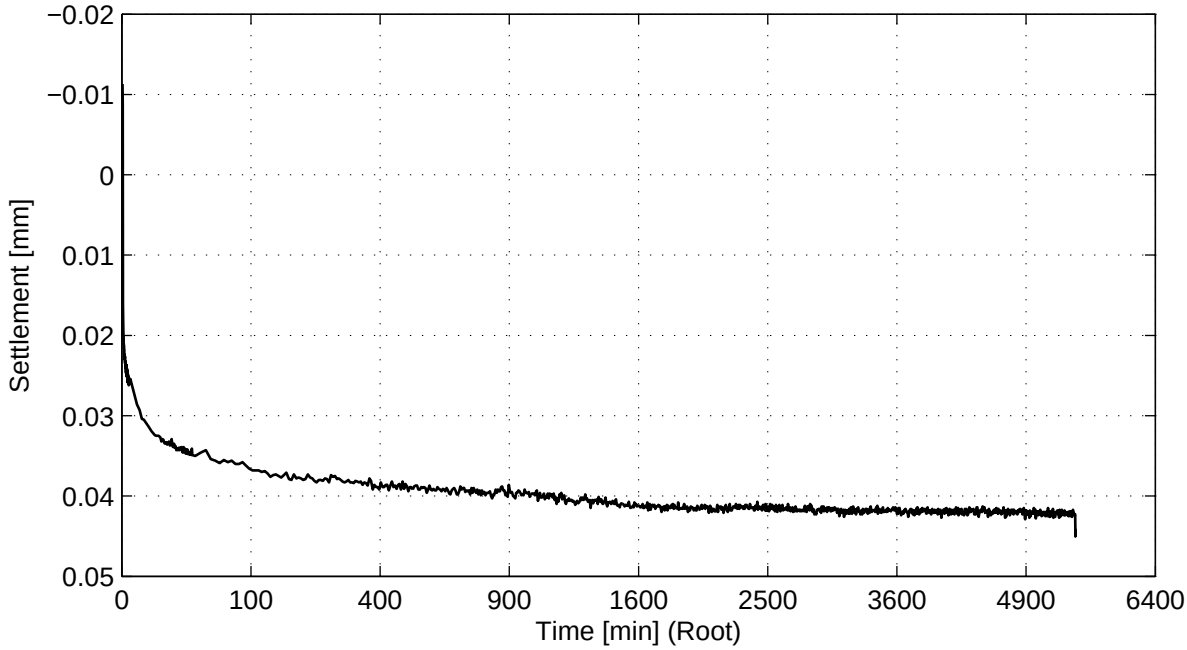


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:46

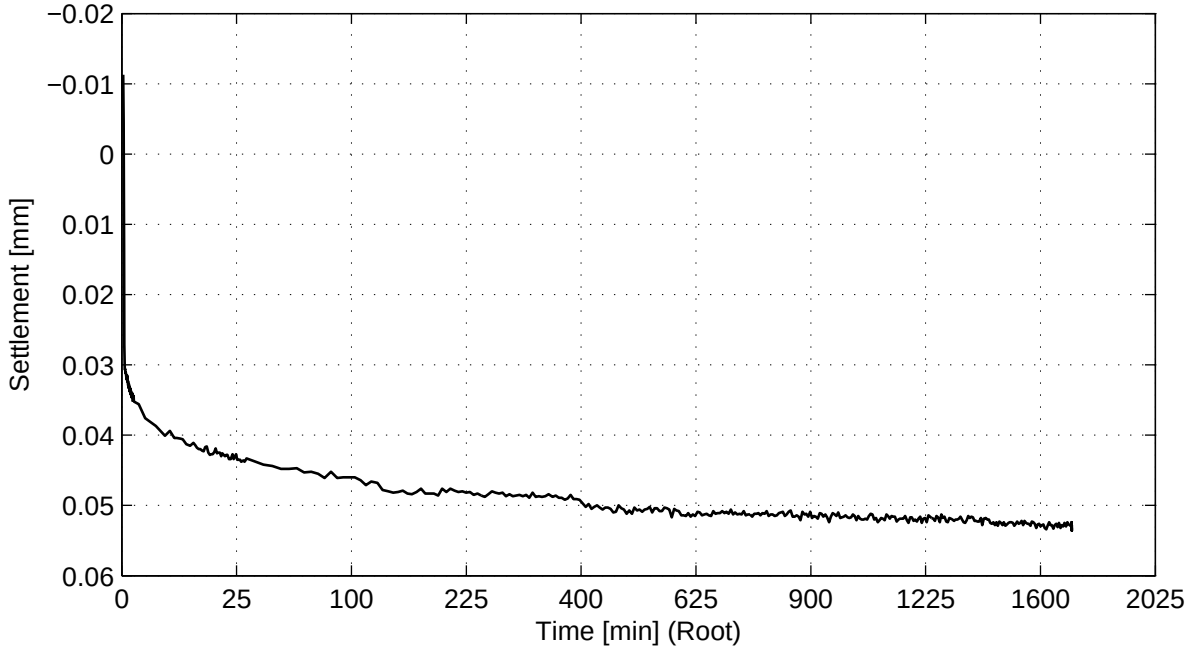
Taylor method (page 2/4)

Load step 78 kPa



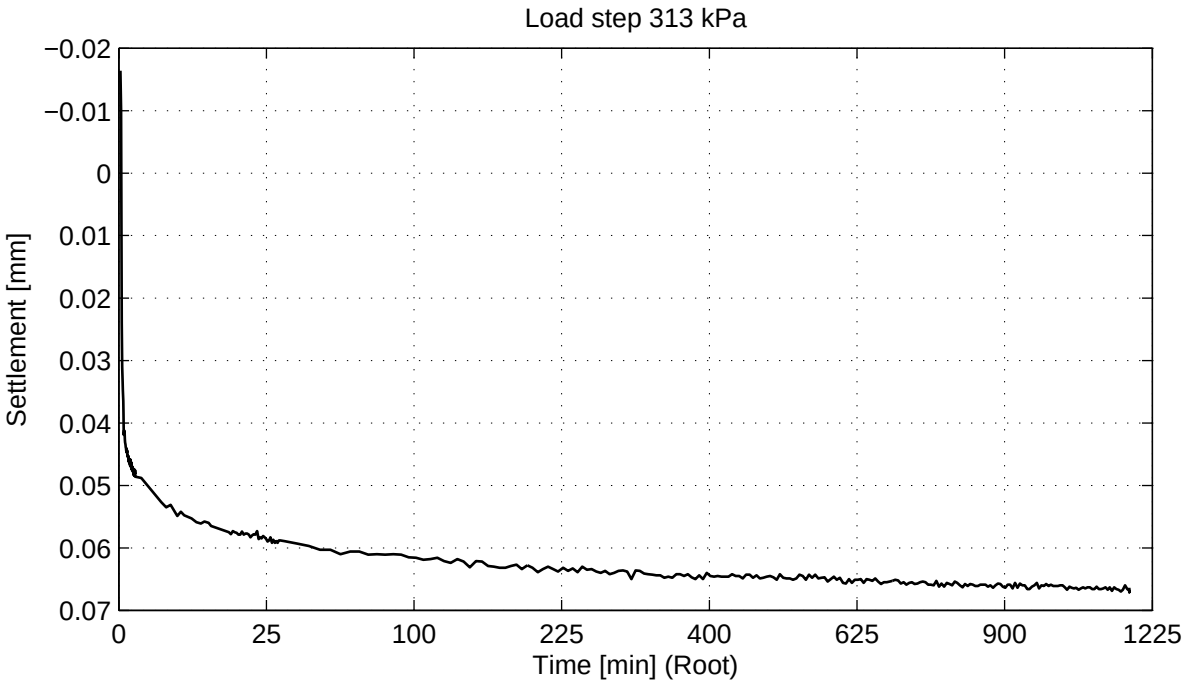
No calculation performed.

Load step 158 kPa

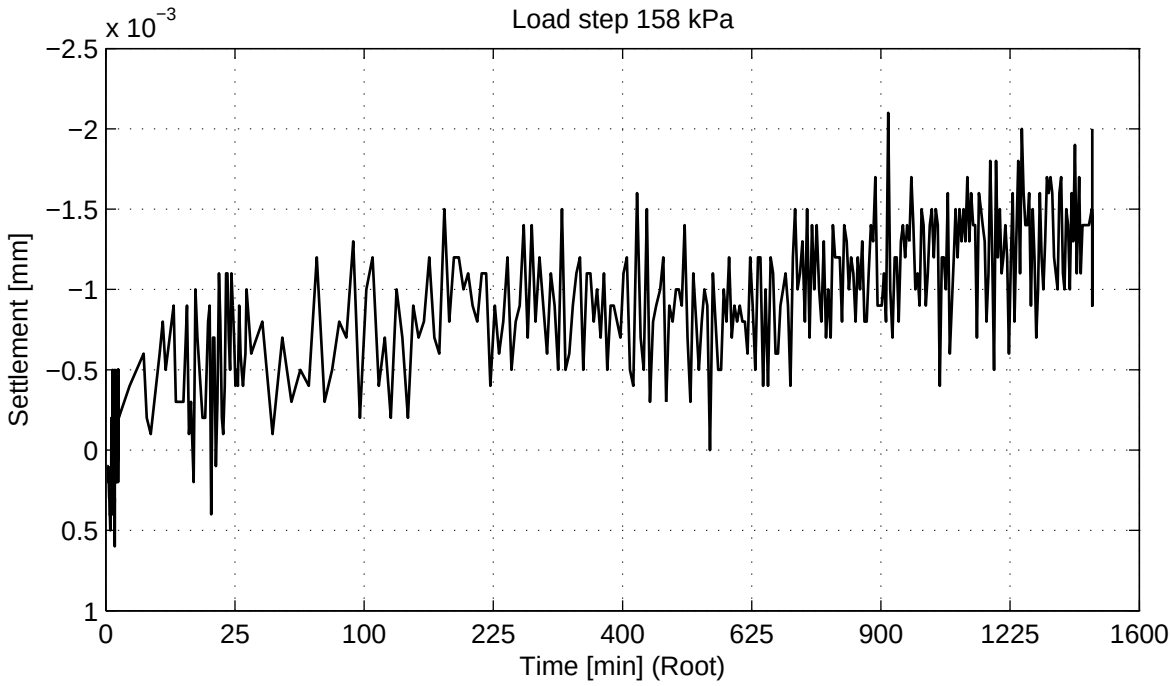


No calculation performed.

Taylor method (page 3/4)



No calculation performed.



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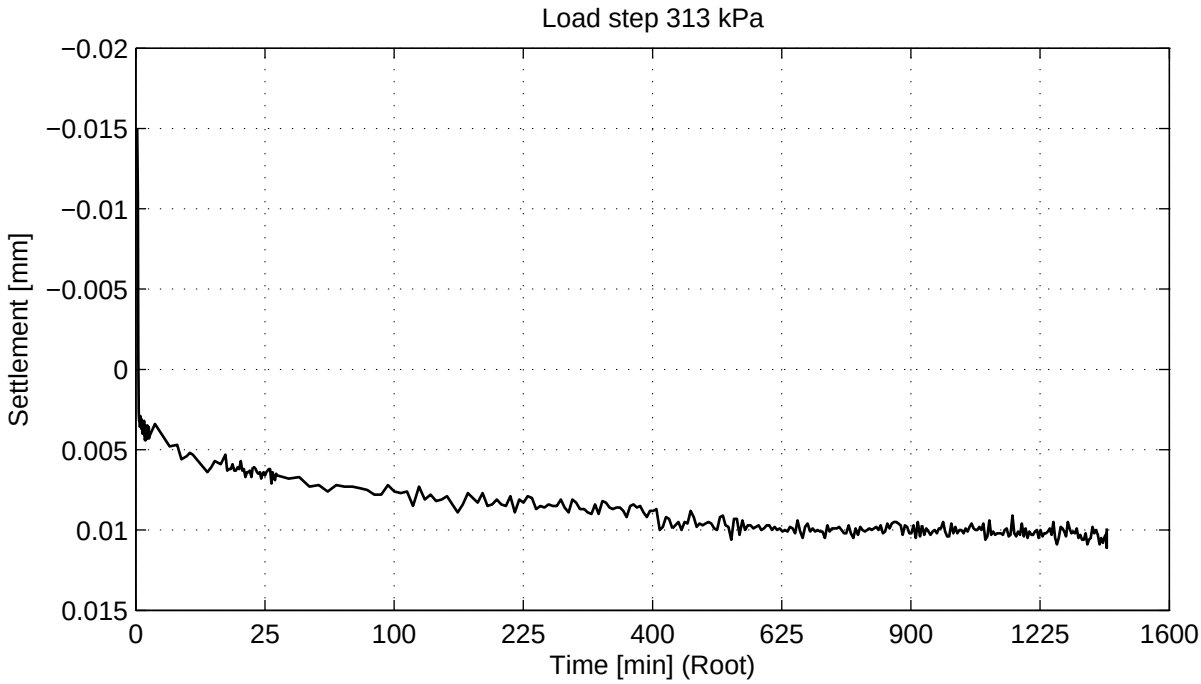
Taylor method (page 4/4)



No calculation performed.

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Boring KB−103, sample KB−103_ST−3A, depth −12.55 m till −12.60 m GL

Oedometer test conform CEN ISO/TS 17892−5

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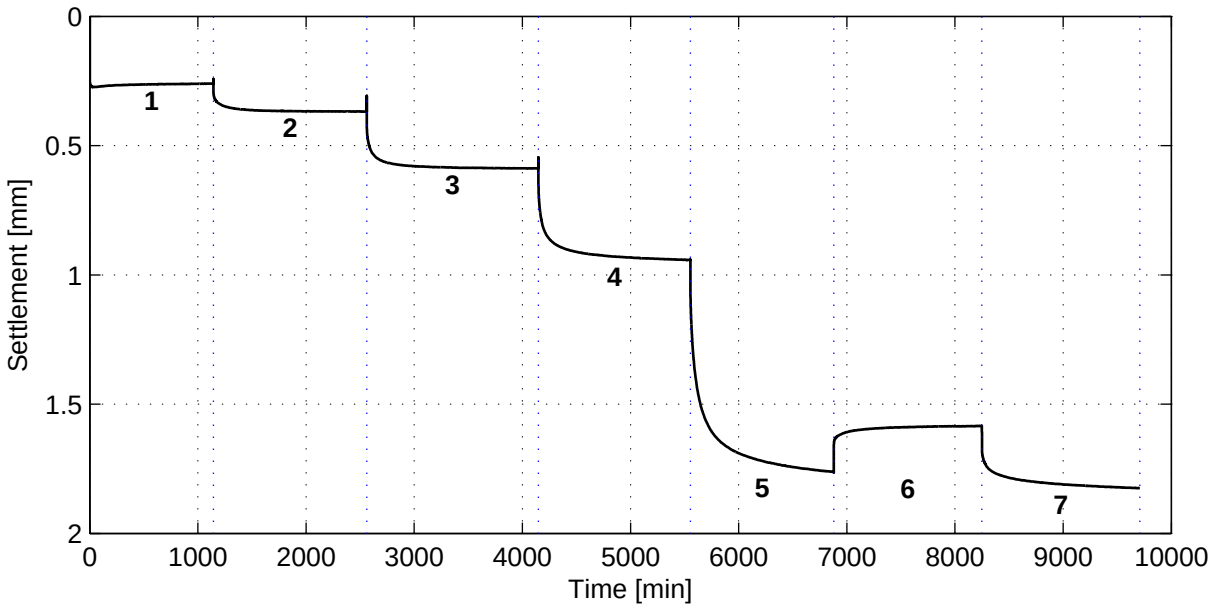
appendix	page
SAKB−103_ST−3A	10

) Vrijgegeven door wb op 2011-07-29 15:46



General soil and test parameters

Soil description	Silty Clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	20.0
Initial volumetric weight − dry [kN/m^3]	16.0
Volumetric weight particles [kN/m^3]	25.9
Initial water content [%]	24.7
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.1
Final volumetric weight − wet [kN/m^3]	21.2
Final volumetric weight − dry [kN/m^3]	17.4
Final water content [%]	21.6
Final saturation [−]	1.2
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	19.0
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	188
2	374
3	750
4	1500
5	3000
6	1500
7	3000

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

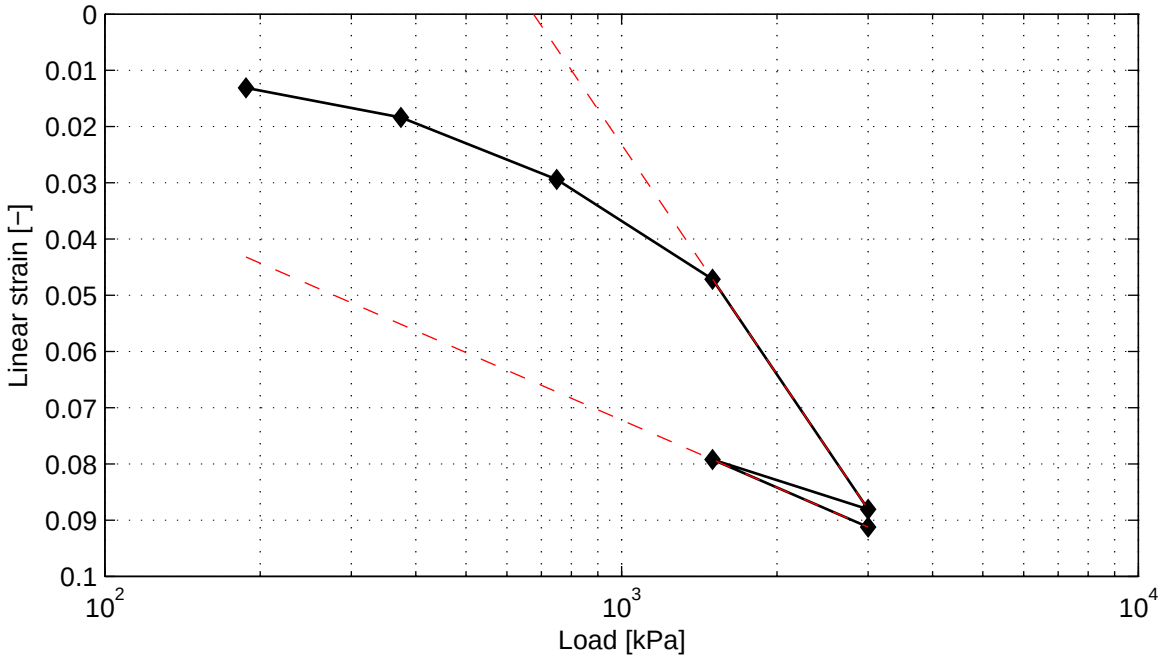
Boring KB−103A, sample KB−103A_ST−4, depth −74.80 m till −75.34 m GL

Oedometer test conform CEN ISO/TS 17892−5

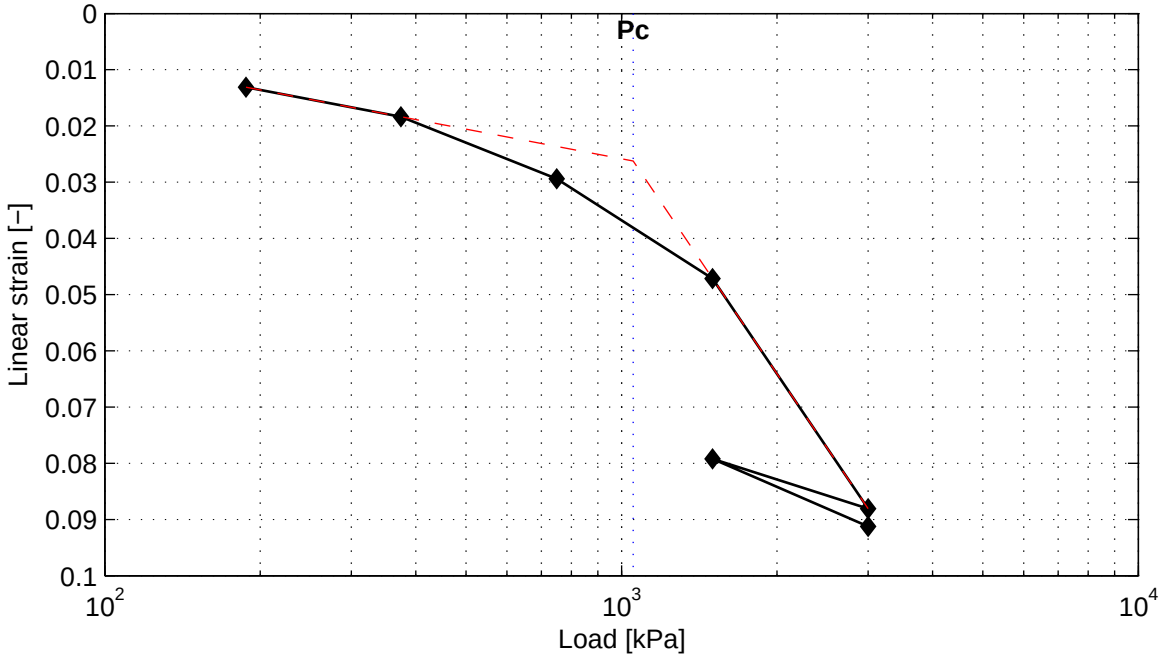
project	seen
1205088.1	–
appendix	page
SAKB−103A_ST−4	1

) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method



Cr = 6.4e−002 Ca = 4.5e−003 Vo = 1.61
Cc = 2.2e−001

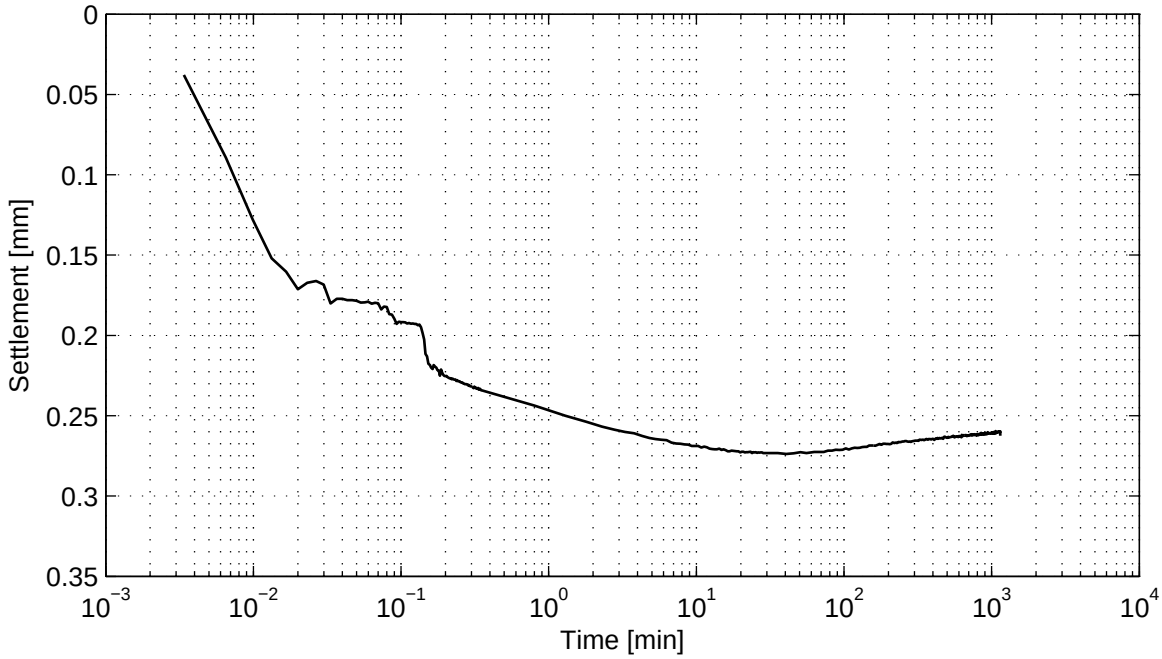


Pc = 1053.5 kPa

) Vrijgegeven door wb op 2011-07-29 15:47

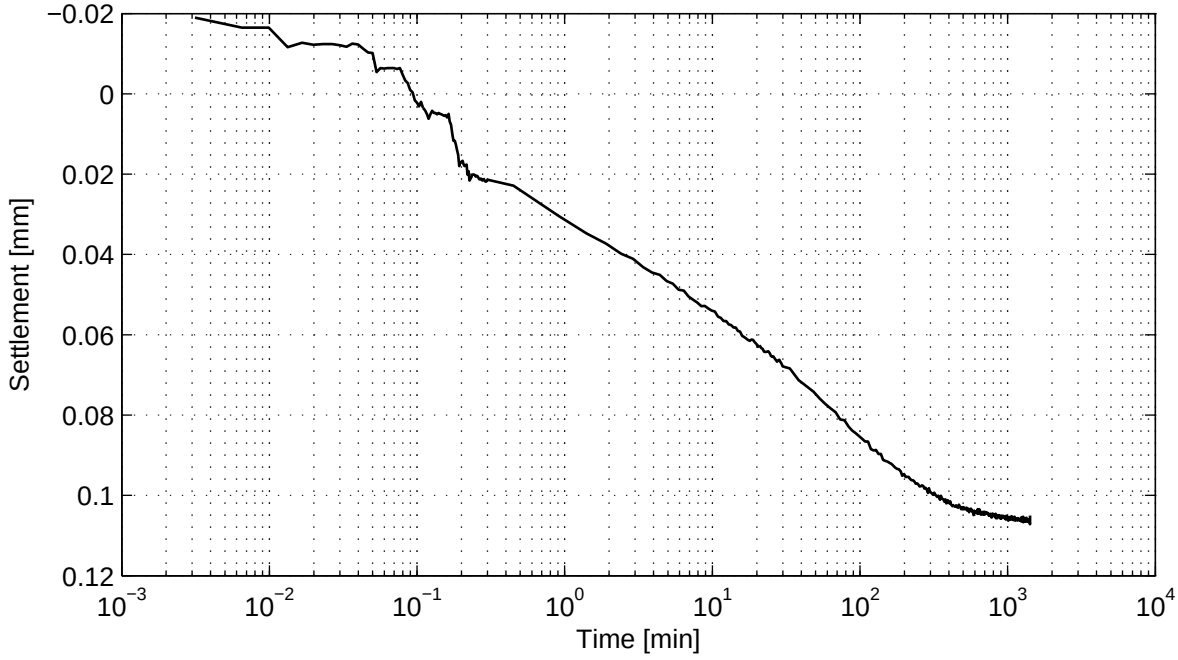
Casagrande method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 374 kPa

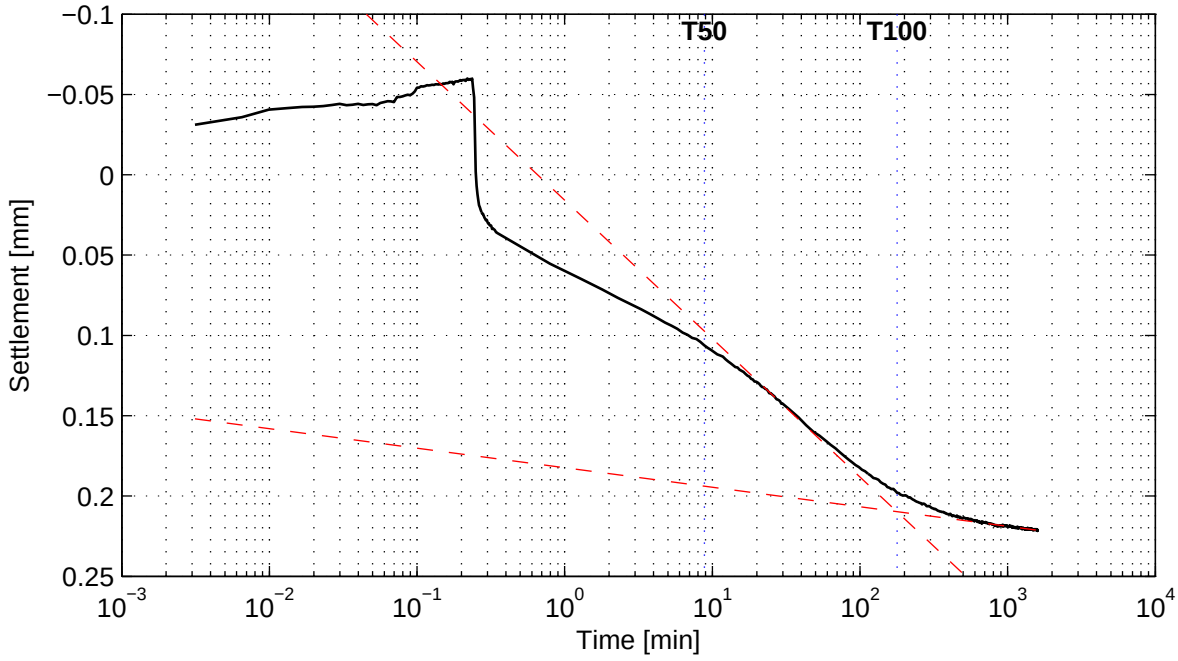


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

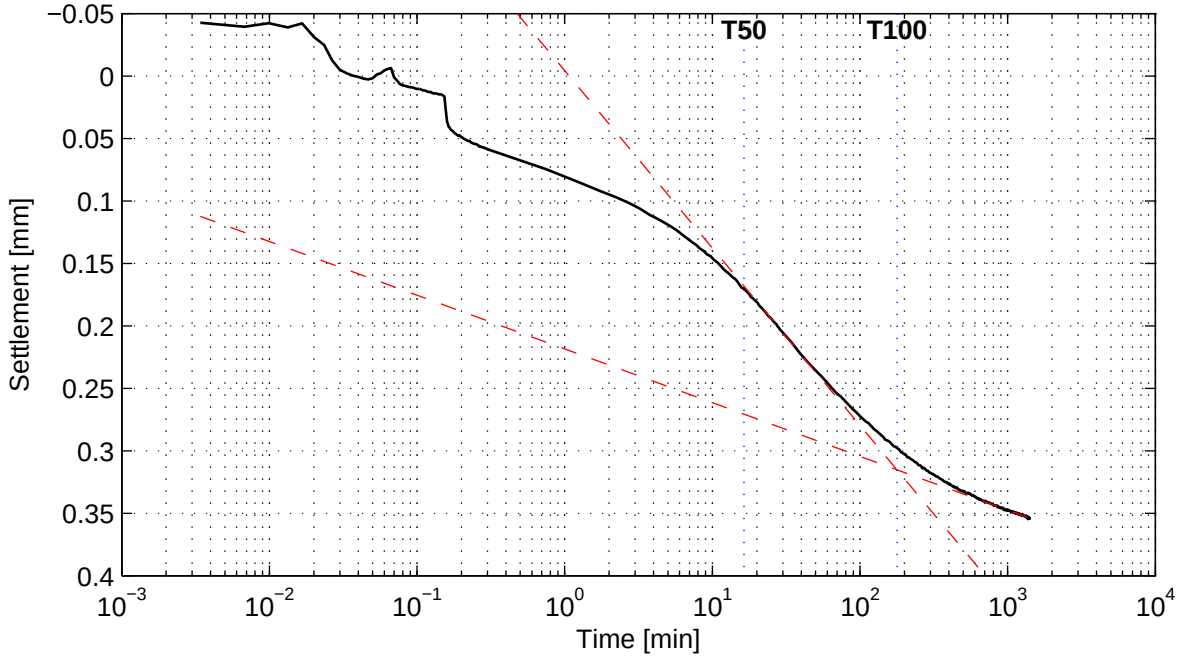
Casagrande method (page 2/4)

Load step 750 kPa



Cv = 2.8e−008 m^2/s Mv = 2.8e−005 m^2/kN
Ca = − K = 7.7e−012 m/s

Load step 1500 kPa

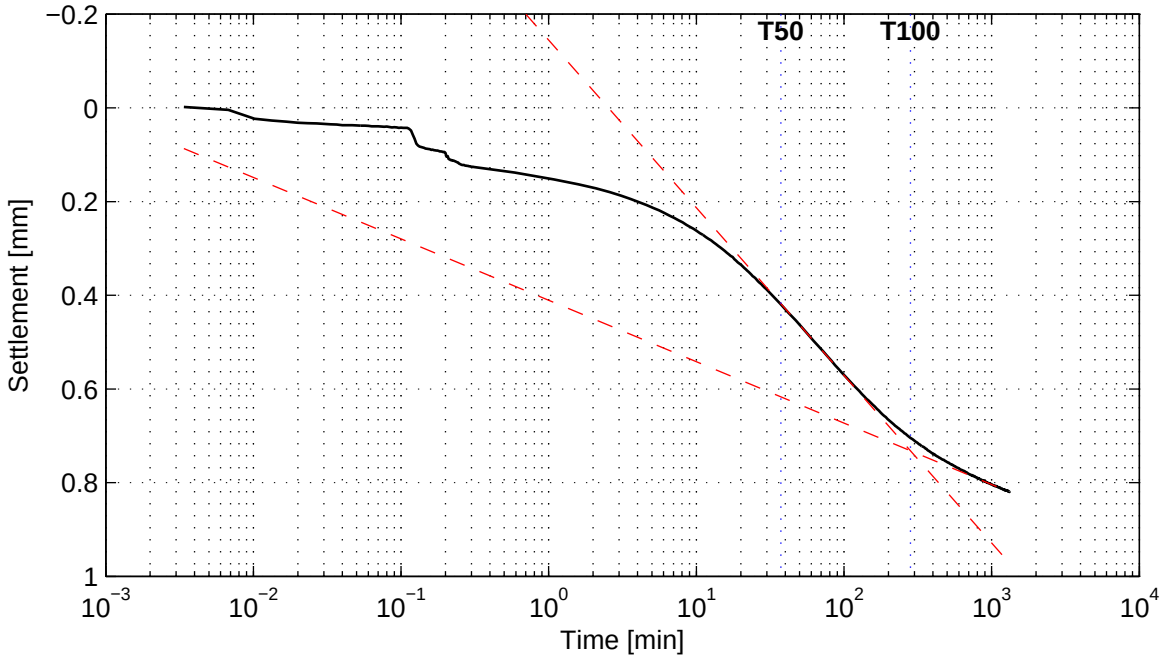


Cv = 1.5e−008 m^2/s Mv = 2.0e−005 m^2/kN
Ca = 2.2e−003 K = 2.9e−012 m/s

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 3/4)

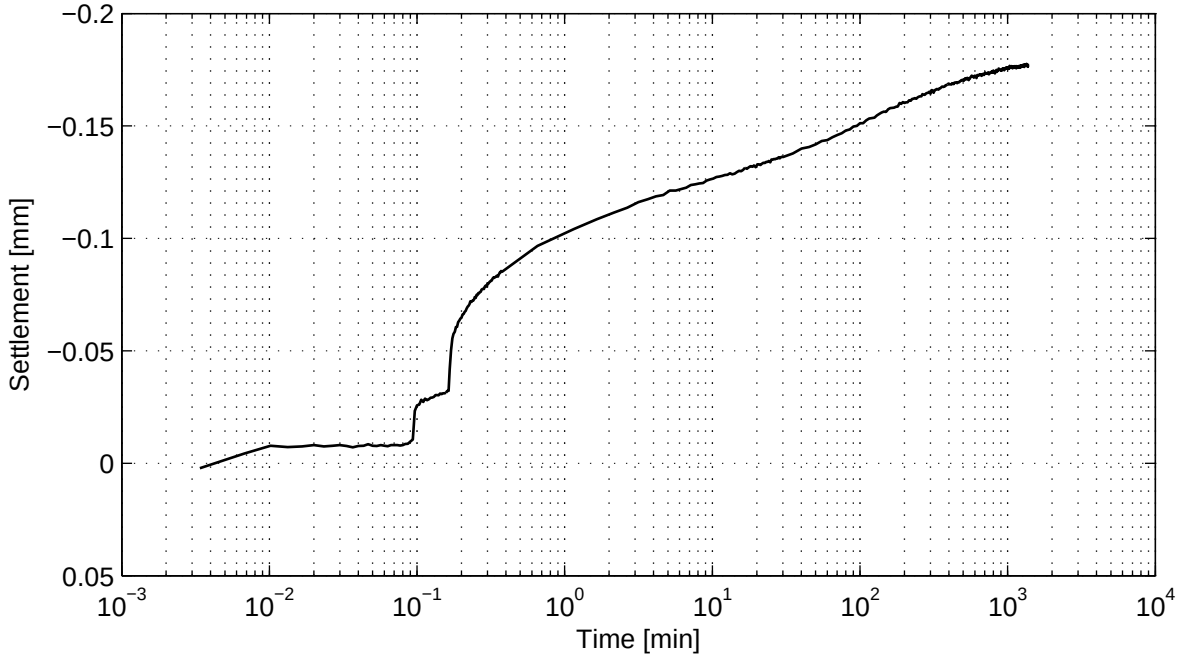
Load step 3000 kPa



Cv = 6.0e−009 m^2/s
Ca = 6.9e−003

Mv = 2.2e−005 m^2/kN
K = 1.3e−012 m/s

Load step 1500 kPa



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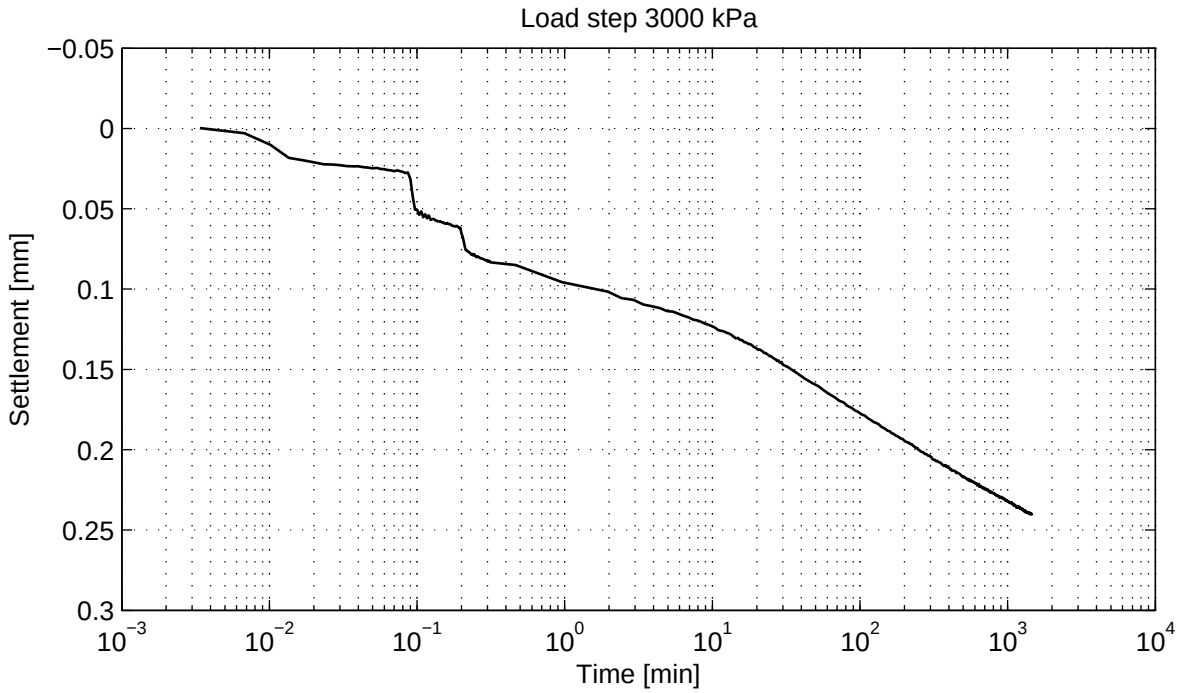
) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 4/4)



No calculation performed.

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Boring KB−103A, sample KB−103A_ST−4, depth −74.80 m till −75.34 m GL

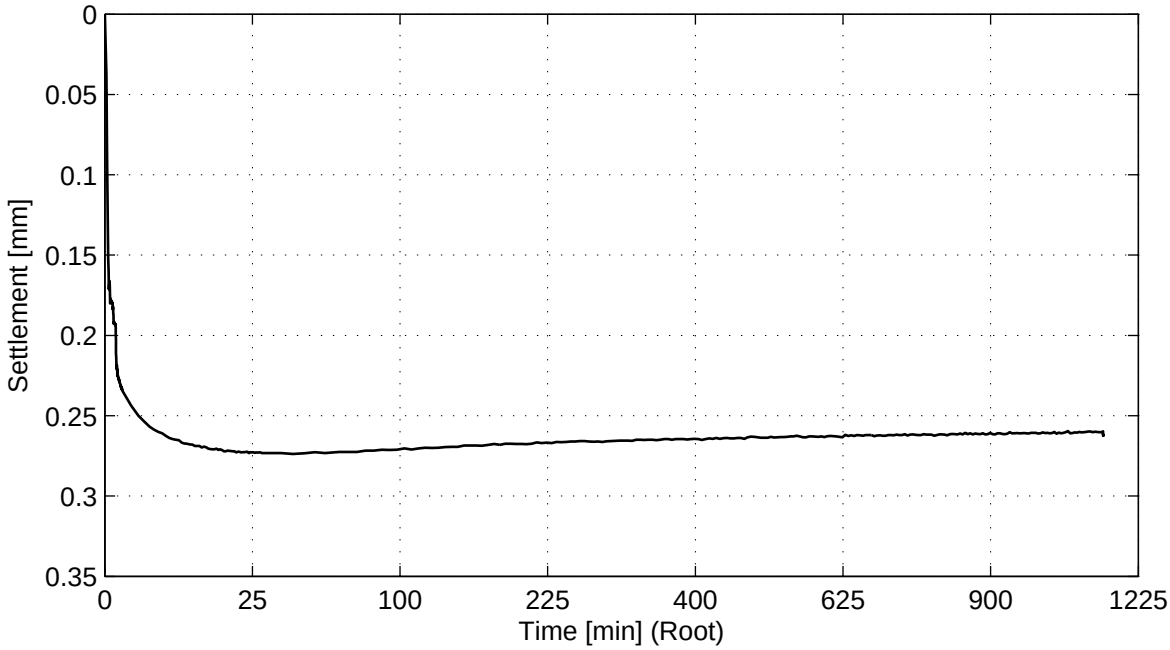
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−103A_ST−4	6

) Vrijgegeven door wb op 2011-07-29 15:47

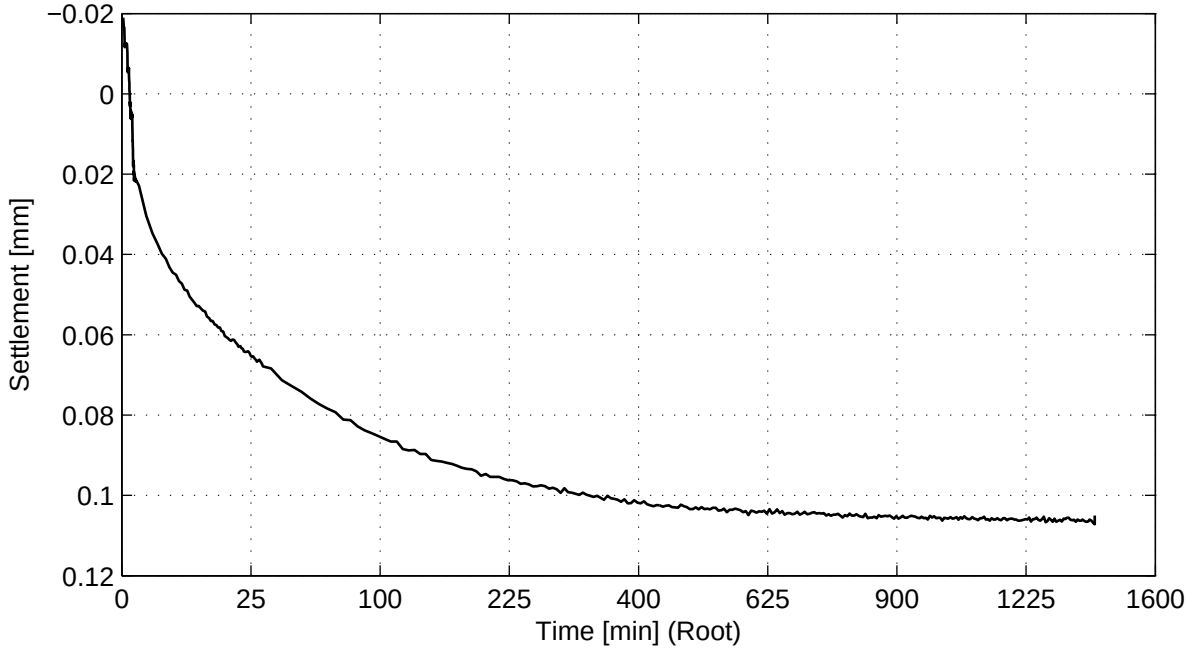
Taylor method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 374 kPa



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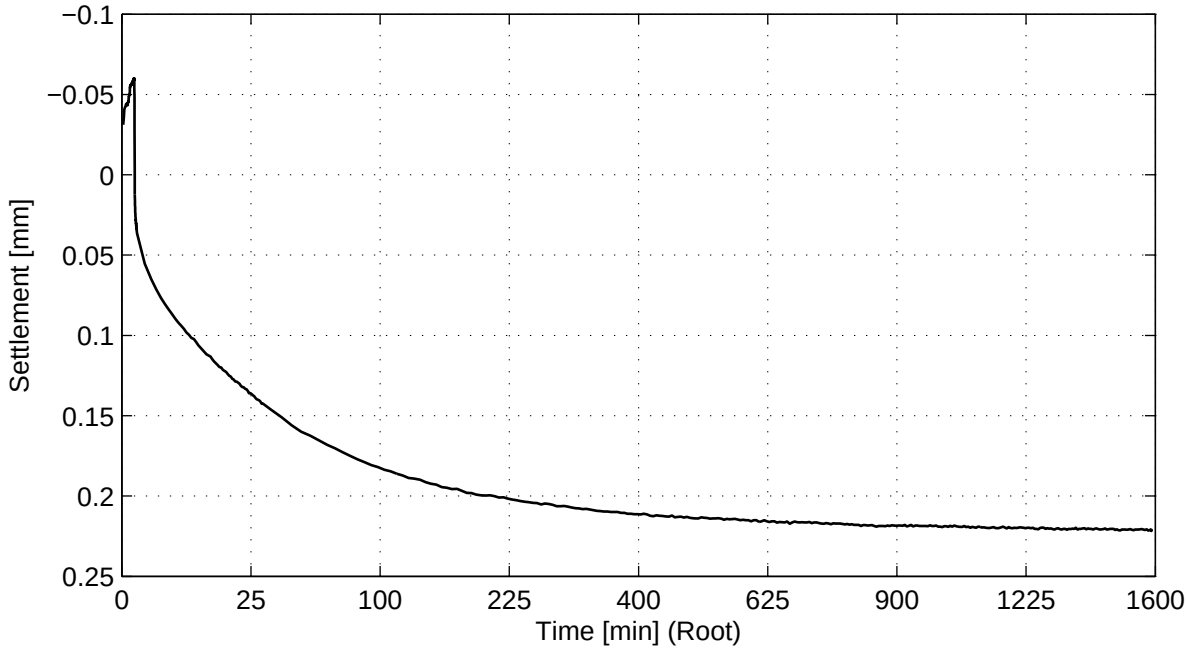
) Vrijgegeven door wb op 2011-07-29 15:47

Taylor method (page 2/4)

Load step 750 kPa



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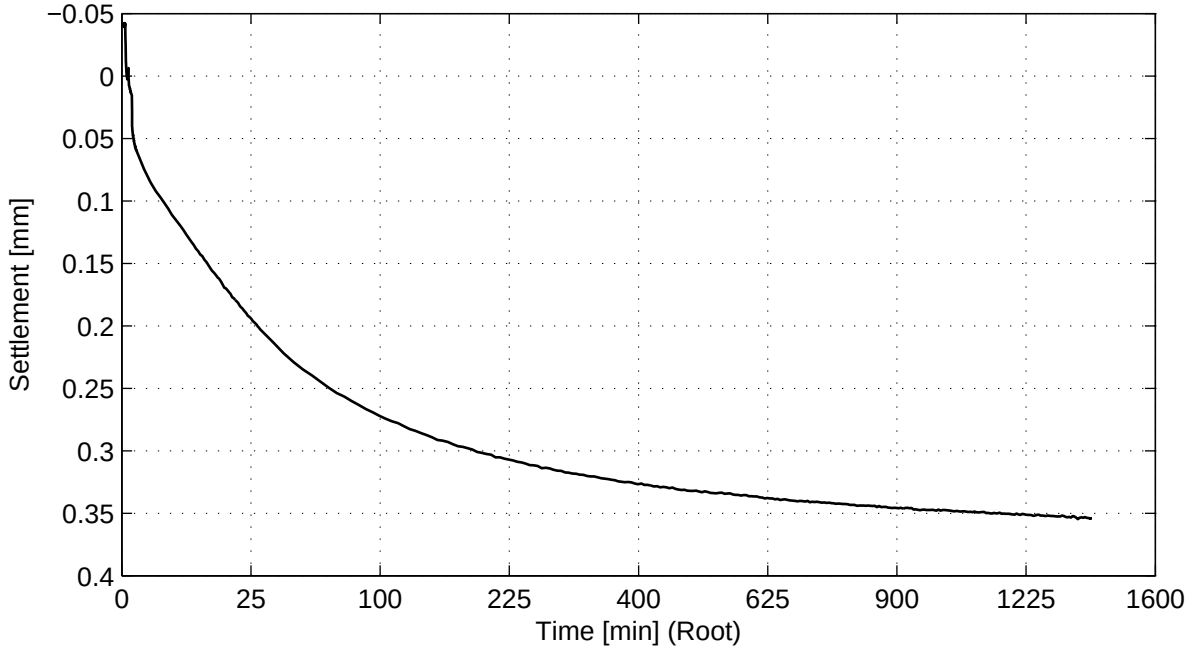
Load step 1500 kPa



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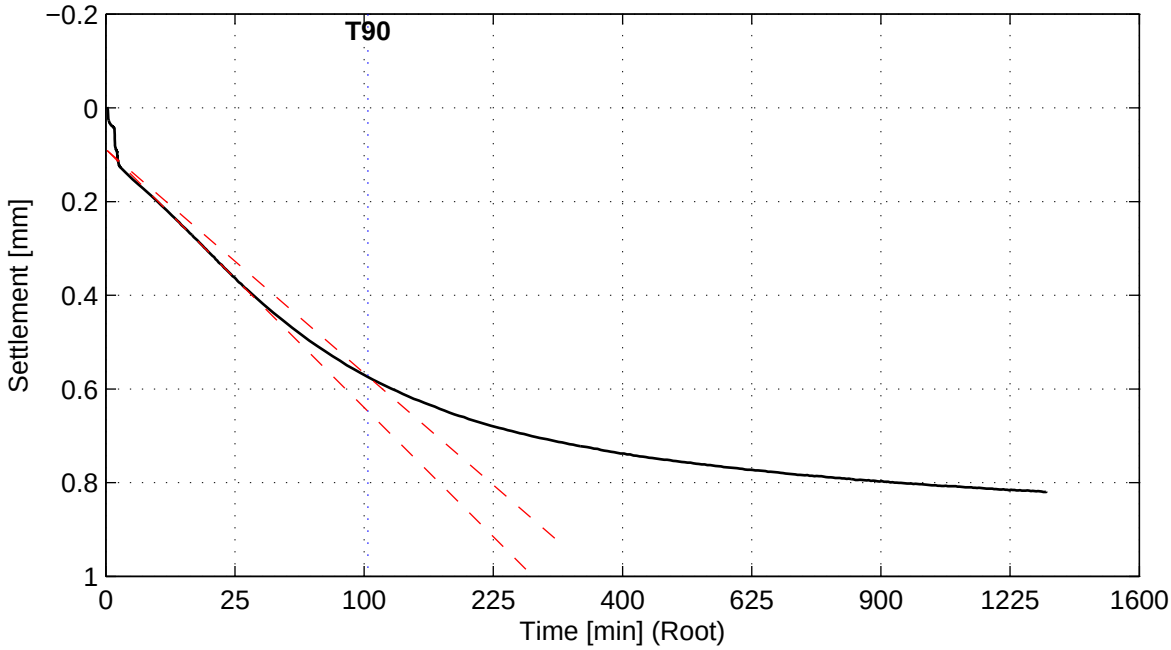
) Vrijgegeven door wb op 2011-07-29 15:47

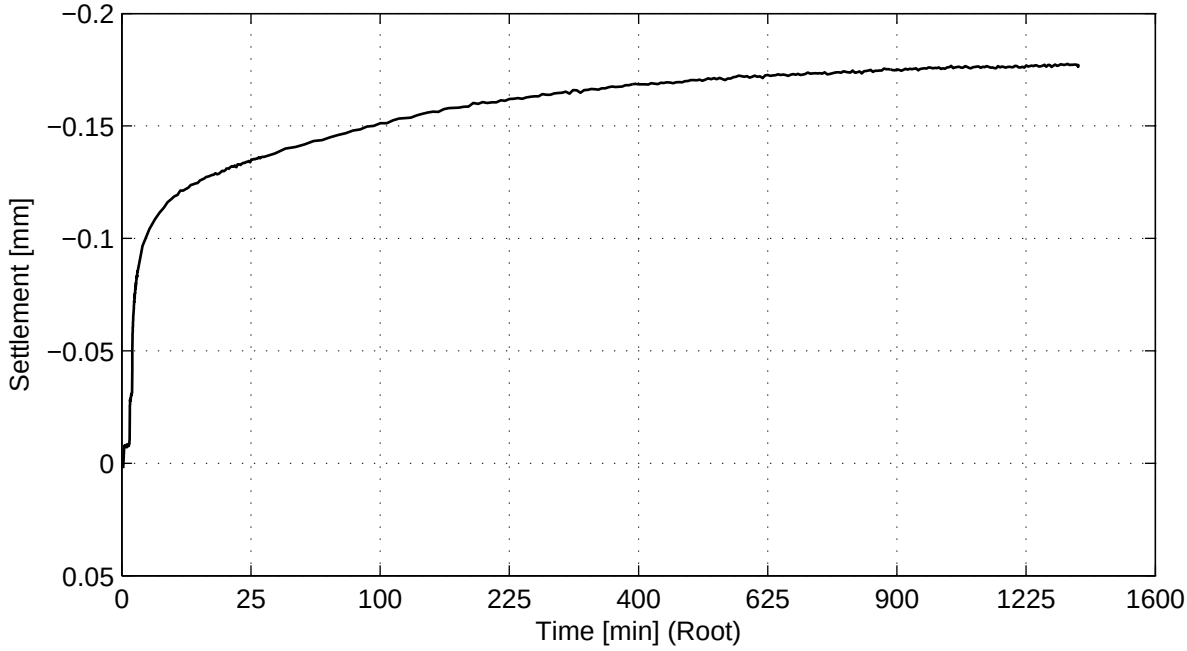
Taylor method (page 3/4)

Load step 3000 kPa



Cv = 9.3e−009 m^2/s

Load step 1500 kPa



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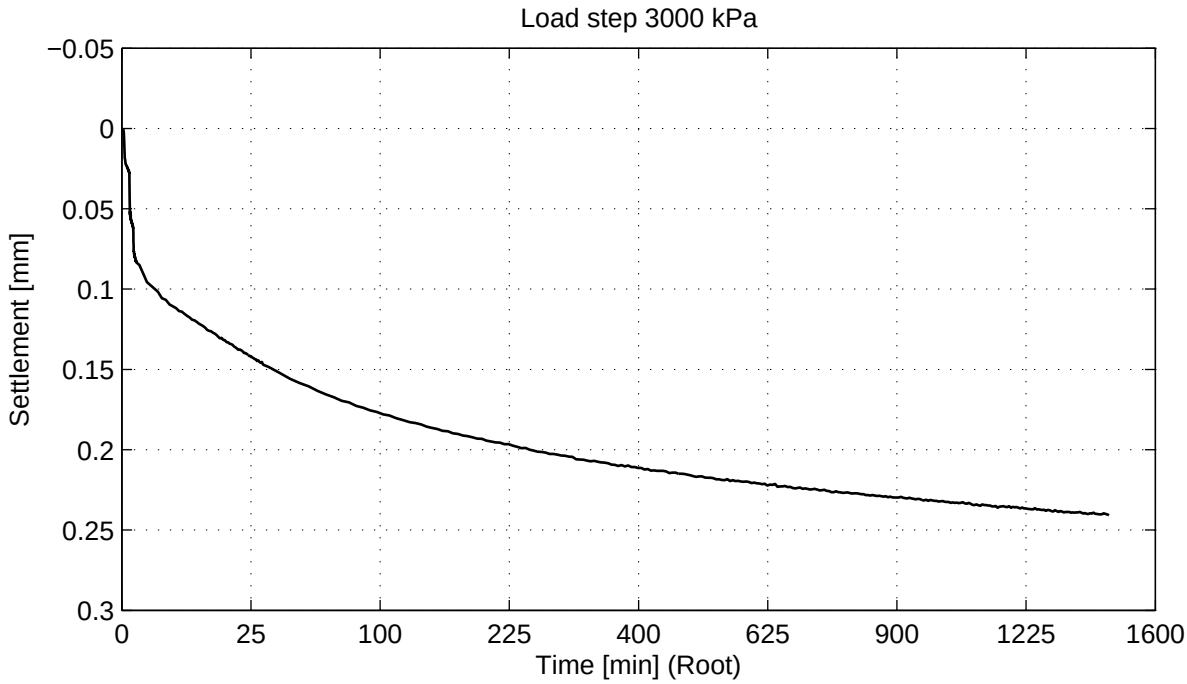
) Vrijgegeven door wb op 2011-07-29 15:47

Taylor method (page 4/4)



No calculation performed.

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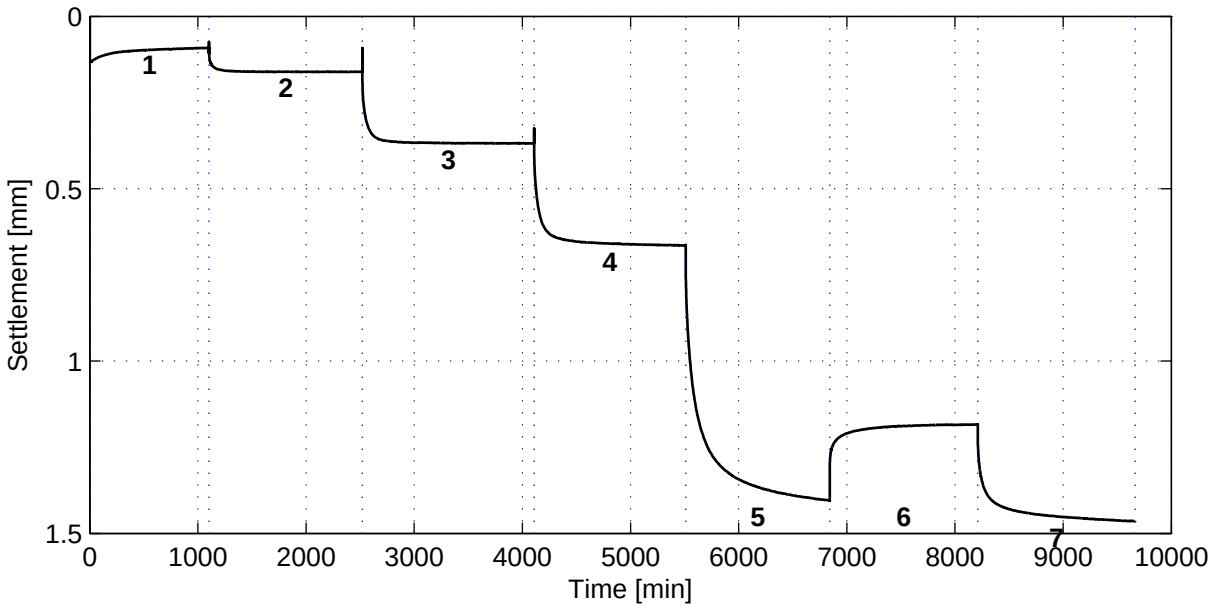
Boring KB−103A, sample KB−103A_ST−4, depth −74.80 m till −75.34 m GL

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−103A_ST−4	10

) Vrijgegeven door wb op 2011-07-29 15:47



General soil and test parameters

Soil description	Silty Clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	19.9
Initial volumetric weight − dry [kN/m^3]	15.9
Volumetric weight particles [kN/m^3]	25.6
Initial water content [%]	24.7
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.1
Final volumetric weight − wet [kN/m^3]	20.7
Final volumetric weight − dry [kN/m^3]	16.8
Final water content [%]	23.2
Final saturation [−]	1.2
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	19.0
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	187
2	374
3	749
4	1500
5	3000
6	1499
7	3000

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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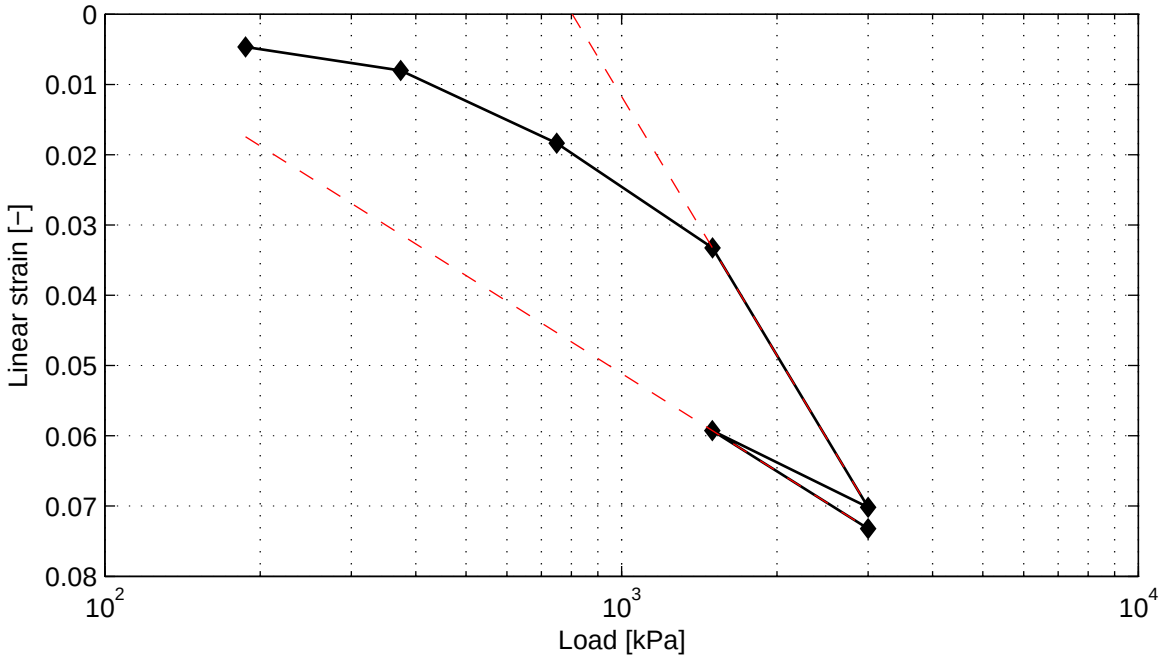
Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

Oedometer test conform CEN ISO/TS 17892−5

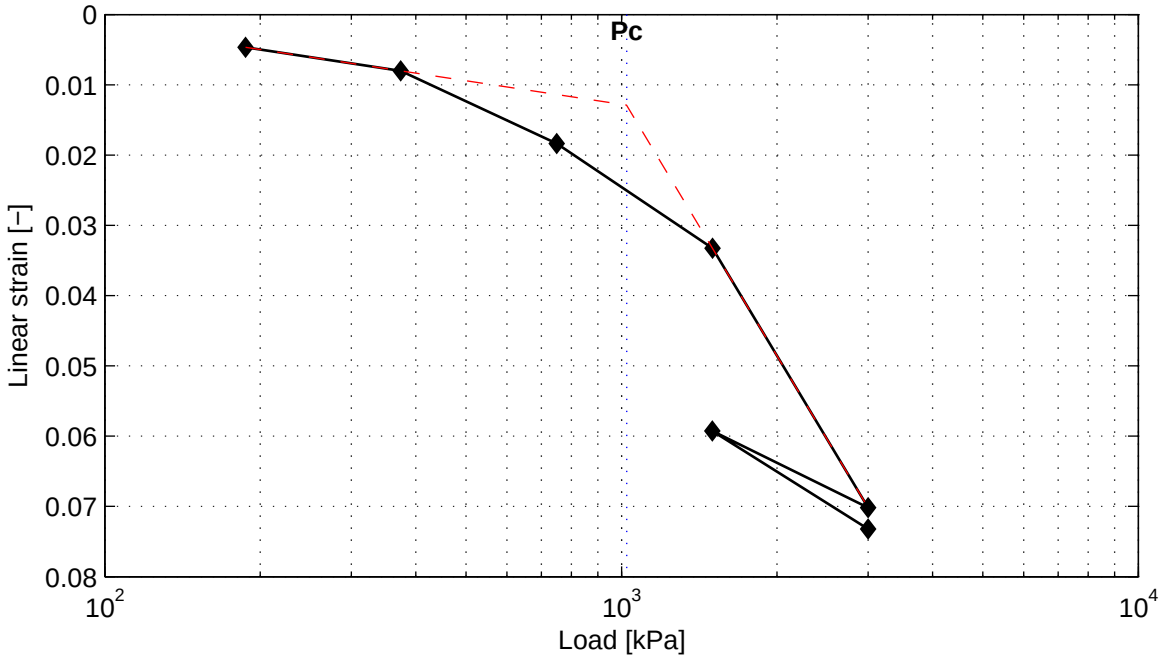
project	seen
1205088.1	–
appendix	page
SAKB−103A_ST−6	1

) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method



Cr = 7.4e−002 Ca = 3.5e−003 Vo = 1.61
Cc = 2.0e−001



Pc = 1023.4 kPa

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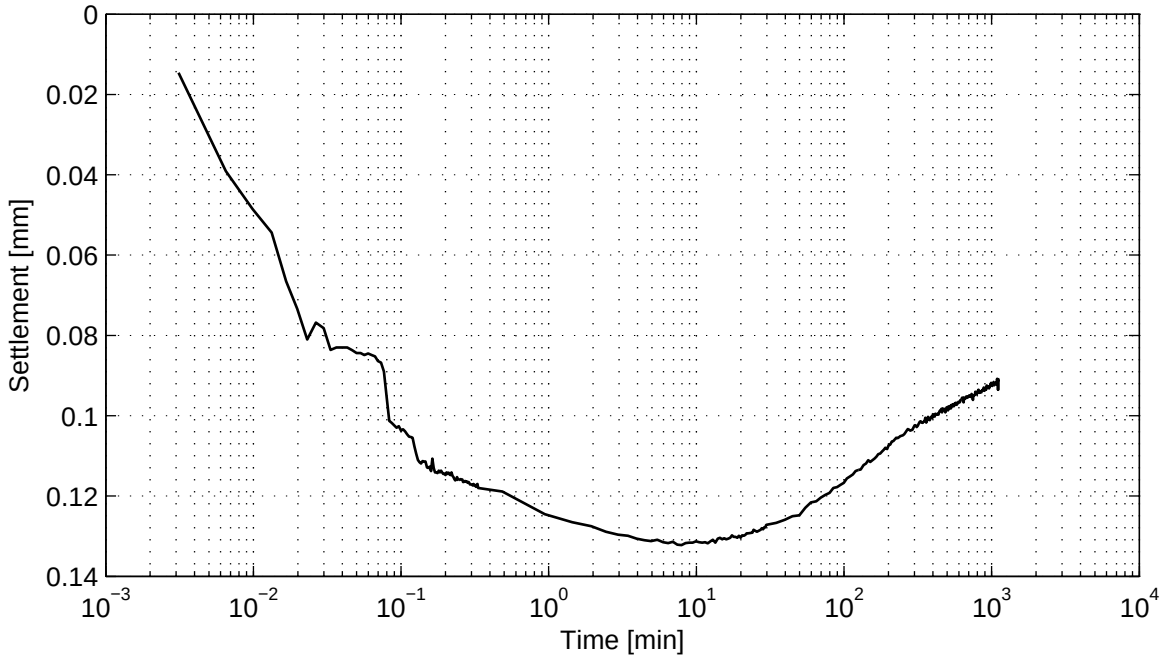
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	–
appendix	page
SAKB−103A_ST−6	2

) Vrijgegeven door wb op 2011-07-29 15:47

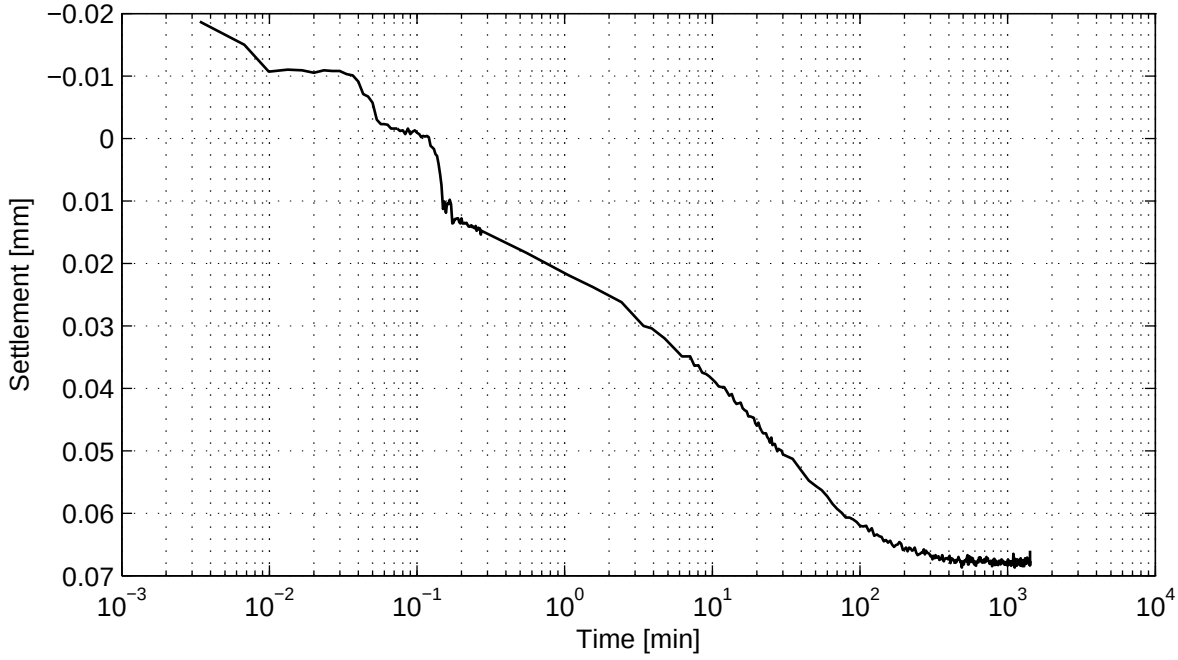
Casagrande method (page 1/4)

Load step 187 kPa



No calculation performed.

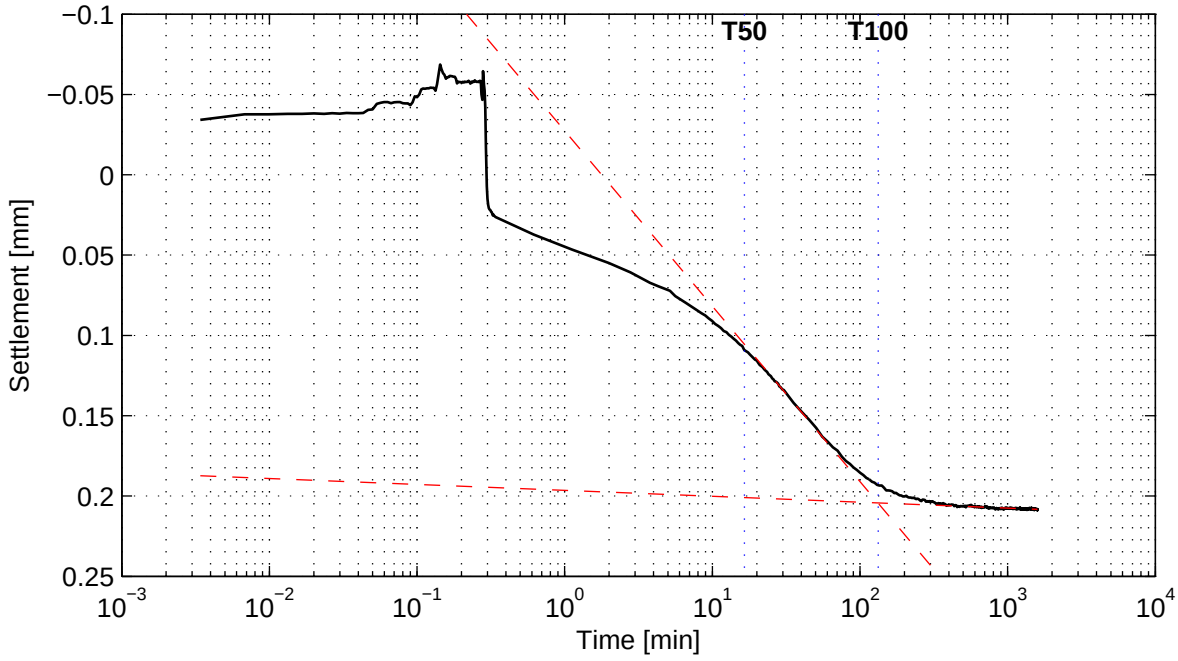
Load step 374 kPa



No calculation performed.

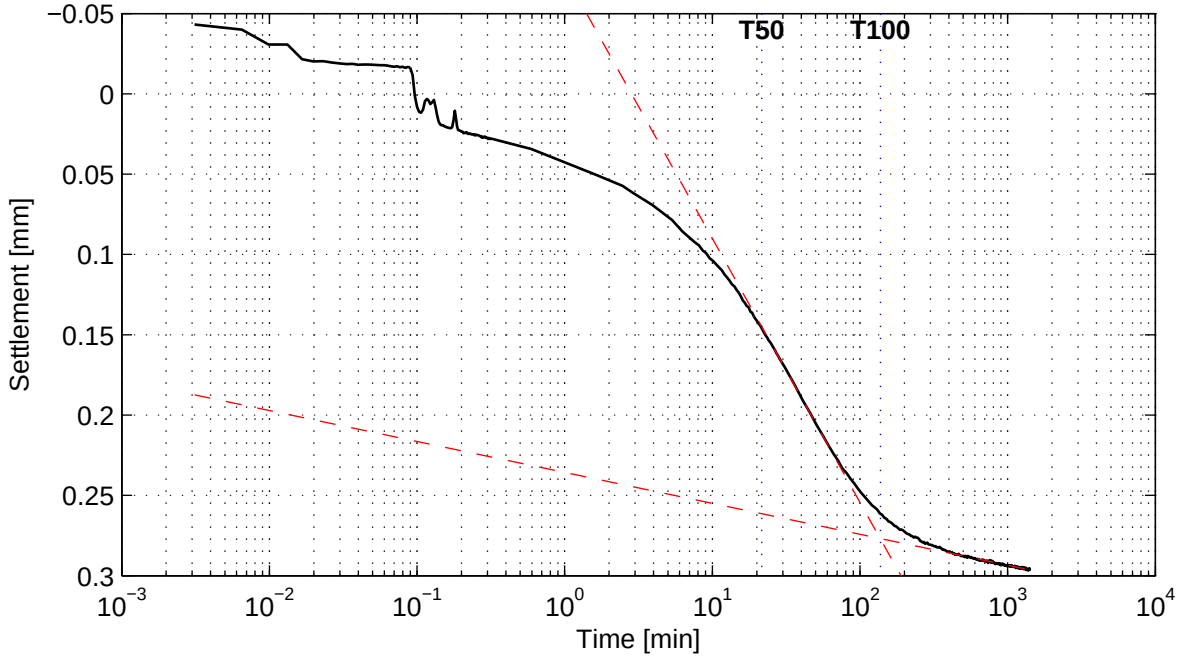
Casagrande method (page 2/4)

Load step 749 kPa



Cv = 1.5e−008 m^2/s Mv = 2.6e−005 m^2/kN
Ca = − K = 3.9e−012 m/s

Load step 1500 kPa



Cv = 1.1e−008 m^2/s Mv = 1.8e−005 m^2/kN
Ca = 9.8e−004 K = 2.0e−012 m/s

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Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

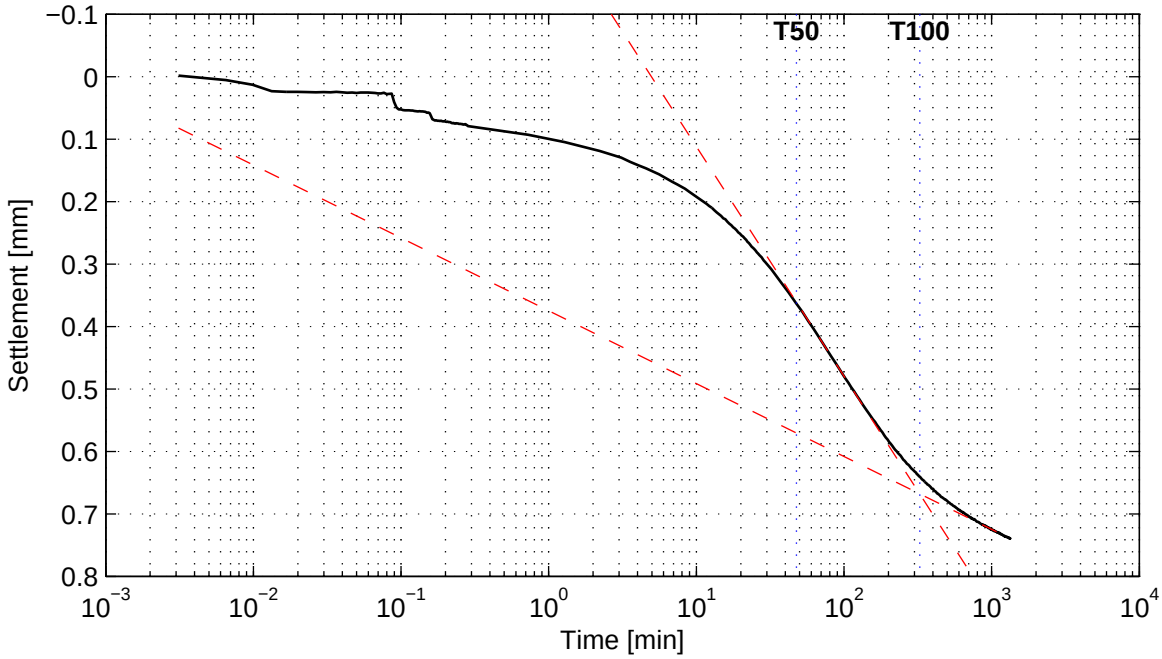
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−103A_ST−6	4

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 3/4)

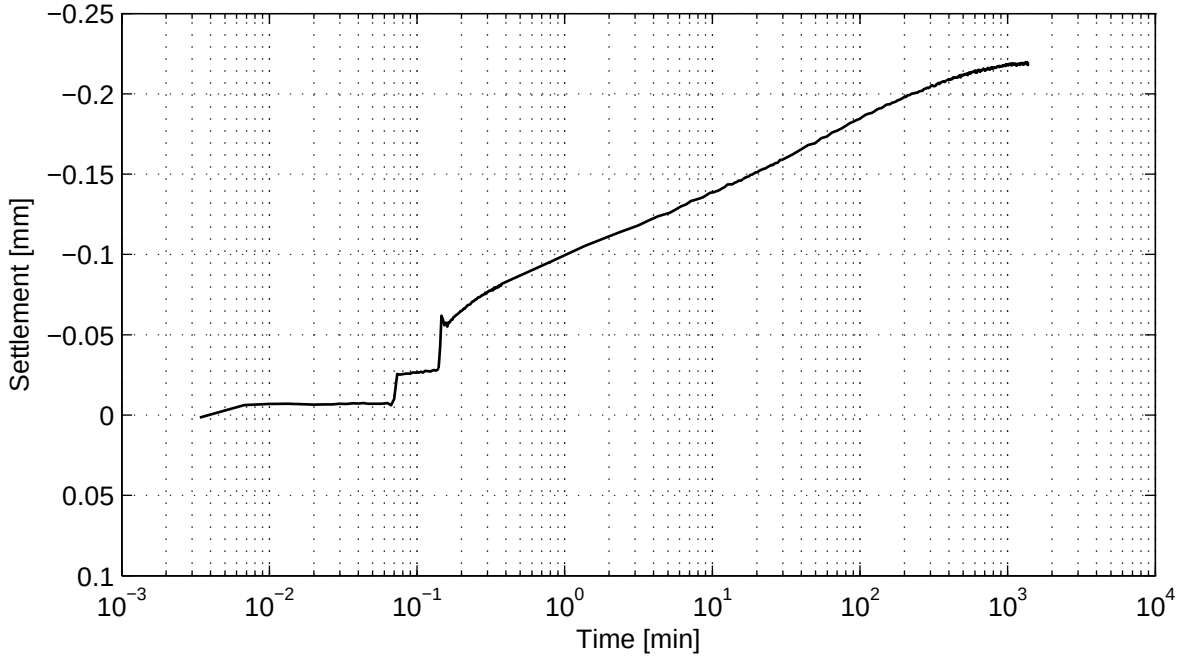
Load step 3000 kPa



Cv = 4.9e−009 m^2/s
Ca = 6.0e−003

Mv = 2.1e−005 m^2/kN
K = 1.0e−012 m/s

Load step 1499 kPa

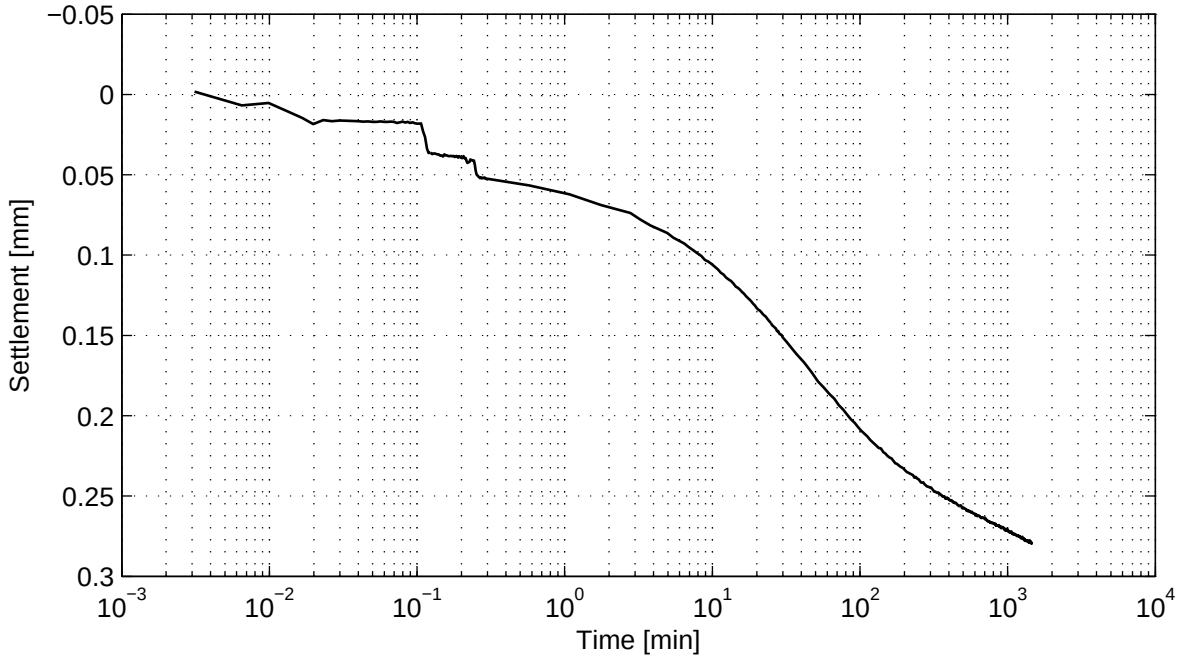


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 4/4)

Load step 3000 kPa



No calculation performed.

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date	signed
2011−07−29	Ess

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Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

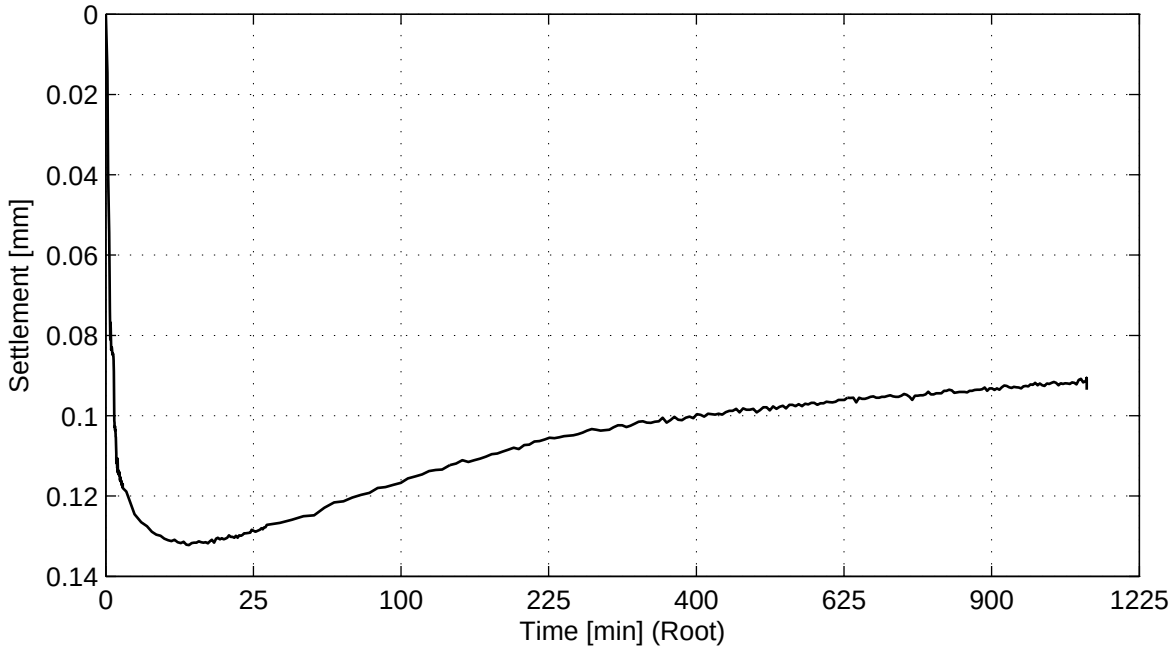
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−103A_ST−6	6

) Vrijgegeven door wb op 2011-07-29 15:47

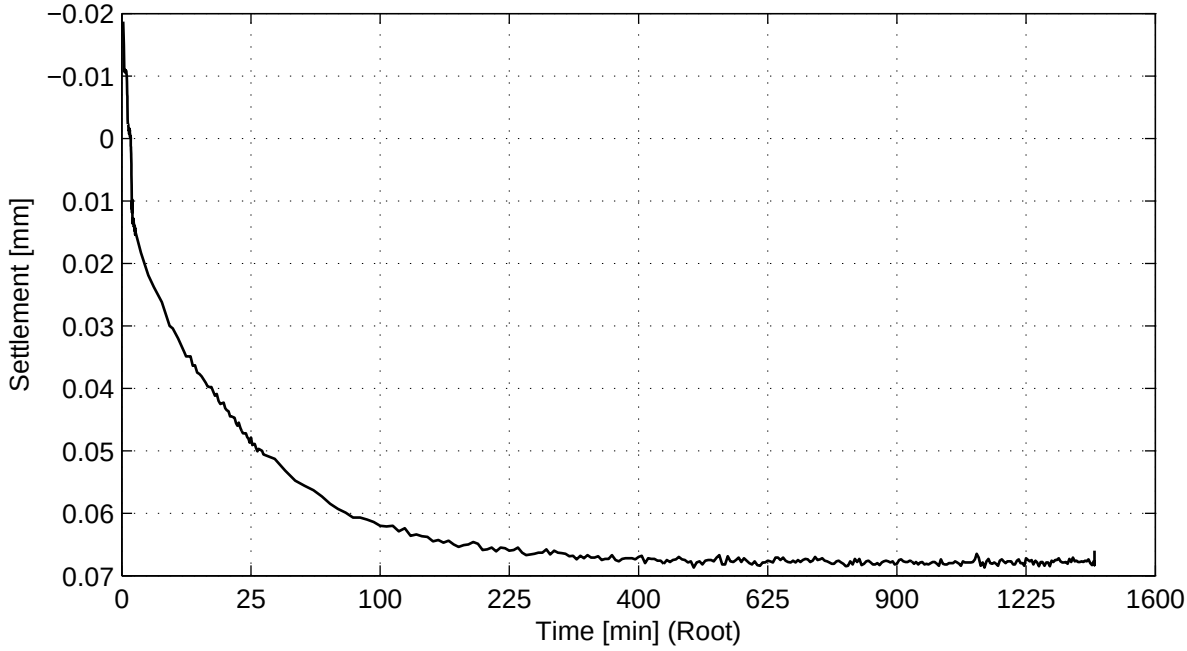
Taylor method (page 1/4)

Load step 187 kPa



No calculation performed.

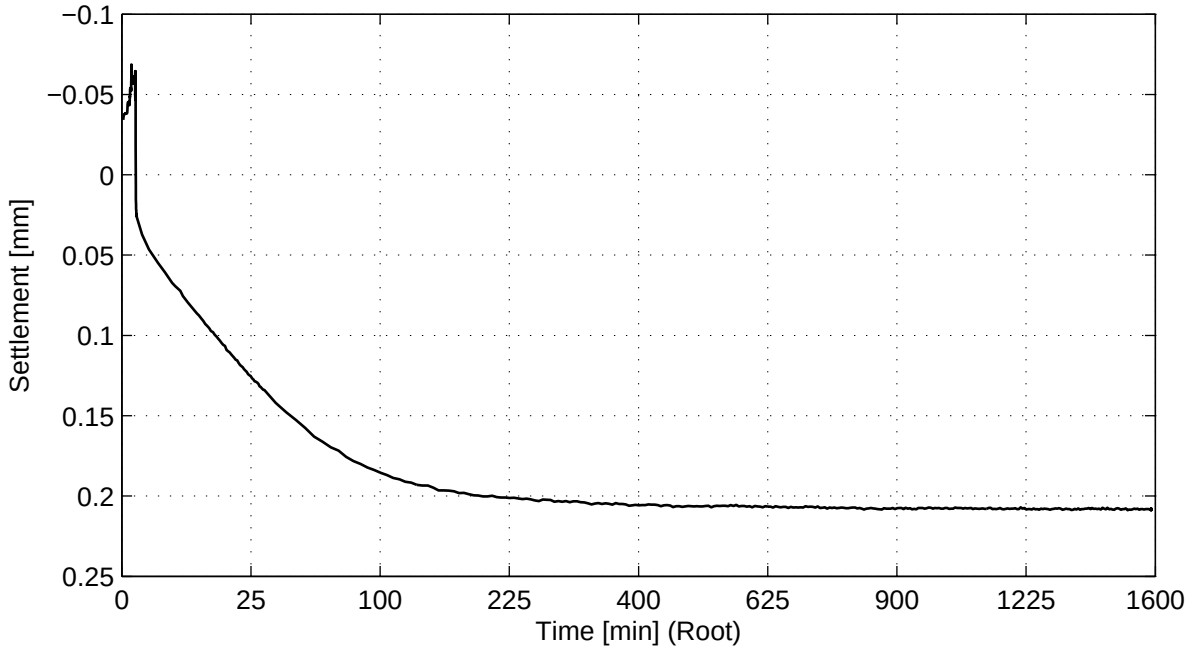
Load step 374 kPa



No calculation performed.

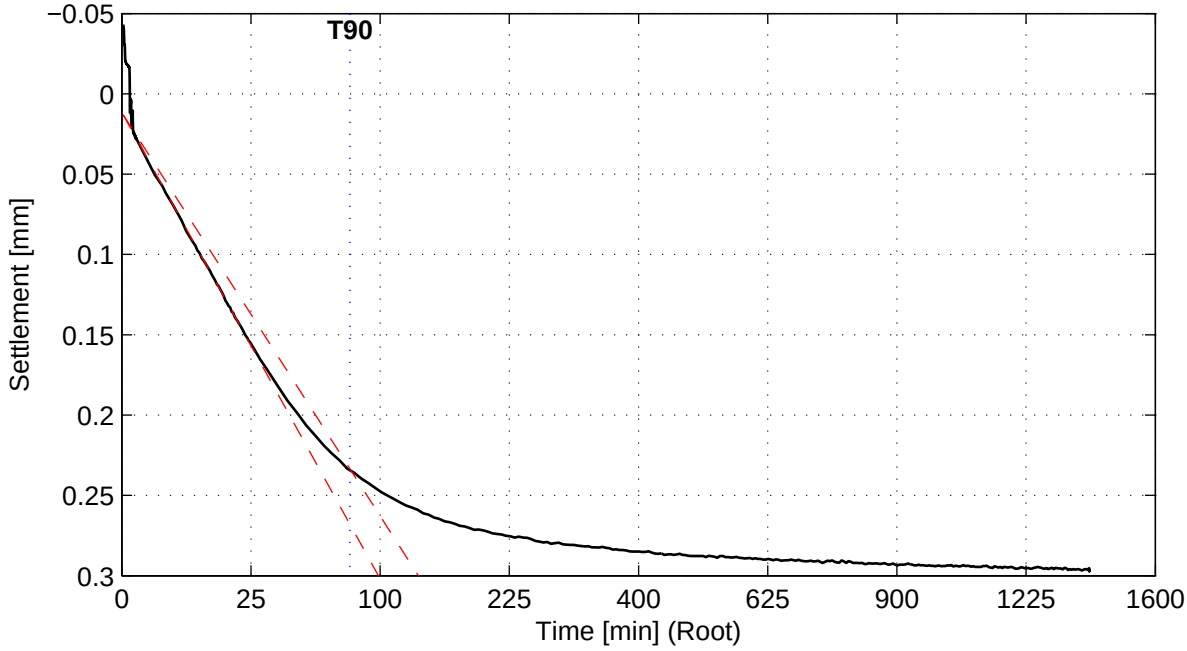
Taylor method (page 2/4)

Load step 749 kPa



No calculation performed.

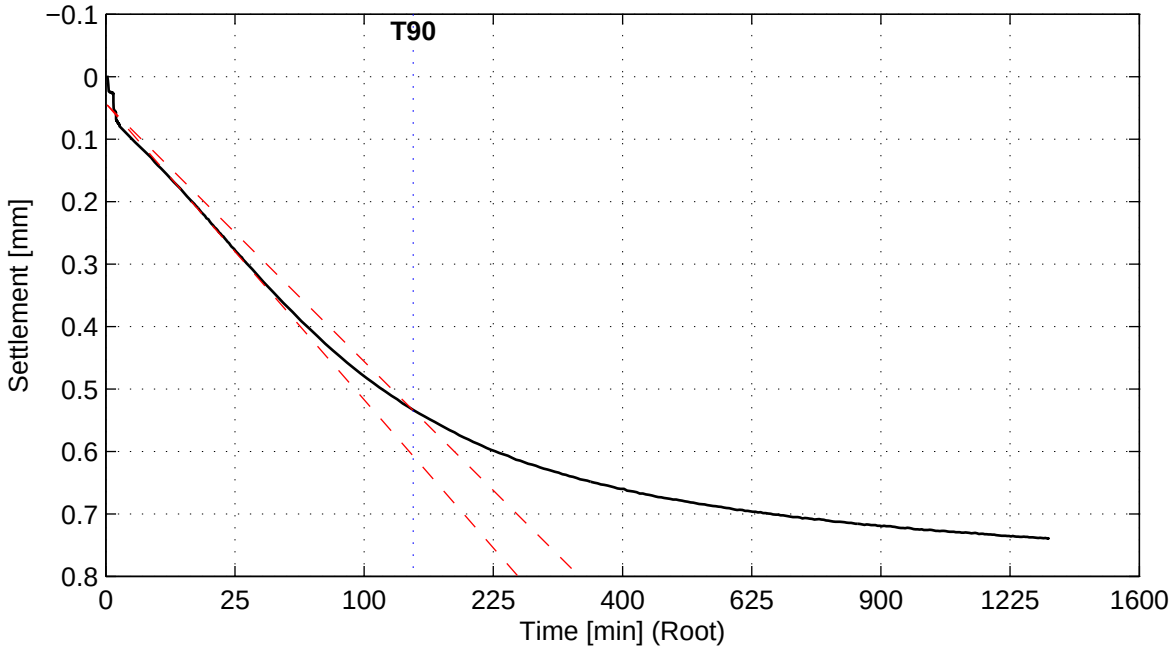
Load step 1500 kPa



Cv = 1.3e−008 m^2/s

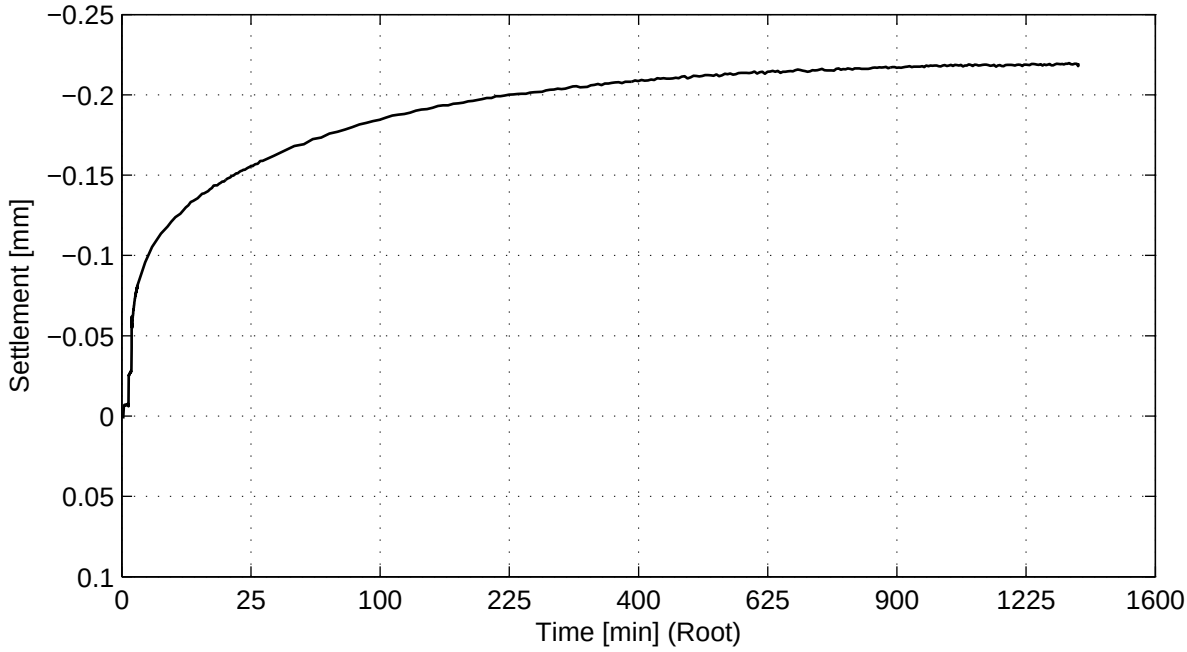
Taylor method (page 3/4)

Load step 3000 kPa



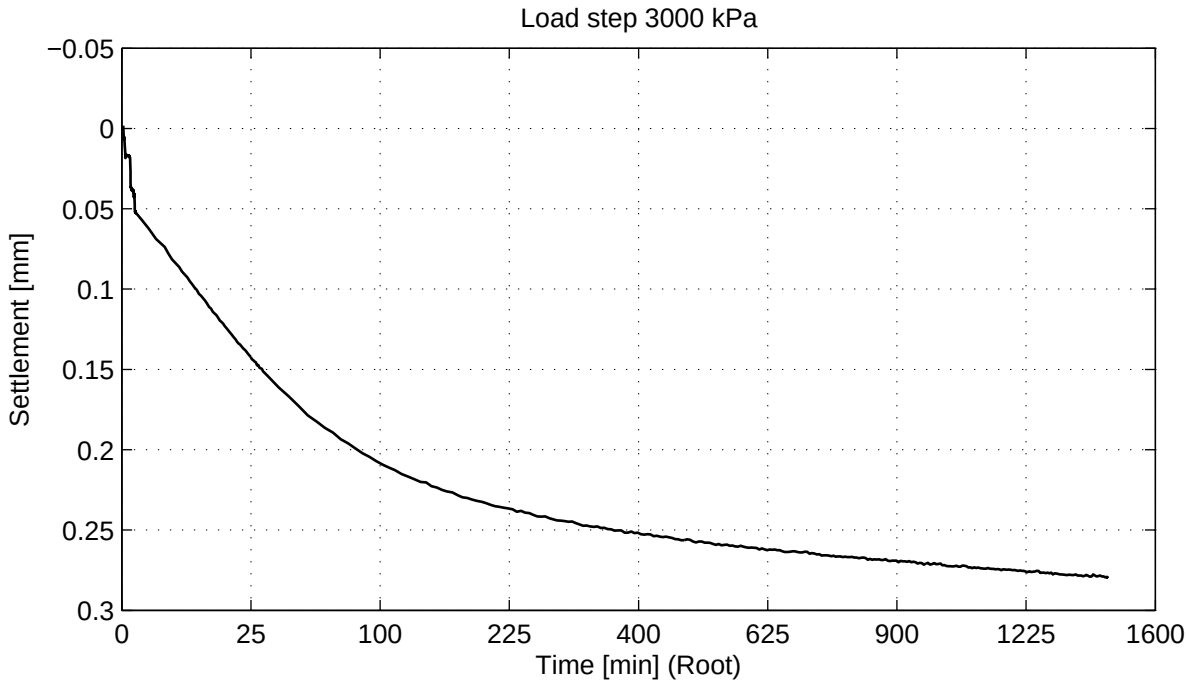
Cv = 7.0e−009 m^2/s

Load step 1499 kPa



No calculation performed.

Taylor method (page 4/4)



No calculation performed.

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date	signed
2011−07−29	Ess

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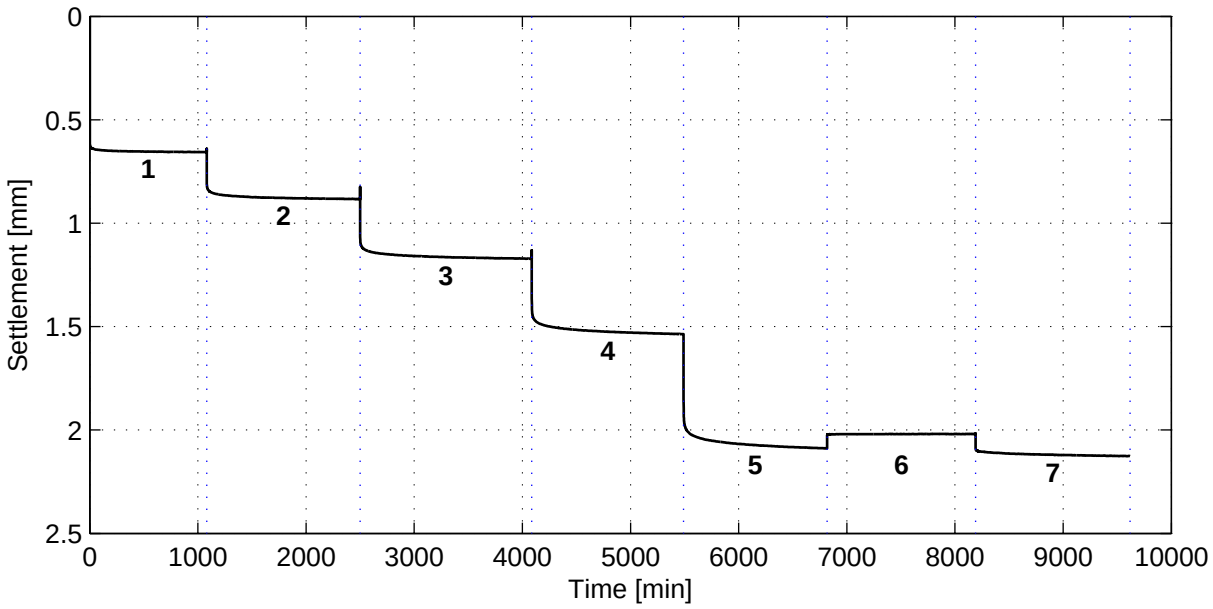
Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−103A_ST−6	10

) Vrijgegeven door wb op 2011-07-29 15:47



General soil and test parameters

Soil description	Silty Sand (SM)
Initial volumetric weight − wet [kN/m^3]	19.3
Initial volumetric weight − dry [kN/m^3]	15.6
Volumetric weight particles [kN/m^3]	26.3
Initial water content [%]	23.7
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	0.9
Final volumetric weight − wet [kN/m^3]	21.1
Final volumetric weight − dry [kN/m^3]	17.3
Final water content [%]	22.3
Final saturation [−]	1.1
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	19.0
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	187
2	374
3	749
4	1500
5	3000
6	1499
7	3000

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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date	signed
2011−07−29	Ess

Project Middelburg

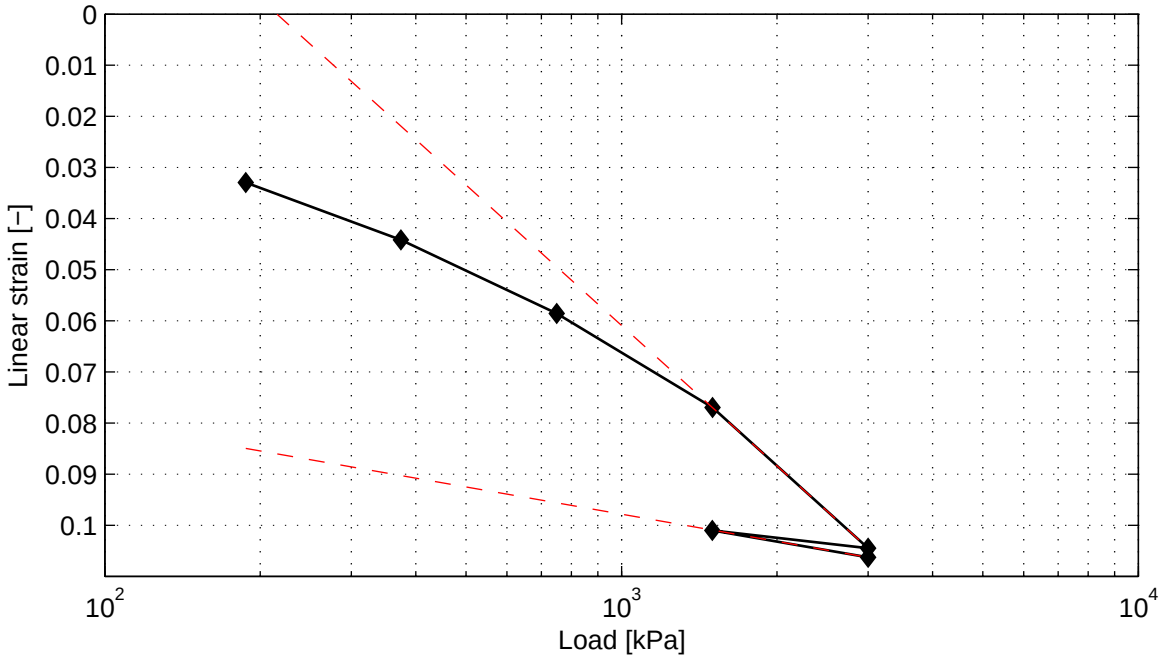
Boring KB−103A, sample KB−103A_ST−9, depth −84.76 m till −85.31 m GL

Oedometer test conform CEN ISO/TS 17892−5

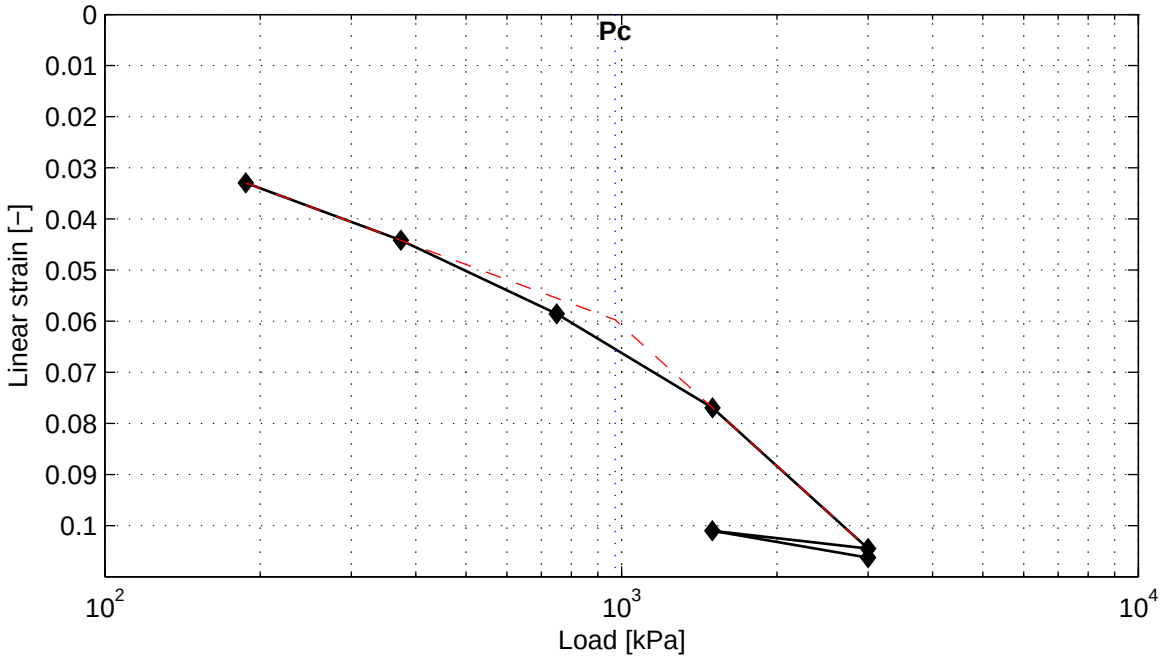
project	seen
1205088.1	–
appendix	page
SAKB−103A_ST−9	1

) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method

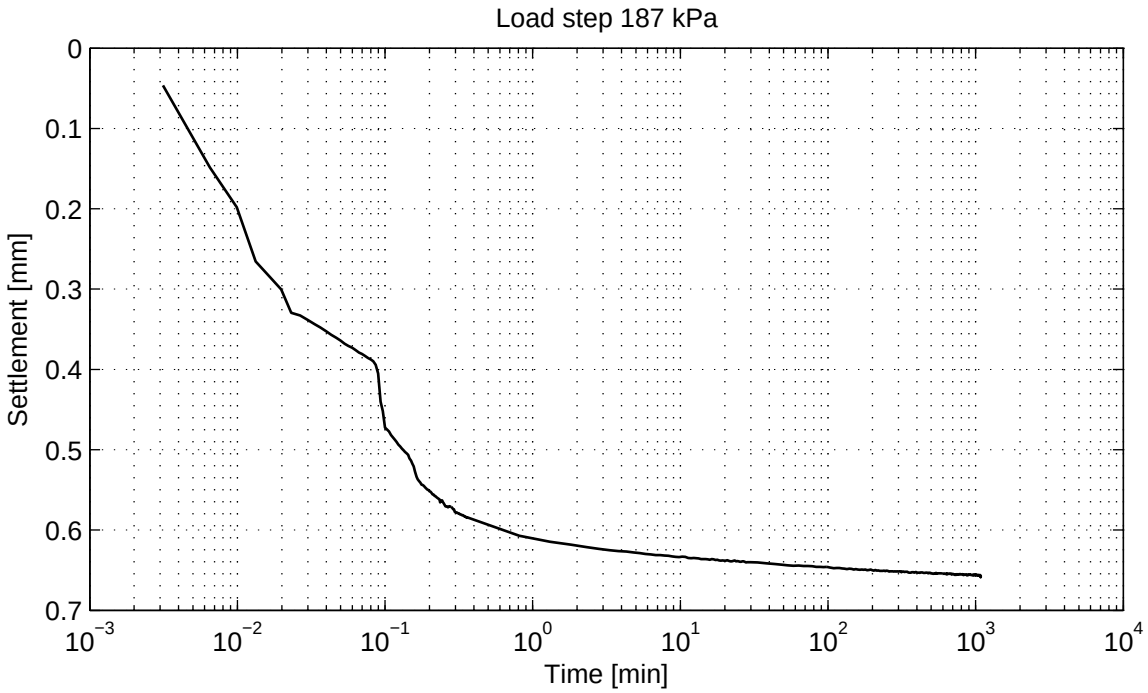


Cr = 3.0e−002 Ca = 2.5e−003 Vo = 1.68
Cc = 1.5e−001



Pc = 971.8 kPa

) Vrijgegeven door wb op 2011-07-29 15:47



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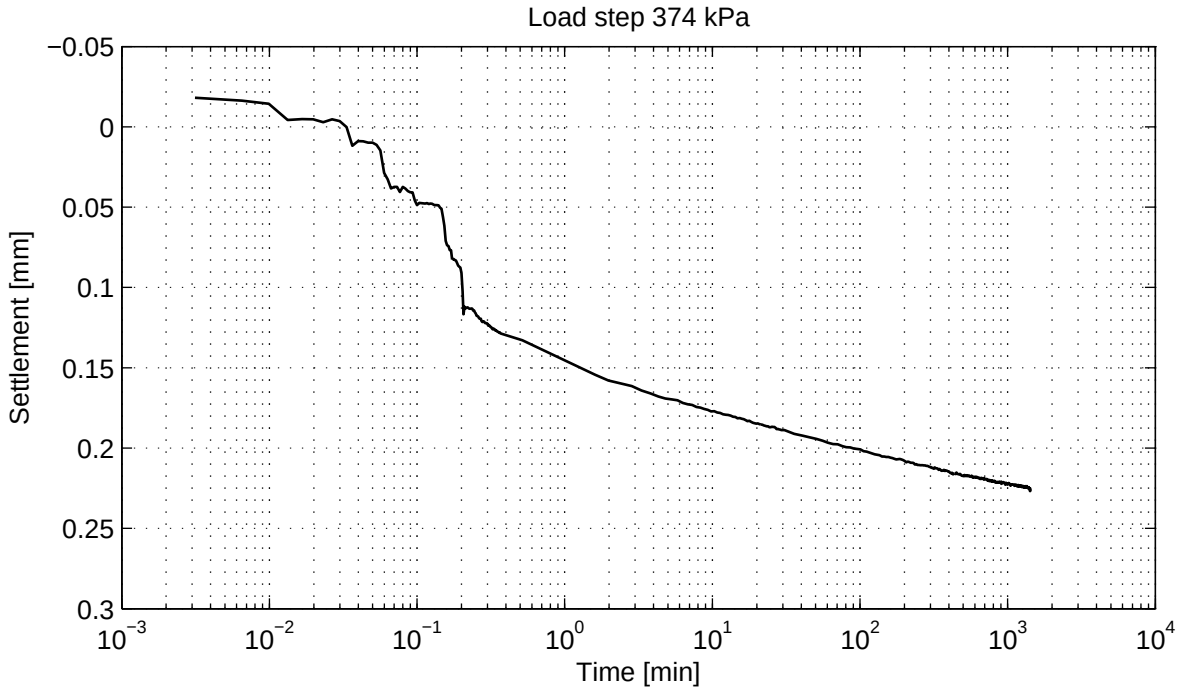

No calculation performed.

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date	signed
2011−07−29	Ess

Project Middelburg

Boring KB−103A, sample KB−103A_ST−9, depth −84.76 m till −85.31 m GL

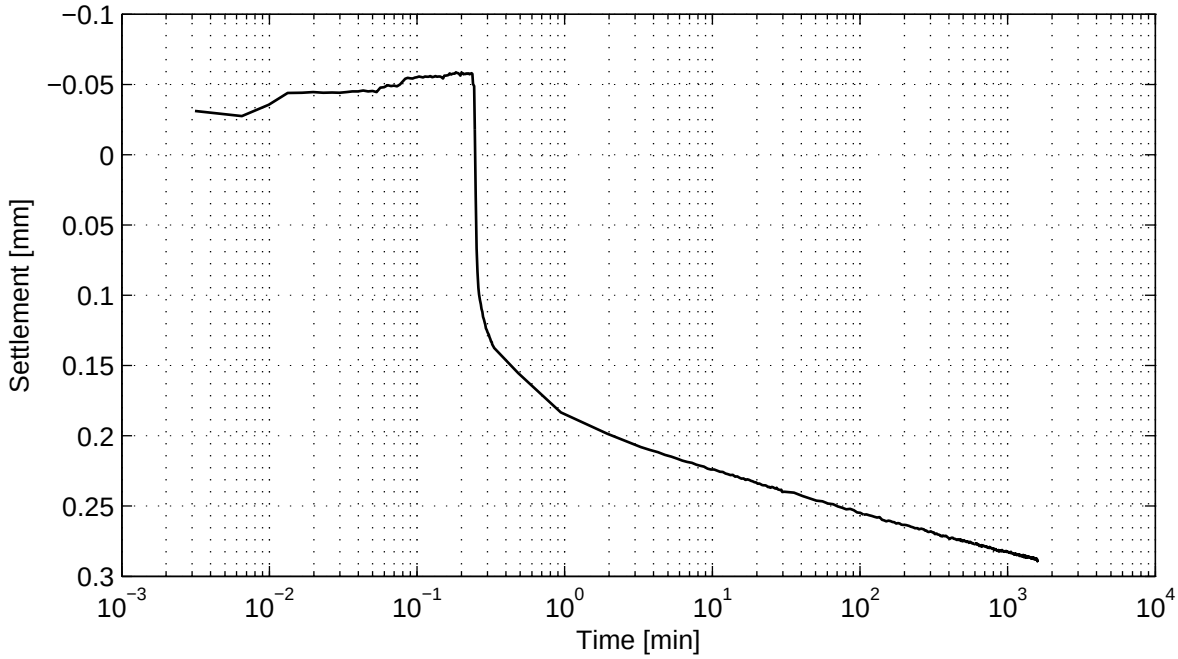
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−103A_ST−9	3

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 2/4)

Load step 749 kPa



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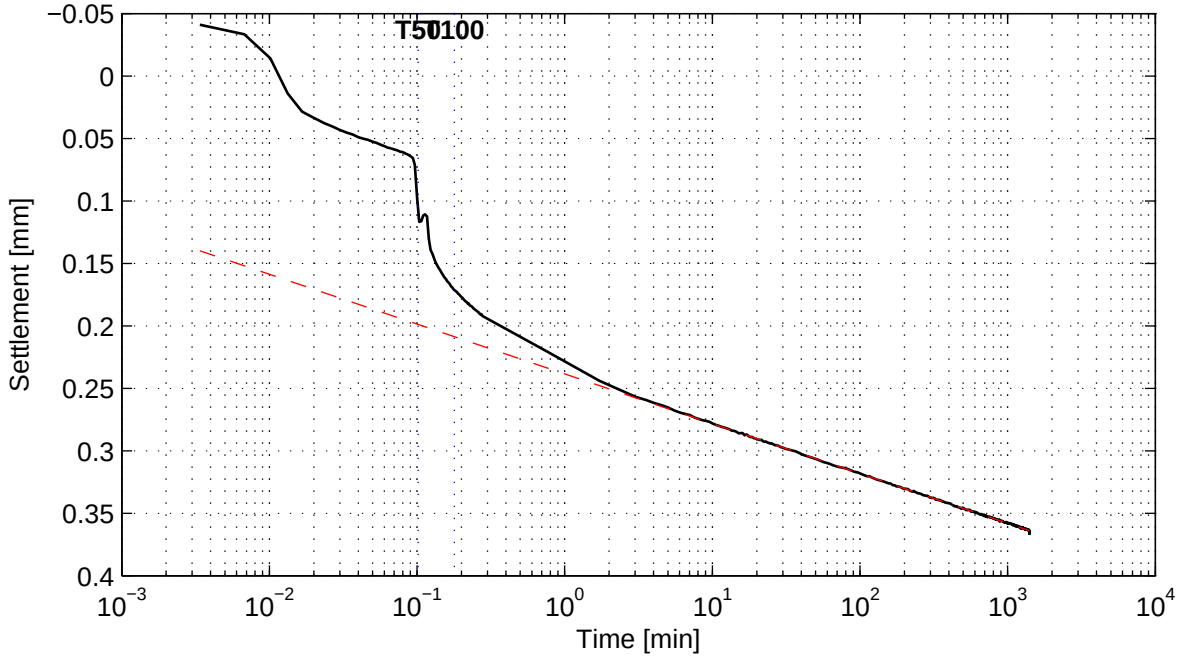
Load step 1500 kPa



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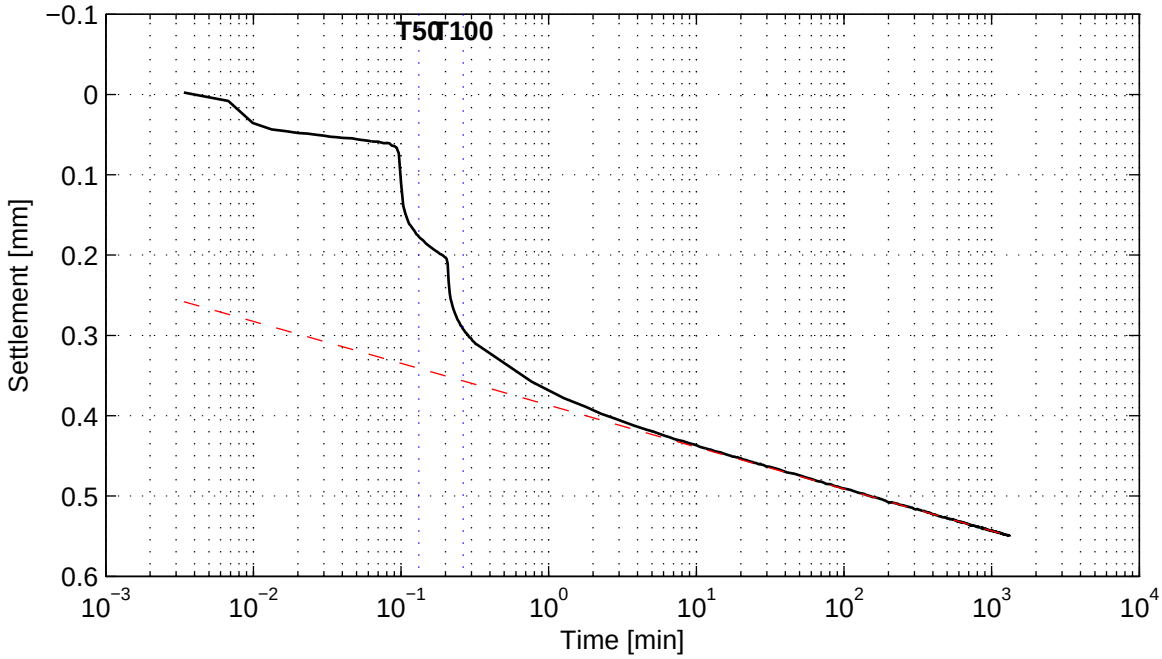
) Vrijgegeven door wb op 2011-07-29 15:47

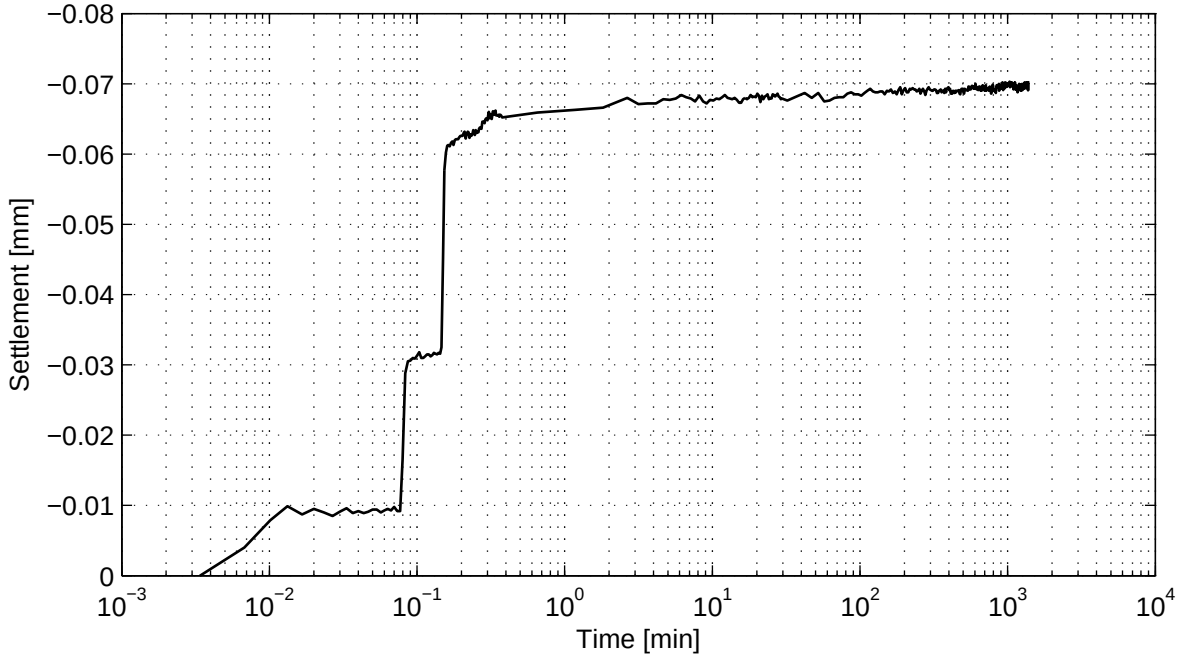
Casagrande method (page 3/4)

Load step 3000 kPa



No calculation performed.

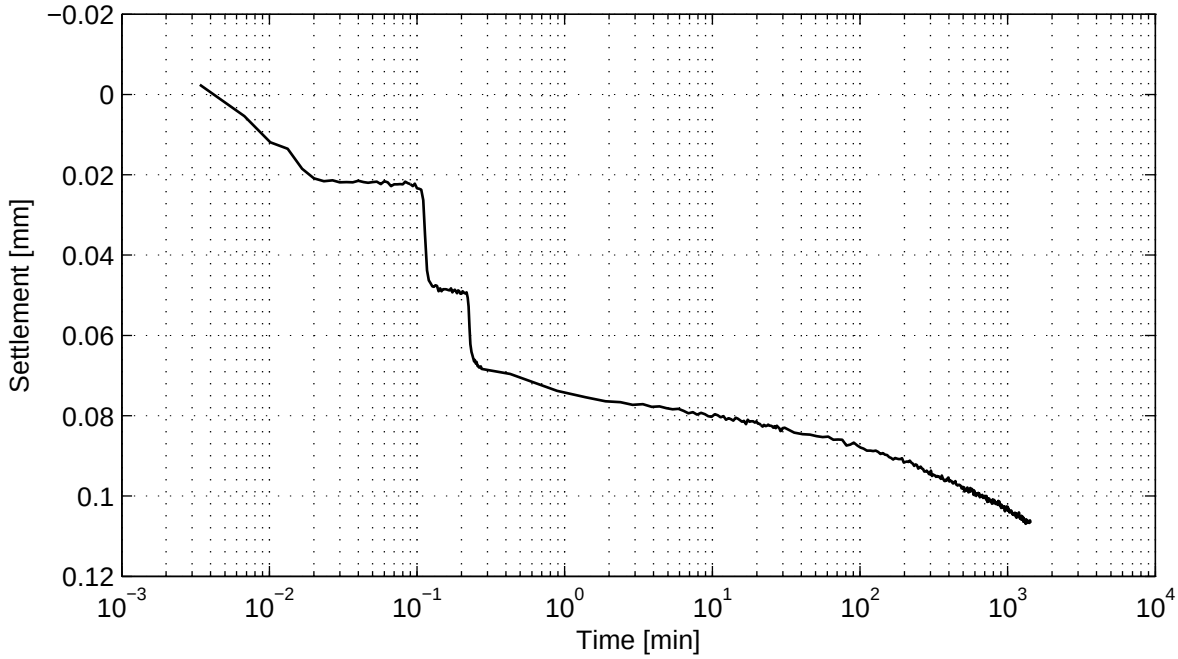
Load step 1499 kPa



No calculation performed.

Casagrande method (page 4/4)

Load step 3000 kPa

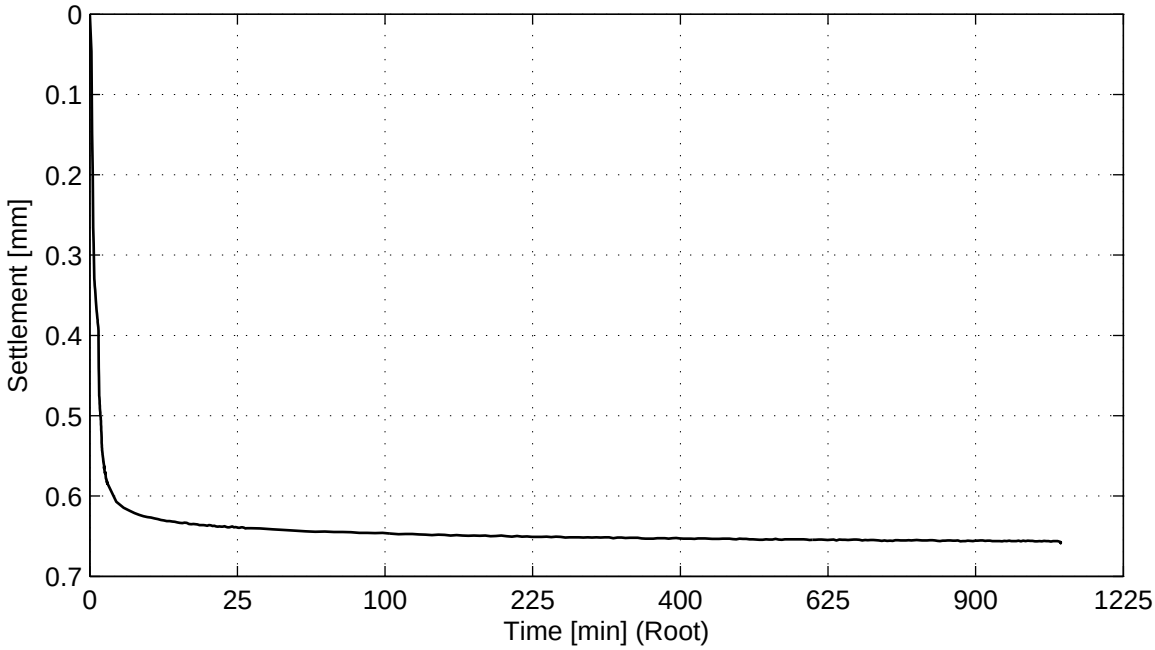


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

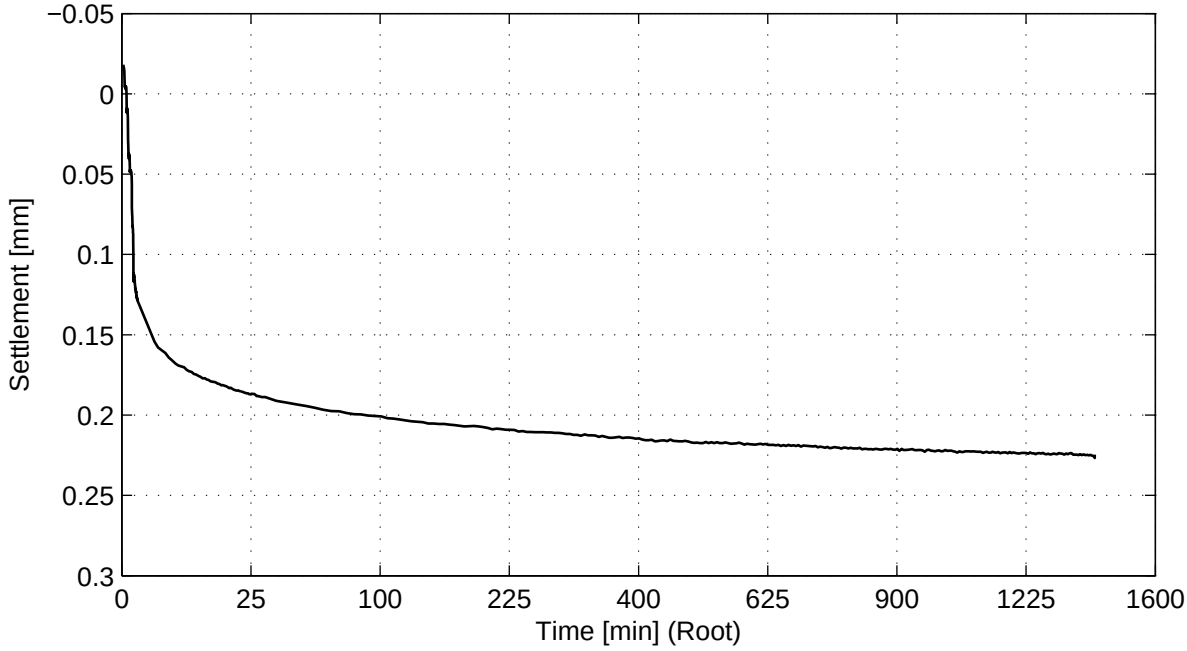
Taylor method (page 1/4)

Load step 187 kPa



No calculation performed.

Load step 374 kPa



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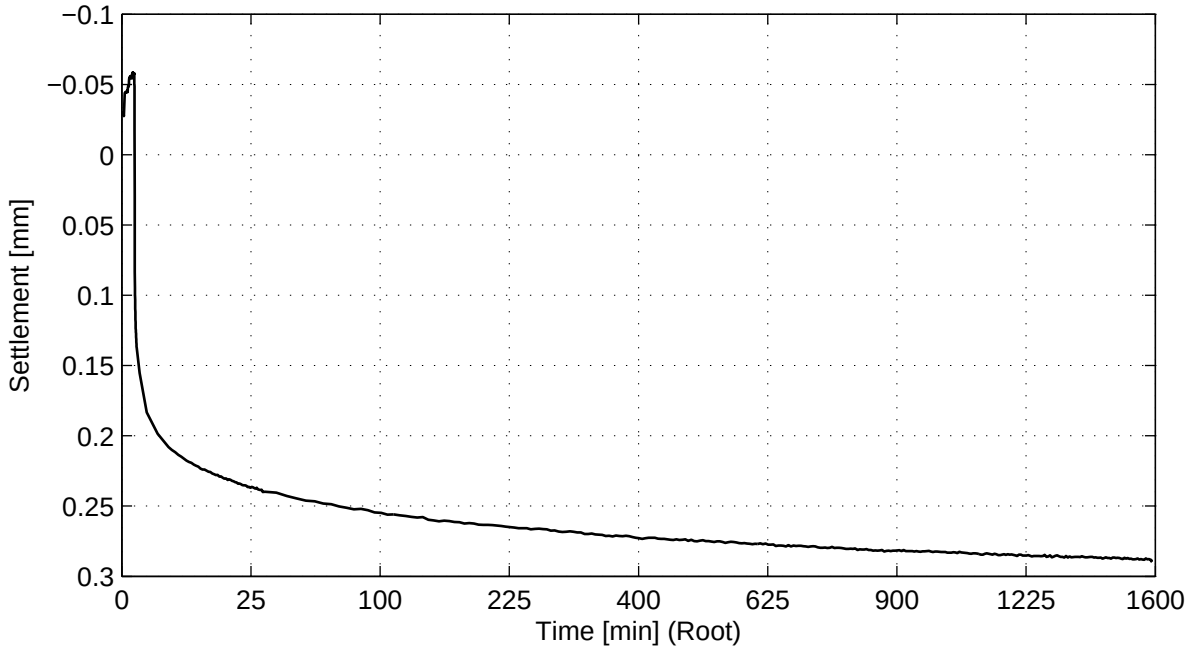
) Vrijgegeven door wb op 2011-07-29 15:47

Taylor method (page 2/4)

Load step 749 kPa



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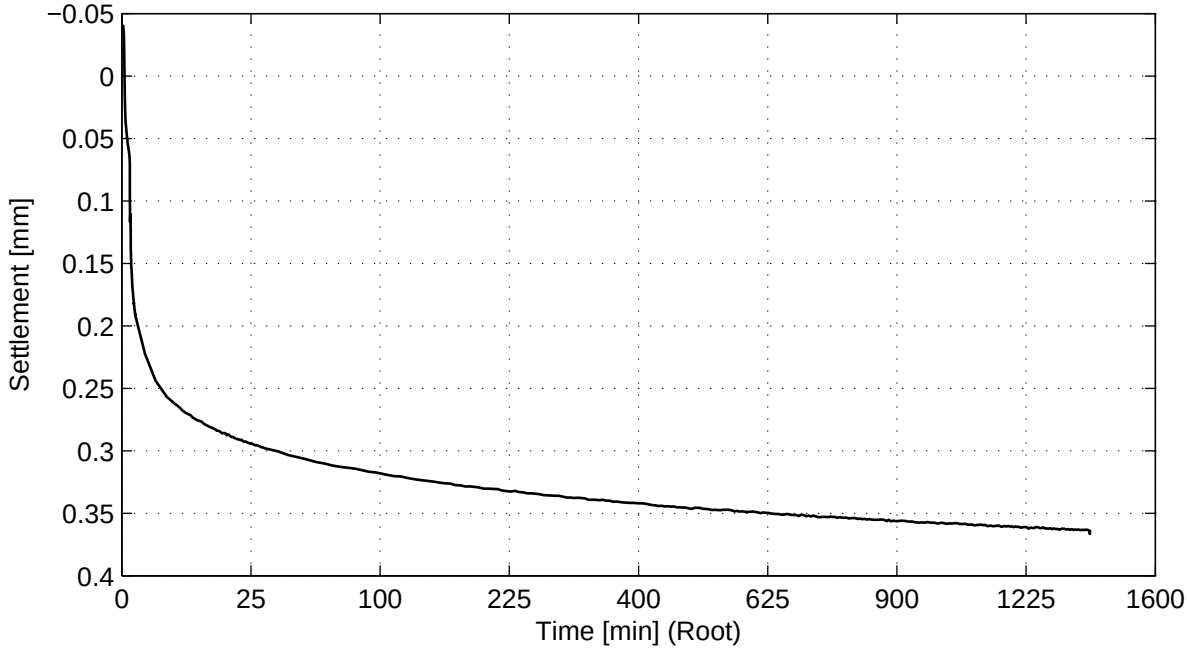
Load step 1500 kPa



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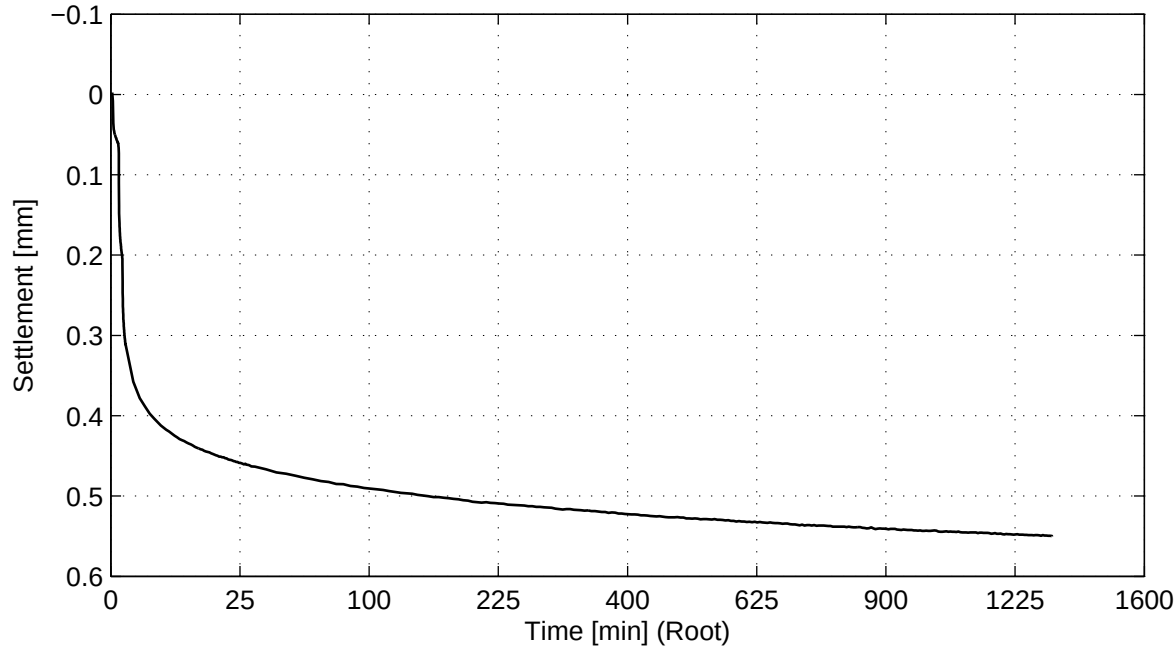
Taylor method (page 3/4)

Load step 3000 kPa



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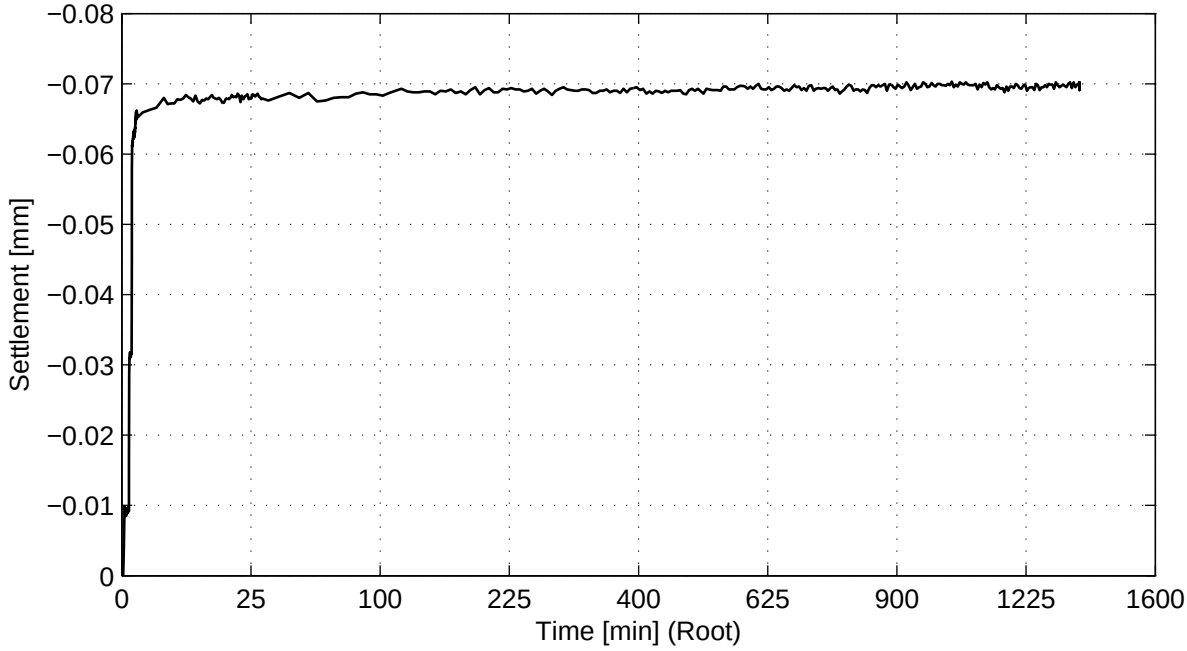
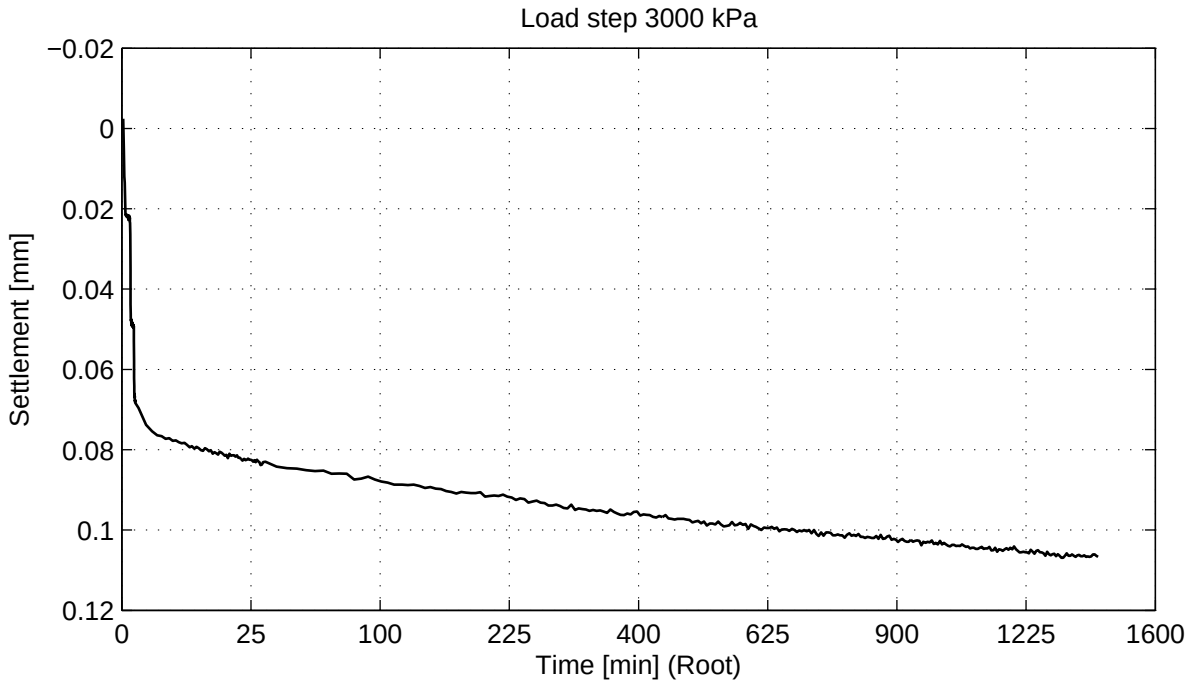
Load step 1499 kPa



No calculation performed.

Taylor method (page 4/4)



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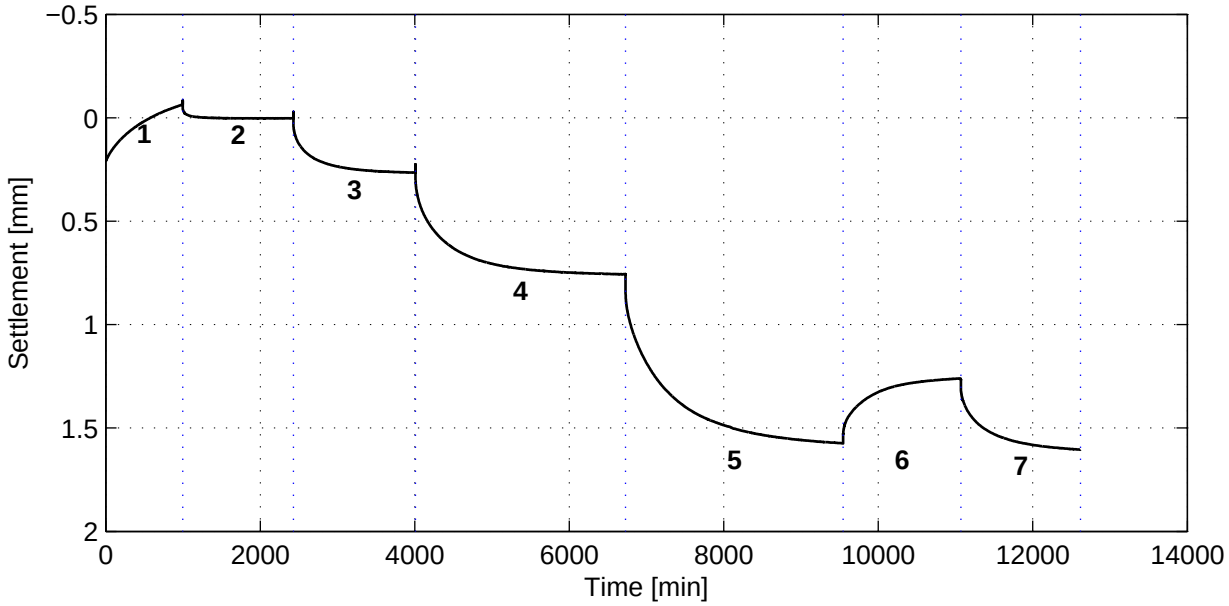
) Vrijgegeven door wb op 2011-07-29 15:47



General soil and test parameters

Soil description	Silty Clay (CL_ML)
Initial volumetric weight − wet [kN/m^3]	19.4
Initial volumetric weight − dry [kN/m^3]	15.1
Volumetric weight particles [kN/m^3]	25.6
Initial water content [%]	28.3
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.1
Final volumetric weight − wet [kN/m^3]	20.5
Final volumetric weight − dry [kN/m^3]	16.0
Final water content [%]	28.3
Final saturation [−]	1.2
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−29
Sample disturbance index	–
Lab temperature [° C]	20.3
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	188
2	374
3	750
4	1500
5	3000
6	1500
7	3000

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

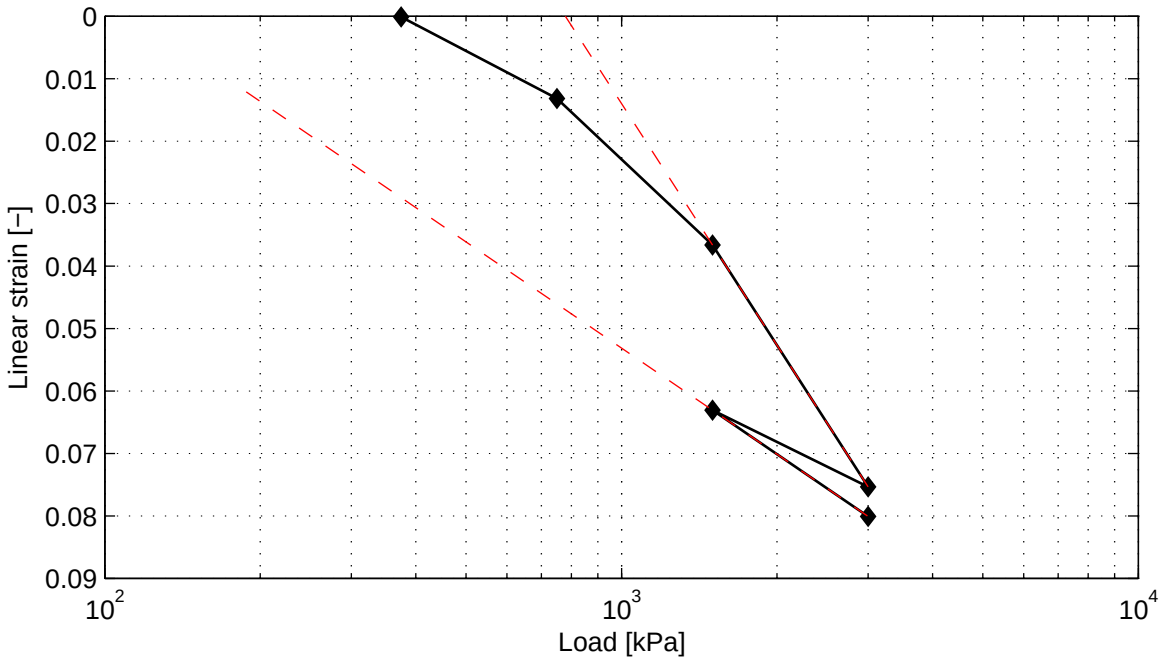
Boring KB−104, sample KB−104_ST−5, depth −73.91 m till −74.46 m NAP

Oedometer test conform CEN ISO/TS 17892−5

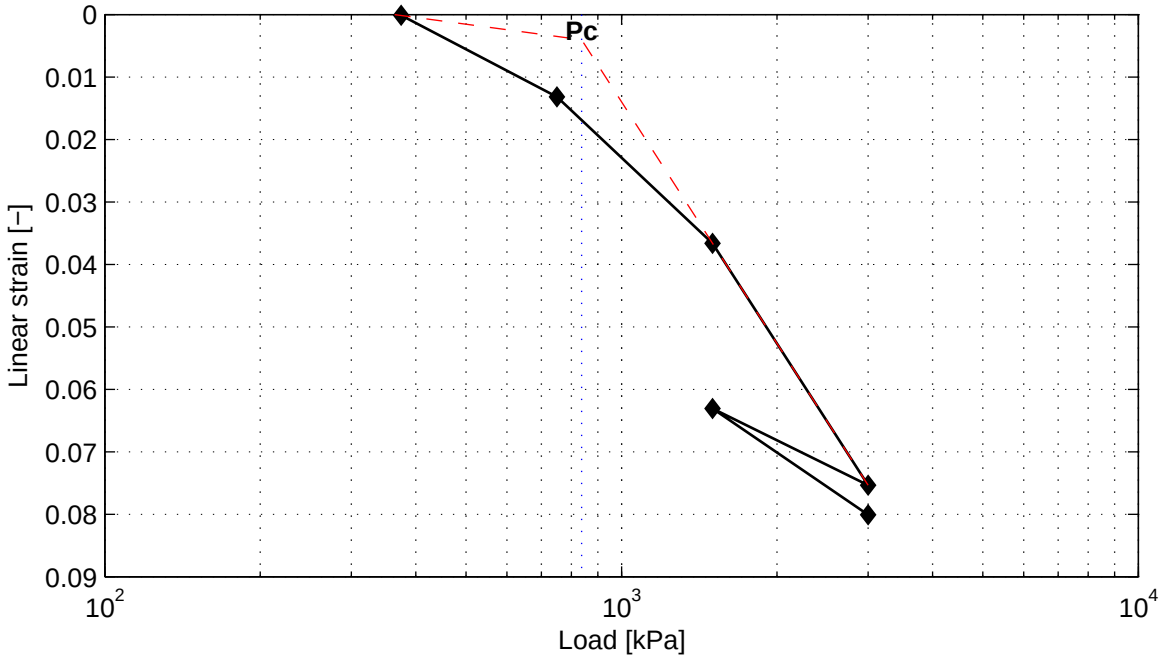
project	seen
1205088.1	–
appendix	page
SAKB−104_ST−5	1

) Vrijgegeven door wb op 2011-07-29 16:13

Bjerrum method



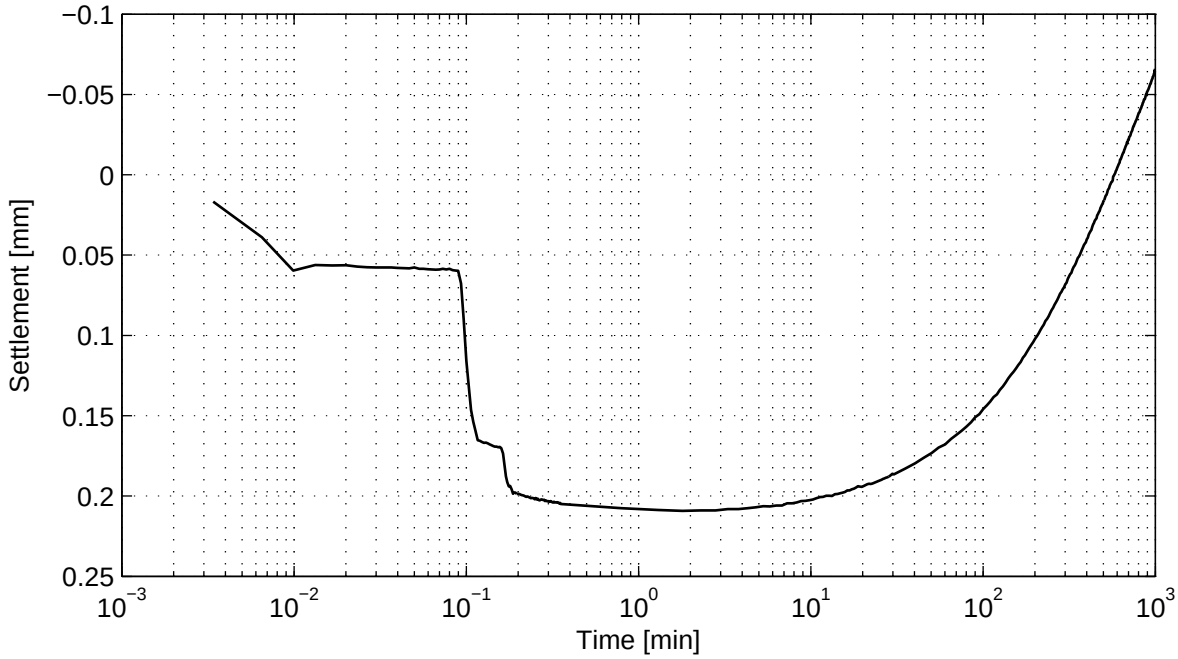
Cr = 9.6e−002 Ca = 6.0e−003 Vo = 1.69
Cc = 2.2e−001



Pc = 836.8 kPa

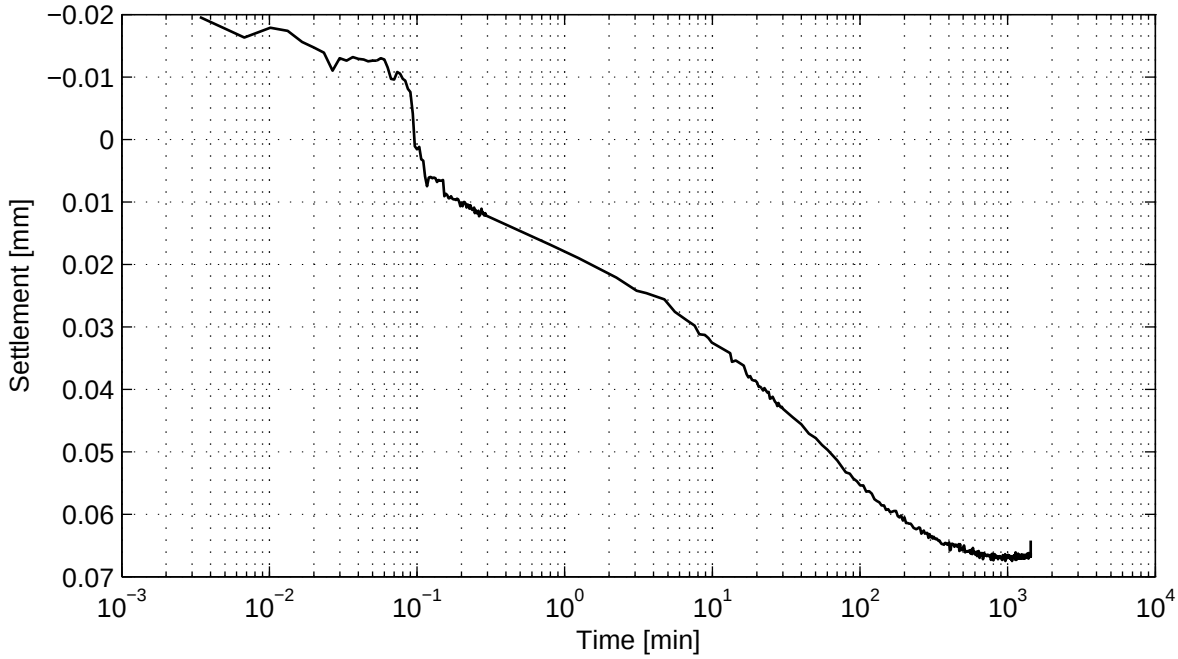
Casagrande method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 374 kPa

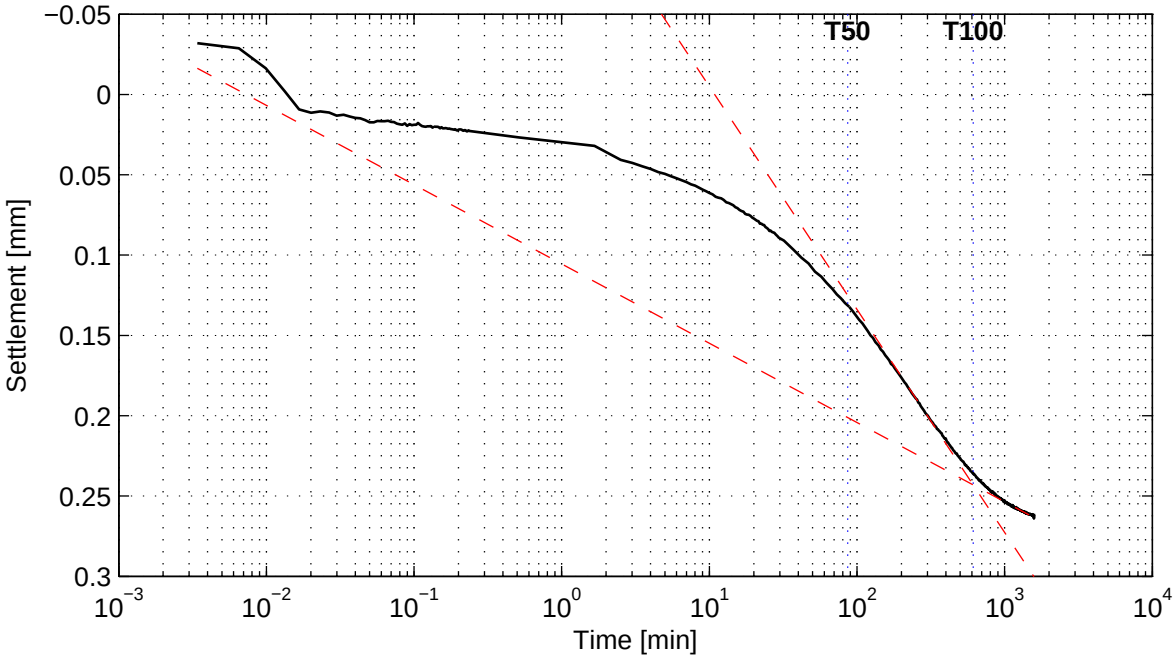


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 16:13

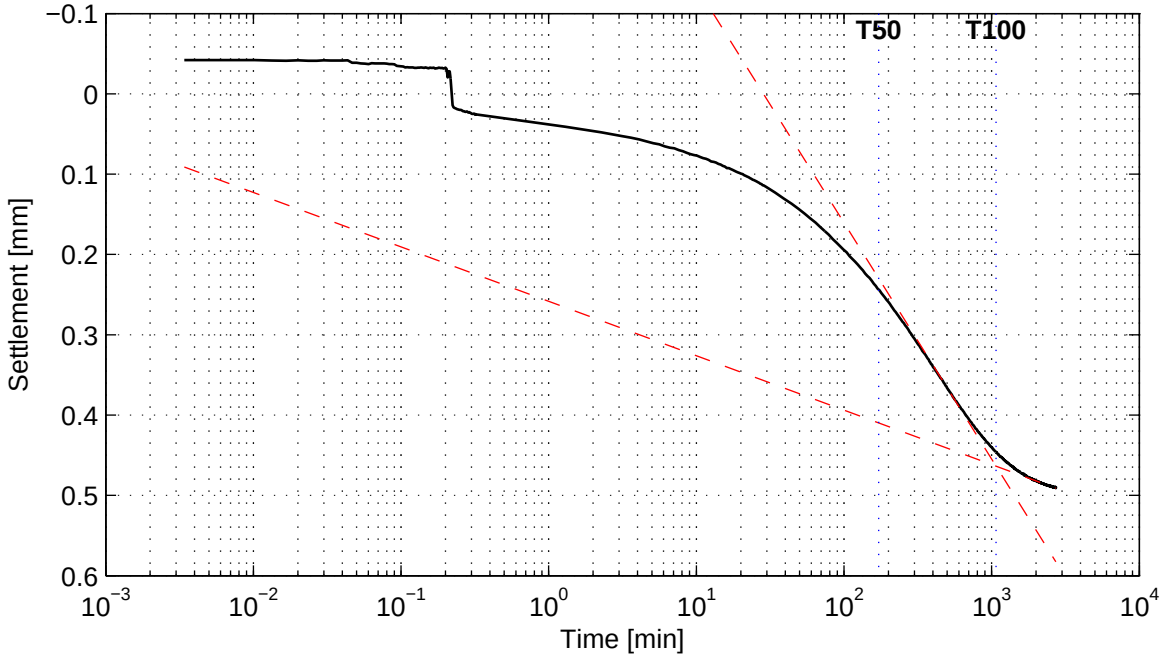
Casagrande method (page 2/4)

Load step 750 kPa



Cv = 2.9e−009 m^2/s Mv = 3.0e−005 m^2/kN
Ca = − K = 8.4e−013 m/s

Load step 1500 kPa



Cv = 1.4e−009 m^2/s Mv = 3.0e−005 m^2/kN
Ca = 3.4e−003 K = 4.1e−013 m/s

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2011−07−29	Ess

Project Middelburg

Boring KB−104, sample KB−104_ST−5, depth −73.91 m till −74.46 m NAP

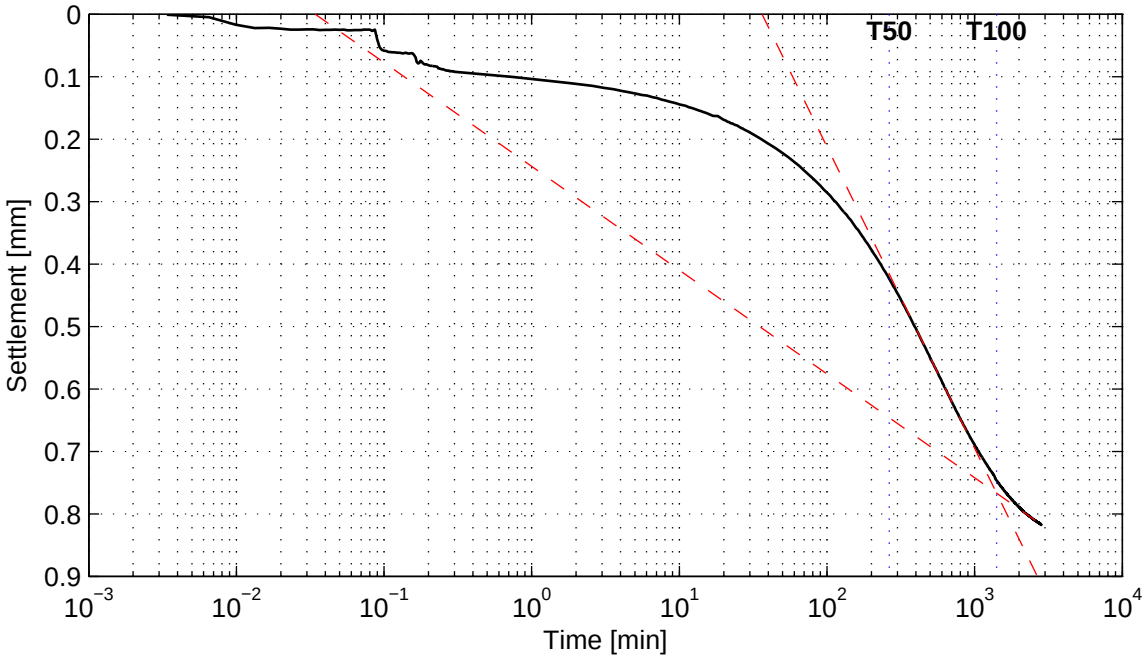
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104_ST−5	4

) Vrijgegeven door wb op 2011-07-29 16:13

Casagrande method (page 3/4)

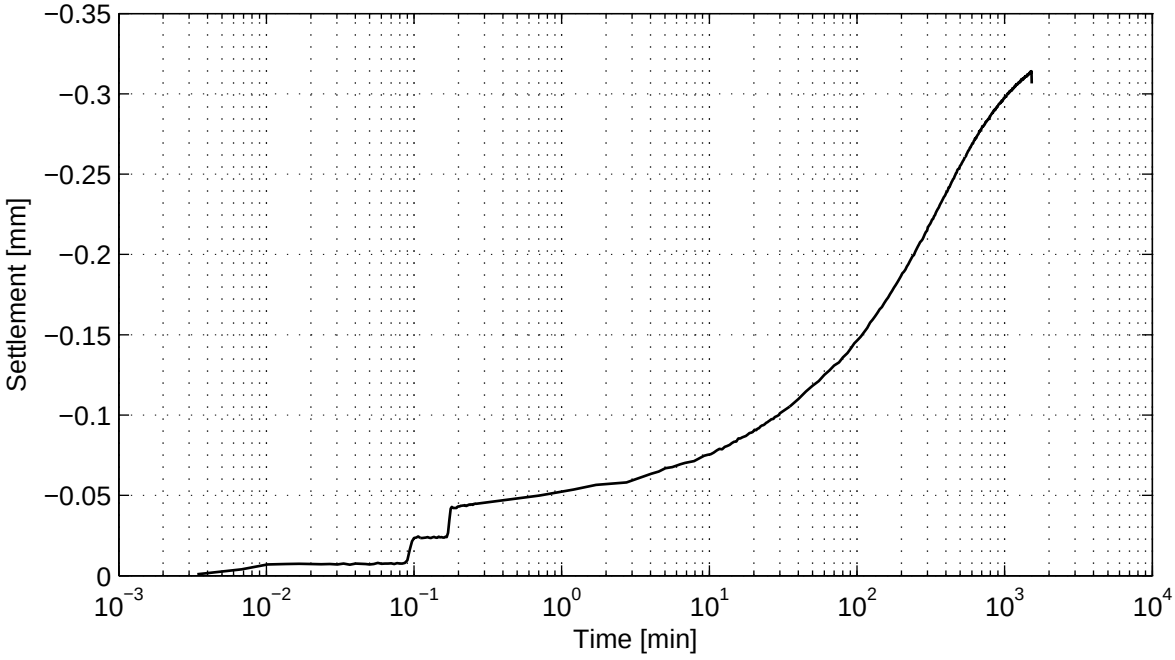
Load step 3000 kPa



Cv = 8.5e−010 m^2/s
Ca = 8.6e−003

Mv = 2.4e−005 m^2/kN
K = 2.0e−013 m/s

Load step 1500 kPa



No calculation performed.

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date	signed
2011−07−29	Ess

Project Middelburg

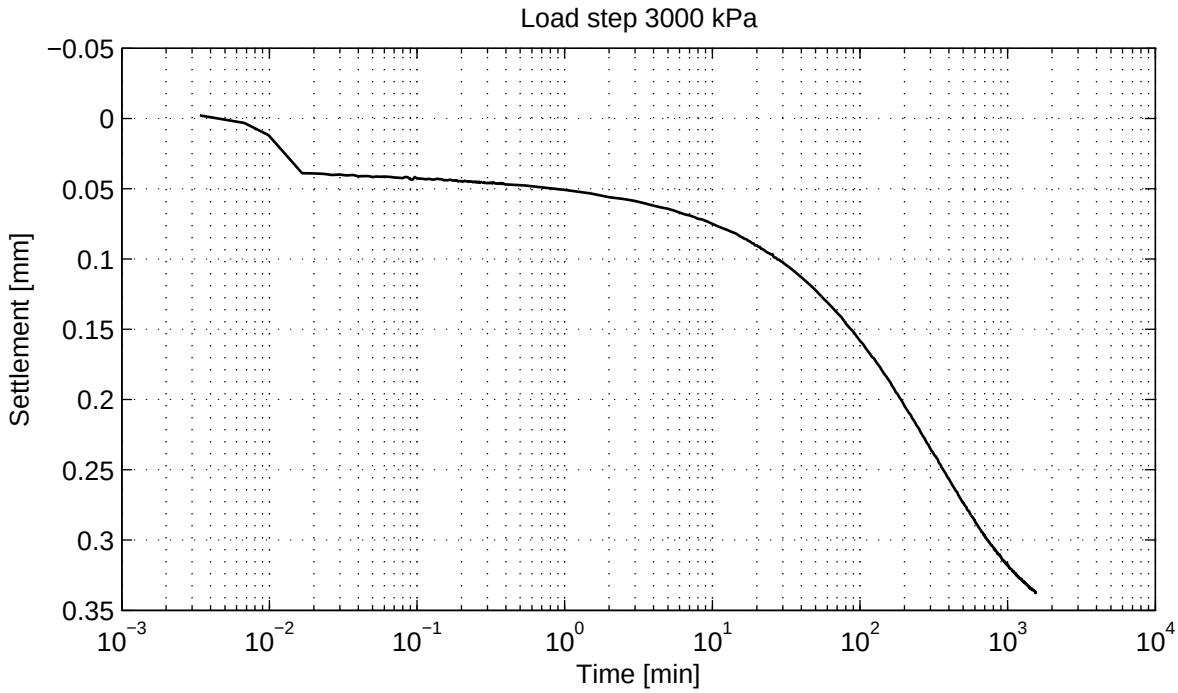
Boring KB−104, sample KB−104_ST−5, depth −73.91 m till −74.46 m NAP

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104_ST−5	5

) Vrijgegeven door wb op 2011-07-29 16:13

Casagrande method (page 4/4)



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date	signed
2011−07−29	Ess

Project Middelburg

Boring KB−104, sample KB−104_ST−5, depth −73.91 m till −74.46 m NAP

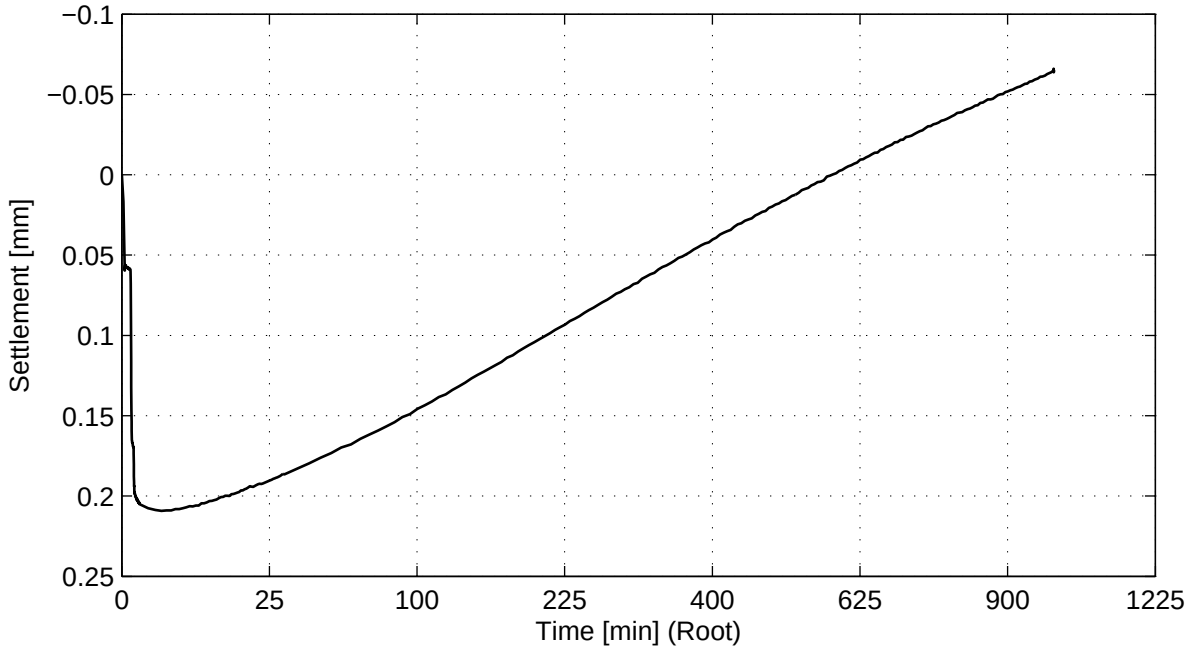
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104_ST−5	6

) Vrijgegeven door wb op 2011-07-29 16:13

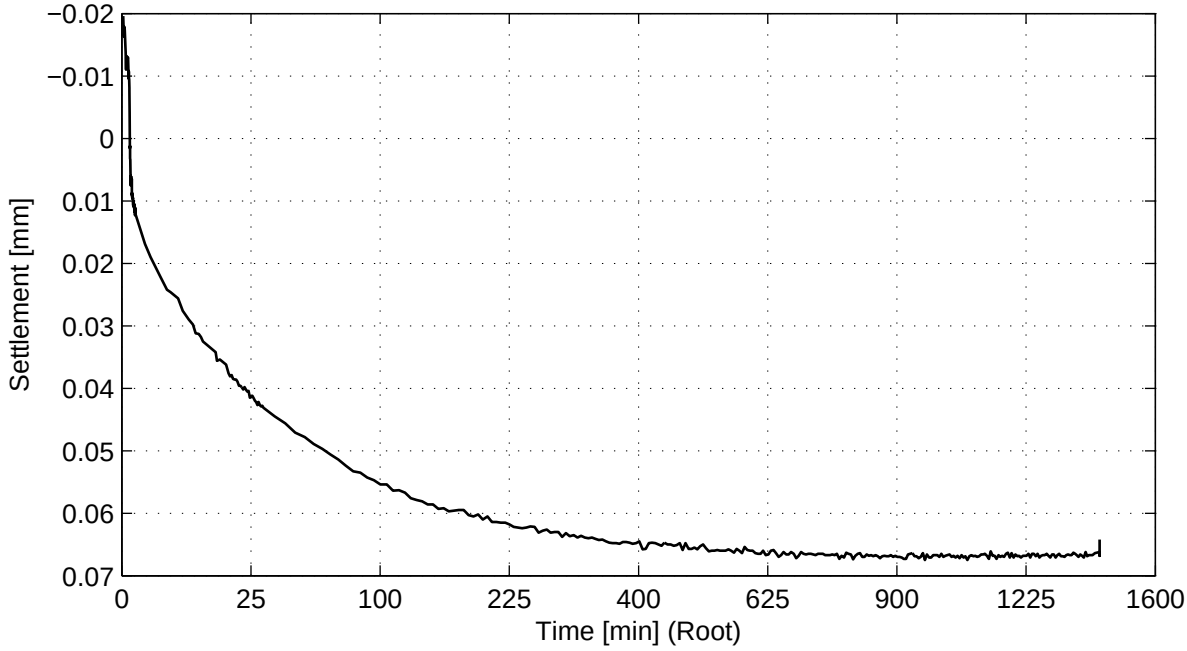
Taylor method (page 1/4)

Load step 188 kPa



No calculation performed.

Load step 374 kPa



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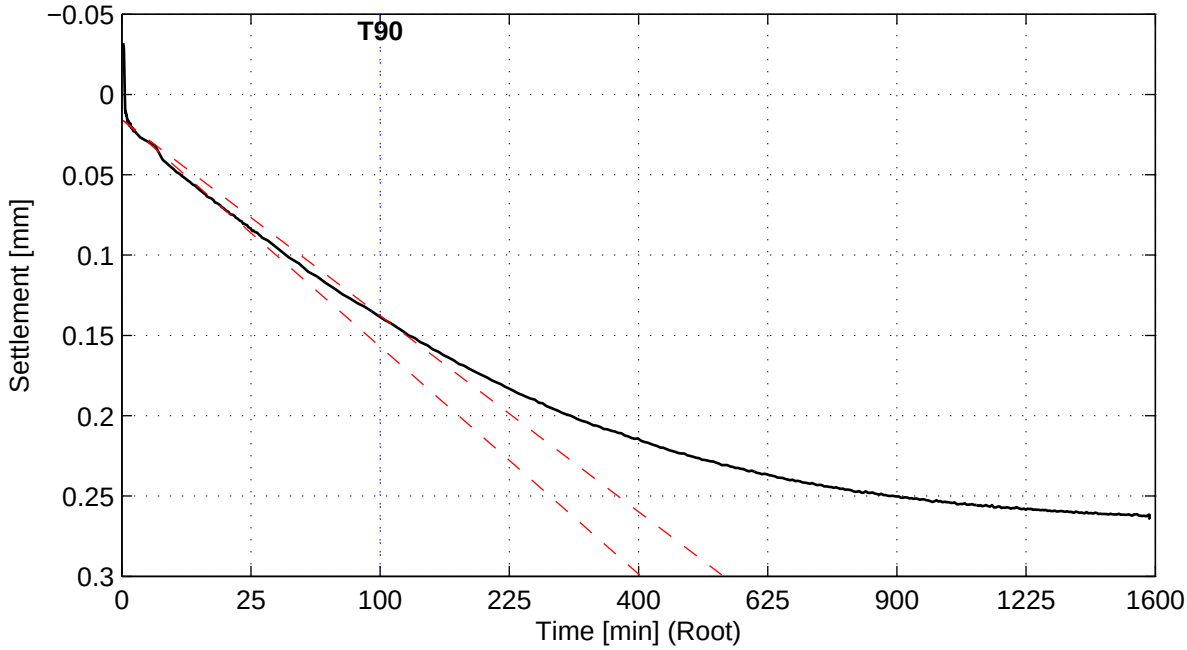
) Vrijgegeven door wb op 2011-07-29 16:13

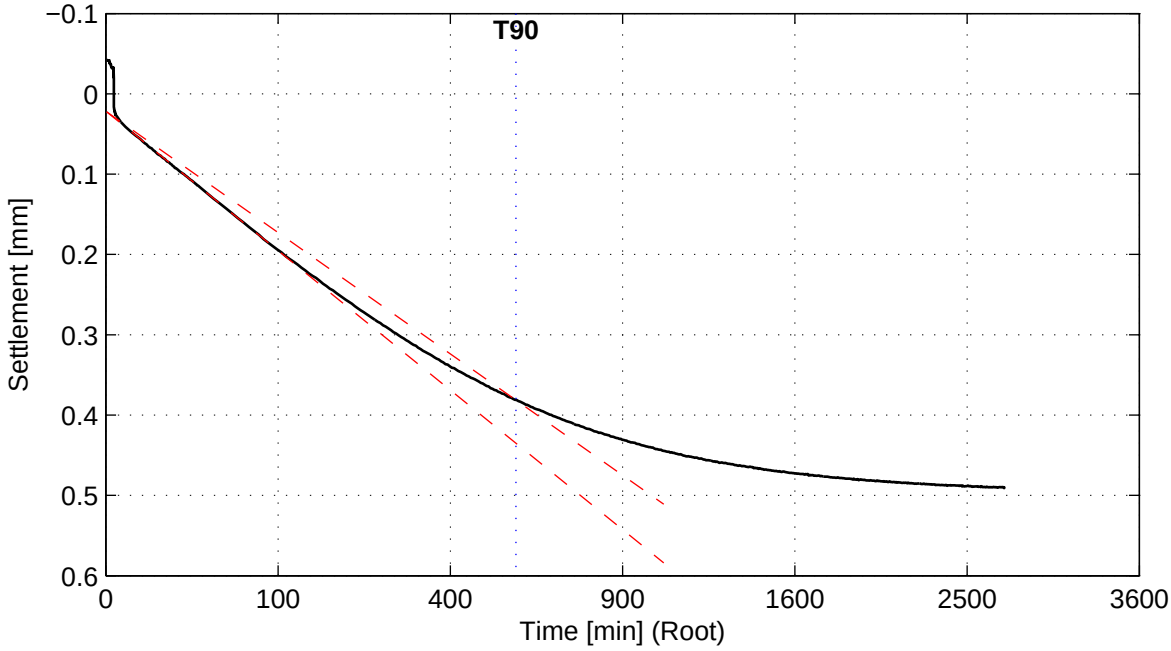
Taylor method (page 2/4)

Load step 750 kPa



Cv = 1.1e−008 m^2/s

Load step 1500 kPa

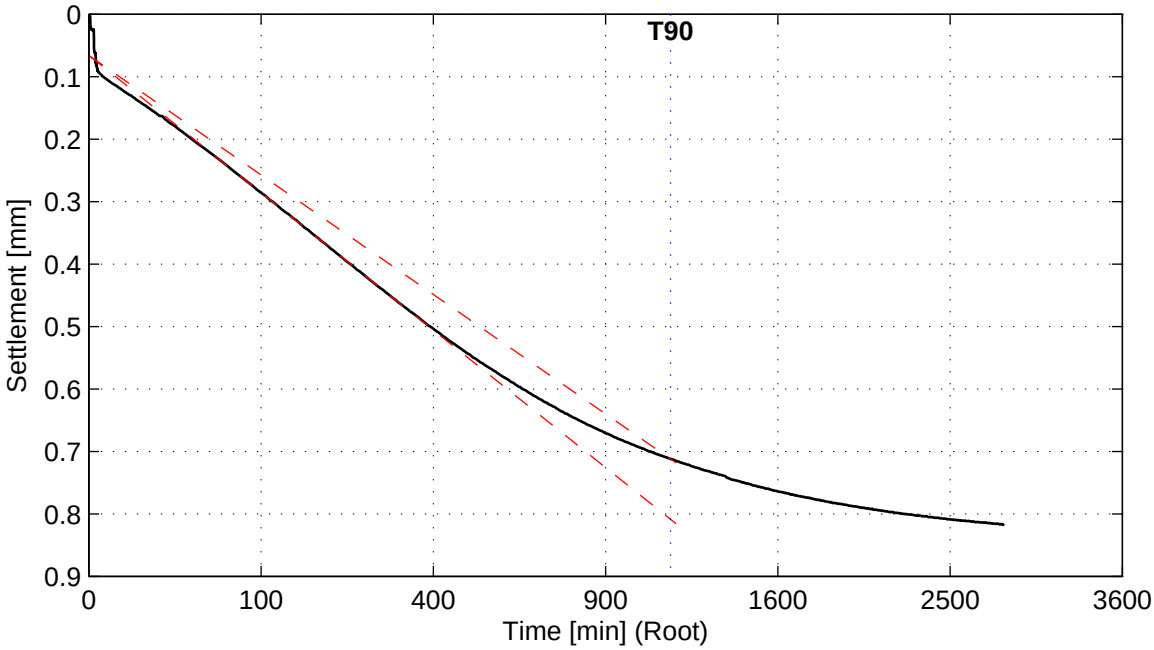


Cv = 1.8e−009 m^2/s

) Vrijgegeven door wb op 2011-07-29 16:13

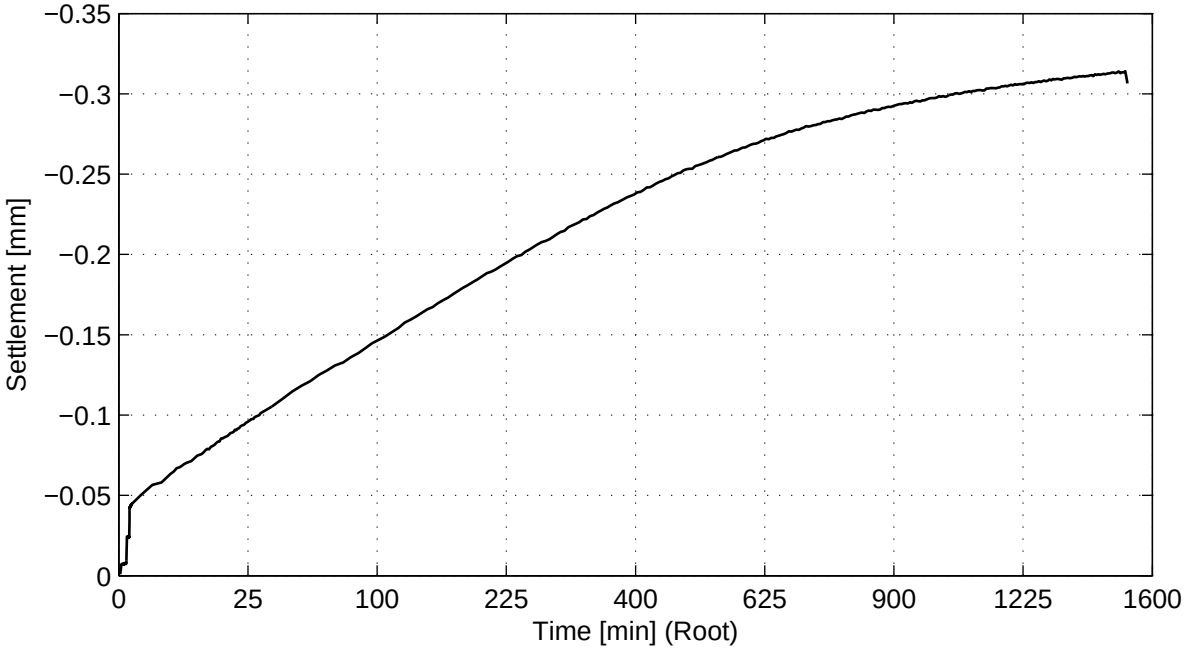
Taylor method (page 3/4)

Load step 3000 kPa



Cv = 8.2e−010 m^2/s

Load step 1500 kPa



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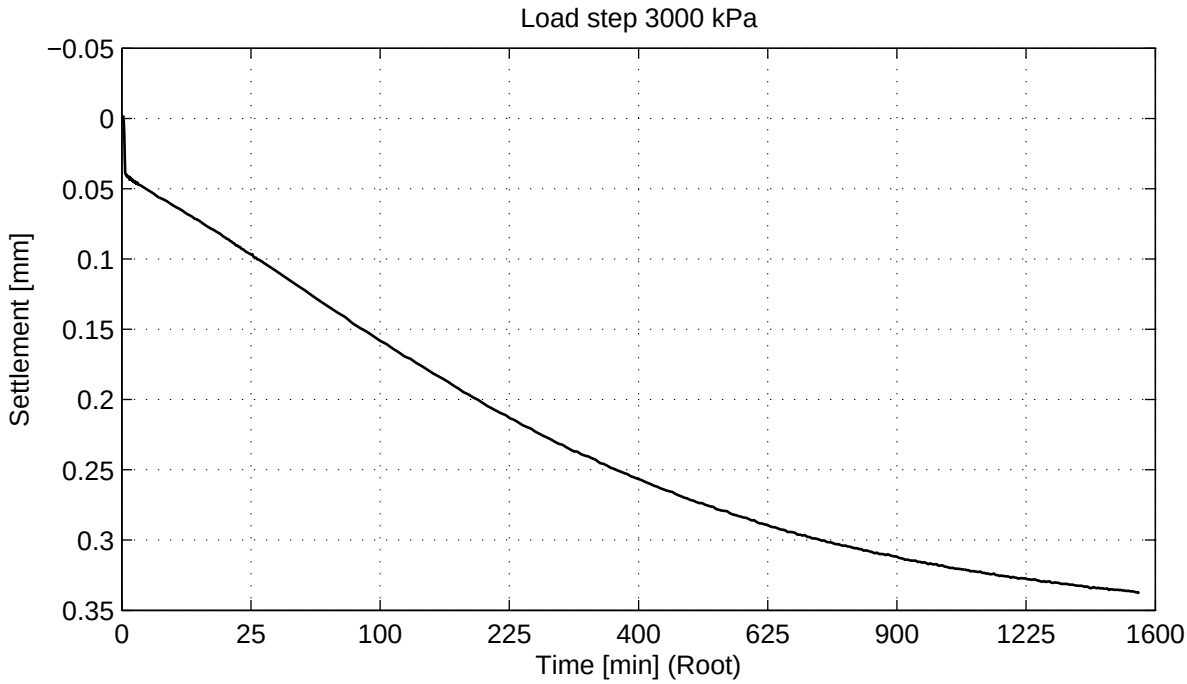
) Vrijgegeven door wb op 2011-07-29 16:13

Taylor method (page 4/4)



No calculation performed.

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2011−07−29	Ess

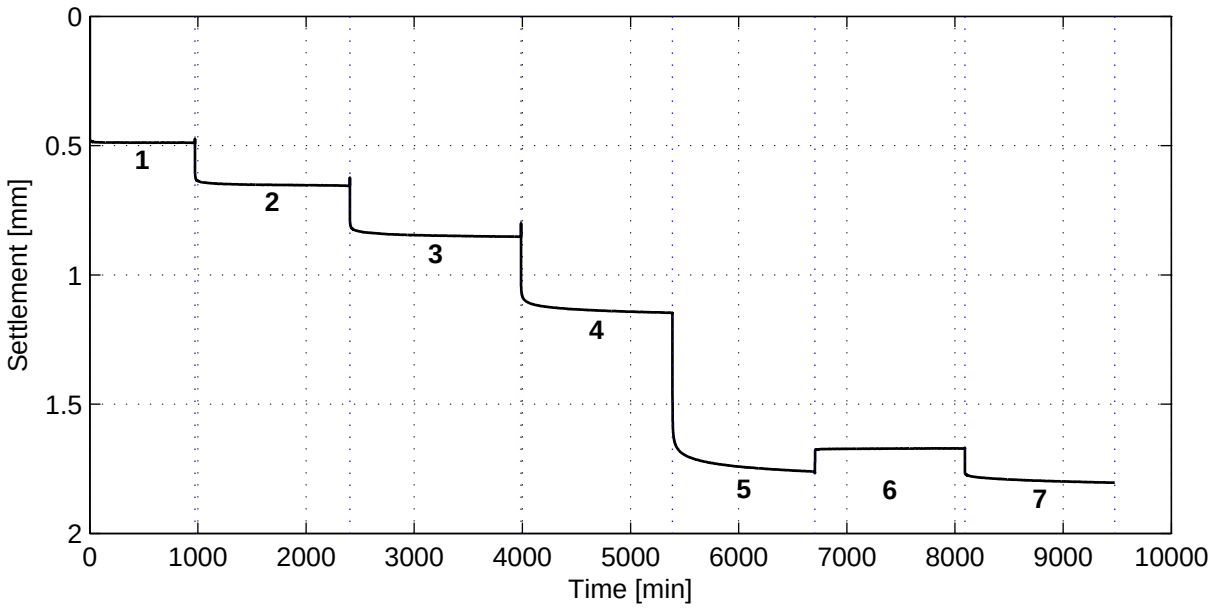
Project Middelburg

Boring KB−104, sample KB−104_ST−5, depth −73.91 m till −74.46 m NAP

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104_ST−5	10

) Vrijgegeven door wb op 2011-07-29 16:13



General soil and test parameters

Soil description	Silty Fat Clay (CH)
Initial volumetric weight − wet [kN/m^3]	19.4
Initial volumetric weight − dry [kN/m^3]	15.7
Volumetric weight particles [kN/m^3]	26.3
Initial water content [%]	23.5
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	0.9
Final volumetric weight − wet [kN/m^3]	21.0
Final volumetric weight − dry [kN/m^3]	17.2
Final water content [%]	22.1
Final saturation [−]	1.1
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	20.3
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	187
2	374
3	749
4	1500
5	3000
6	1500
7	3000

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

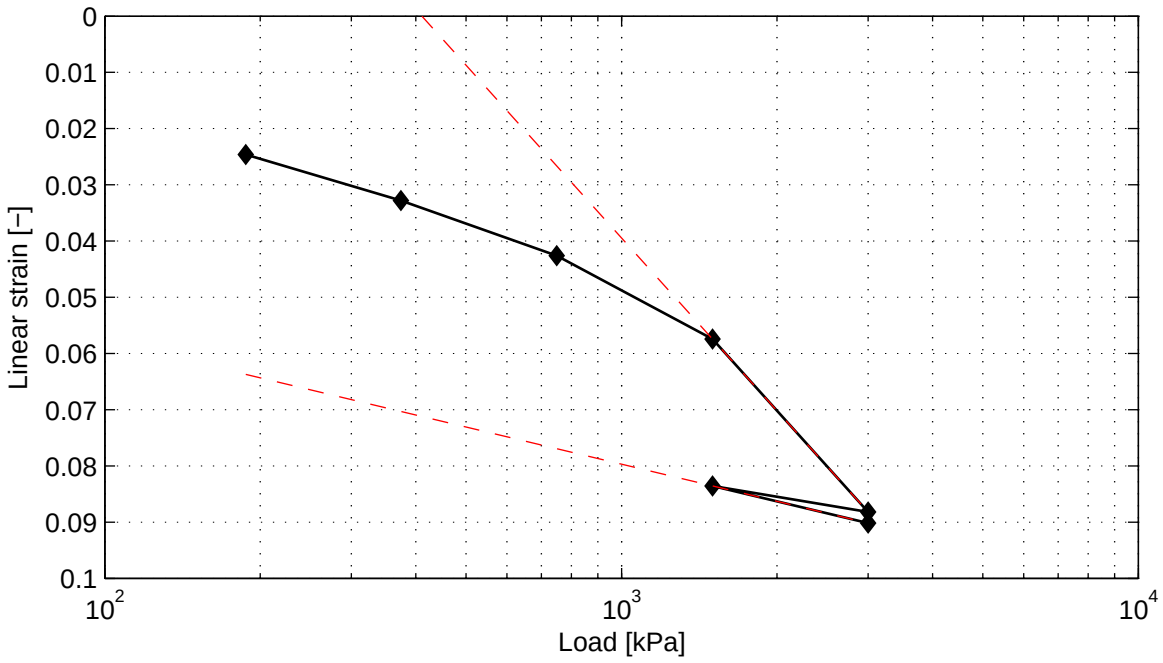
Boring KB−104, sample KB−104_ST−8, depth −92.90 m till −93.40 m NAP

Oedometer test conform CEN ISO/TS 17892−5

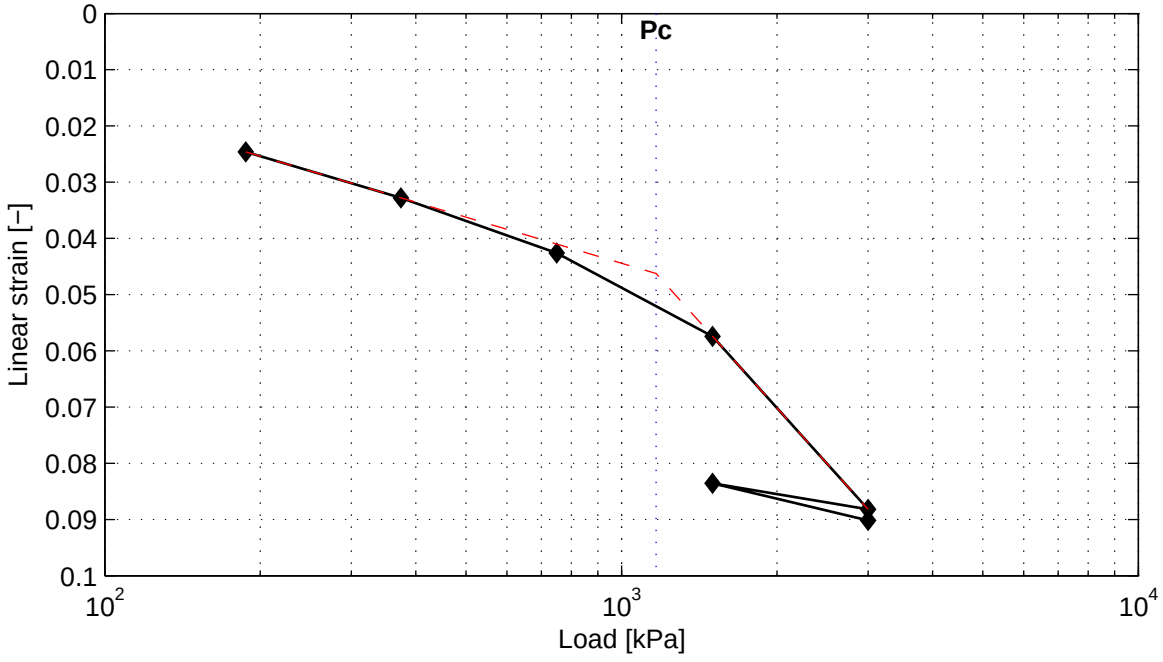
project	seen
1205088.1	–
appendix	page
SAKB−104_ST−8	1

) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method



Cr = 3.7e−002 Ca = 2.4e−003 Vo = 1.67
Cc = 1.7e−001

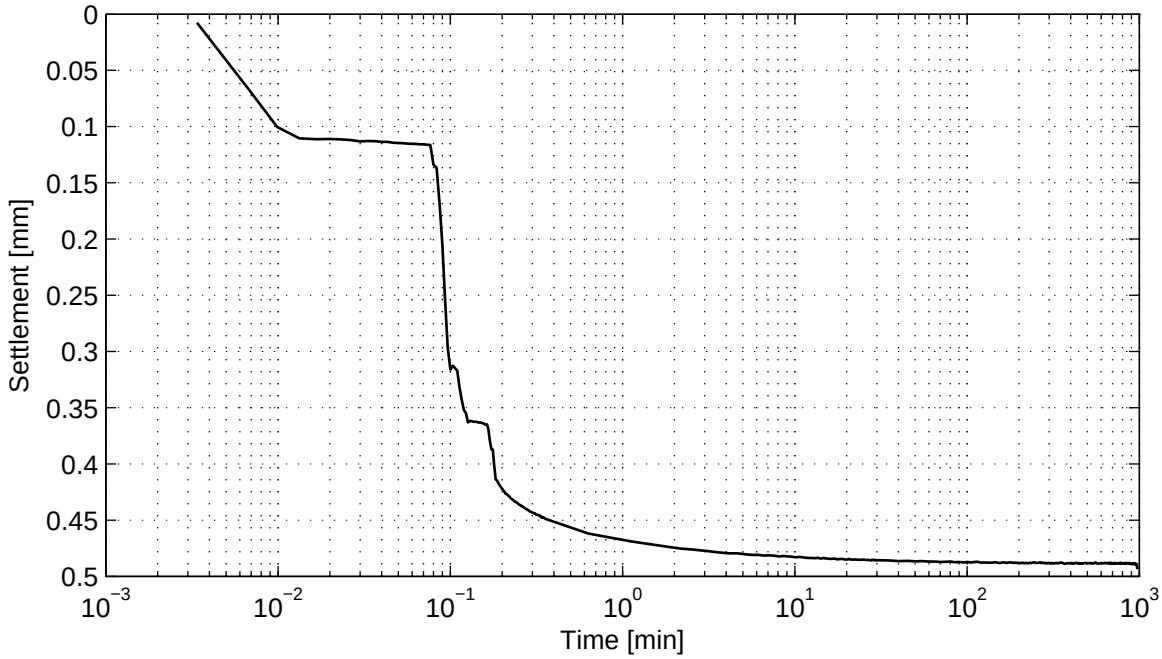


Pc = 1166.0 kPa

) Vrijgegeven door wb op 2011-07-29 15:47

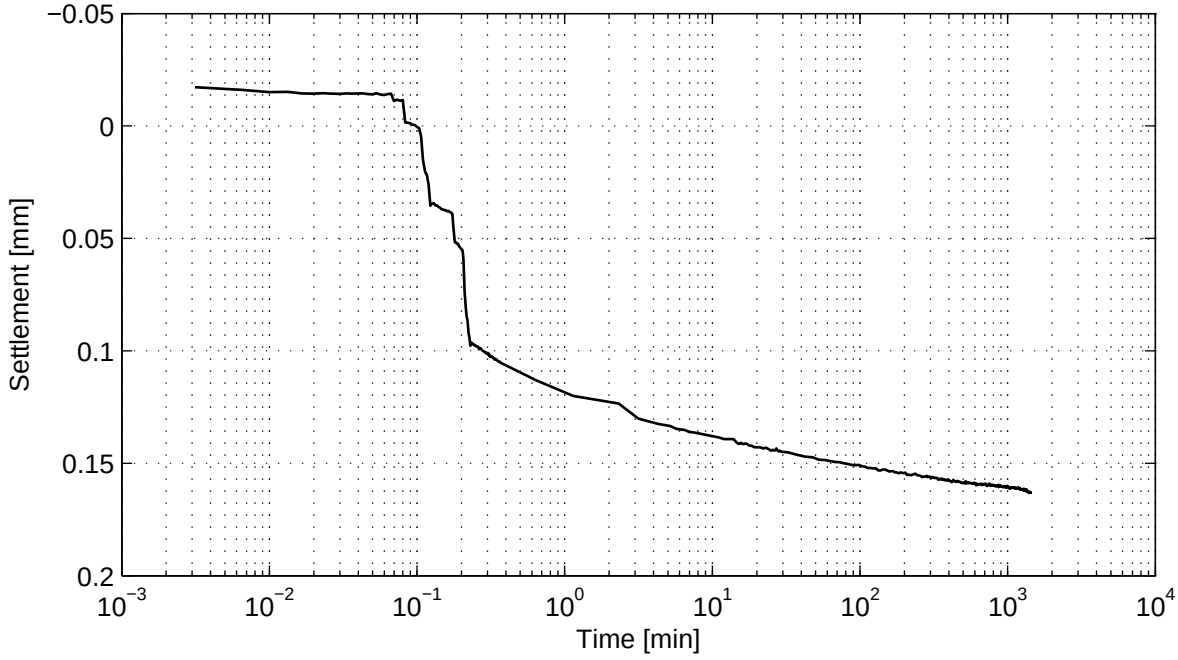
Casagrande method (page 1/4)

Load step 187 kPa



No calculation performed.

Load step 374 kPa

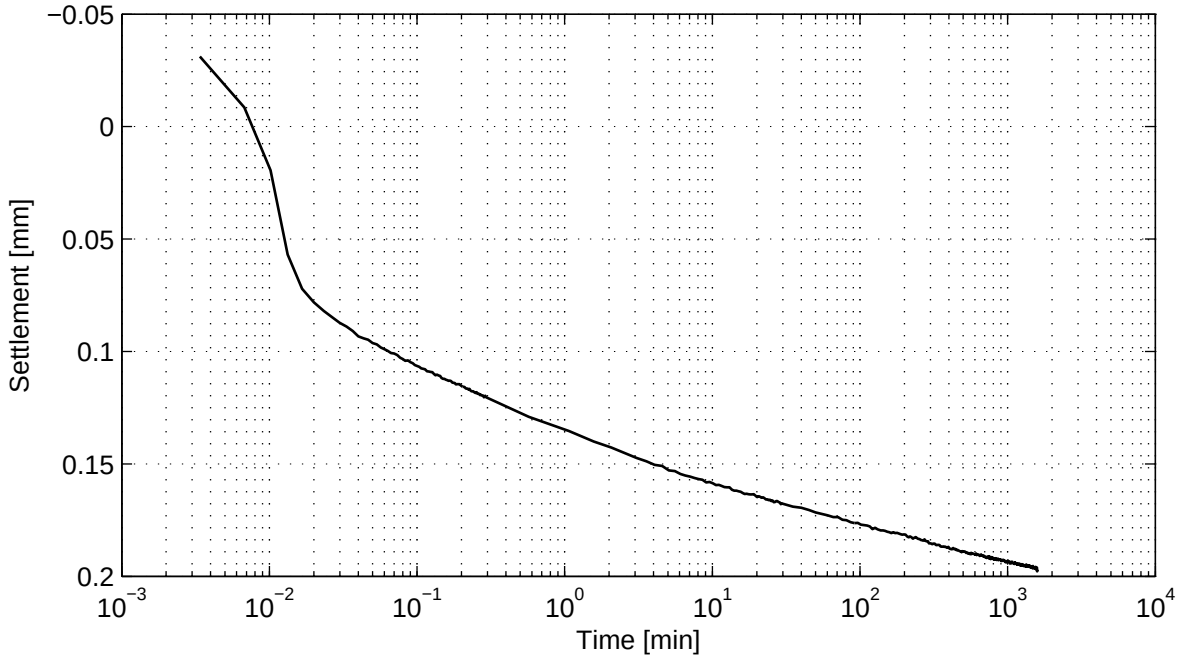


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

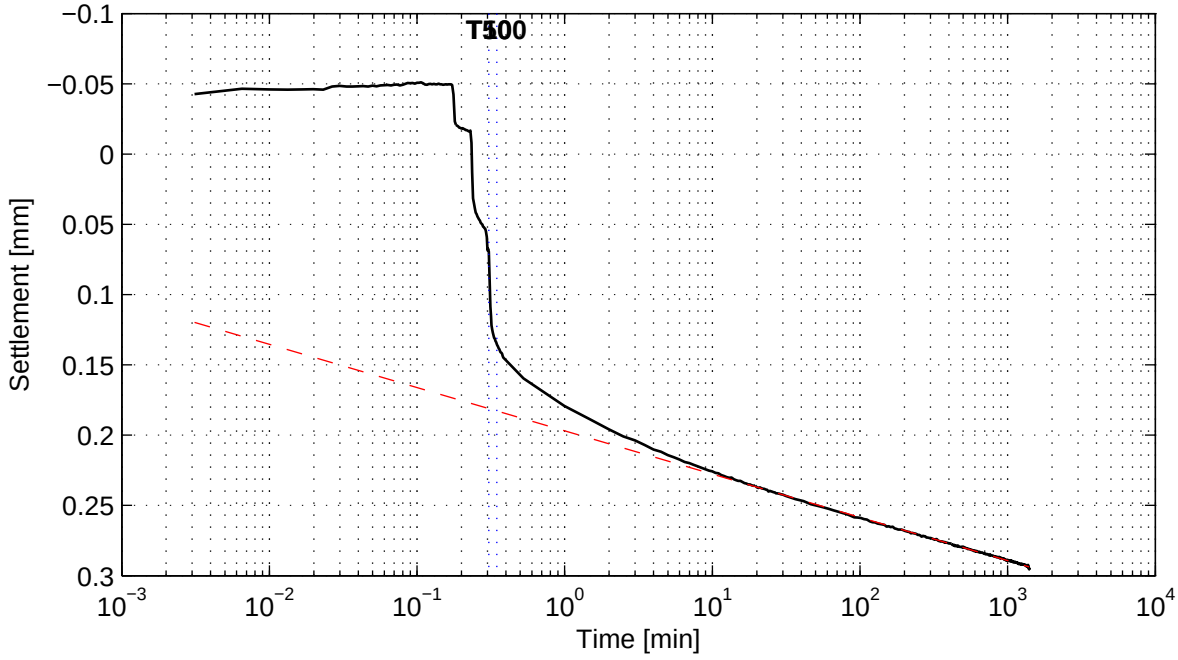
Casagrande method (page 2/4)

Load step 749 kPa



No calculation performed.

Load step 1500 kPa

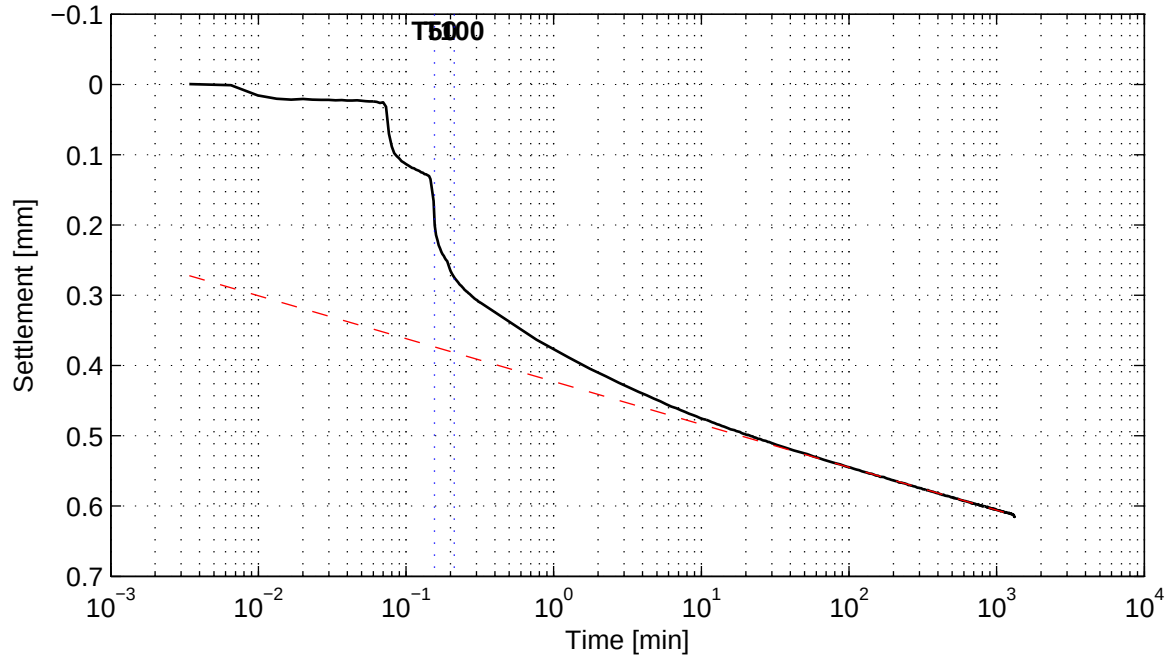


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

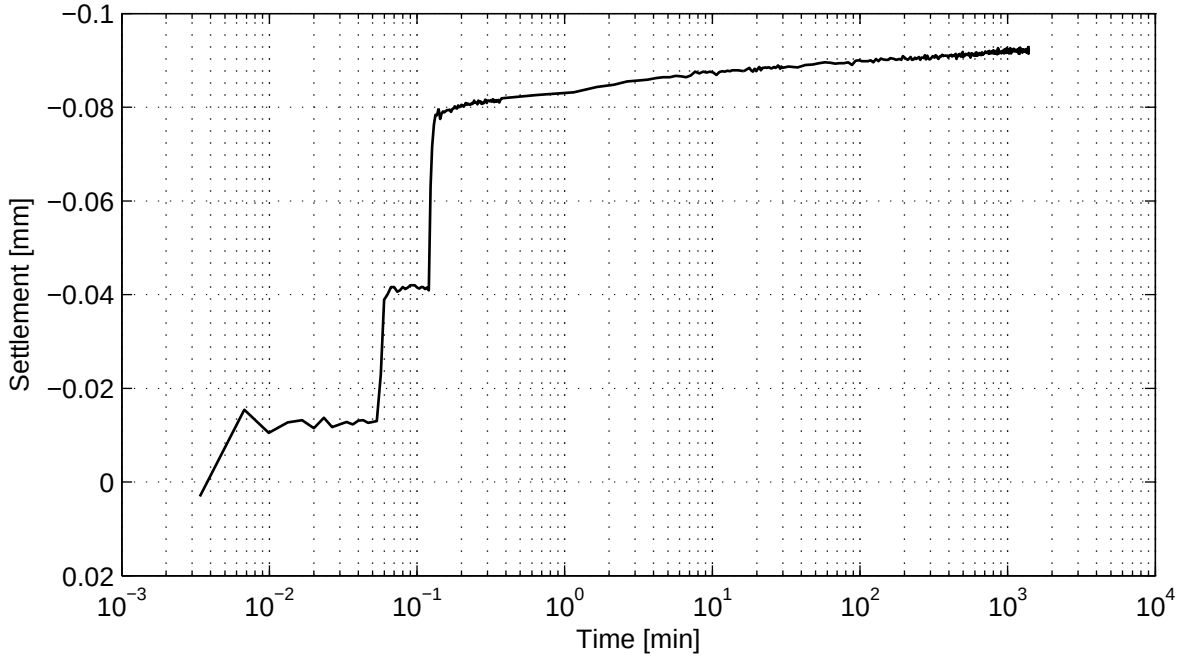
Casagrande method (page 3/4)

Load step 3000 kPa



No calculation performed.

Load step 1500 kPa

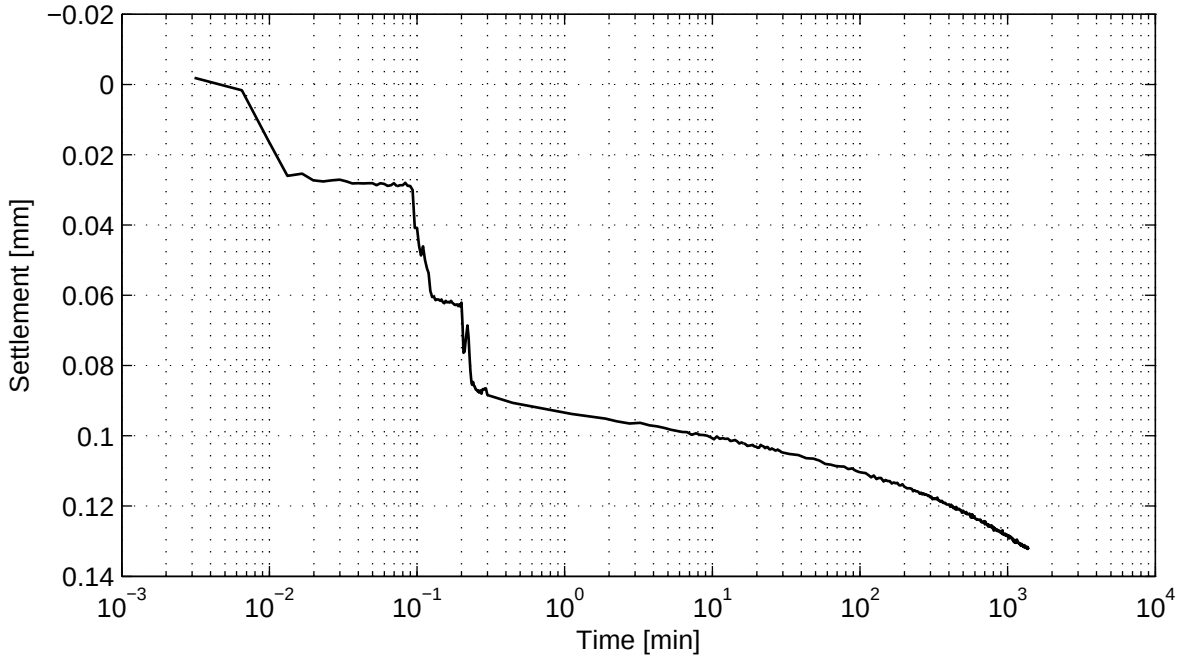


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 4/4)

Load step 3000 kPa



No calculation performed.

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Project Middelburg

Boring KB−104, sample KB−104_ST−8, depth −92.90 m till −93.40 m NAP

Oedometer test conform CEN ISO/TS 17892−5

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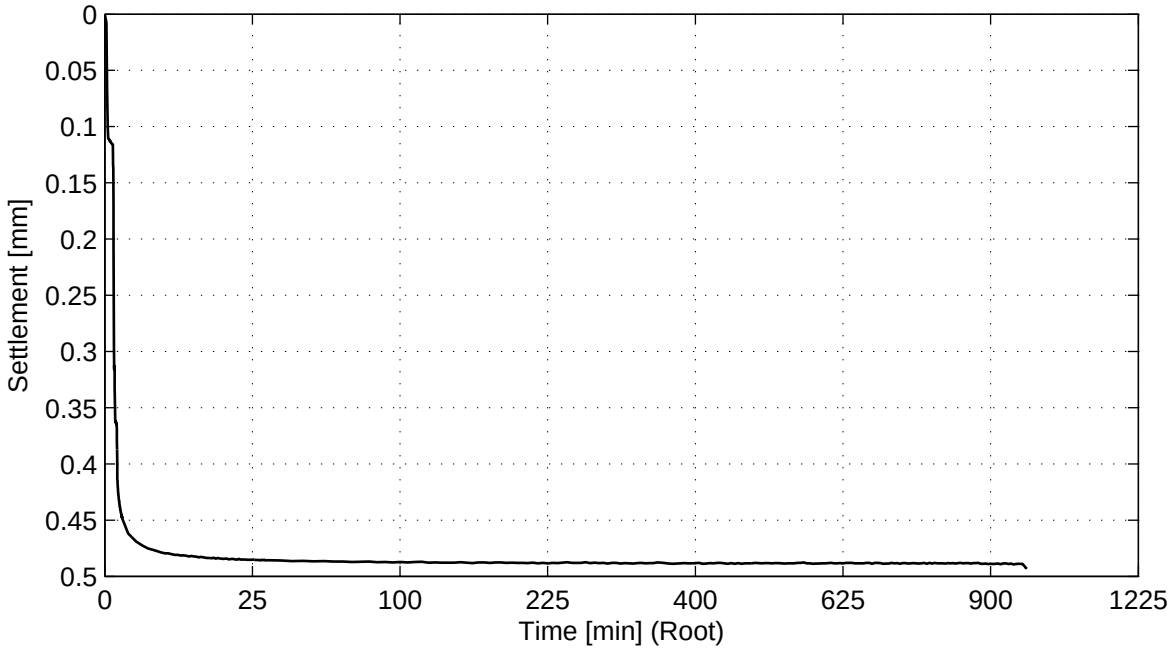
) Vrijgegeven door wb op 2011-07-29 15:47

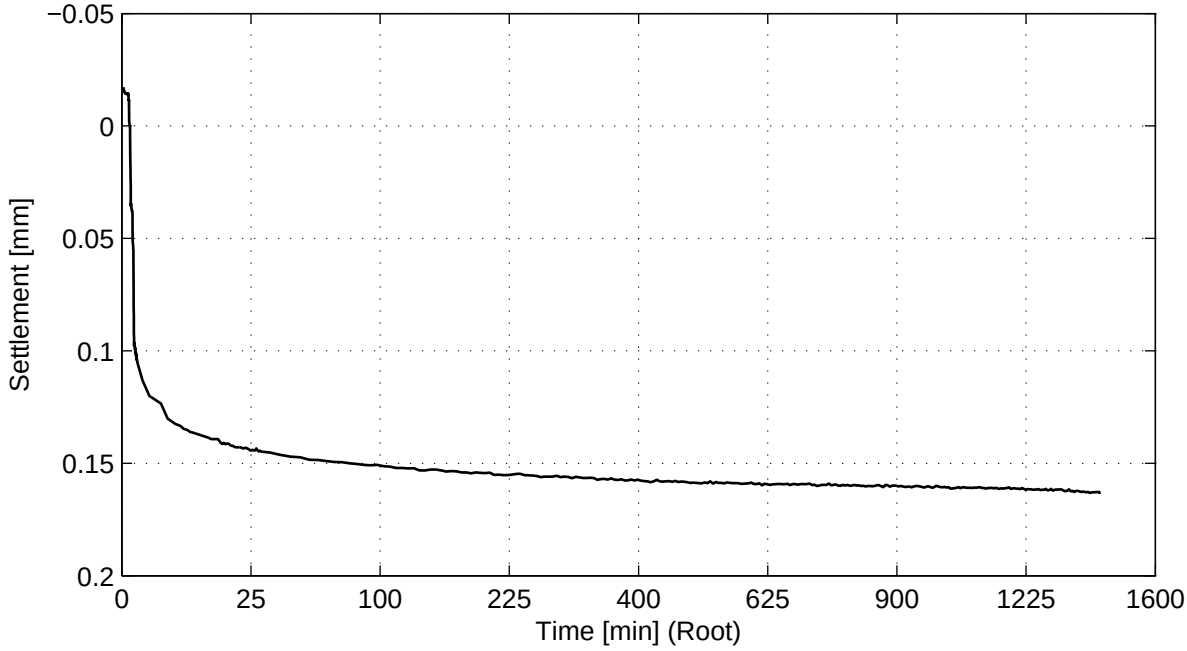
Taylor method (page 1/4)

Load step 187 kPa



No calculation performed.

Load step 374 kPa

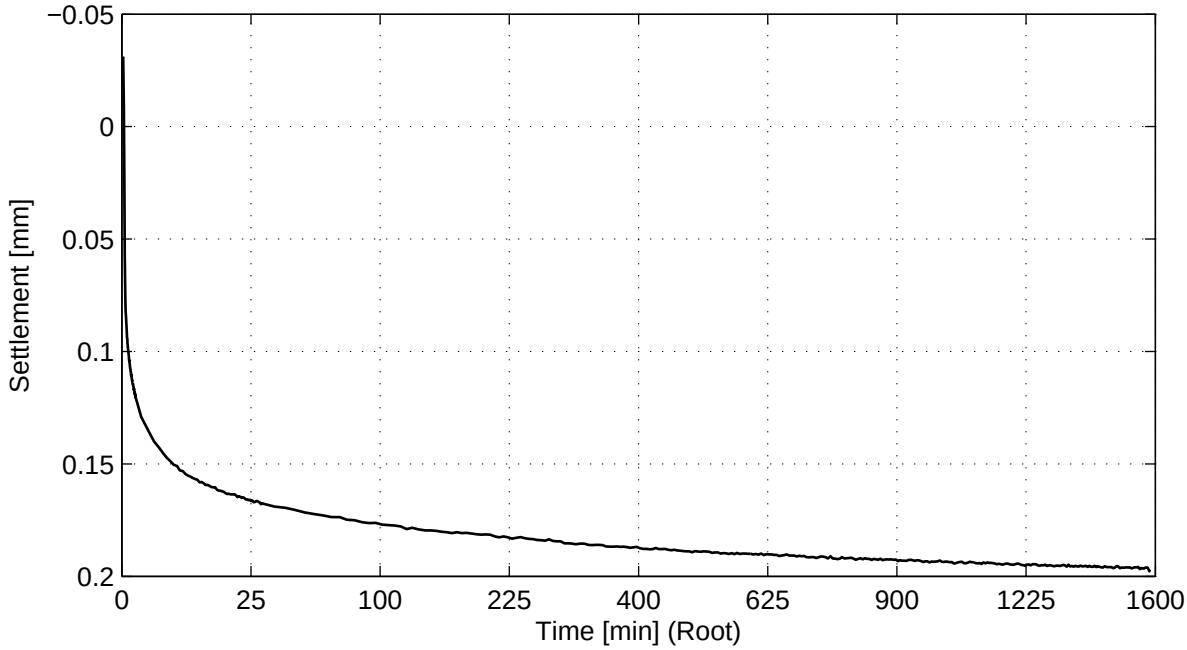


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

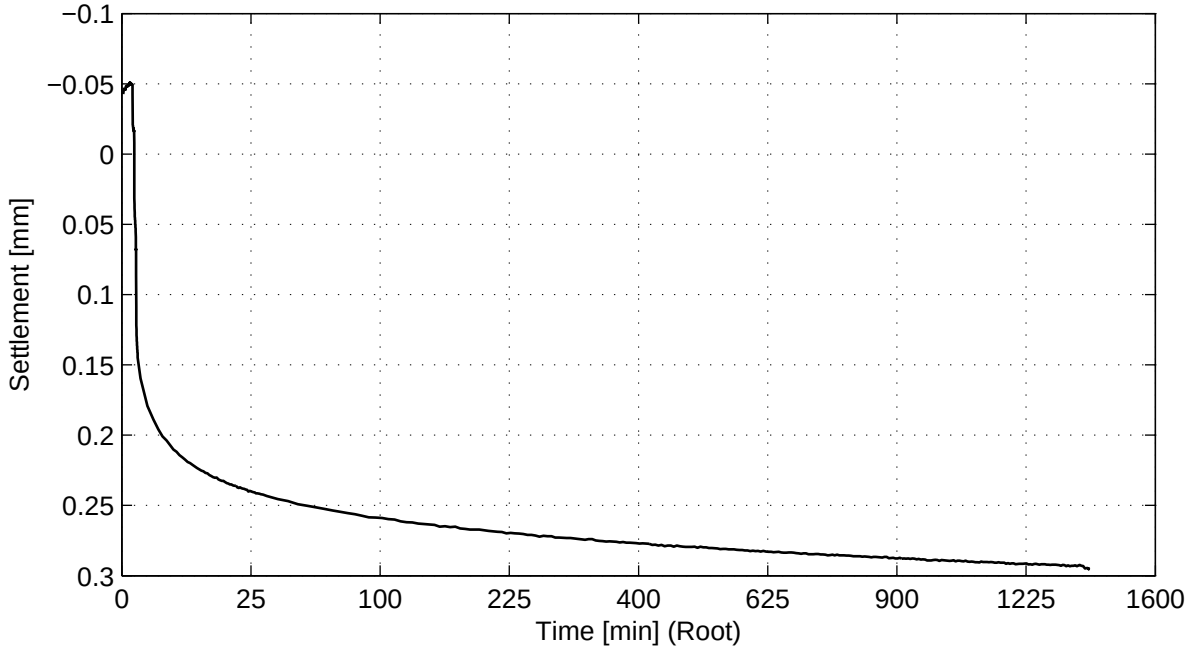
Taylor method (page 2/4)

Load step 749 kPa



No calculation performed.

Load step 1500 kPa

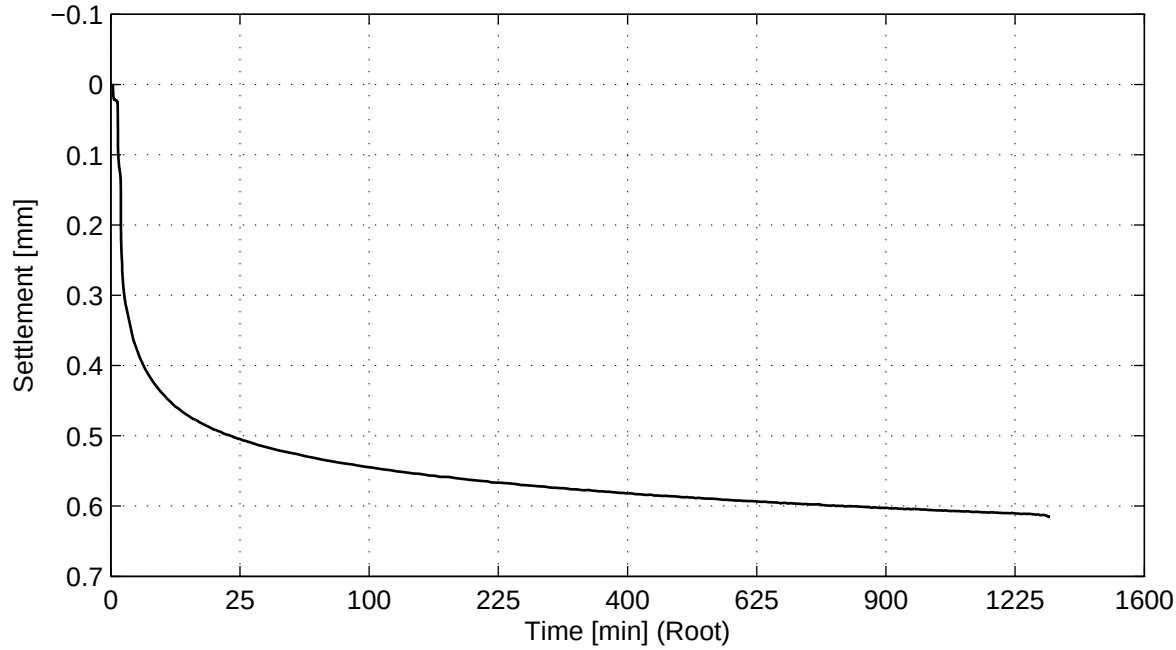


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

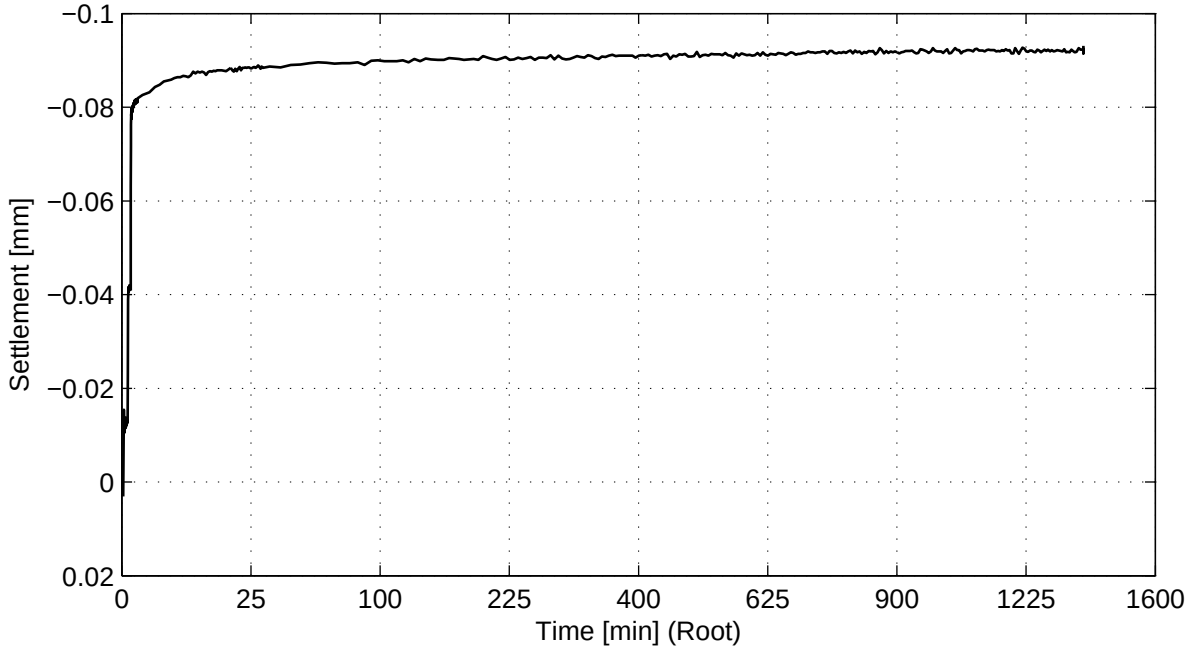
Taylor method (page 3/4)

Load step 3000 kPa



No calculation performed.

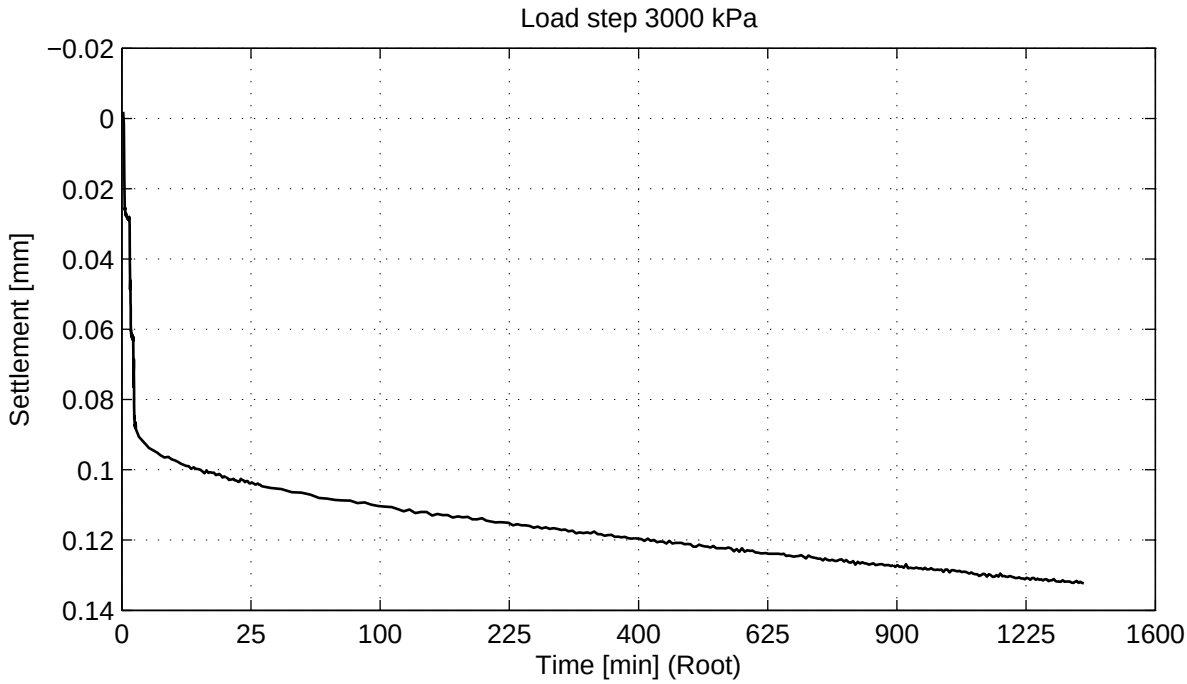
Load step 1500 kPa



No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

Taylor method (page 4/4)



No calculation performed.

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Boring KB−104, sample KB−104_ST−8, depth −92.90 m till −93.40 m NAP

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
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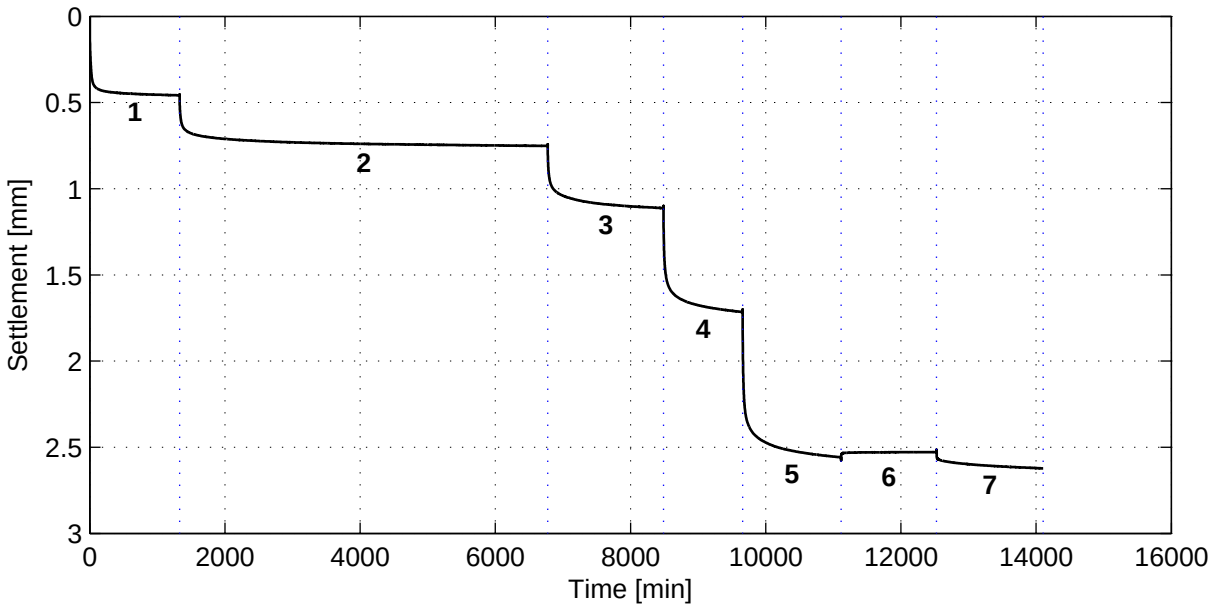
SAKB−104_ST−8	10

) Vrijgegeven door wb op 2011-07-29 15:47



General soil and test parameters

Soil description	Silty Clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	17.4
Initial volumetric weight − dry [kN/m^3]	12.4
Volumetric weight particles [kN/m^3]	25.8
Initial water content [%]	40.2
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.0
Final volumetric weight − wet [kN/m^3]	18.6
Final volumetric weight − dry [kN/m^3]	14.0
Final water content [%]	33.7
Final saturation [−]	1.0
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−13
Enddate	2011−07−24
Sample disturbance index	–
Lab temperature [° C]	20.2
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	18
2	35
3	70
4	139
5	281
6	140
7	281

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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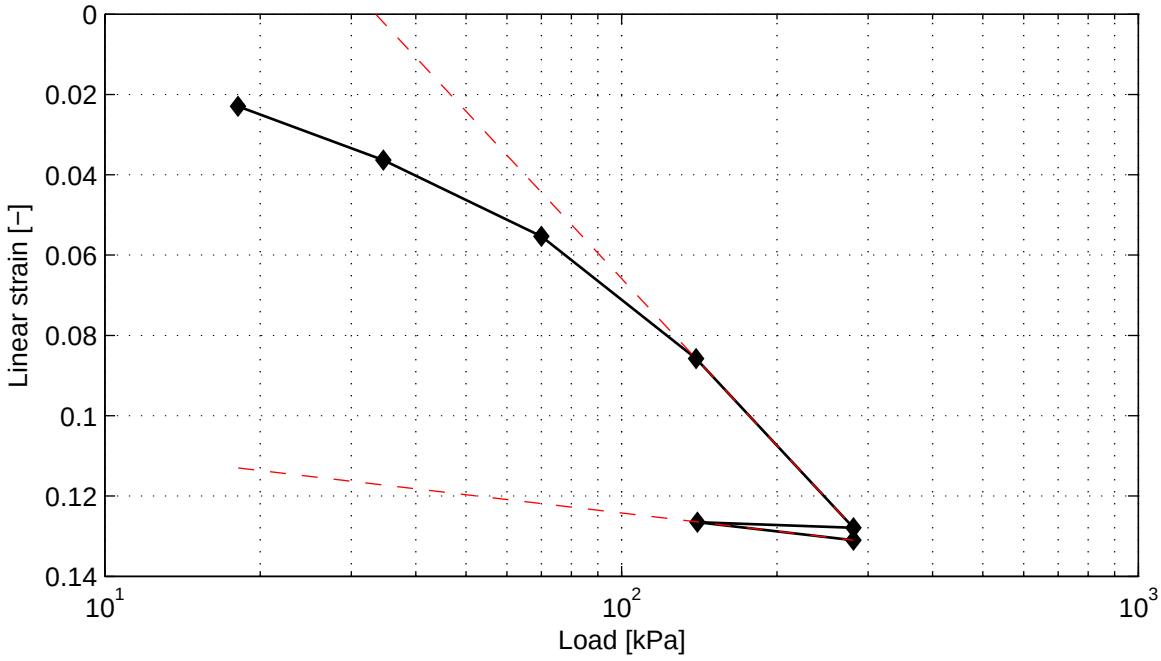
Boring KB−104A, sample KB−104A_ST−3, depth −9.00 m till −9.60 m GL

Oedometer test conform CEN ISO/TS 17892−5

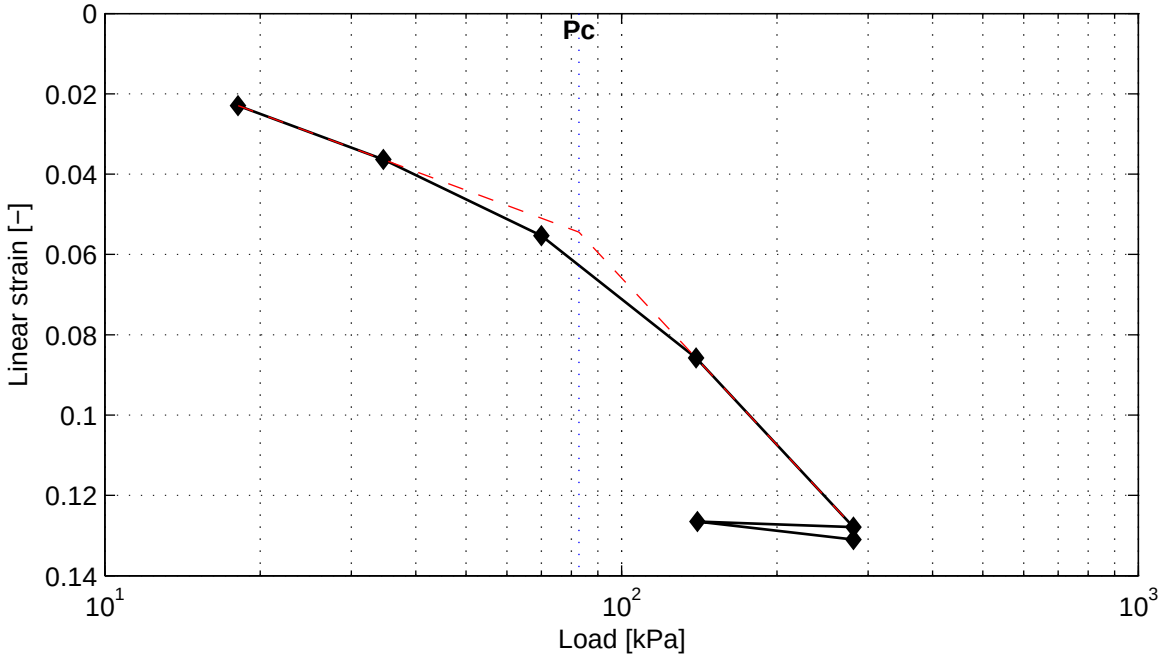
project	seen
1205088.1	–
appendix	page
SAKB−104A_ST−3	1

) Vrijgegeven door wb op 2011-07-29 15:46

Bjerrum method



Cr = 3.1e−002 Ca = 6.5e−003 Vo = 2.08
Cc = 2.9e−001

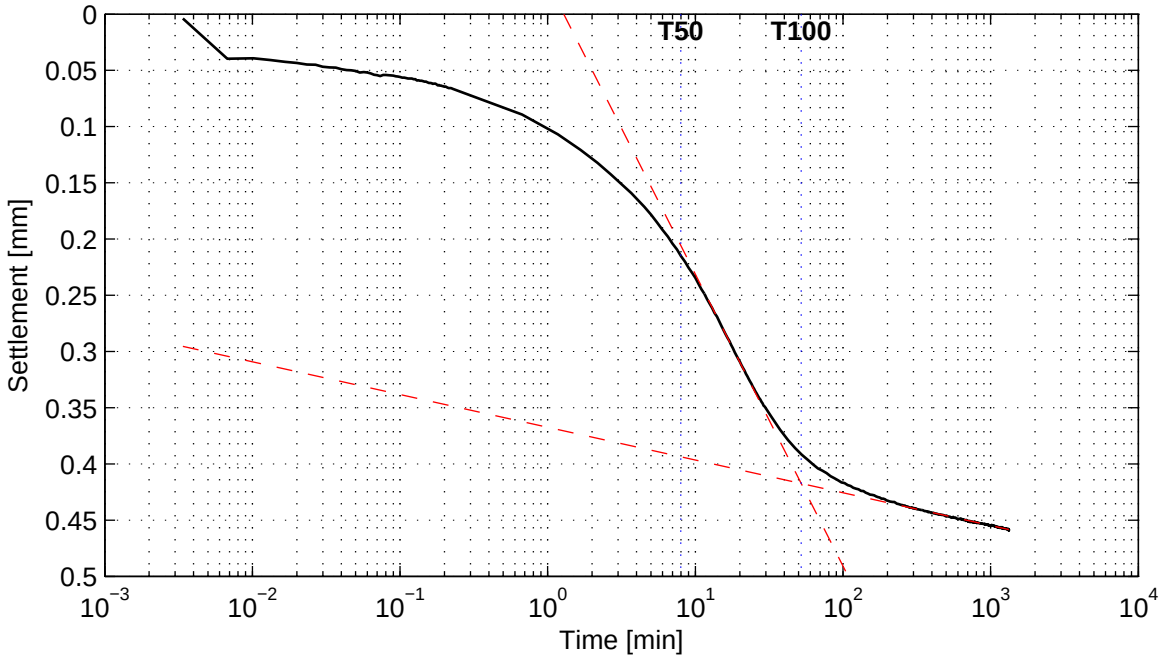


Pc = 82.8 kPa

) Vrijgegeven door wb op 2011-07-29 15:46

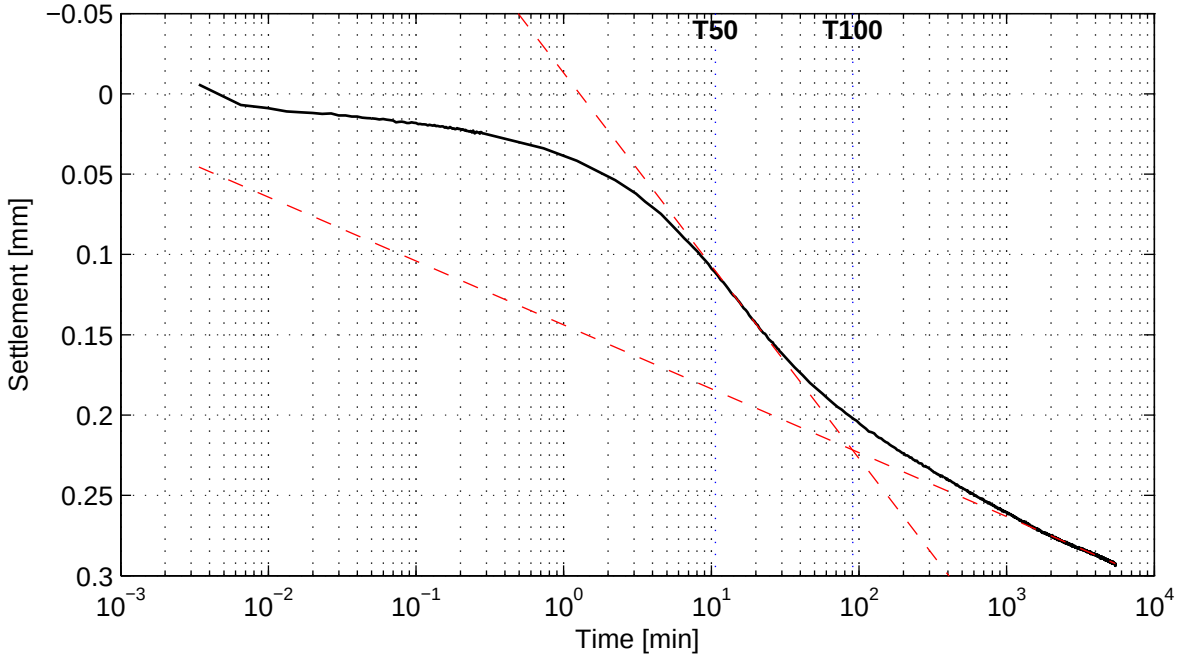
Casagrande method (page 1/4)

Load step 18 kPa



Cv = 3.1e−008 m^2/s Mv = 1.1e−003 m^2/kN
Ca = − K = 3.4e−010 m/s

Load step 35 kPa



Cv = 2.2e−008 m^2/s Mv = 6.9e−004 m^2/kN
Ca = − K = 1.5e−010 m/s

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Oedometer test conform CEN ISO/TS 17892−5

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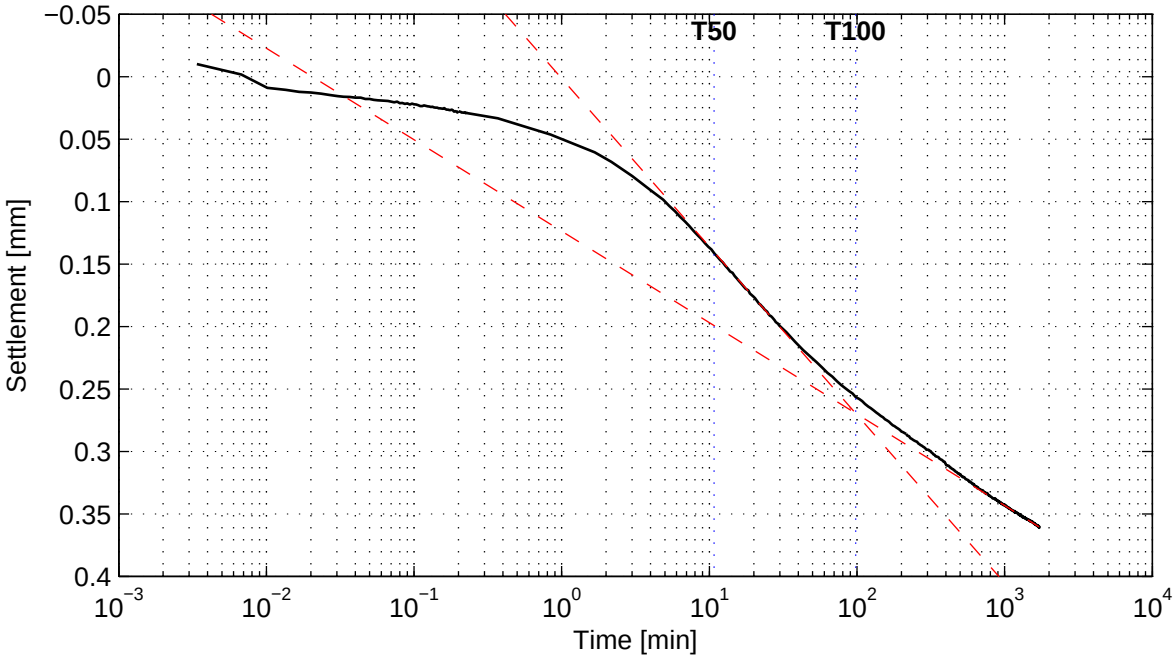
SAKB−104A_ST−3	3

) Vrijgegeven door wb op 2011-07-29 15:46

Casagrande method (page 2/4)

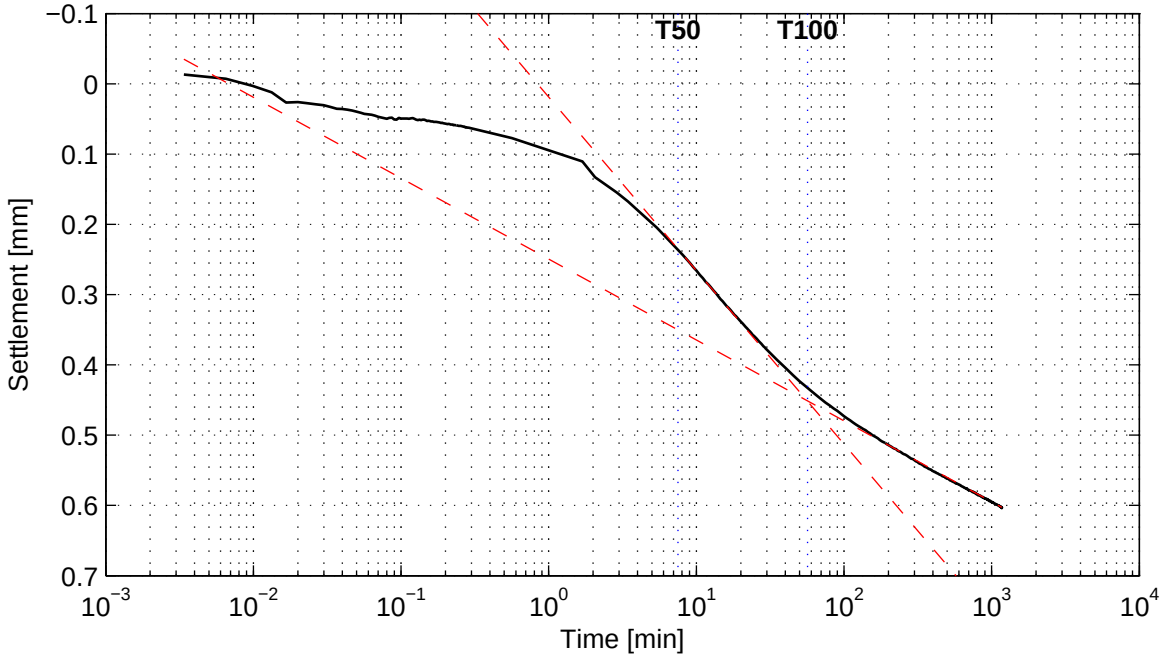
Load step 70 kPa



Cv = 2.1e−008 m^2/s
Ca = −

Mv = 3.8e−004 m^2/kN
K = 7.9e−011 m/s

Load step 139 kPa



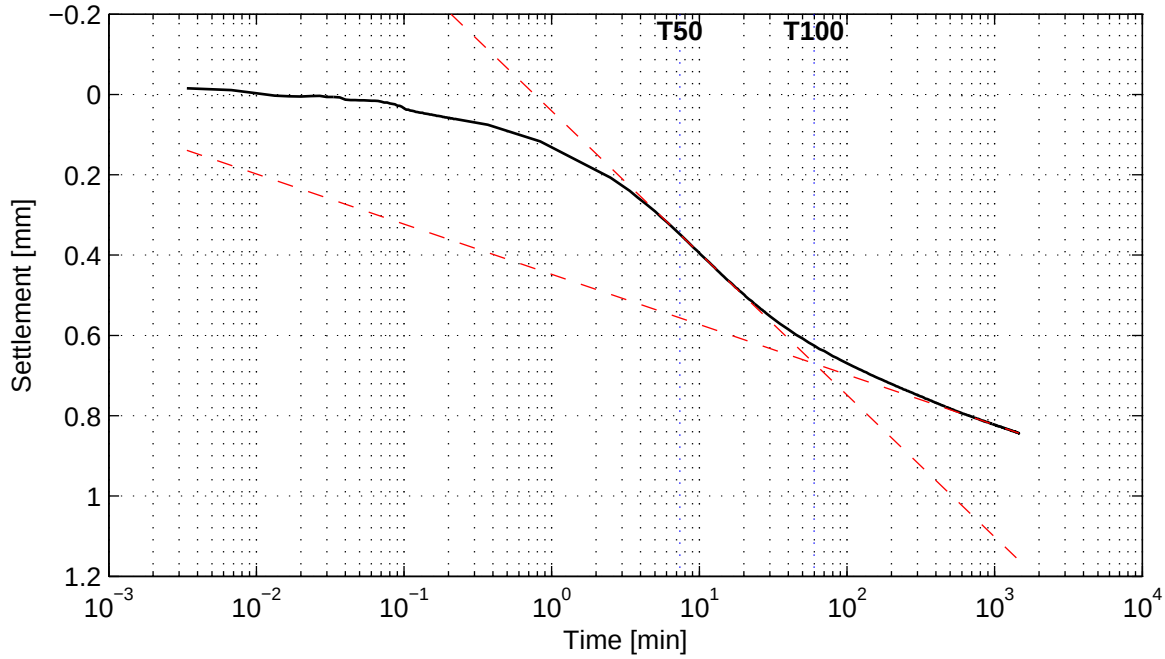
Cv = 2.9e−008 m^2/s
Ca = 6.1e−003

Mv = 3.3e−004 m^2/kN
K = 9.4e−011 m/s

) Vrijgegeven door wb op 2011-07-29 15:46

Casagrande method (page 3/4)

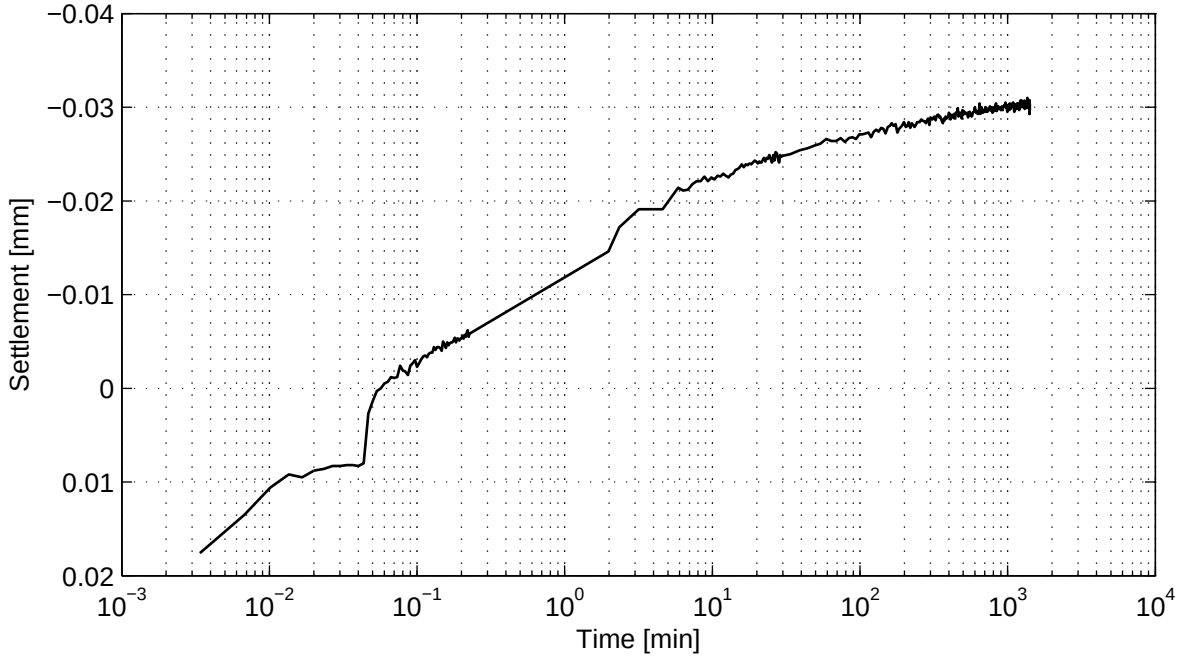
Load step 281 kPa



Cv = 2.7e−008 m^2/s
Ca = 6.8e−003

Mv = 2.5e−004 m^2/kN
K = 6.7e−011 m/s

Load step 140 kPa

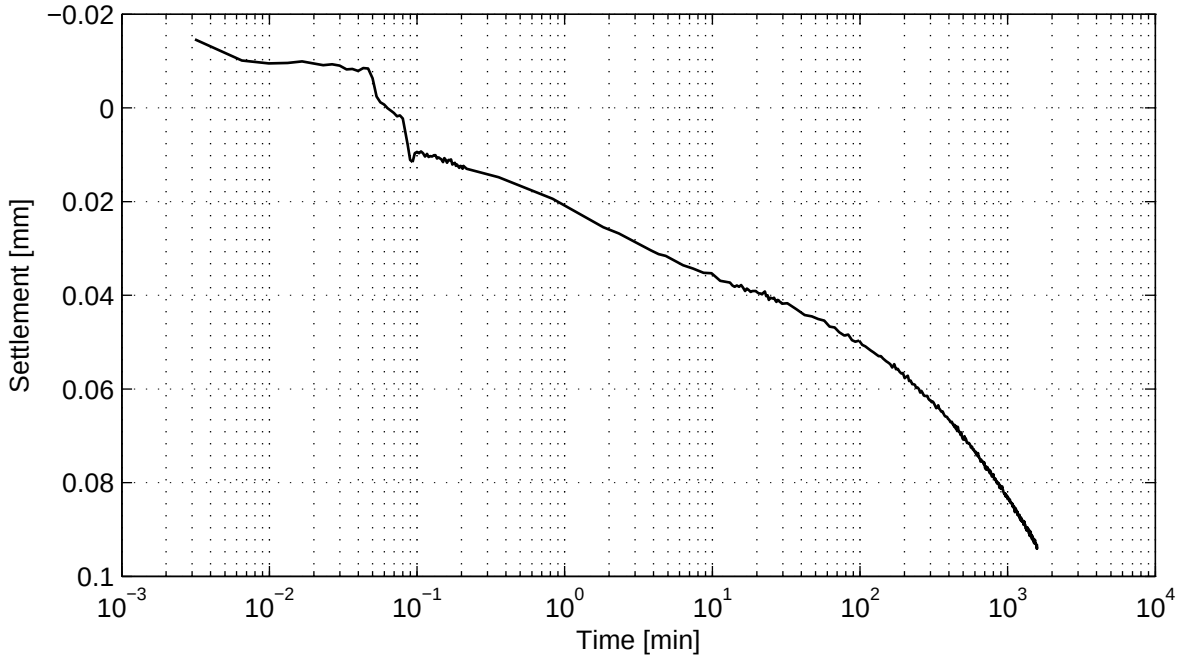


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:46

Casagrande method (page 4/4)

Load step 281 kPa



No calculation performed.

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Boring KB−104A, sample KB−104A_ST−3, depth −9.00 m till −9.60 m GL

Oedometer test conform CEN ISO/TS 17892−5

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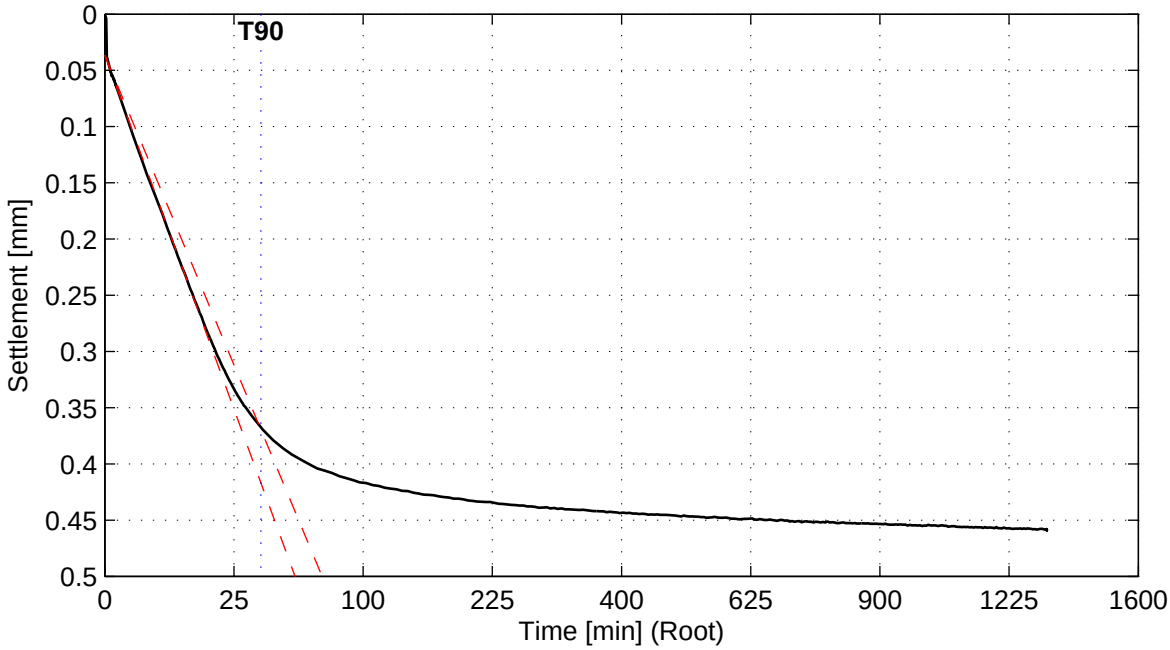
SAKB−104A_ST−3	6

) Vrijgegeven door wb op 2011-07-29 15:46

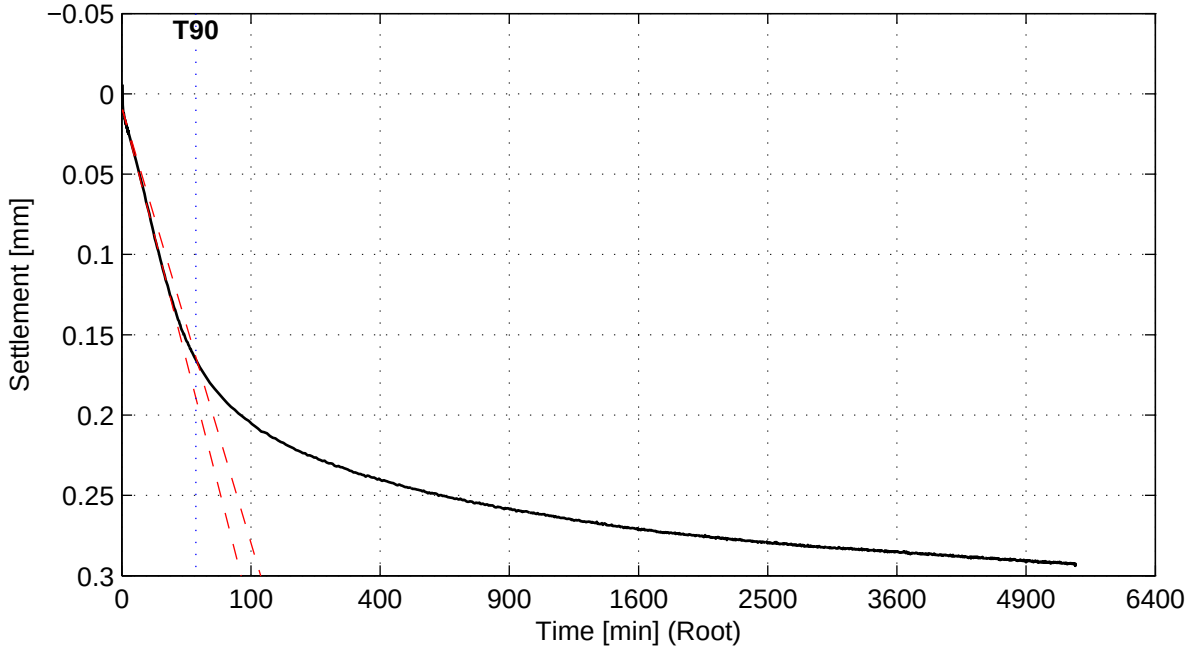
Taylor method (page 1/4)

Load step 18 kPa



Cv = 2.9e−008 m^2/s

Load step 35 kPa

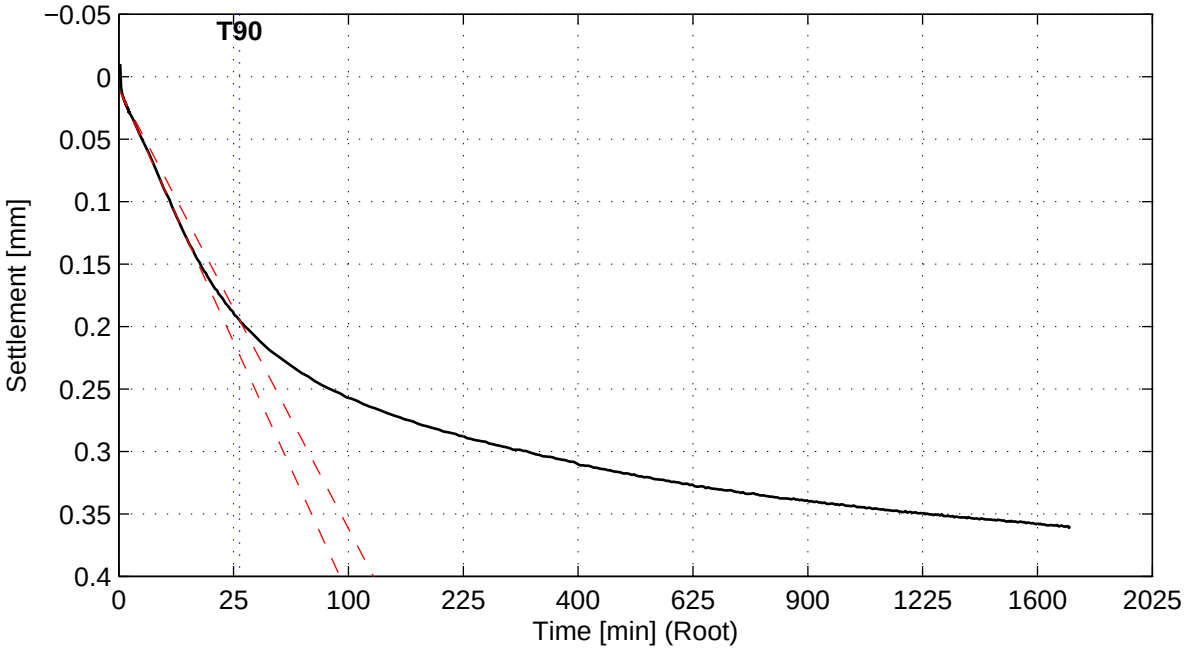


Cv = 3.1e−008 m^2/s

) Vrijgegeven door wb op 2011-07-29 15:46

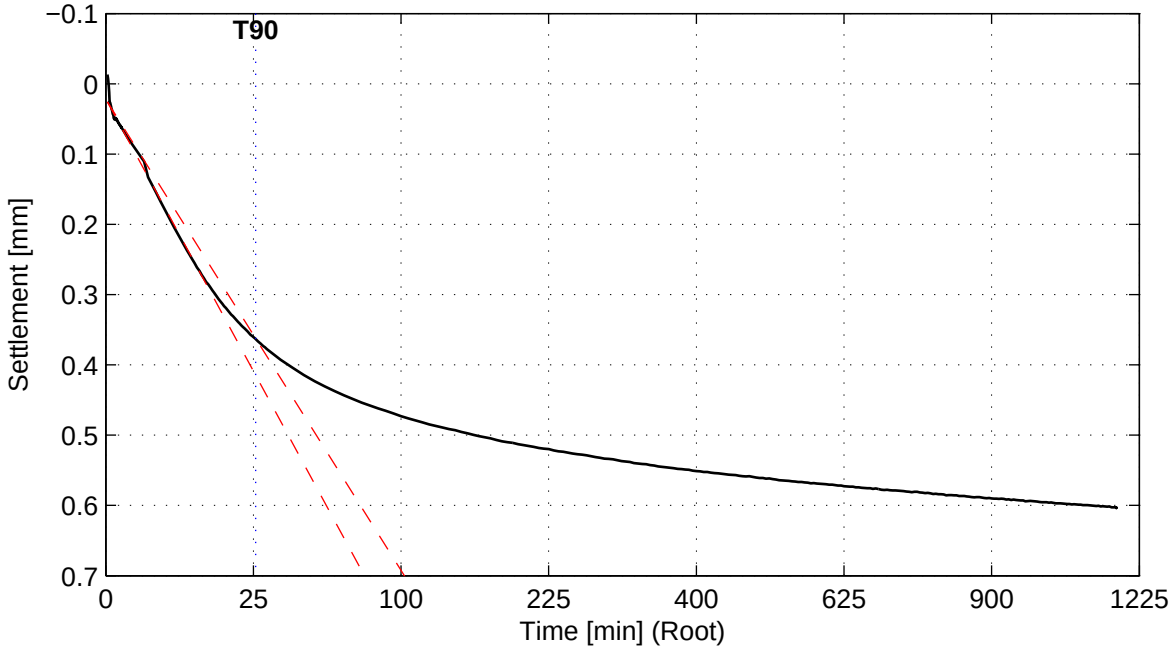
Taylor method (page 2/4)

Load step 70 kPa



Cv = 3.6e−008 m^2/s

Load step 139 kPa

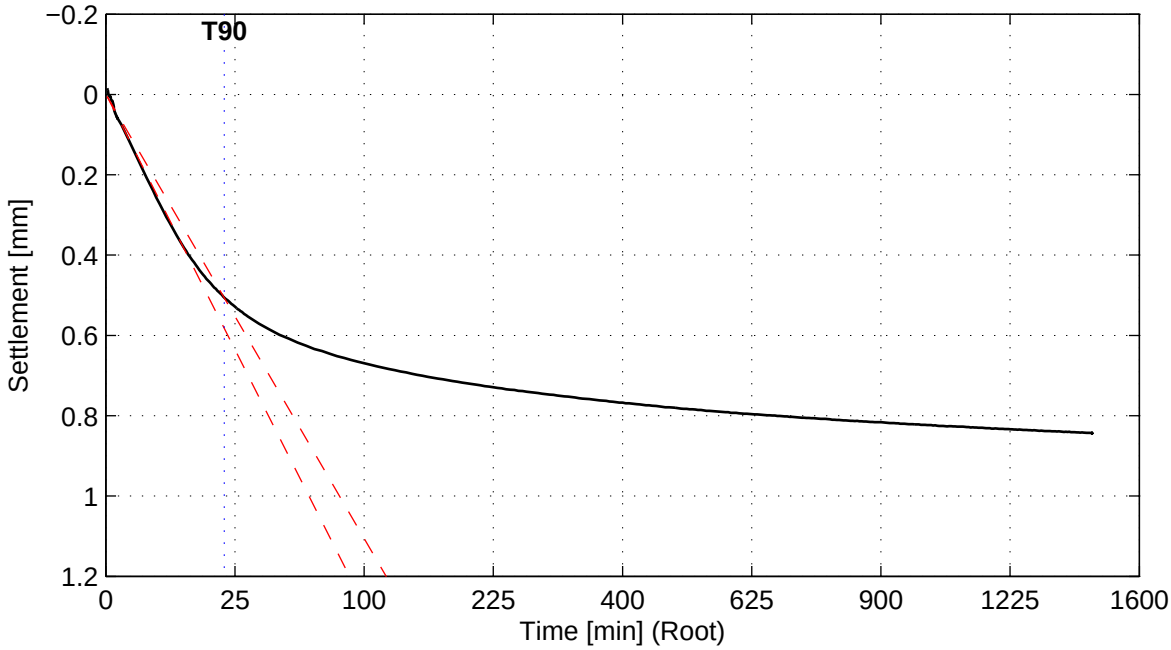


Cv = 3.6e−008 m^2/s

) Vrijgegeven door wb op 2011-07-29 15:46

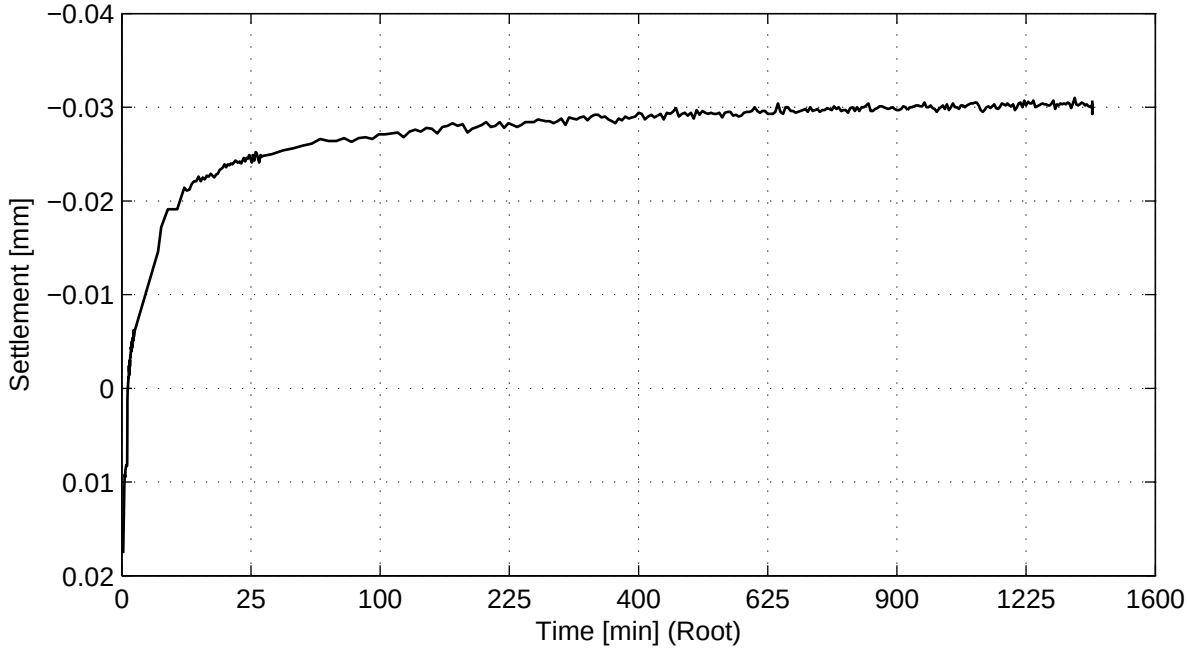
Taylor method (page 3/4)

Load step 281 kPa



Cv = 4.1e−008 m^2/s

Load step 140 kPa



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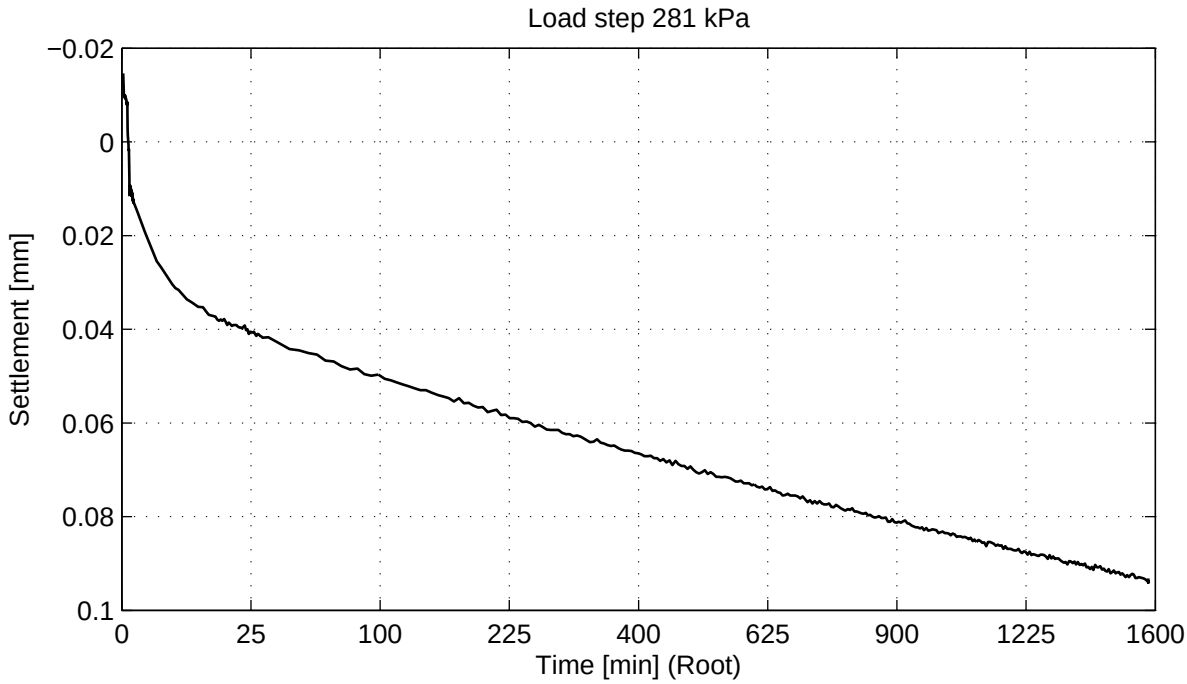
) Vrijgegeven door wb op 2011-07-29 15:46

Taylor method (page 4/4)



No calculation performed.

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Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
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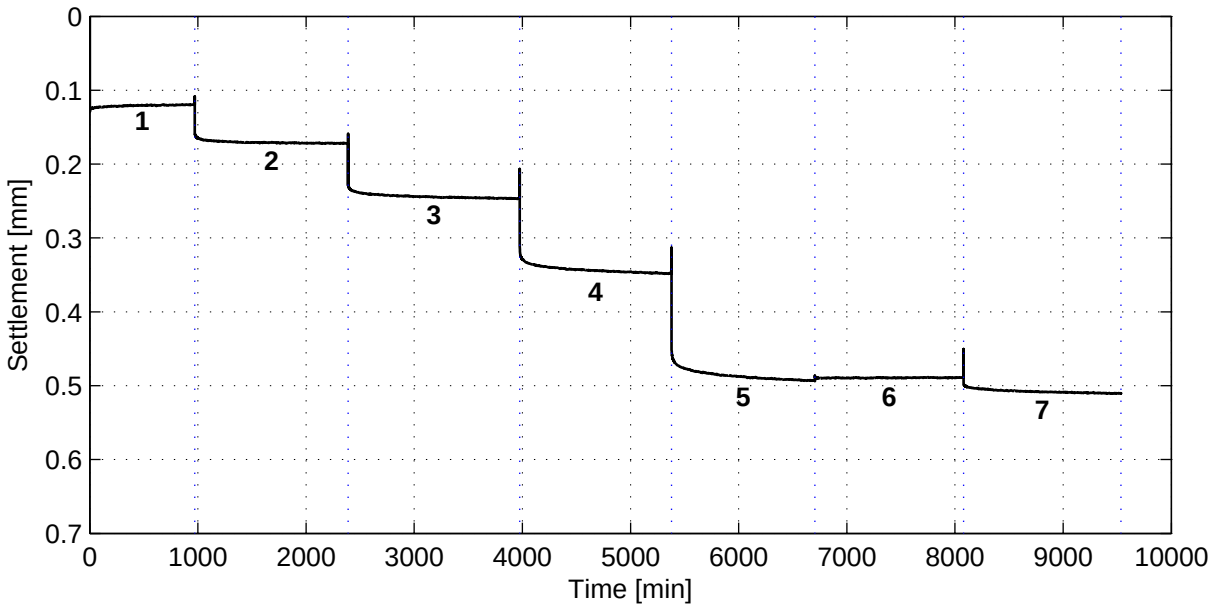
) Vrijgegeven door wb op 2011-07-29 15:46



General soil and test parameters

Soil description	Silty Sand (SM)
Initial volumetric weight − wet [kN/m^3]	19.6
Initial volumetric weight − dry [kN/m^3]	15.5
Volumetric weight particles [kN/m^3]	25.8
Initial water content [%]	26.3
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	1.0
Final volumetric weight − wet [kN/m^3]	19.8
Final volumetric weight − dry [kN/m^3]	15.9
Final water content [%]	24.4
Final saturation [−]	1.0
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−20
Enddate	2011−07−27
Sample disturbance index	–
Lab temperature [° C]	19.0
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	56
2	112
3	222
4	443
5	885
6	443
7	885

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

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Oedometer test conform CEN ISO/TS 17892−5

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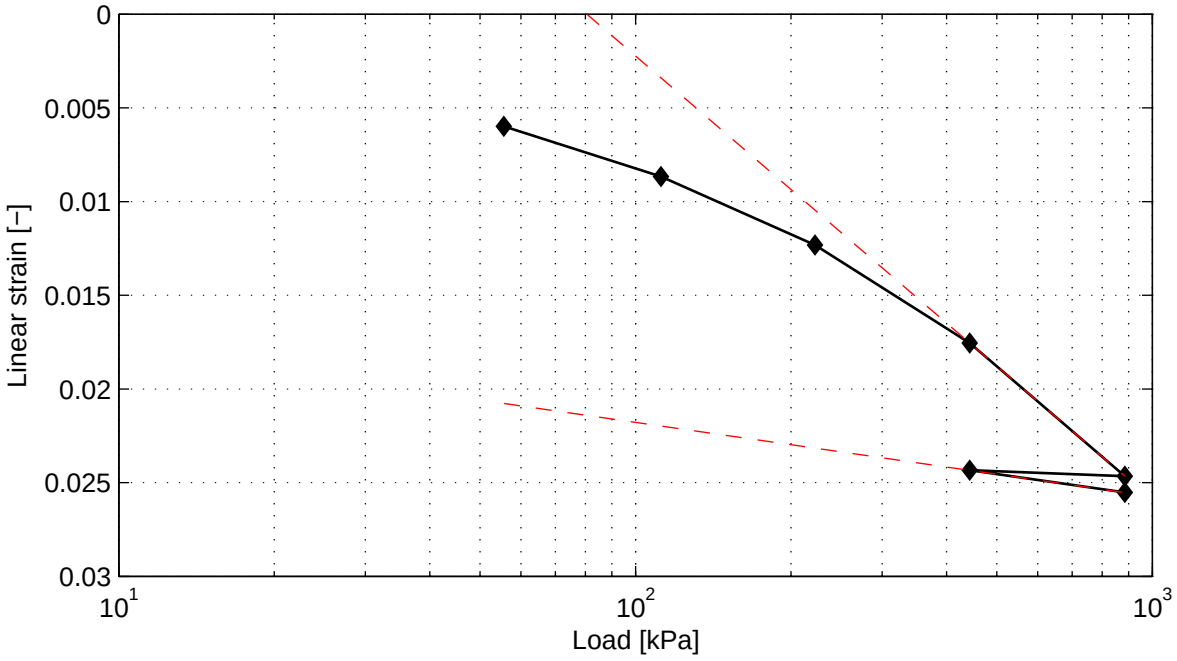
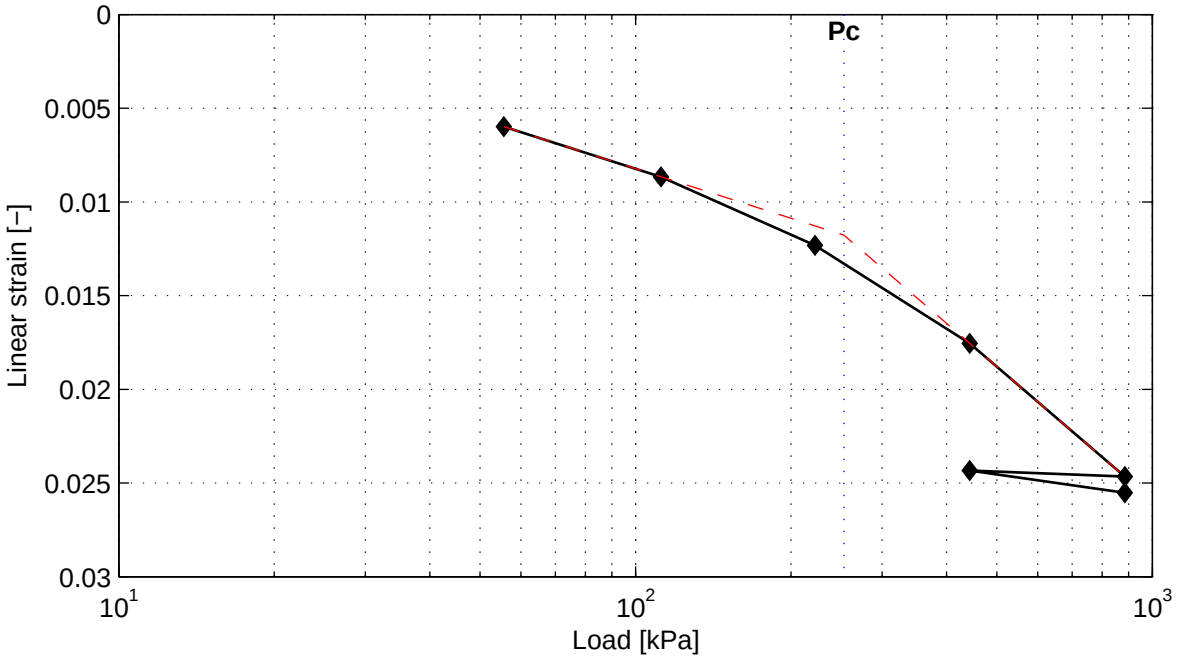
) Vrijgegeven door wb op 2011-07-29 15:47

Bjerrum method



Cr = 6.5e−003 Ca = 6.1e−004 Vo = 1.66
Cc = 3.9e−002



Pc = 253.0 kPa

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2011−07−29	Ess

Project Middelburg

Boring KB−104A, sample KB−104A_ST−5, depth −20.40 m till −21.00 m GL

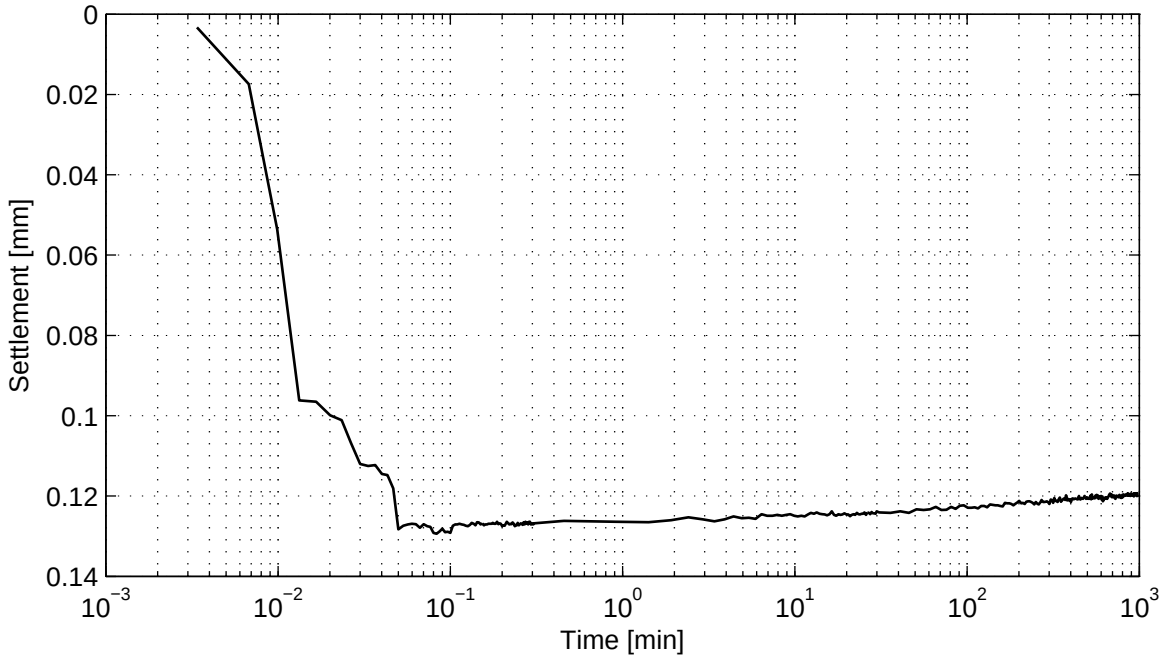
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	–
appendix	page
SAKB−104A_ST−5	2

) Vrijgegeven door wb op 2011-07-29 15:47

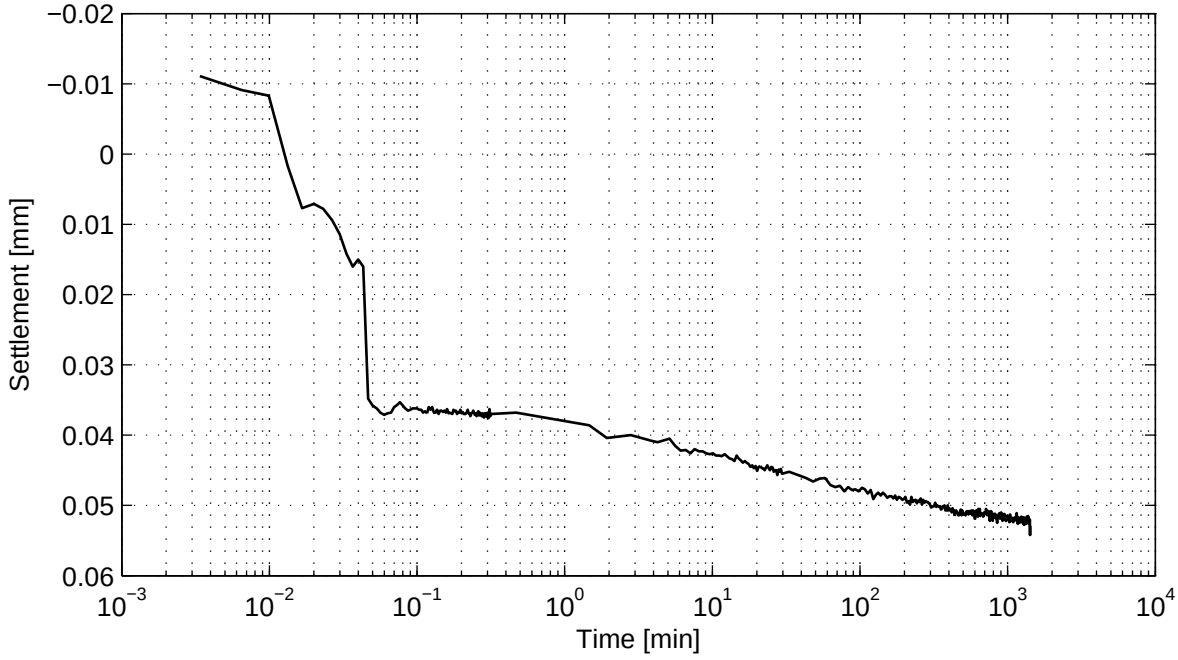
Casagrande method (page 1/4)

Load step 56 kPa



No calculation performed.

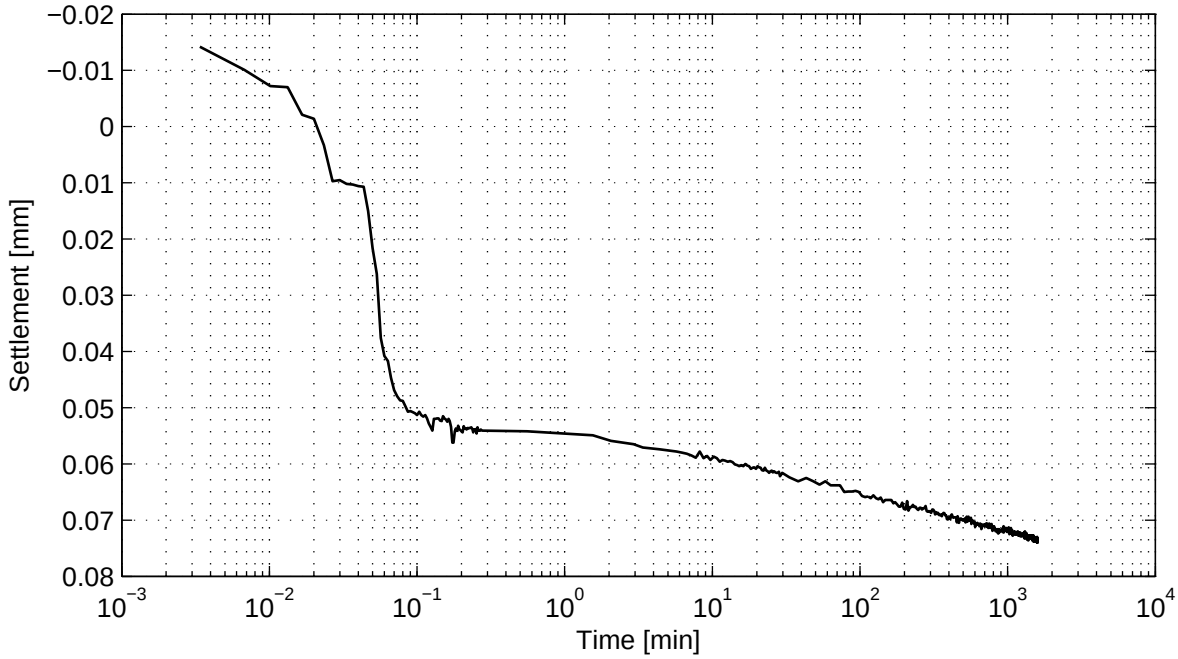
Load step 112 kPa



No calculation performed.

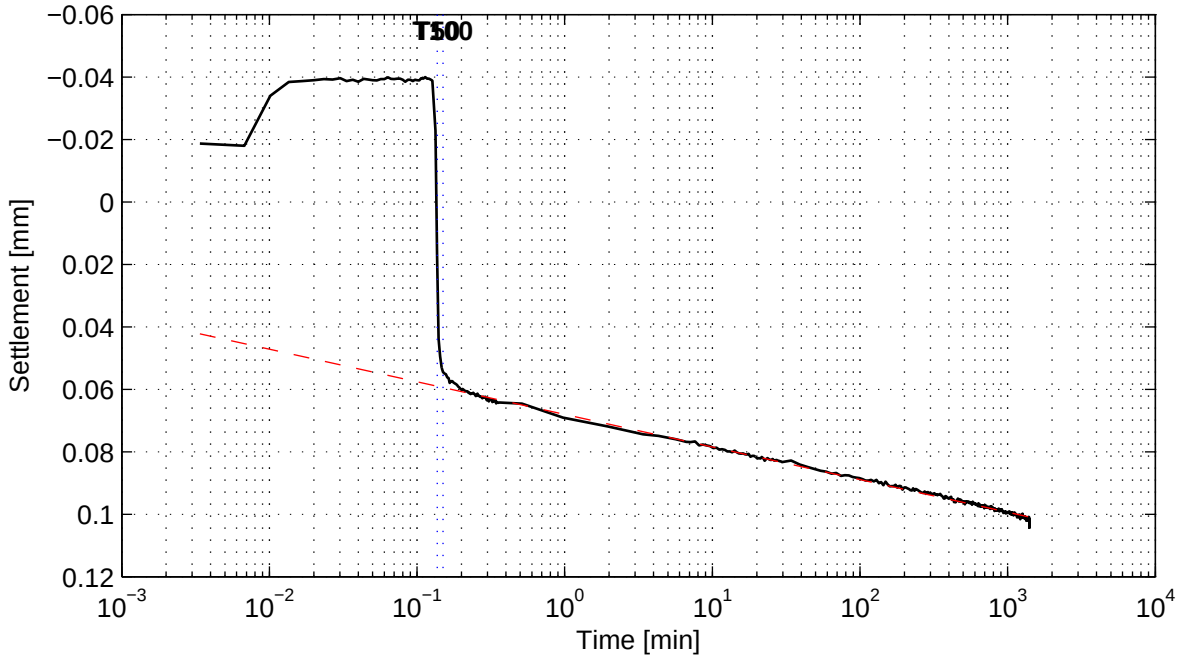
Casagrande method (page 2/4)

Load step 222 kPa



No calculation performed.

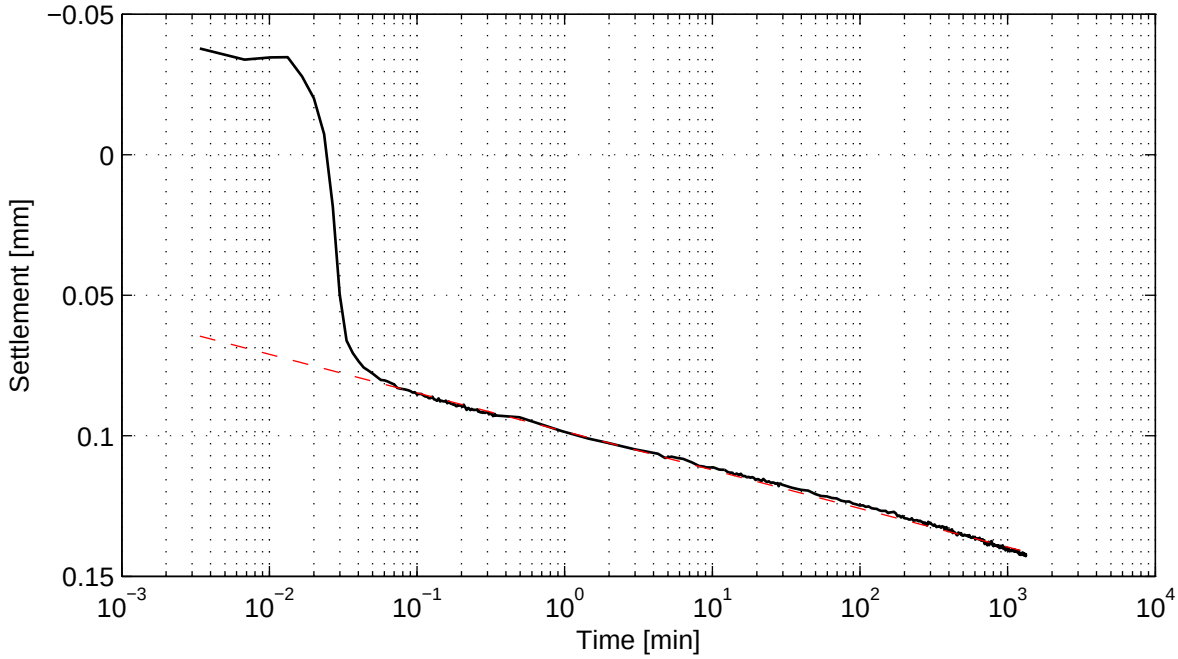
Load step 443 kPa



No calculation performed.

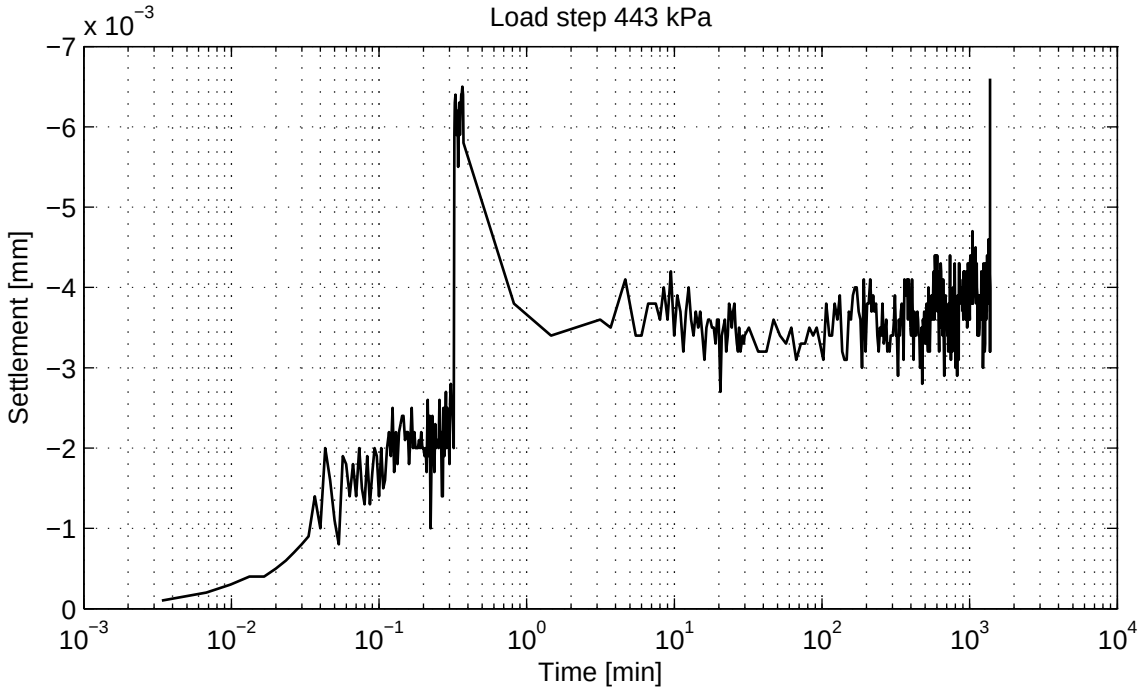
Casagrande method (page 3/4)

Load step 885 kPa



No calculation performed.

Load step 443 kPa



No calculation performed.

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Boring KB−104A, sample KB−104A_ST−5, depth −20.40 m till −21.00 m GL

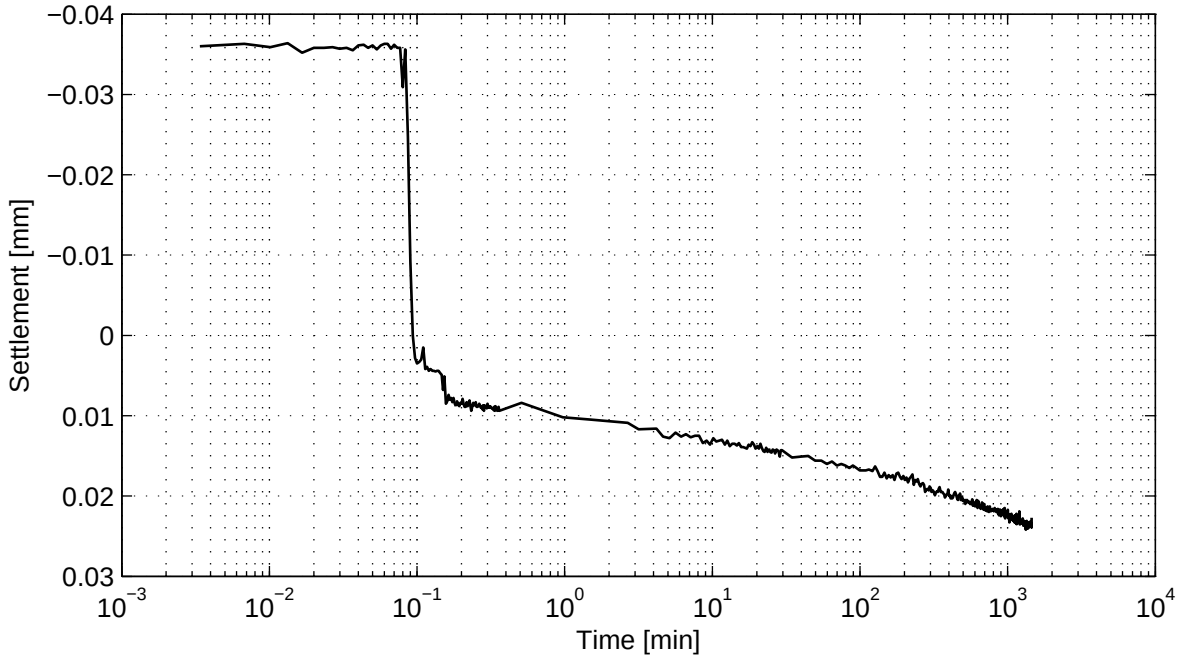
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104A_ST−5	5

) Vrijgegeven door wb op 2011-07-29 15:47

Casagrande method (page 4/4)

Load step 885 kPa



No calculation performed.

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2011−07−29	Ess

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Boring KB−104A, sample KB−104A_ST−5, depth −20.40 m till −21.00 m GL

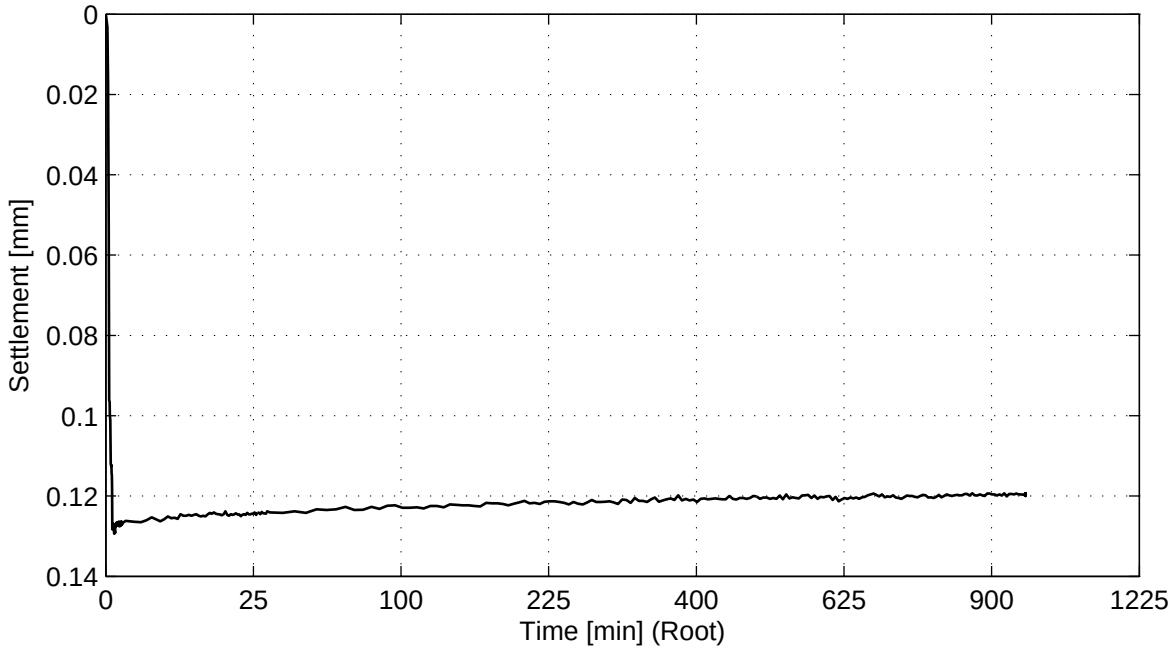
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104A_ST−5	6

) Vrijgegeven door wb op 2011-07-29 15:47

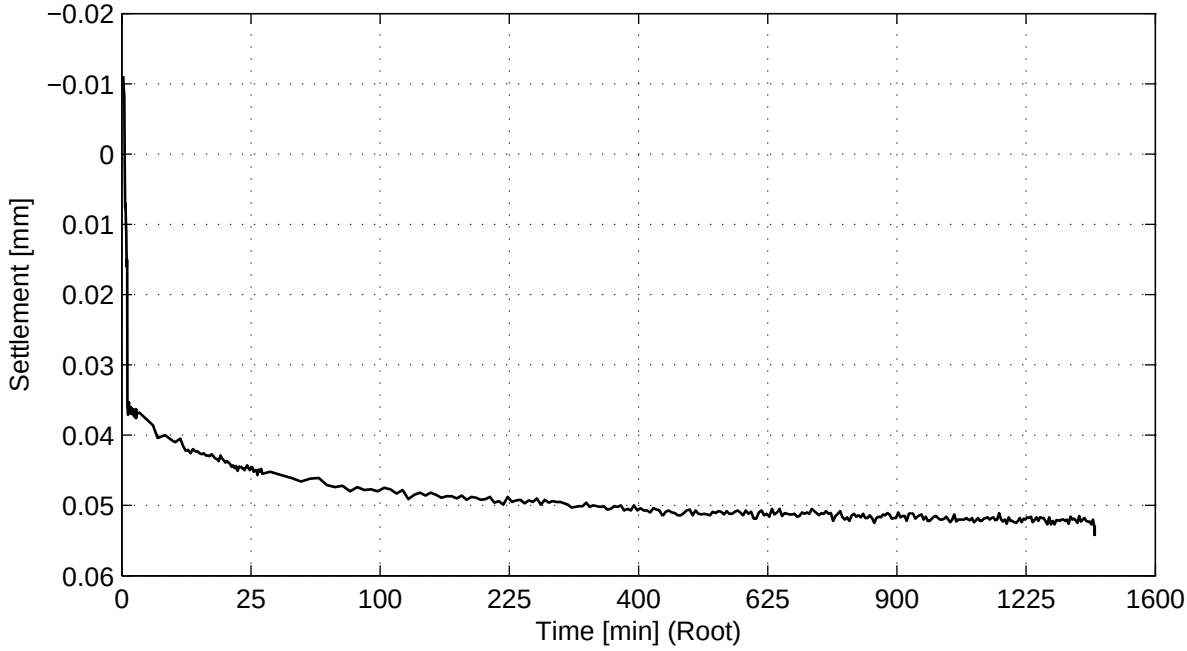
Taylor method (page 1/4)

Load step 56 kPa



No calculation performed.

Load step 112 kPa

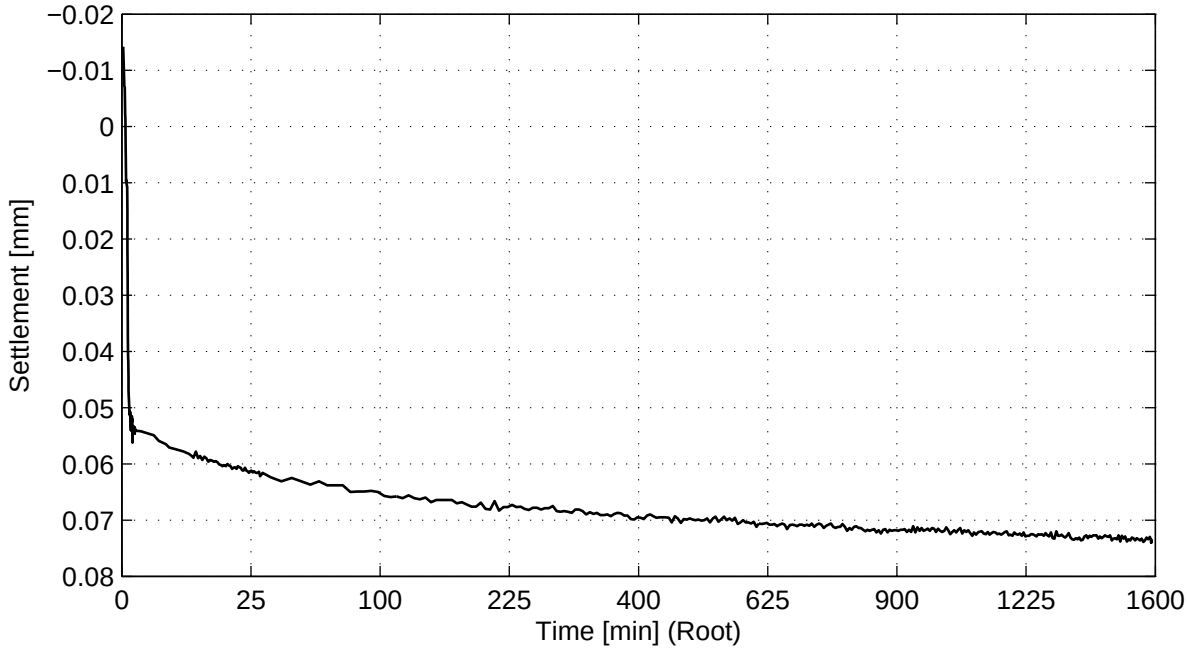


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:47

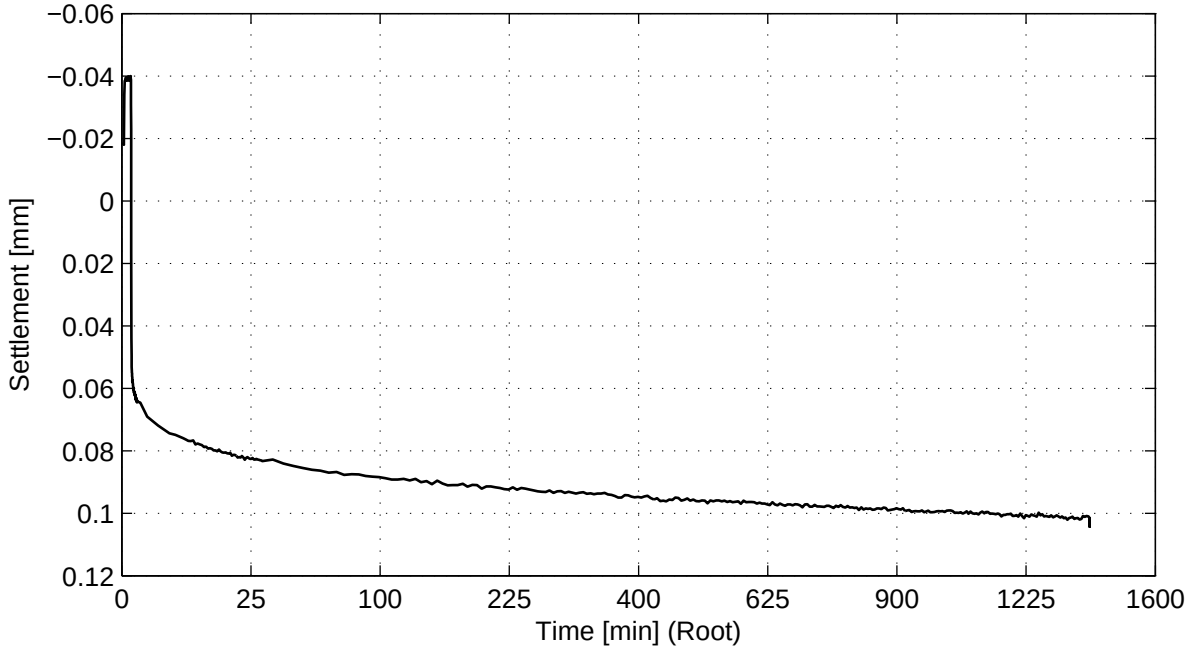
Taylor method (page 2/4)

Load step 222 kPa



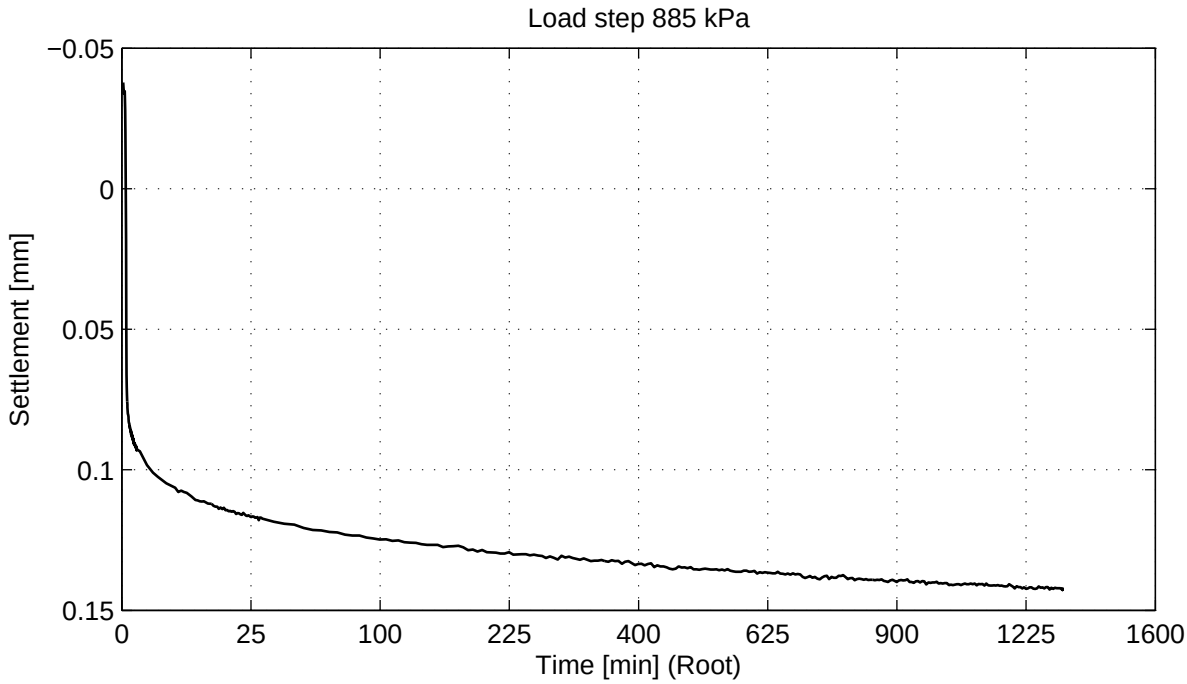
No calculation performed.

Load step 443 kPa

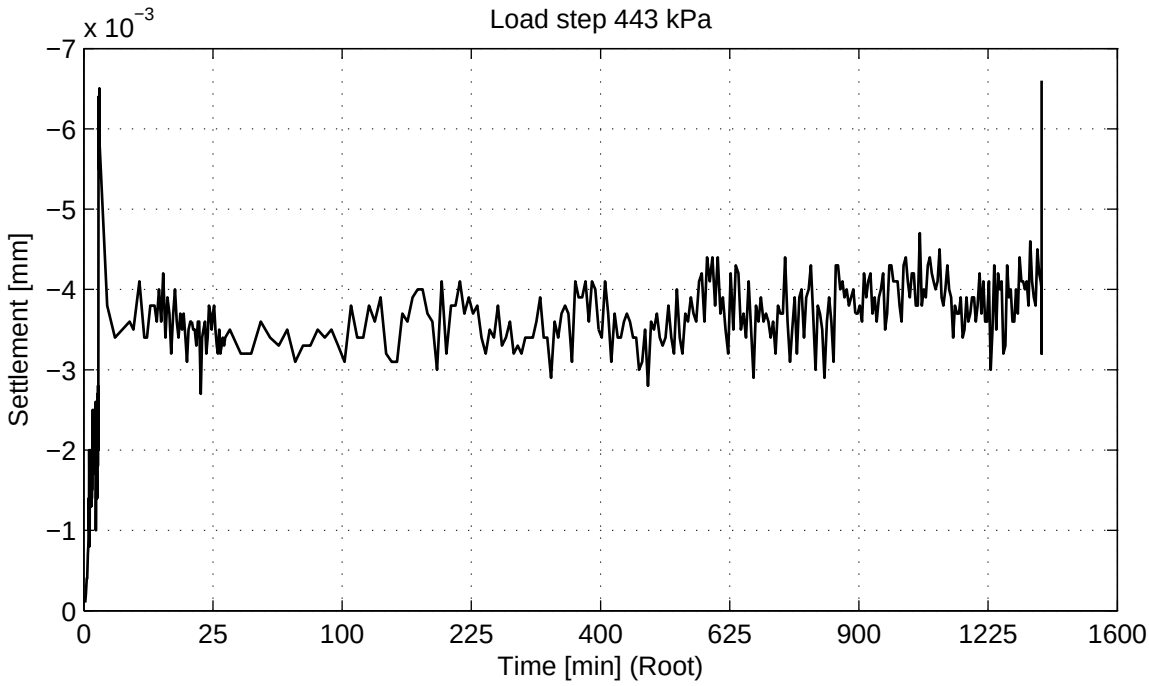


No calculation performed.

Taylor method (page 3/4)

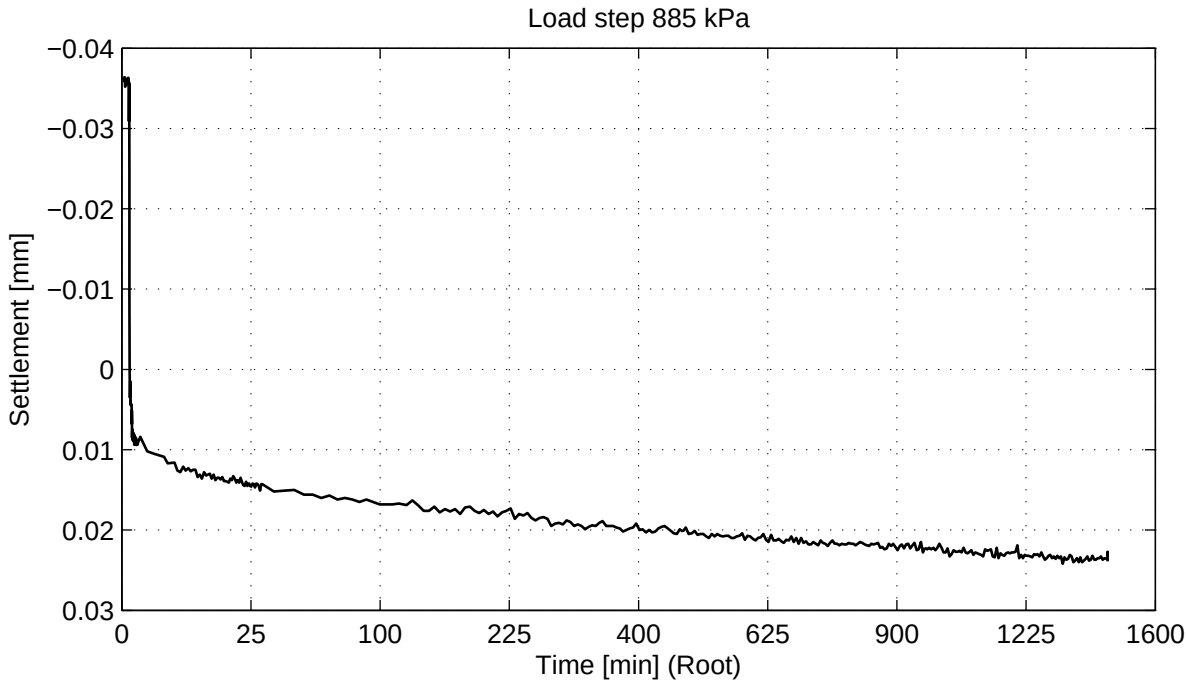


No calculation performed.



No calculation performed.

Taylor method (page 4/4)



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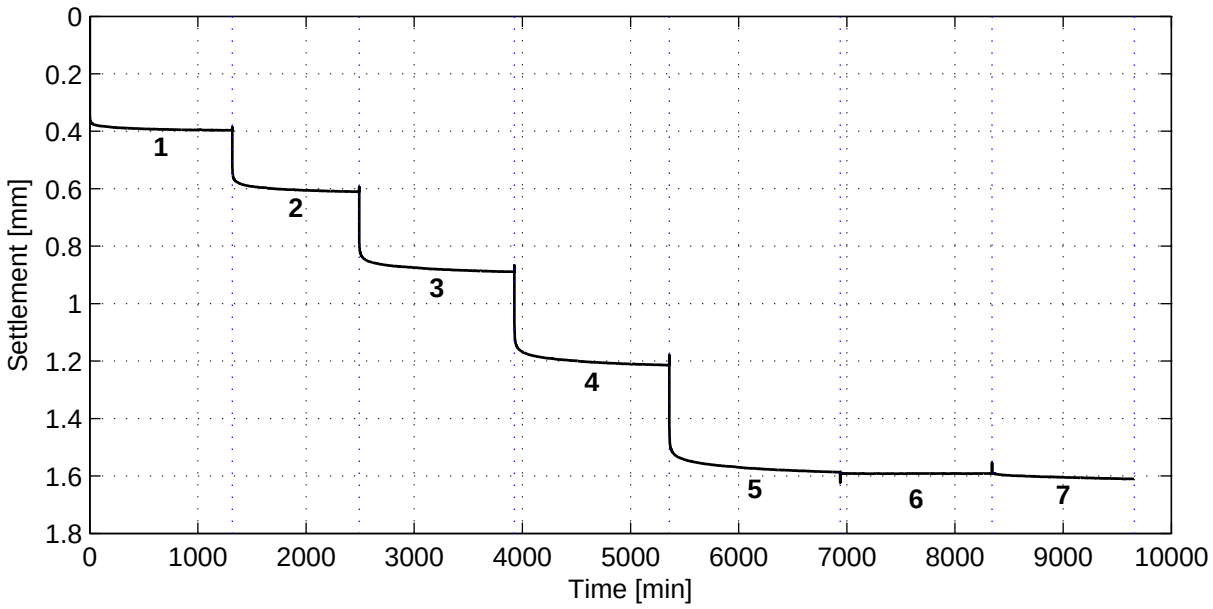
) Vrijgegeven door wb op 2011-07-29 15:47



General soil and test parameters

Soil description	Sandy Fat Clay (CH)
Initial volumetric weight − wet [kN/m^3]	20.3
Initial volumetric weight − dry [kN/m^3]	17.0
Volumetric weight particles [kN/m^3]	26.5
Initial water content [%]	19.6
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Initial saturation [−]	0.9
Final volumetric weight − wet [kN/m^3]	21.7
Final volumetric weight − dry [kN/m^3]	18.7
Final water content [%]	16.2
Final saturation [−]	1.1
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−18
Enddate	2011−07−25
Sample disturbance index	–
Lab temperature [° C]	20.3
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–

Load step number	Load [kPa]
1	60
2	121
3	241
4	482
5	963
6	482
7	963

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

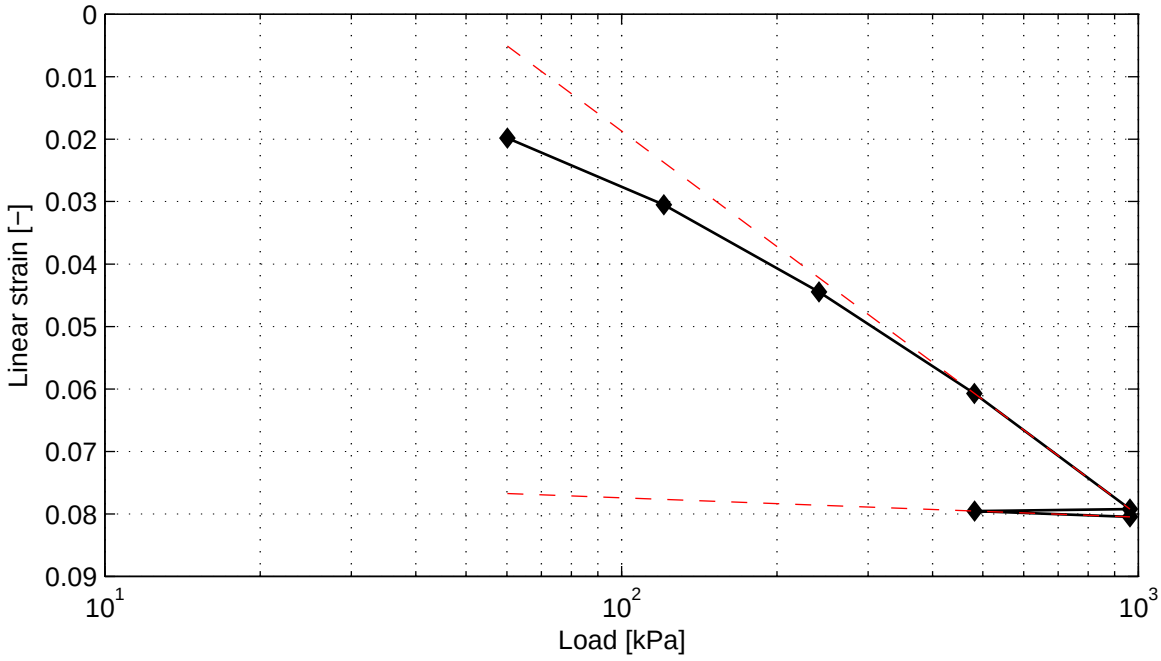
Boring KB−104A, sample KB−104A_ST−6, depth −27.00 m till −27.60 m GL

Oedometer test conform CEN ISO/TS 17892−5

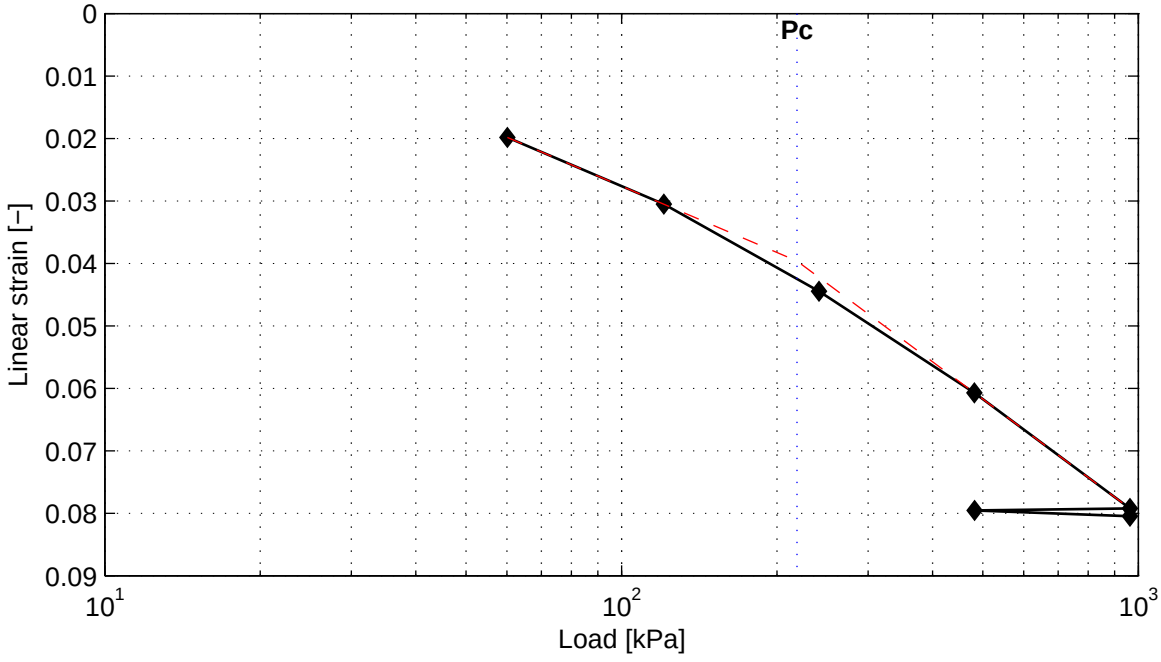
project	seen
1205088.1	–
appendix	page
SAKB−104A_ST−6	1

) Vrijgegeven door wb op 2011-07-29 15:46

Bjerrum method



Cr = 4.8e−003 Ca = 2.0e−003 Vo = 1.56
Cc = 9.6e−002



Pc = 218.5 kPa

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Boring KB−104A, sample KB−104A_ST−6, depth −27.00 m till −27.60 m GL

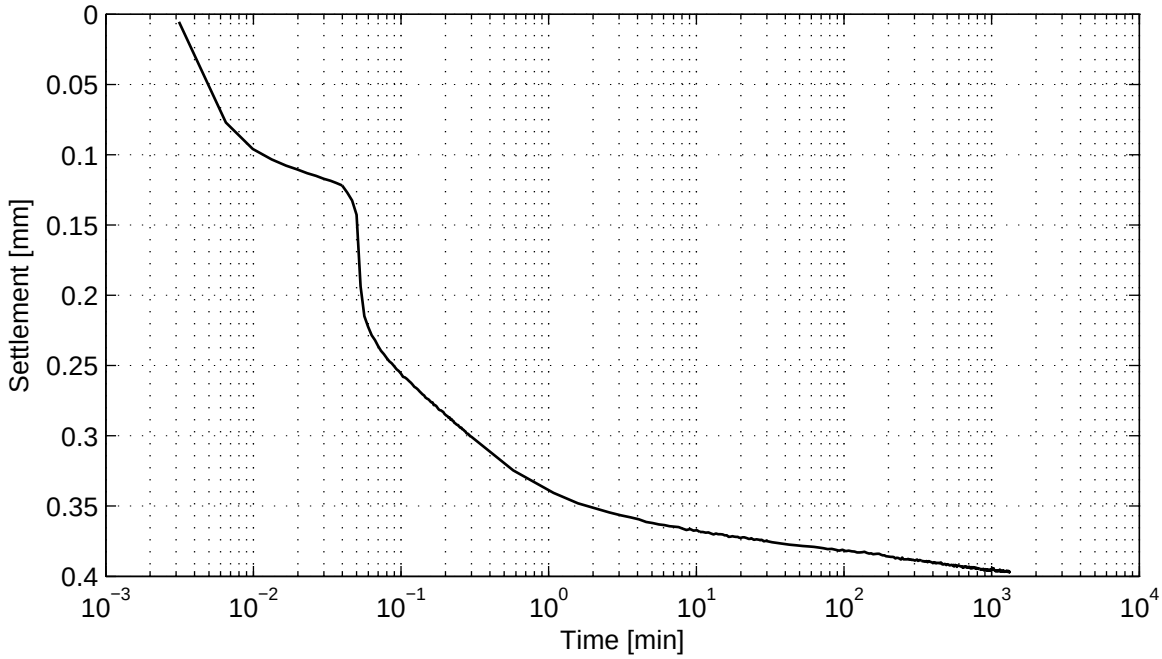
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	–
appendix	page
SAKB−104A_ST−6	2

) Vrijgegeven door wb op 2011-07-29 15:46

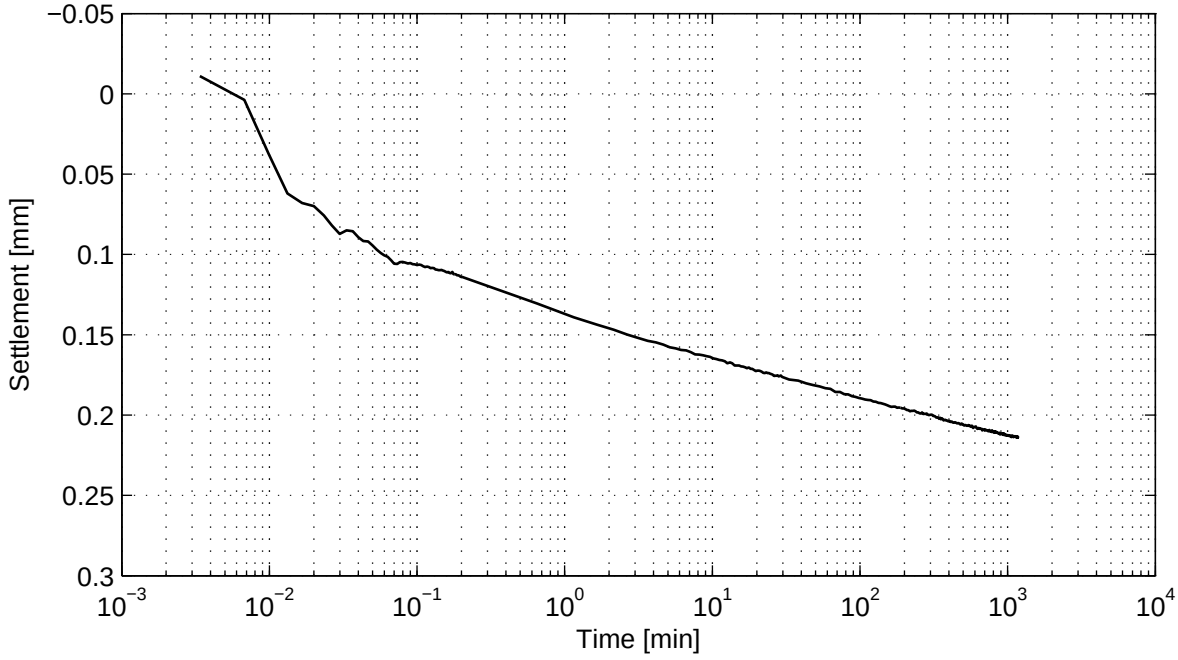
Casagrande method (page 1/4)

Load step 60 kPa



No calculation performed.

Load step 121 kPa



No calculation performed.

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date	signed
2011−07−29	Ess

Project Middelburg

Boring KB−104A, sample KB−104A_ST−6, depth −27.00 m till −27.60 m GL

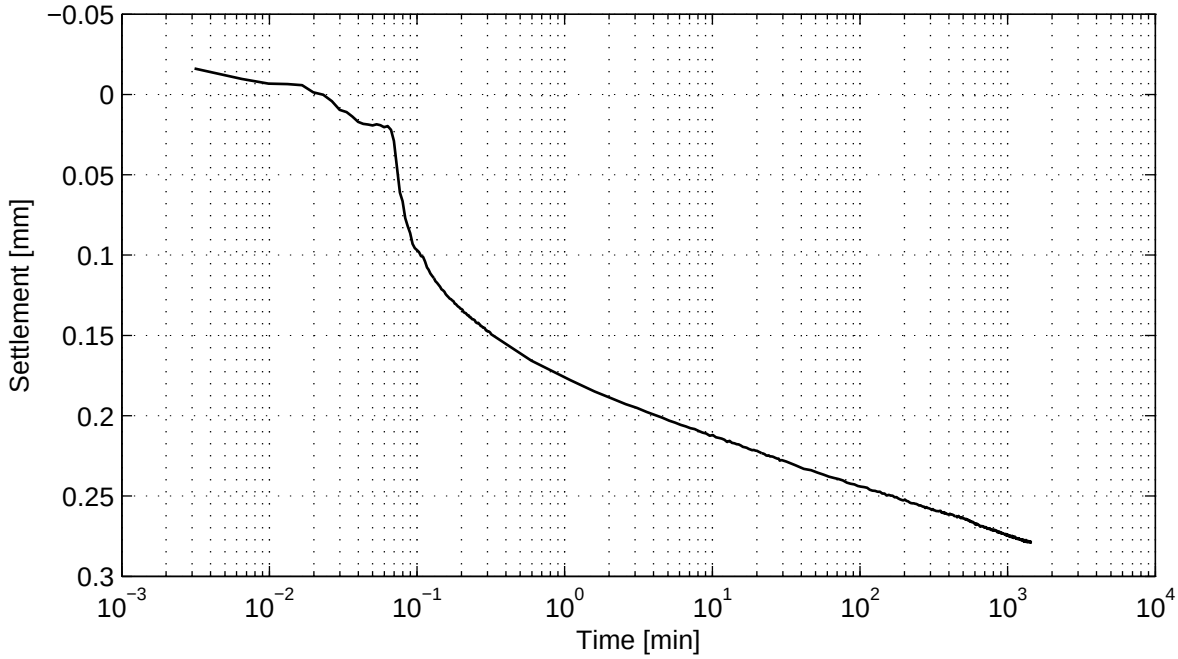
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104A_ST−6	3

) Vrijgegeven door wb op 2011-07-29 15:46

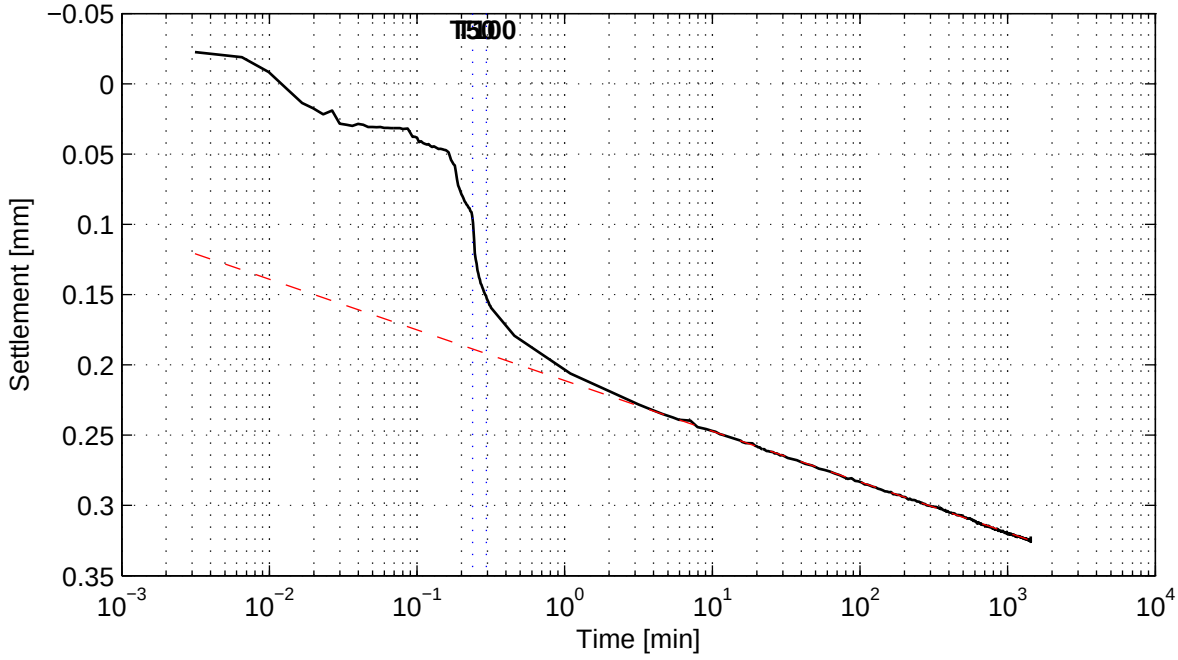
Casagrande method (page 2/4)

Load step 241 kPa



No calculation performed.

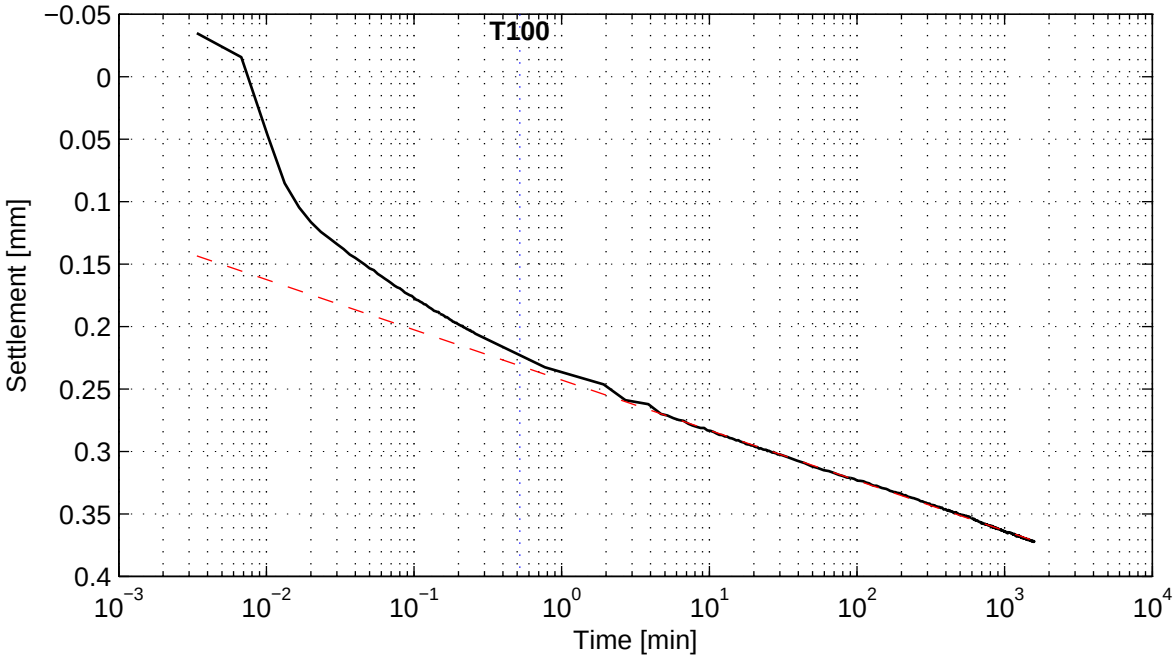
Load step 482 kPa



No calculation performed.

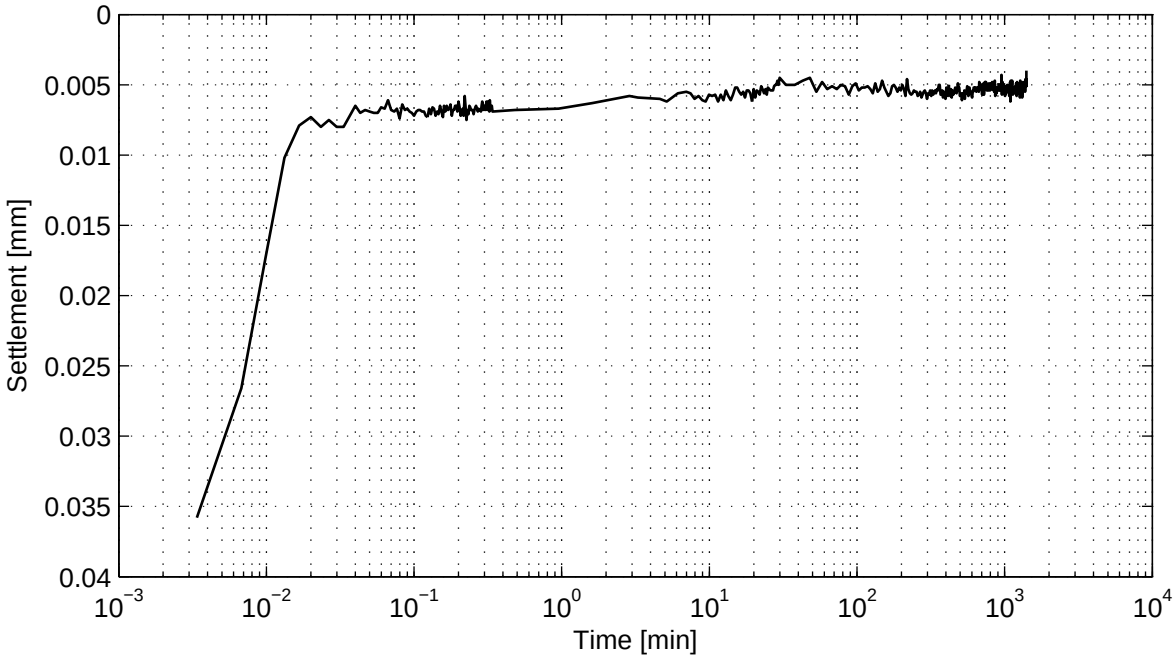
Casagrande method (page 3/4)

Load step 963 kPa



No calculation performed.

Load step 482 kPa

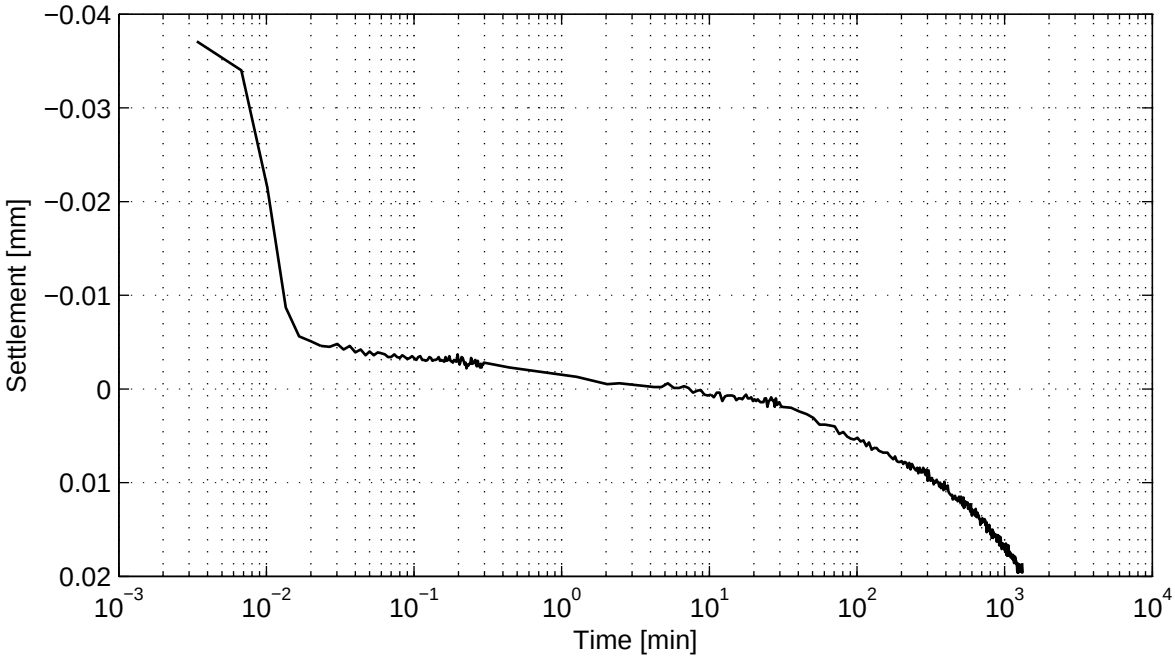


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:46

Casagrande method (page 4/4)

Load step 963 kPa



No calculation performed.

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Project Middelburg

Boring KB−104A, sample KB−104A_ST−6, depth −27.00 m till −27.60 m GL

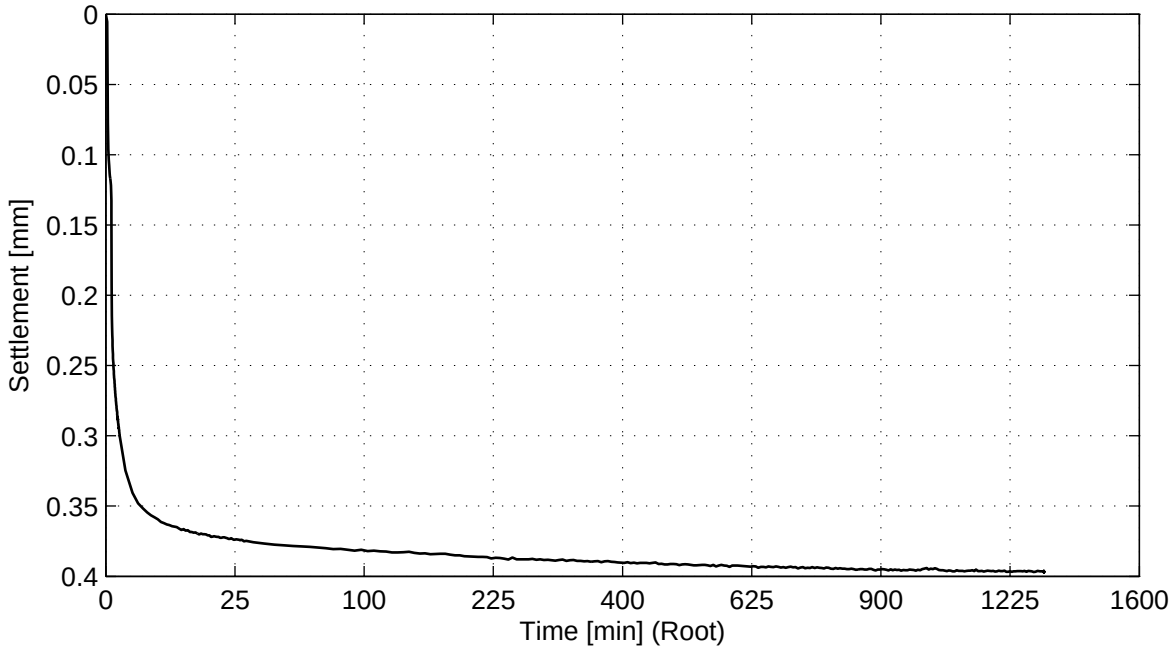
Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104A_ST−6	6

) Vrijgegeven door wb op 2011-07-29 15:46

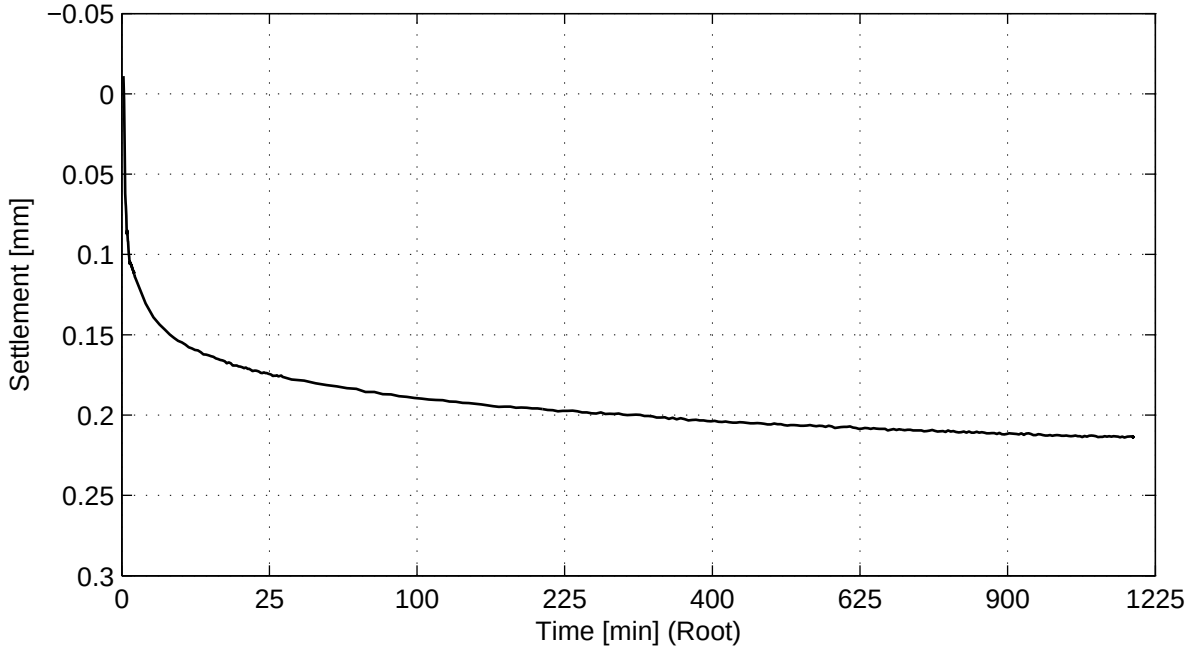
Taylor method (page 1/4)

Load step 60 kPa



No calculation performed.

Load step 121 kPa

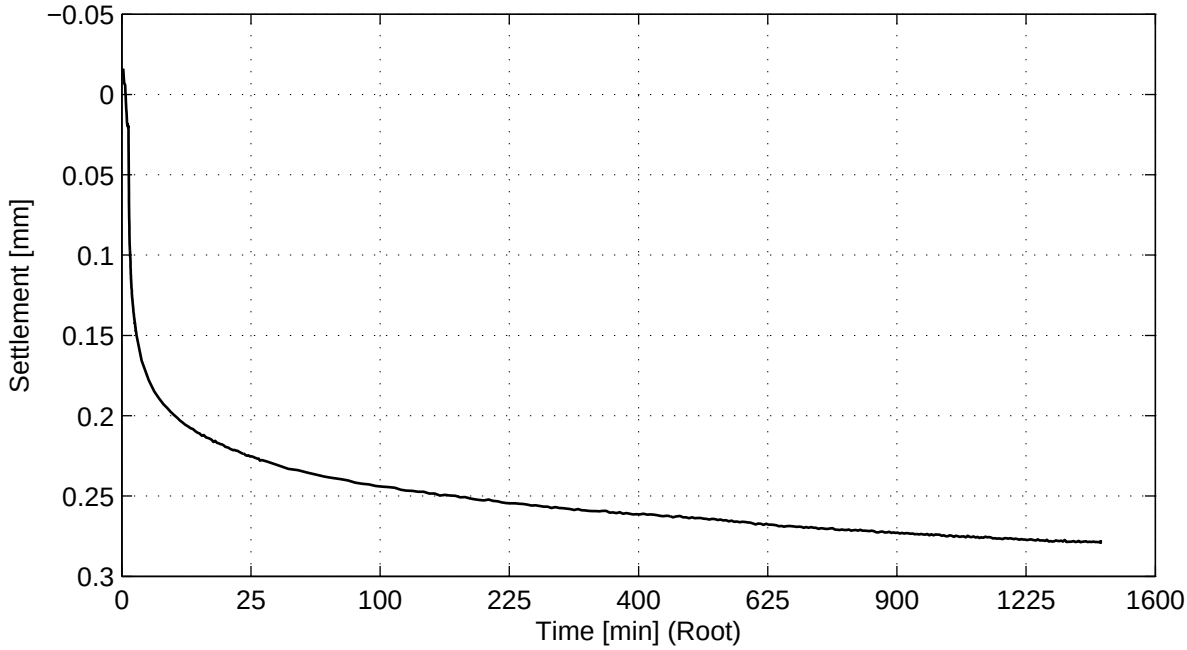


No calculation performed.

) Vrijgegeven door wb op 2011-07-29 15:46

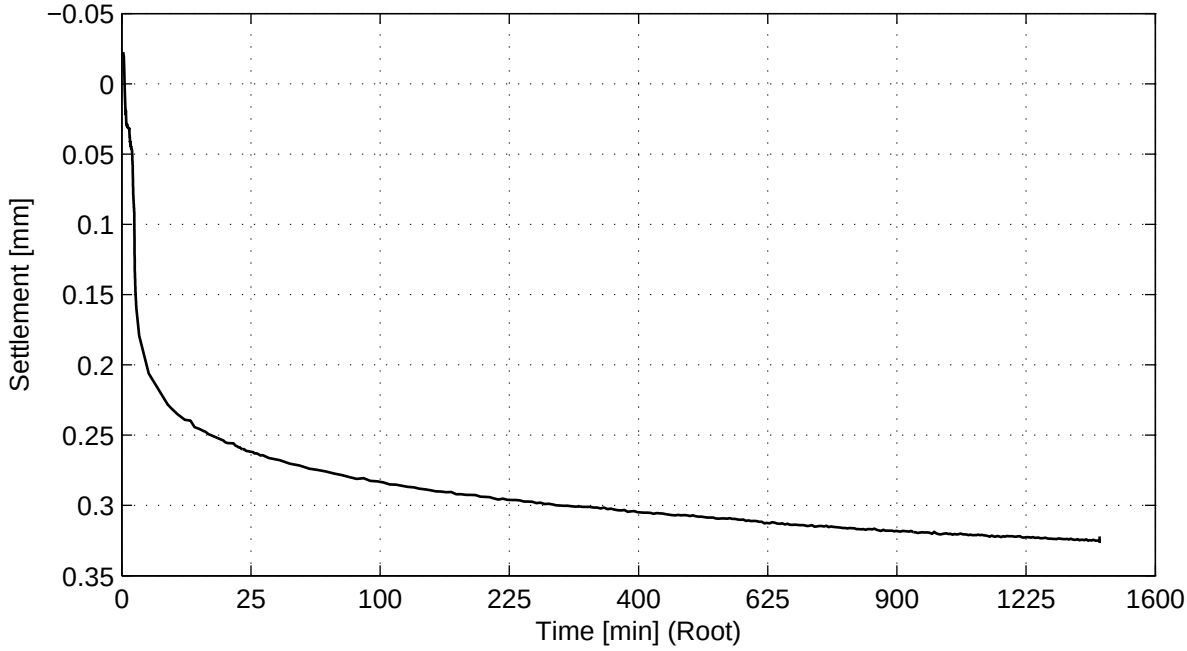
Taylor method (page 2/4)

Load step 241 kPa



No calculation performed.

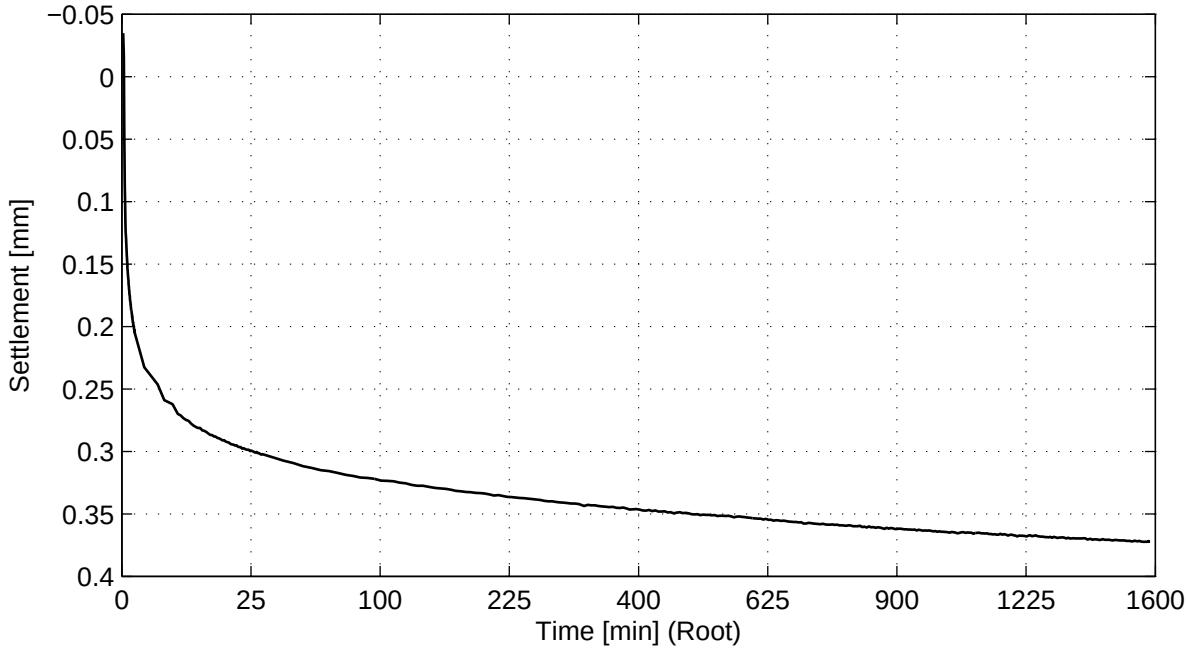
Load step 482 kPa



No calculation performed.

Taylor method (page 3/4)

Load step 963 kPa



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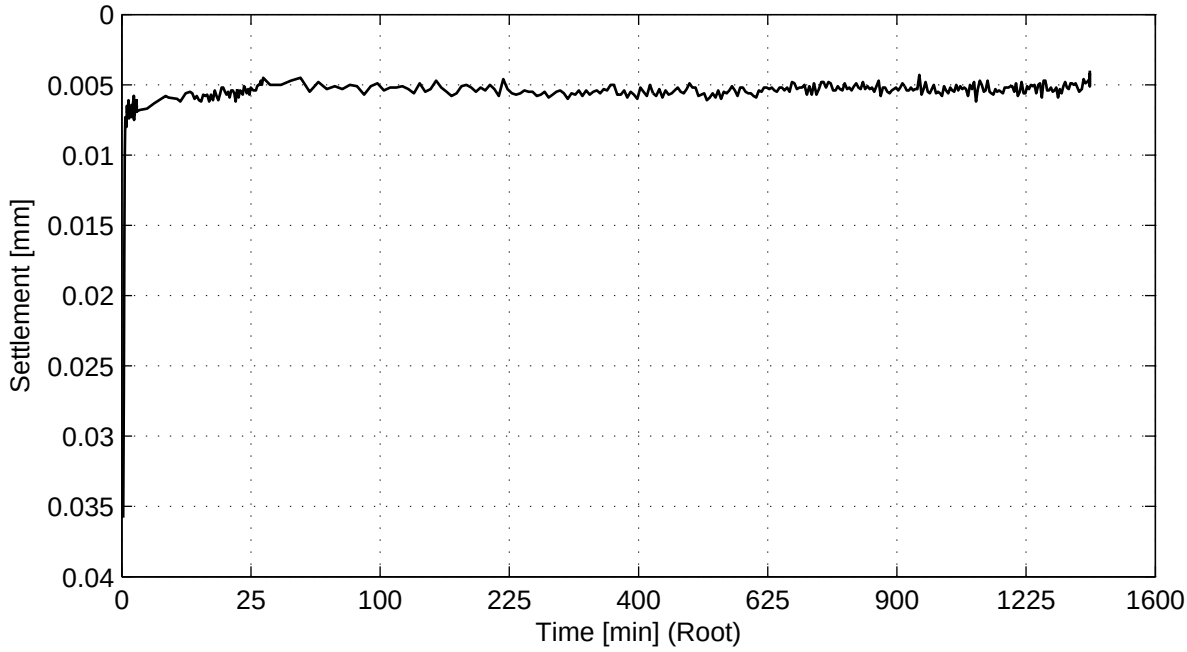
Load step 482 kPa

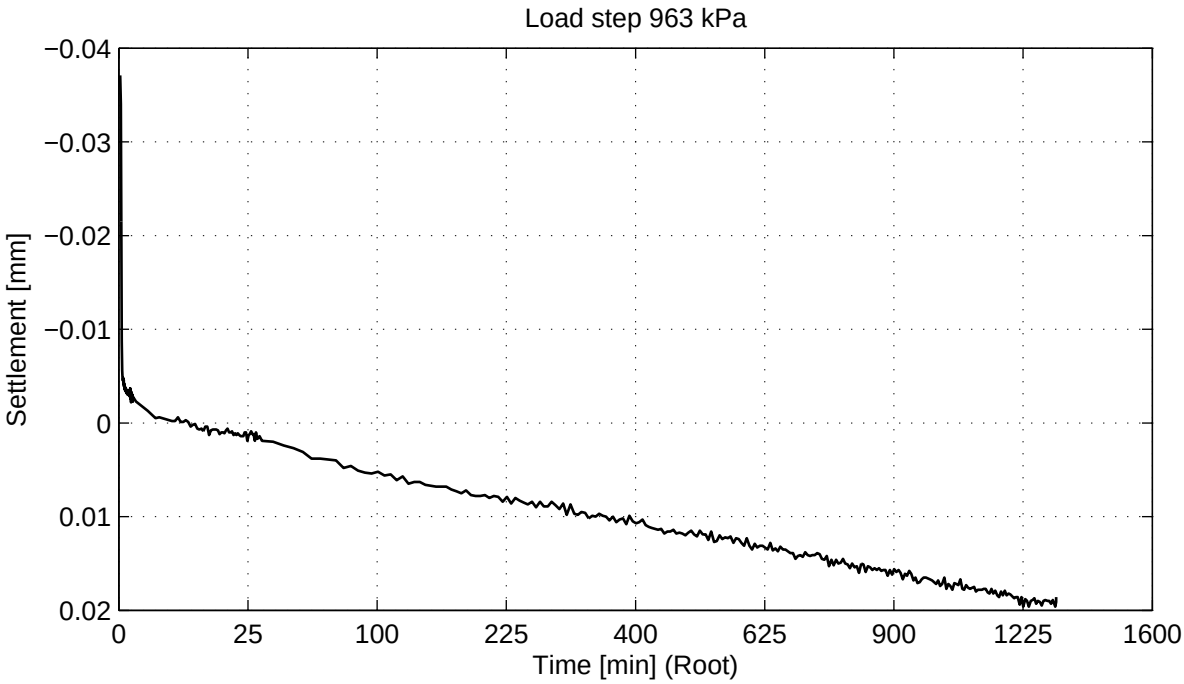


No calculation performed.

E Results one-dimensional swell tests

KB-103_ST-6
KB-103A_ST-1
KB-103A_ST-6
KB-104_ST-5
KB-105_ST-7

Taylor method (page 4/4)



No calculation performed.

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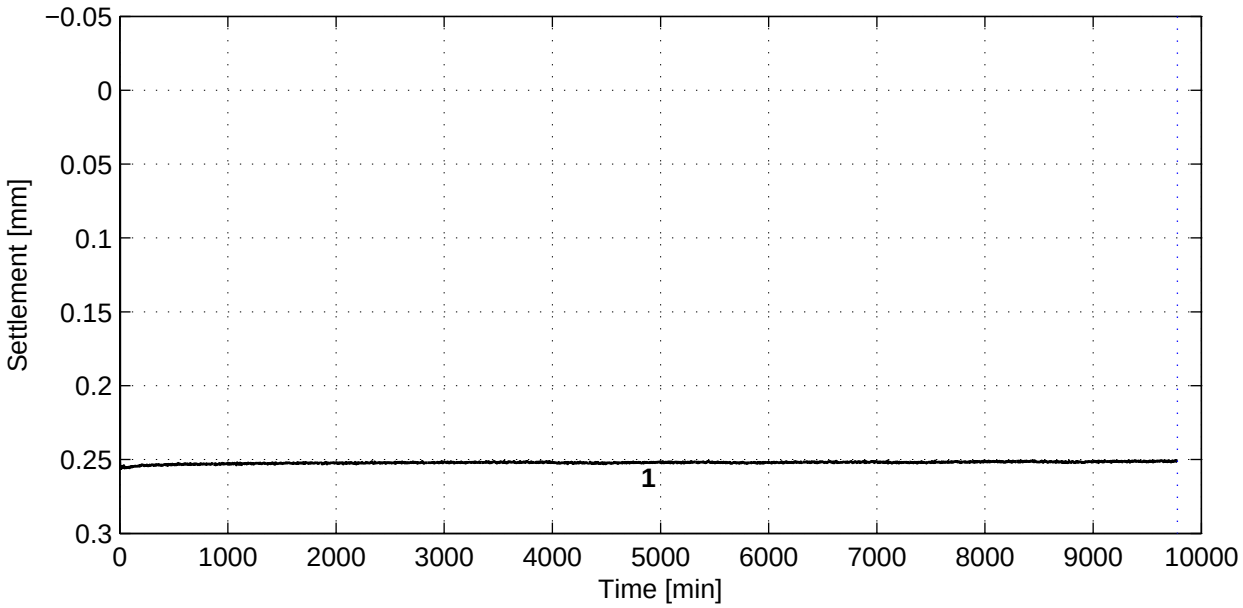
Project Middelburg

Boring KB−104A, sample KB−104A_ST−6, depth −27.00 m till −27.60 m GL

Oedometer test conform CEN ISO/TS 17892−5

project	seen
1205088.1	−
appendix	page
SAKB−104A_ST−6	10

) Vrijgegeven door wb op 2011-07-29 15:46



General soil and test parameters

Soil description (NEN 5104)	Silty sand (SM)
Initial volumetric weight − wet [kN/m^3]	33.4
Initial volumetric weight − dry [kN/m^3]	27.7
Volumetric weight particles (γ_s)[kN/m^3](*1)	66.2
Initial water content [%]	20.6
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Final volumetric weight − wet [kN/m^3]	20.3
Final volumetric weight − dry [kN/m^3]	16.7
Final water content [%]	21.3
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−29
Enddate	2011−08−05
Sample disturbance index	–
Lab temperature [° C]	20.2
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–
(*1)γ_s calculated with assumed complete saturation	

Load step number	Load [kPa]
1	120

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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date	signed
2011−08−09	setiawan

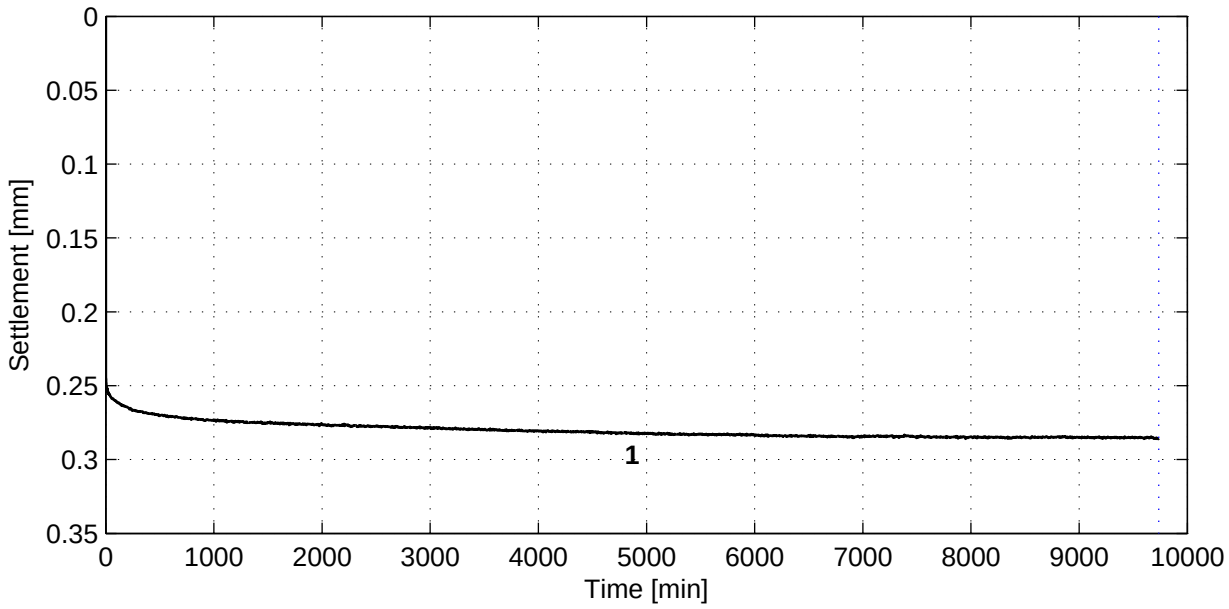
Project Middelburg

Boring KB−103, sample KB−103_ST−6, depth −26.91 m till −26.96 m GL

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103_ST−6	1

) Vrijgegeven door Dui op 2011-08-10 14:39



General soil and test parameters

Soil description (NEN 5104)	Silty sand (SM)
Initial volumetric weight − wet [kN/m^3]	18.8
Initial volumetric weight − dry [kN/m^3]	15.5
Volumetric weight particles (γ_s)[kN/m^3](*1)	23.4
Initial water content [%]	21.4
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Final volumetric weight − wet [kN/m^3]	19.0
Final volumetric weight − dry [kN/m^3]	15.1
Final water content [%]	25.6
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−29
Enddate	2011−08−05
Sample disturbance index	–
Lab temperature [° C]	20.3
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–
(*1)γ_s calculated with assumed complete saturation	

Load step number	Load [kPa]
1	200

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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2011−08−09	setiawan

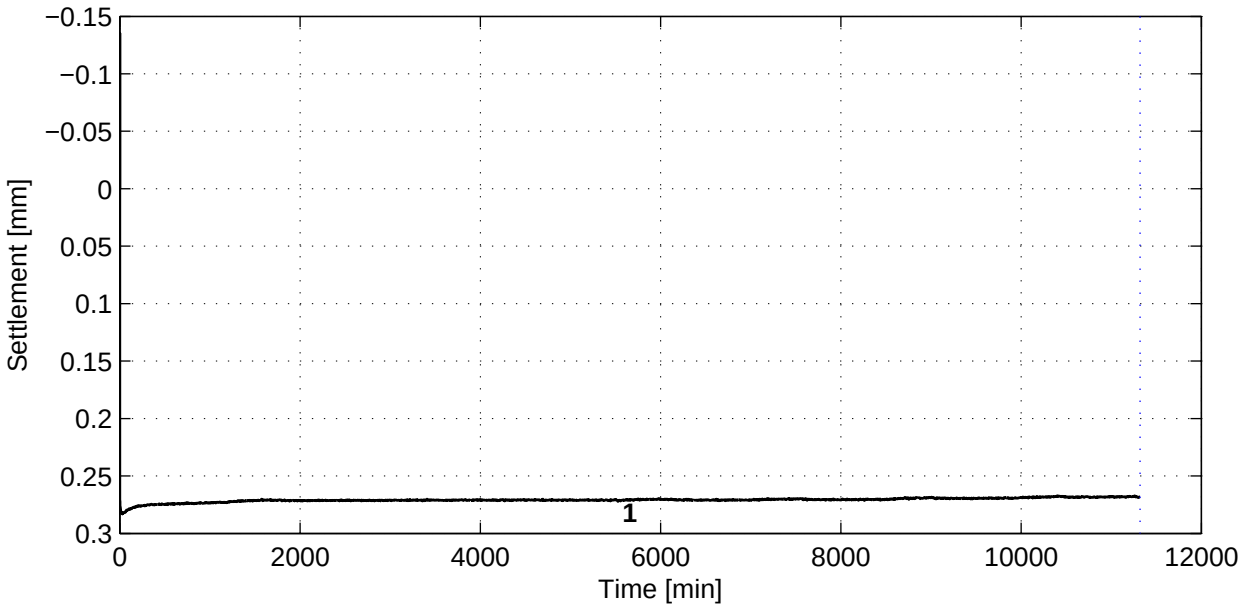
Project Middelburg

Boring KB−103A, sample KB−103A_ST−1, depth −31.74 m till −32.27 m GL

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103A_ST−1	1

) Vrijgegeven door Dui op 2011-08-10 14:39



General soil and test parameters

Soil description (NEN 5104)	Silty clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	19.9
Initial volumetric weight − dry [kN/m^3]	15.7
Volumetric weight particles (γ_s)[kN/m^3](*1)	27.2
Initial water content [%]	26.4
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Final volumetric weight − wet [kN/m^3]	20.3
Final volumetric weight − dry [kN/m^3]	16.0
Final water content [%]	27.0
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−28
Enddate	2011−08−05
Sample disturbance index	–
Lab temperature [° C]	20.3
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–
(*1)γ_s calculated with assumed complete saturation	

Load step number	Load [kPa]
1	600

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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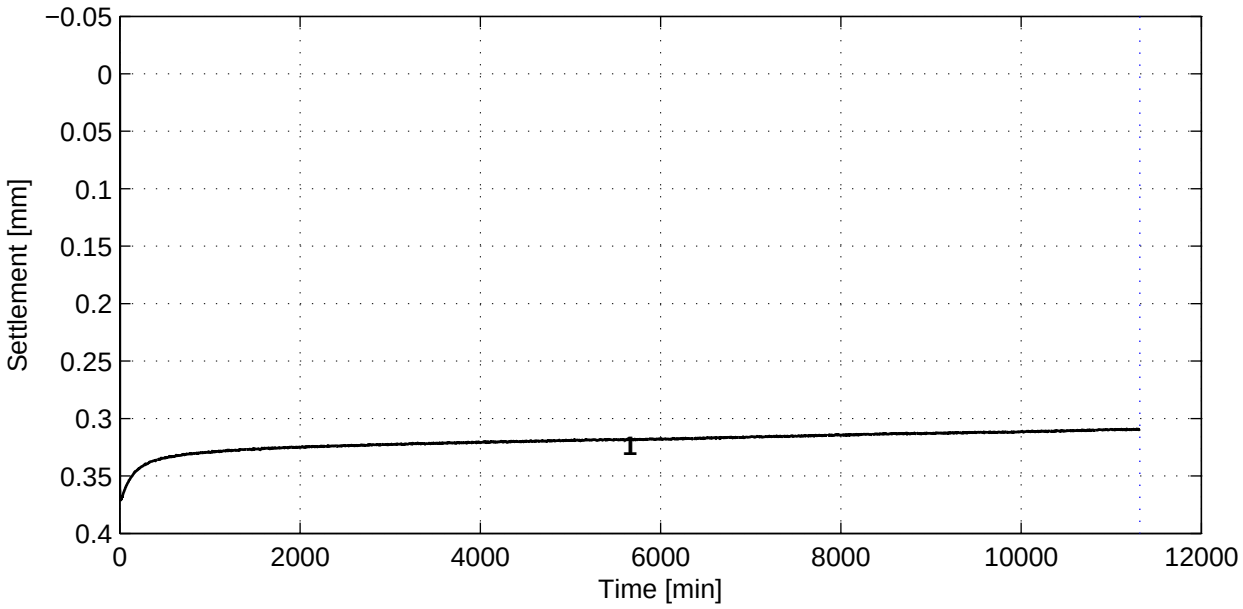
Project Middelburg

Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103A_ST−6	1

) Vrijgegeven door Dui op 2011-08-10 14:39



General soil and test parameters

Soil description (NEN 5104)	Silty clay (CL−ML)
Initial volumetric weight − wet [kN/m^3]	19.5
Initial volumetric weight − dry [kN/m^3]	15.2
Volumetric weight particles (γ_s)[kN/m^3](*1)	26.8
Initial water content [%]	27.9
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Final volumetric weight − wet [kN/m^3]	19.9
Final volumetric weight − dry [kN/m^3]	15.3
Final water content [%]	29.8
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−28
Enddate	2011−08−05
Sample disturbance index	–
Lab temperature [° C]	20.2
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–
(*1)γ_s calculated with assumed complete saturation	

Load step number	Load [kPa]
1	550

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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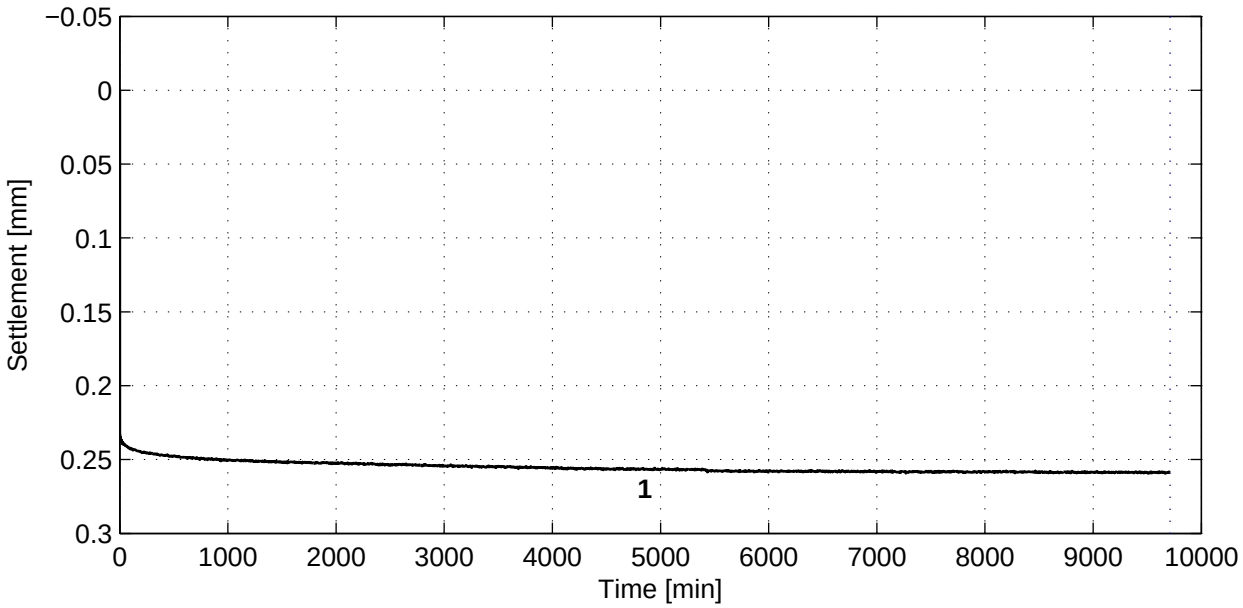
Project Middelburg

Boring KB−104, sample KB−104_ST−5, depth −74.42 m till −74.46 m NAP

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−104_ST−5	1

) Vrijgegeven door Dui op 2011-08-10 14:40



General soil and test parameters

Soil description (NEN 5104)	Silty sand (SM)
Initial volumetric weight − wet [kN/m^3]	18.7
Initial volumetric weight − dry [kN/m^3]	15.9
Volumetric weight particles (γ_s)[kN/m^3](*1)	22.2
Initial water content [%]	17.4
Initial sample height [mm]	20
Initial sample diameter [mm]	63
Final volumetric weight − wet [kN/m^3]	18.9
Final volumetric weight − dry [kN/m^3]	15.5
Final water content [%]	22.0
Type of test (wet/dry)	Wet
Visual disturbance sample	undisturbed
Startdate	2011−07−29
Enddate	2011−08−05
Sample disturbance index	–
Lab temperature [° C]	20.2
Pc'$_{Becker}$ [kPa]	–
Pc'$_{Janbu}$ [kPa]	–
(*1)γ_s calculated with assumed complete saturation	

Load step number	Load [kPa]
1	50

References:
Isotachenparameters: CUR recommendation 101
Pc Becker: Becker et al. (1987)
Pc Janbu: Janbu (1969)
Sample disturbance index: Lunne et al (2006)

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Project Middelburg

Boring KB−105, sample KB−105_ST−7, depth −19.62 m till −19.65 m GL

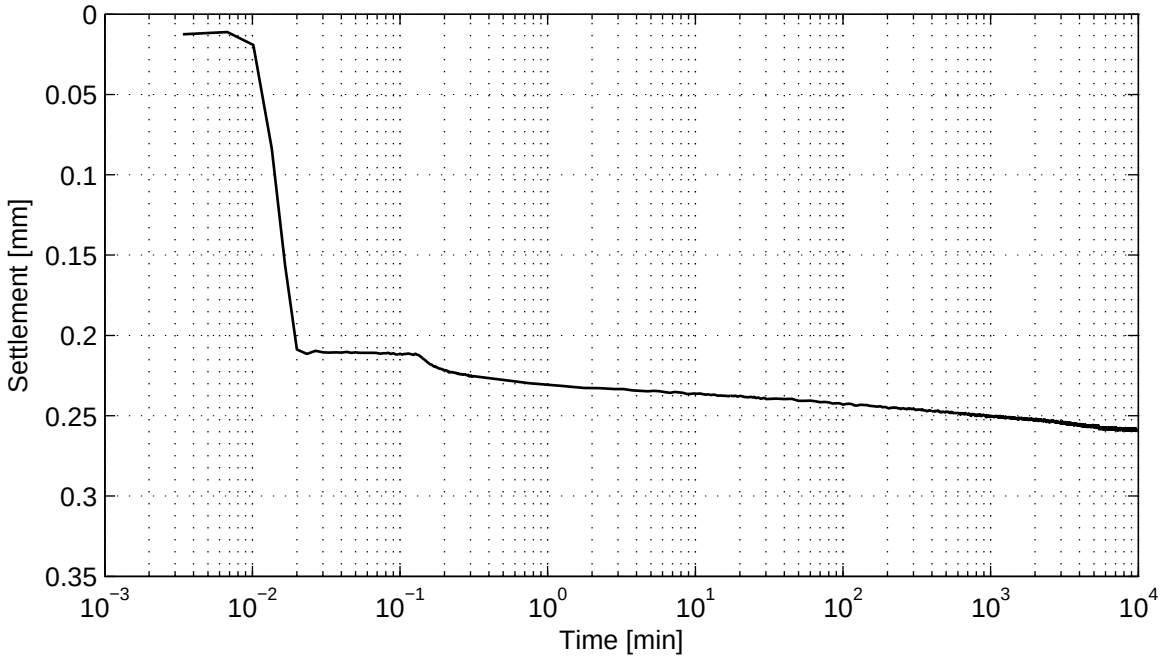
Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−105_ST−7	1

) Vrijgegeven door Dui op 2011-08-10 14:39

Casagrande method (page 1/1)

Load step 50 kPa



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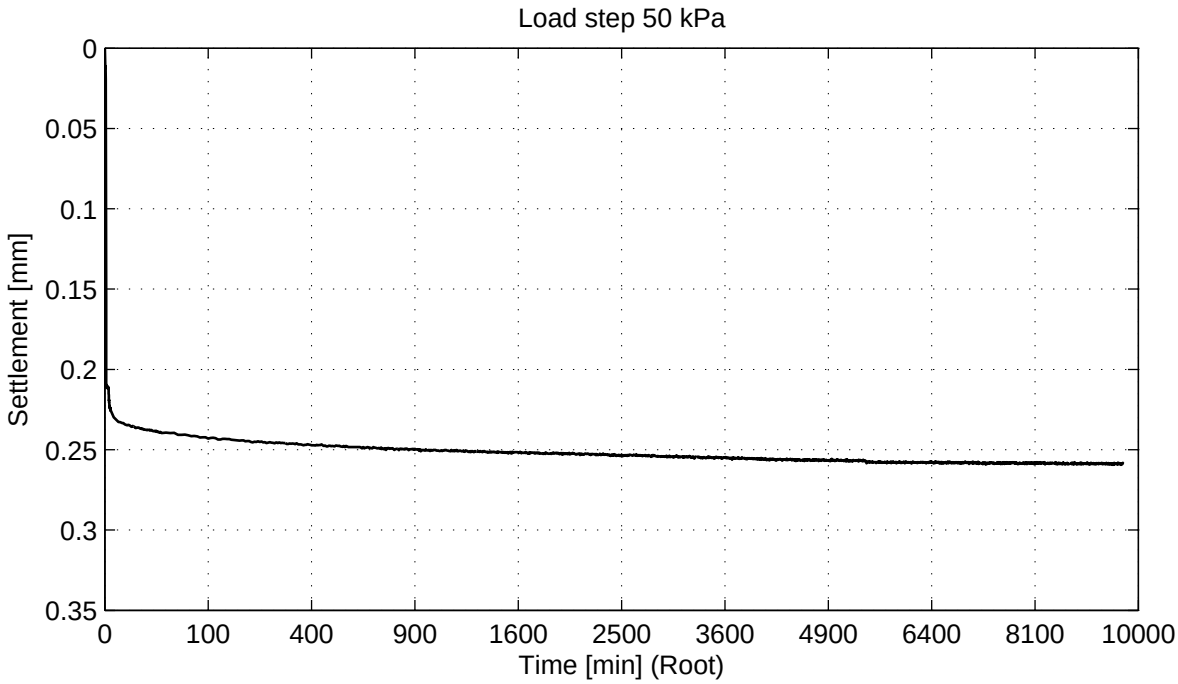
) Vrijgegeven door Dui op 2011-08-10 14:39

Taylor method (page 1/1)



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Project Middelburg

Boring KB−105, sample KB−105_ST−7, depth −19.62 m till −19.65 m GL

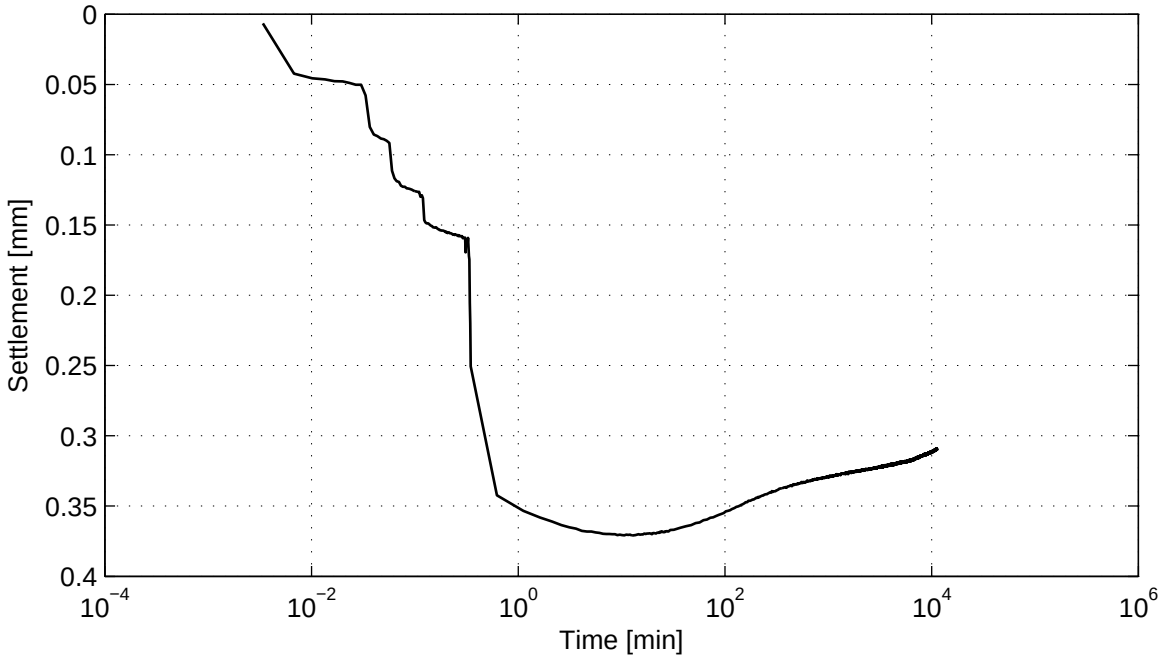
Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−105_ST−7	3

) Vrijgegeven door Dui op 2011-08-10 14:39

Casagrande method (page 1/1)

Load step 550 kPa



No calculation performed.

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Project Middelburg

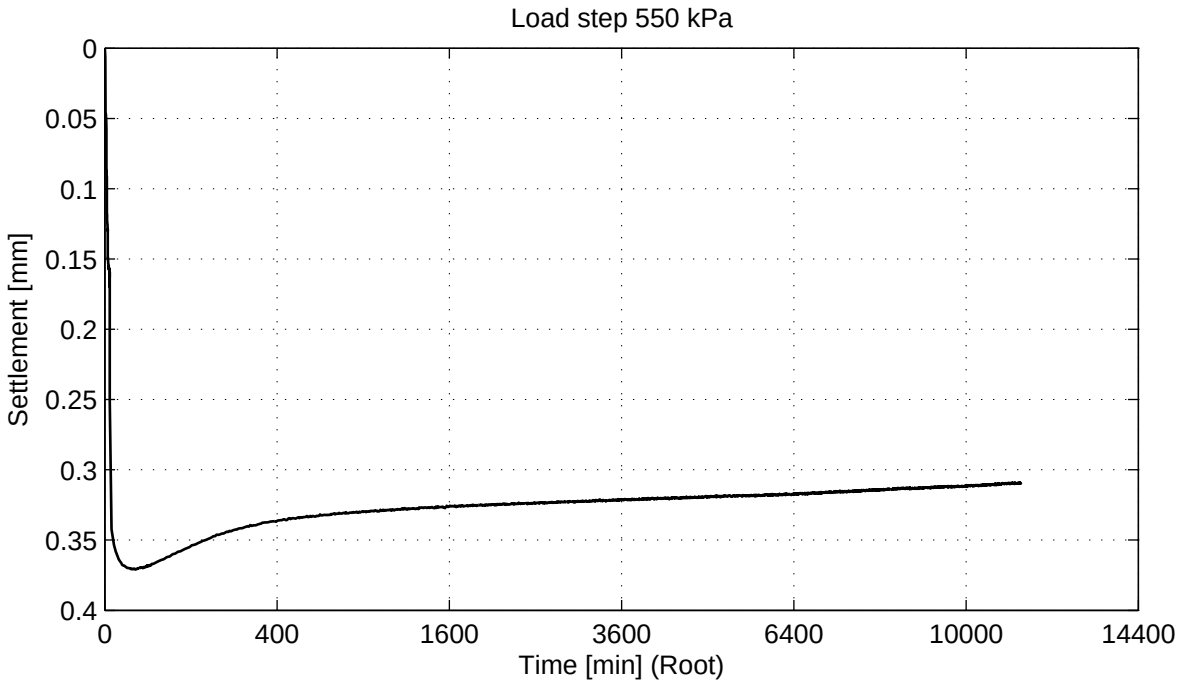
Boring KB−104, sample KB−104_ST−5, depth −74.42 m till −74.46 m NAP

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−104_ST−5	2

) Vrijgegeven door Dui op 2011-08-10 14:40

Taylor method (page 1/1)



No calculation performed.

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Project Middelburg

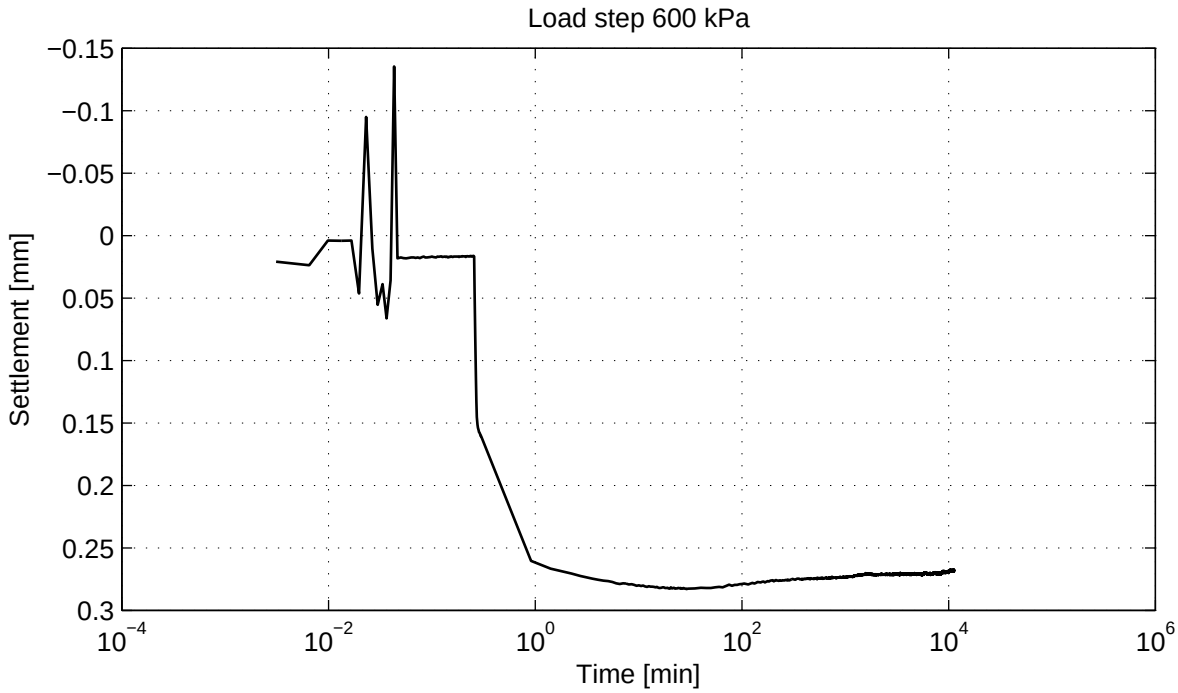
Boring KB−104, sample KB−104_ST−5, depth −74.42 m till −74.46 m NAP

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−104_ST−5	3

) Vrijgegeven door Dui op 2011-08-10 14:40

Casagrande method (page 1/1)



No calculation performed.

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Project Middelburg

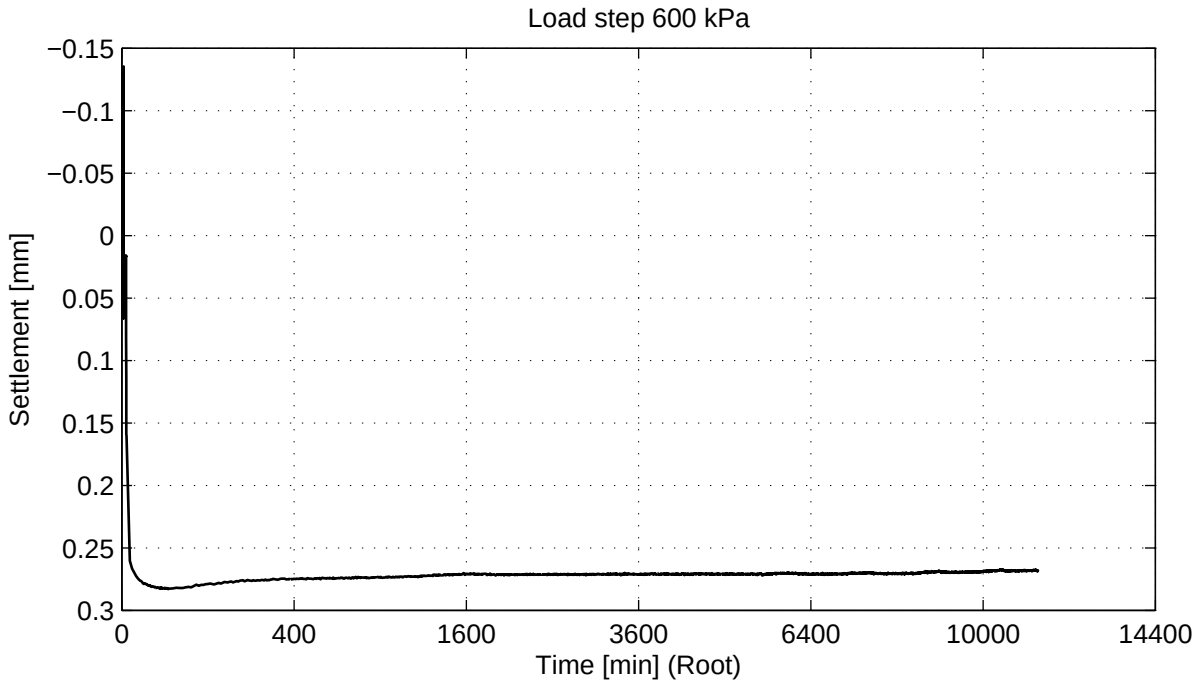
Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103A_ST−6	2

) Vrijgegeven door Dui op 2011-08-10 14:39

Taylor method (page 1/1)



No calculation performed.

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Project Middelburg

Boring KB−103A, sample KB−103A_ST−6, depth −78.17 m till −78.72 m GL

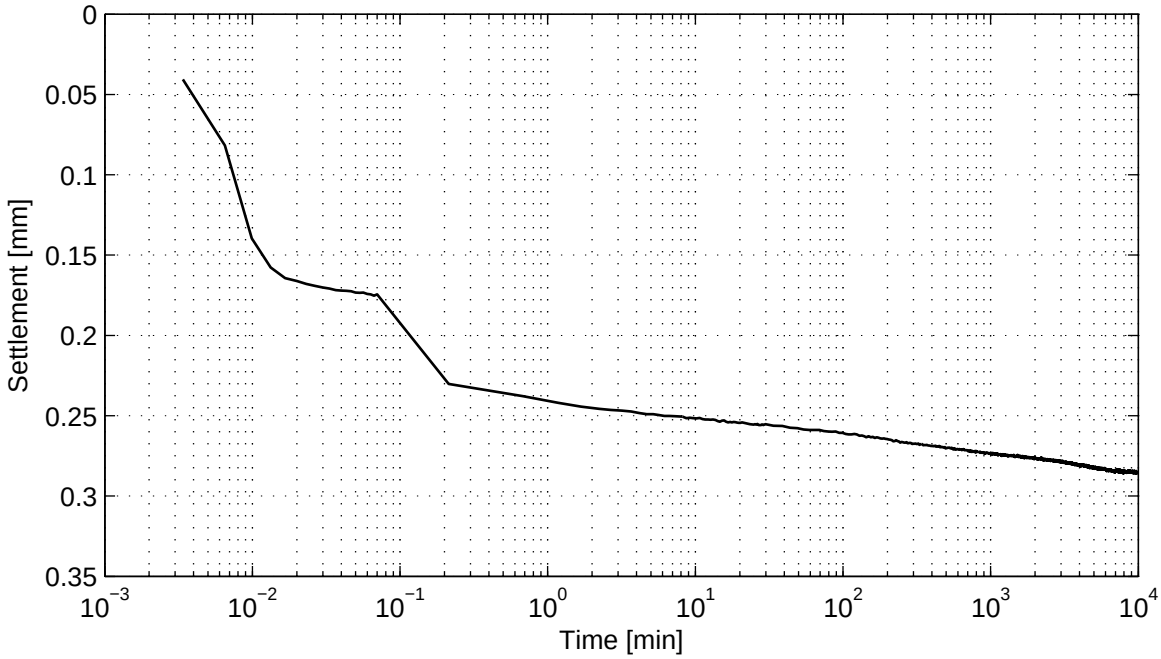
Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103A_ST−6	3

) Vrijgegeven door Dui op 2011-08-10 14:39

Casagrande method (page 1/1)

Load step 200 kPa



No calculation performed.

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Project Middelburg

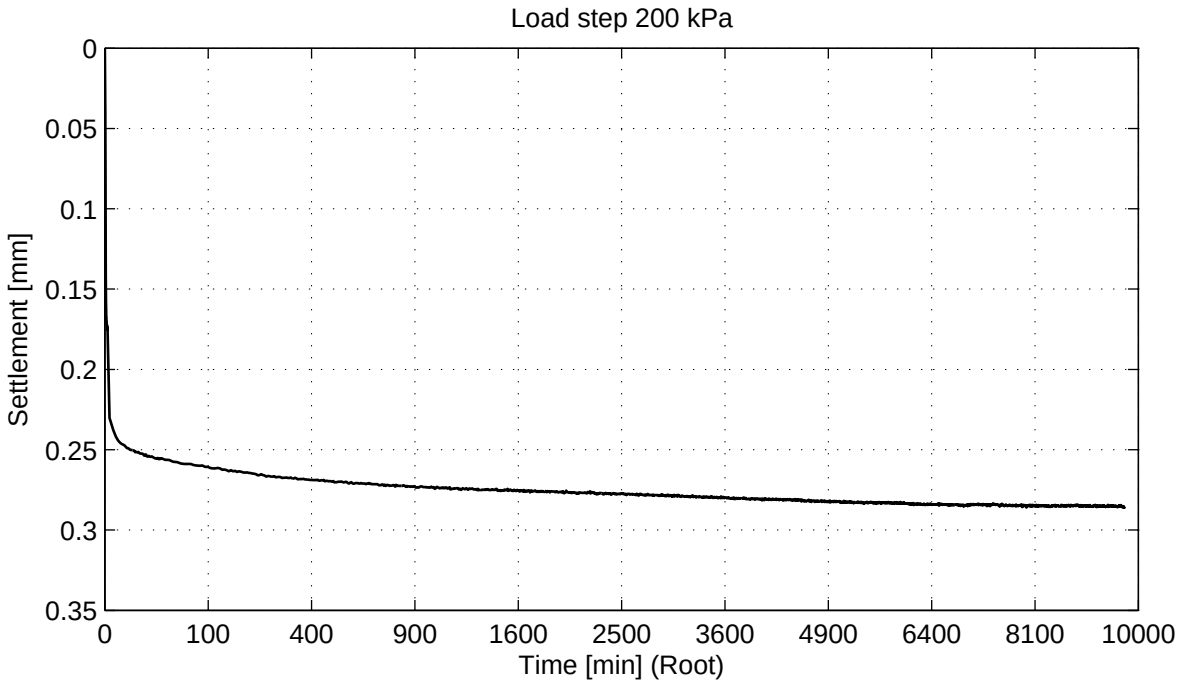
Boring KB−103A, sample KB−103A_ST−1, depth −31.74 m till −32.27 m GL

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103A_ST−1	2

) Vrijgegeven door Dui op 2011-08-10 14:39

Taylor method (page 1/1)



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Project Middelburg

Boring KB−103A, sample KB−103A_ST−1, depth −31.74 m till −32.27 m GL

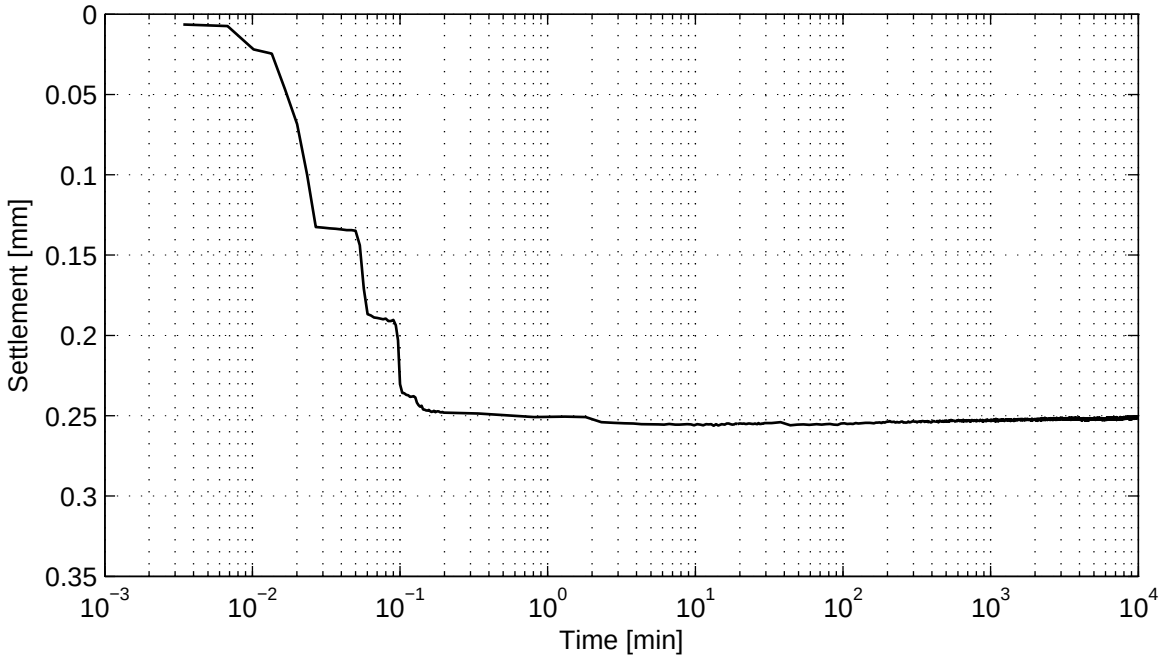
Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103A_ST−1	3

) Vrijgegeven door Dui op 2011-08-10 14:39

Casagrande method (page 1/1)

Load step 120 kPa



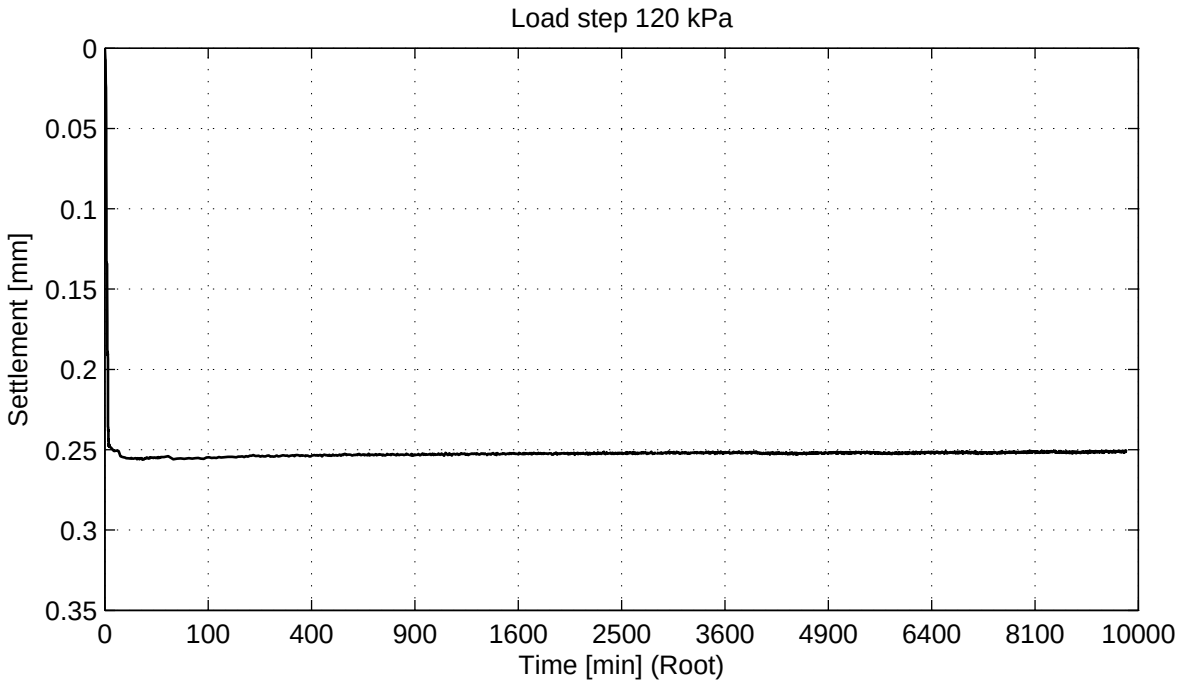
No calculation performed.

) Vrijgegeven door Dui op 2011-08-10 14:39

F Results Triaxial tests

KB-101_ST-1
KB-101_ST-6
KB-101_ST-7
KB-101_ST-8
KB-101_ST_9
KB-101_ST-11
KB-102_ST-1
KB-102_ST-2
KB-102_ST-6
KB-103_ST-1
KB-103_ST-3
KB-103_ST-5
KB-103_ST-6
KB-103A_ST-1
KB-103A_ST-6
KB-103A_ST-9
KB-103A_ST-10
KB-104_ST-2
KB-104_ST-7
KB-104A_ST-6
KB-105_ST-4
KB-105_ST-7
KB-105_ST-8
KB-105A_ST-1
KB-105A_ST-2
KB-105A_ST-3
KB-105A_ST-5
KB-105A_ST-6

Taylor method (page 1/1)



No calculation performed.

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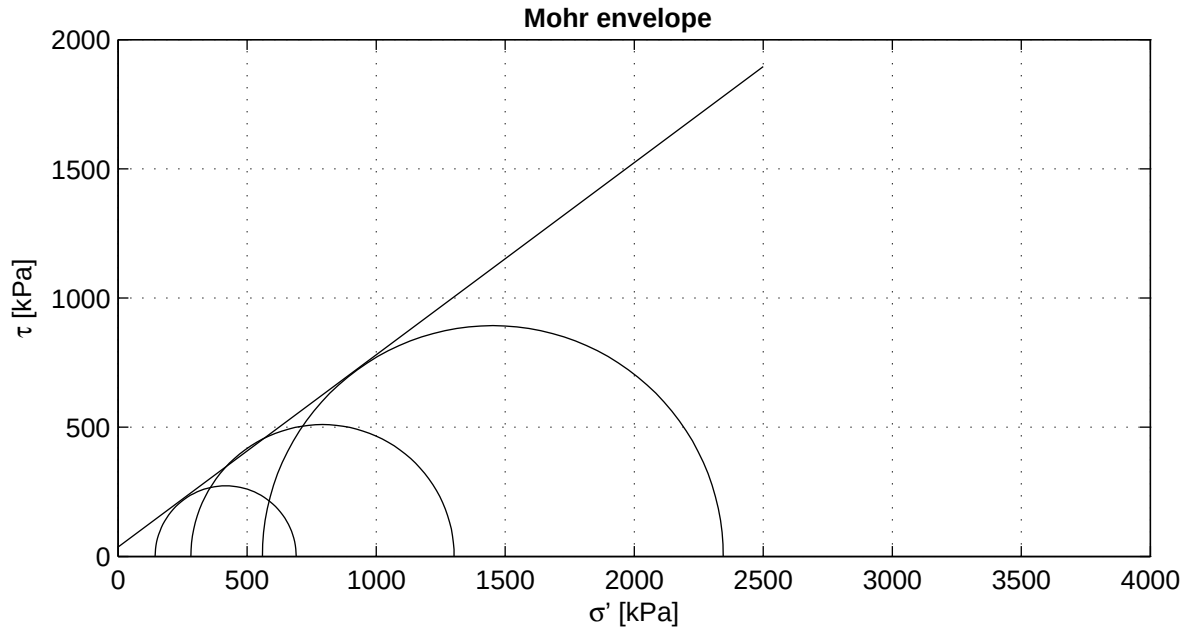
Project Middelburg

Boring KB−103, sample KB−103_ST−6, depth −26.91 m till −26.96 m GL

Oedometer test (swell) conform CEN ISO/TS 17892−5

project	seen
1205088.1	Dui
appendix	page
SAKB−103_ST−6	3

) Vrijgegeven door Dui op 2011-08-10 14:39



Criterion	maximum t
ϕ' [°]	36.64
c' [kPa]	36.65

Start testing

Stage number	1	2	3
Sample name	KB−101_ST−1	KB−101_ST−1A	KB−101_ST−1B
m_i [g]	1063.8	1074.0	1093.0
D_i [mm]	66.0	66.0	66.0
h_i [mm]	149.8	149.8	149.8
w_i [%]	17.4	17.8	16.0
ρ_i [kg/m^3]	2076	2096	2133
ρ_{dr} [kg/m^3]	1769	1779	1838
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 1
WF−B sample 1A
WF−C sample 1B

Consolidation period t100 follows from isotropic phase.

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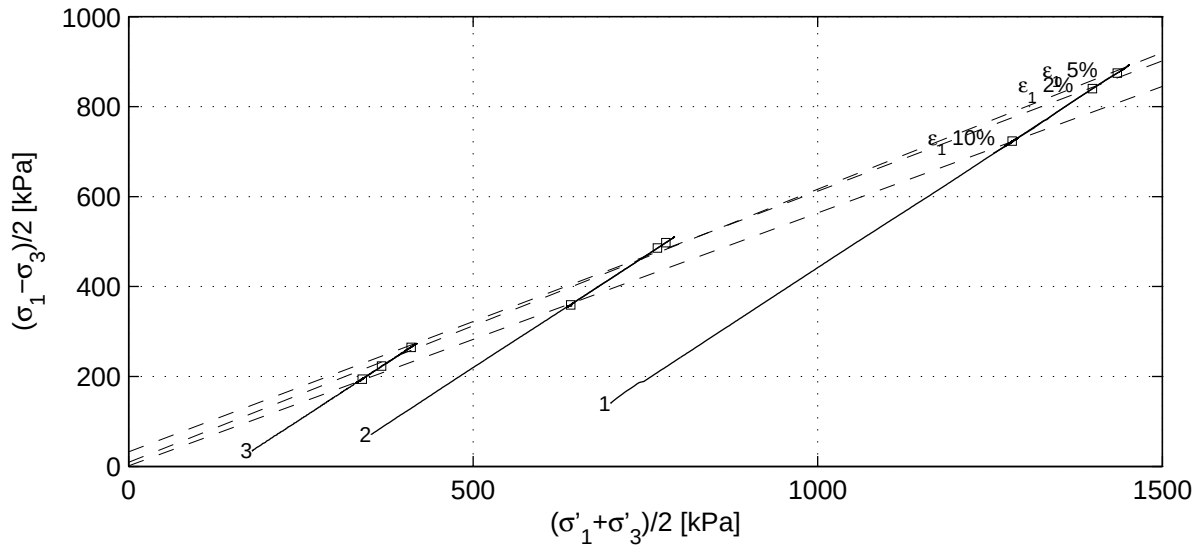
Project Middelburg

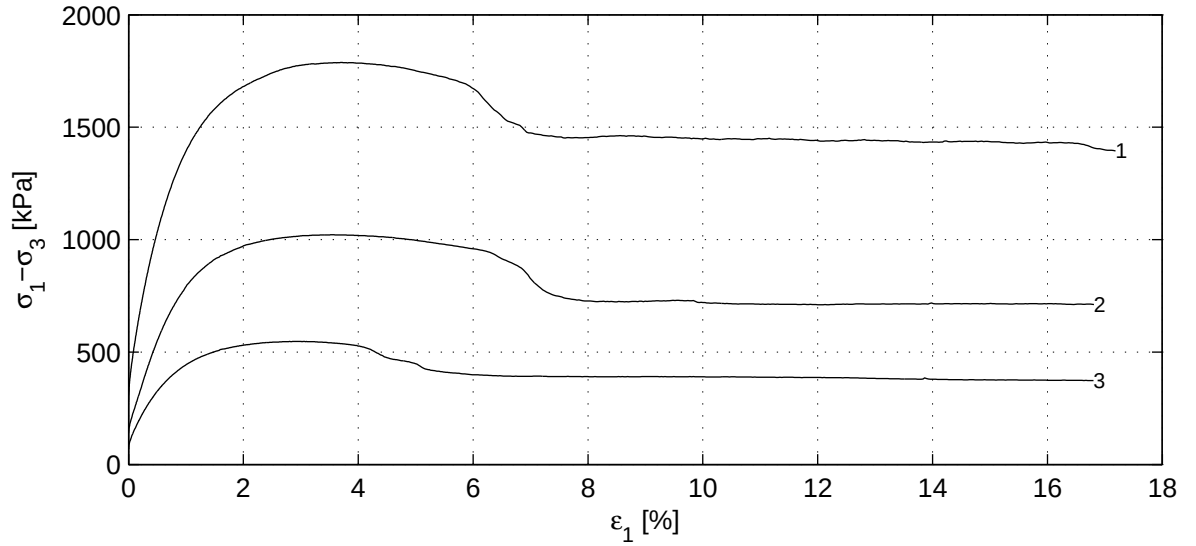
Boring KB−101, Sample KB−101_ST−1, depth −10.27 till −10.82 GL

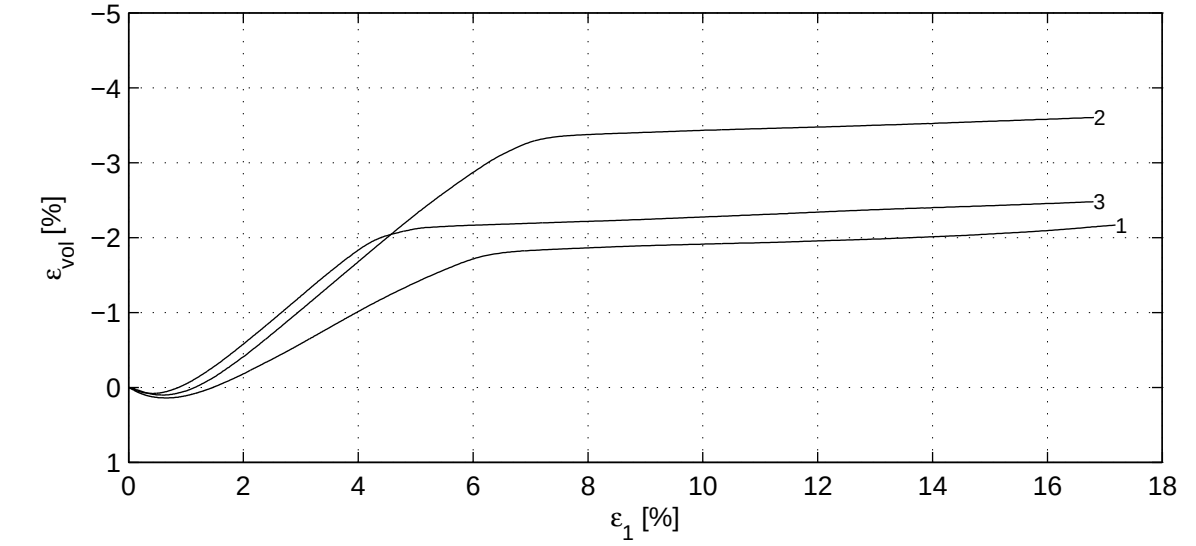
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 18:30







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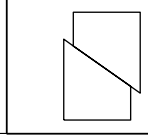
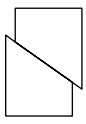
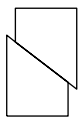
Project Middelburg Boring KB−101, Sample KB−101_ST−1, depth −10.27 till −10.82 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−101_ST−1	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:30

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.90	0.97	0.97
	B_1 [−]	0.98	0.97	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	840.4	422.4	215.1
	t_{100} [min]	0.6	0.5	0.9
	h_c [mm]	149.2	149.3	149.4
	V_c [cm^3]	503.1	506.4	508.9
	$\rho_{n,c}$ [kg/m^3]	2096	2109	2141
	w_c [%]	16.3	17.1	15.7
	u_{bk} [kPa]	299	299	297
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−	0.001
	v_{max} [%/h]	62.4	67.1	38.1
Shear stage	v [%/h]	3.8	3.8	3.8
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1786.3	1020.3	546.3
After testing	f_{undr} [kPa]	893.1	510.1	273.2
	$\varepsilon_{1,50}$ [%]	0.50	0.55	0.45
	E_{50} [MPa]	150.1	79.8	52.7
	w_e [%]	17.7	17.9	18.6
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1398.7	767.4	410.0	840.1	485.5	264.7	35.4	39.8
5.0	1434.8	779.8	367.1	874.7	497.5	223.0	37.4	11.5
10.0	1282.3	641.6	339.2	723.4	359.4	194.0	34.2	1.6
$\varepsilon_{1,tmax}$ [%]	1452.2	792.2	417.0	893.1	510.1	273.2	36.6	36.7

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Project Middelburg

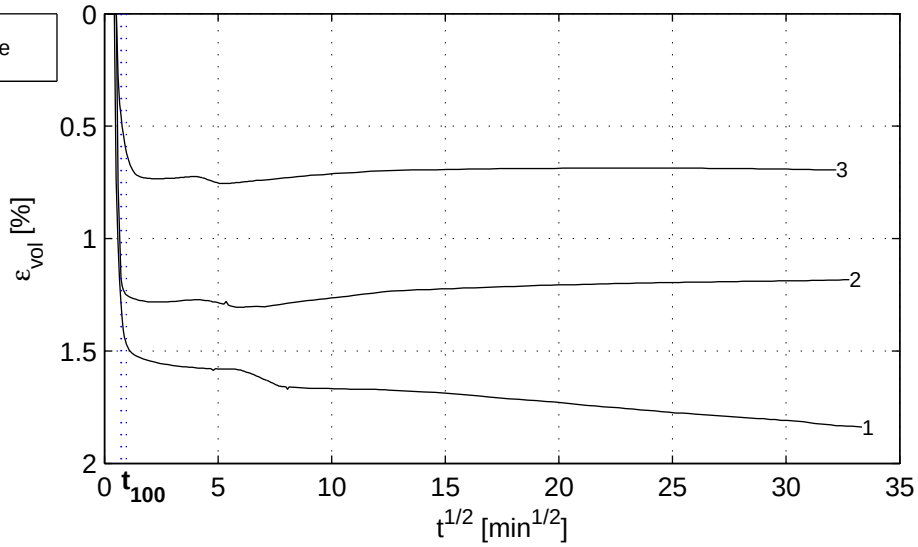
Boring KB−101, Sample KB−101_ST−1, depth −10.27 till −10.82 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

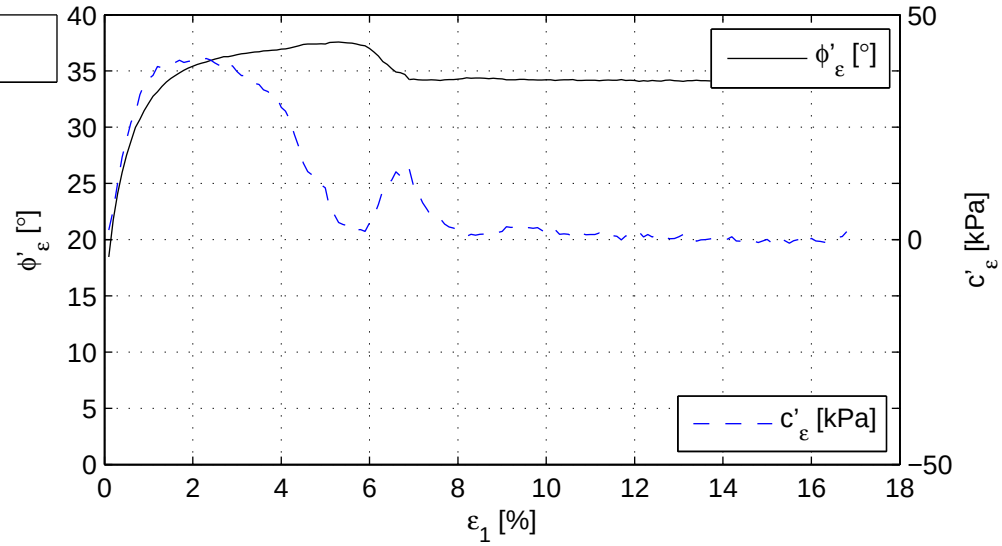
project	seen
1205088.1	Dui
appendix	type
KB−101_ST−1	A4

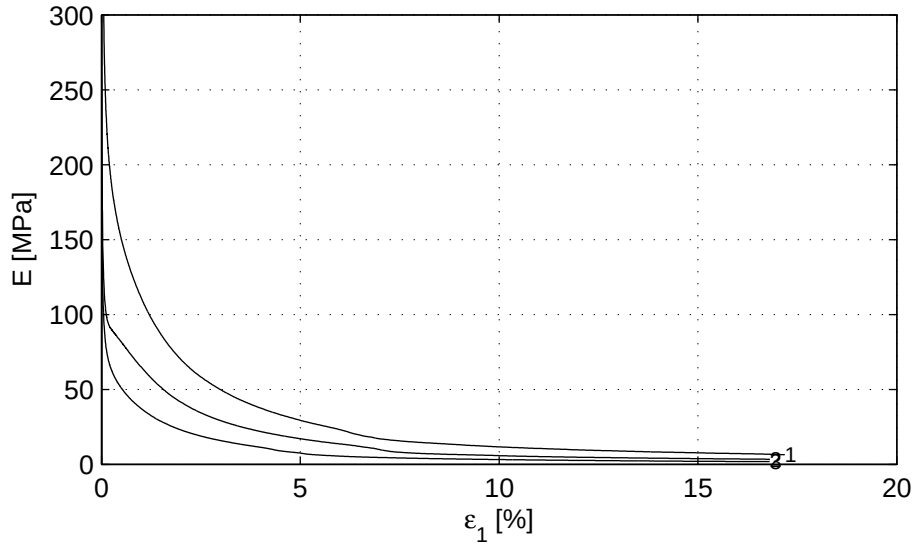
) Vrijgegeven door Dui op 2011-08-08 18:30

Consolidation stage



Shear stage





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Project Middelburg

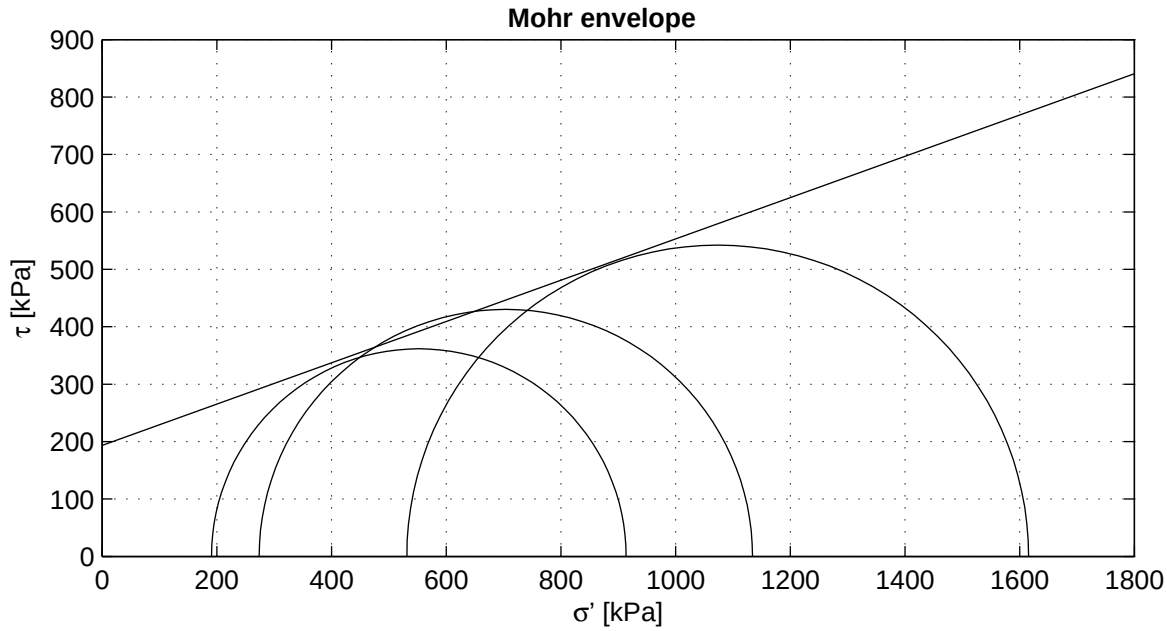
Boring KB−101, Sample KB−101_ST−1, depth −10.27 till −10.82 GL

project	seen
1205088.1	Dui

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−101_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 18:30



Criterion	maximum t
ϕ' [°]	19.78
c' [kPa]	193.24

Start testing

Stage number	1	2	3
Sample name	KB−101_ST−6	KB−101_ST−6A	KB−101_ST−6B
m_i [g]	957.9	972.6	1022.9
D_i [mm]	67.6	66.0	67.3
h_i [mm]	140.3	148.4	150.0
w_i [%]	32.7	31.2	30.5
ρ_i [kg/m^3]	1902	1916	1917
ρ_{dr} [kg/m^3]	1433	1461	1469
Description cf. ASTM	Silty clay (CL−ML)		

Setup: ELE−A sample 6
ELE−B sample 6A
ELE−C sample 6B

Consolidation period t100 follows from isotropic phase.

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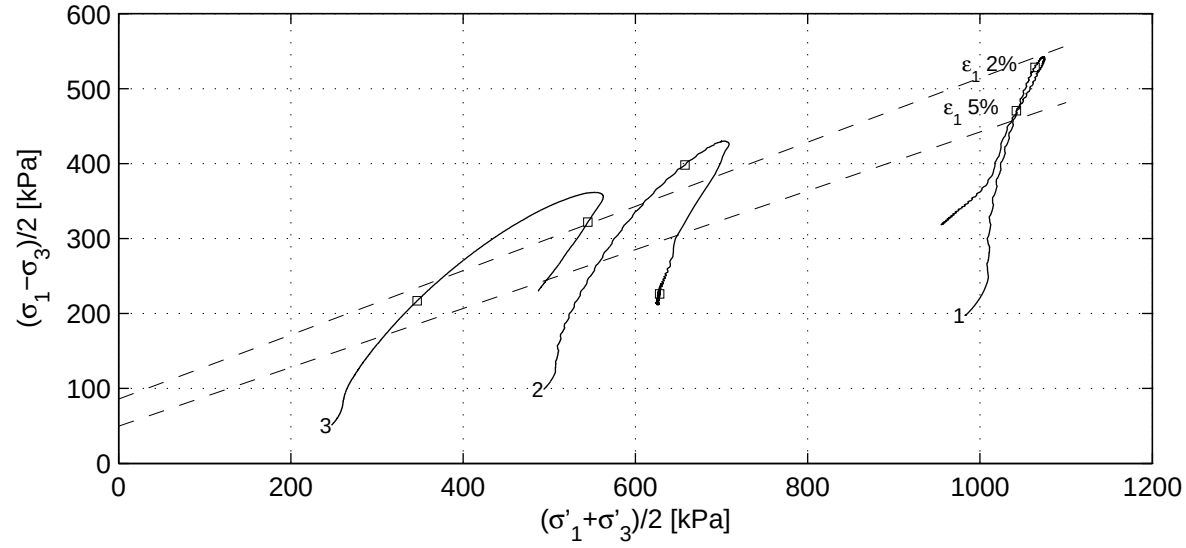
Project Middelburg

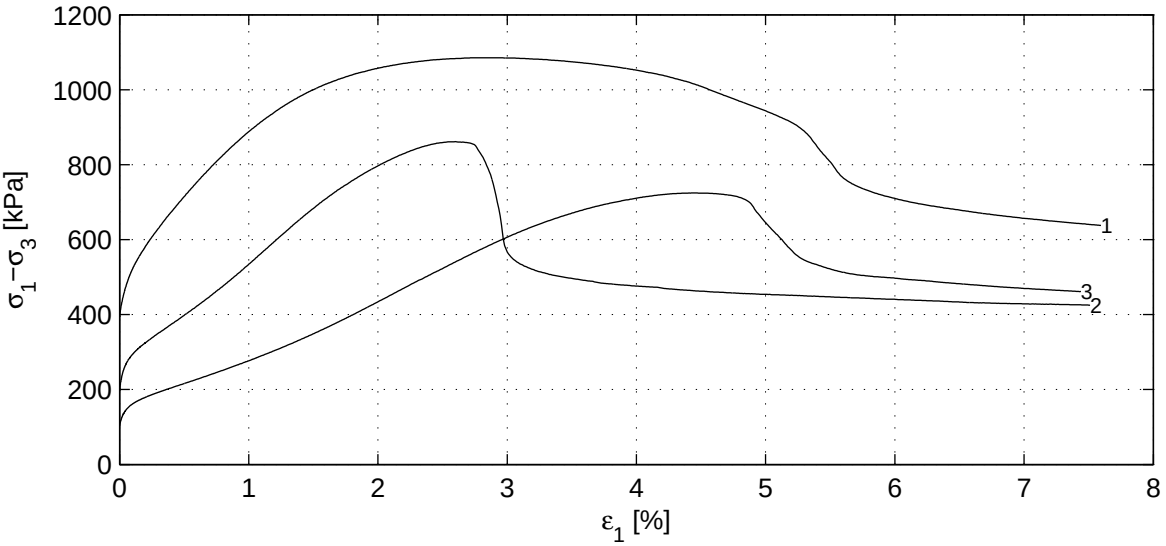
Boring KB−101, Sample KB−101_ST−6, depth −102.70 till −103.25 GL

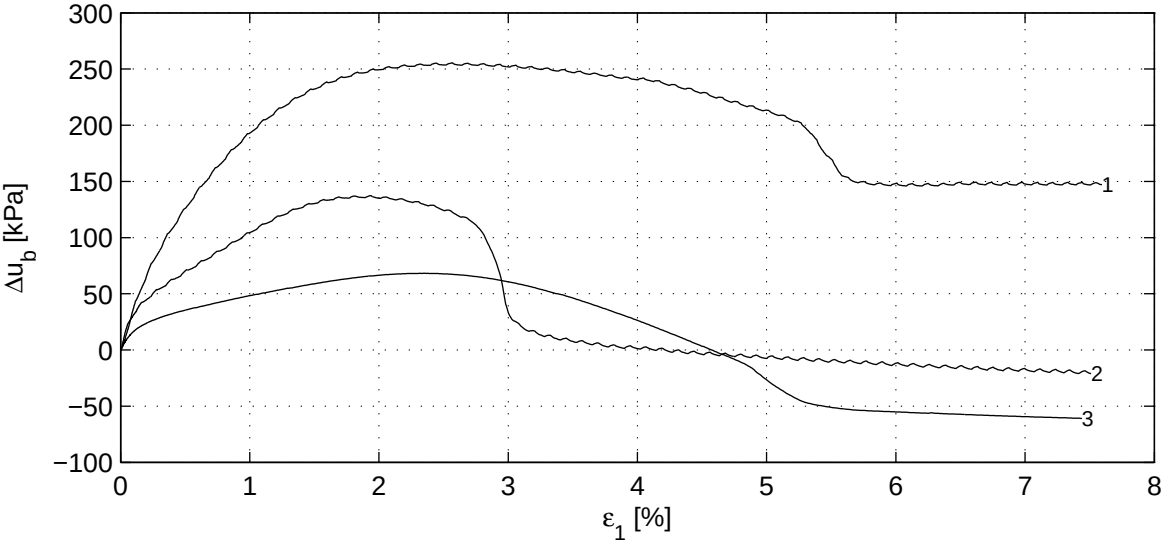
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−6	A4

) Vrijgegeven door Dui op 2011-08-10 13:52







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Project Middelburg

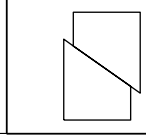
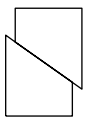
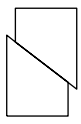
Boring KB−101, Sample KB−101_ST−6, depth −102.70 till −103.25 GL

project	seen
1205088.1	Dui

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−101_ST−6	A4

) Vrijgegeven door Dui op 2011-08-10 13:52

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.48	0.85	0.98
	B_1 [−]	0.97	0.98	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1180.3	592.5	298.8
	t_{100} [min]	2.4	1.7	2.1
	h_c [mm]	137.3	146.1	148.3
	V_c [cm^3]	494.3	504.3	533.4
	$\rho_{n,c}$ [kg/m^3]	1919	1922	1917
	w_c [%]	31.4	30.7	30.5
	u_{bk} [kPa]	299	299	298
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	54.3	76.1	61.7
Shear stage	v [%/h]	0.3	0.3	0.3
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1084.3	860.3	723.1
After testing	f_{undr} [kPa]	542.1	430.2	361.6
	$\varepsilon_{1,50}$ [%]	0.57	0.99	1.89
	E_{50} [MPa]	60.9	33.6	16.5
	w_e [%]	31.9	36.5	33.8
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1064.0	657.5	346.7	528.3	398.1	216.9	25.4	94.9
5.0	1042.3	628.2	544.8	470.6	226.3	321.9	23.1	54.1
10.0								
$\varepsilon_{1,tmax}$ [%]	1073.6	704.1	552.3	542.1	430.2	361.6	19.8	193.2

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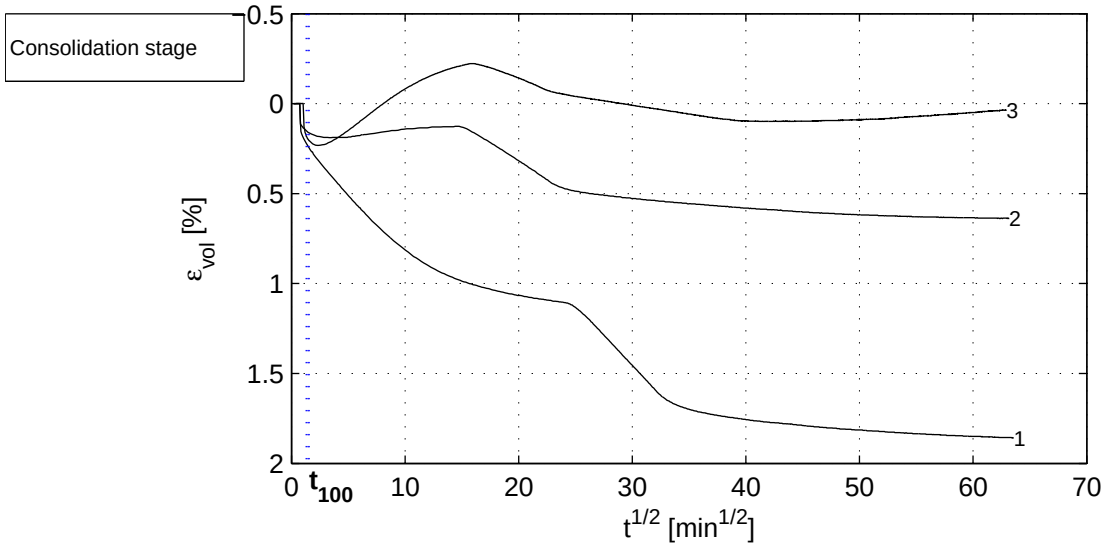
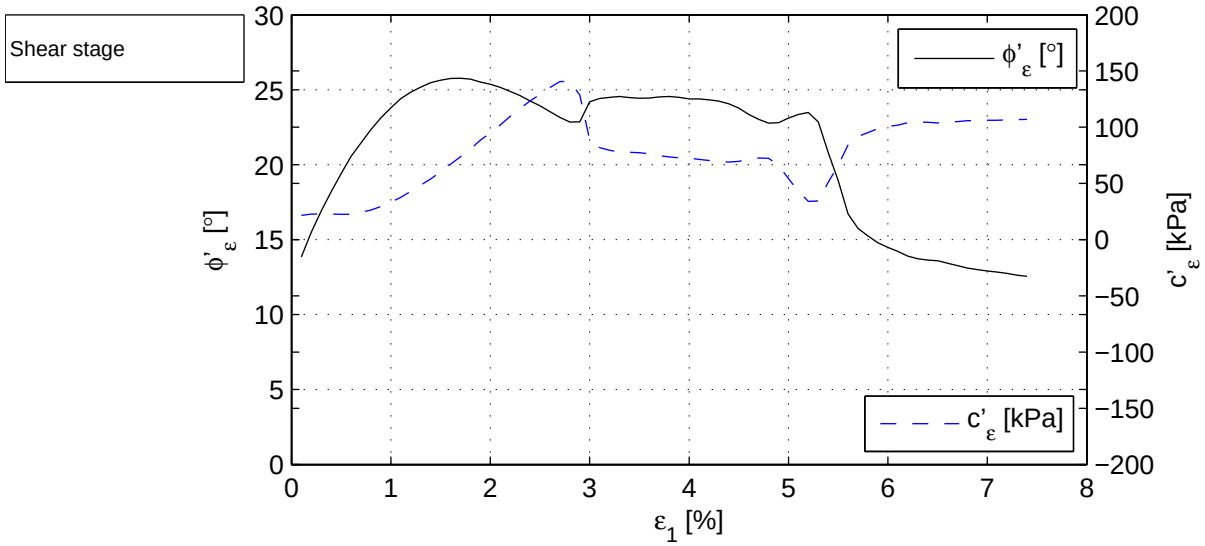
Boring KB−101, Sample KB−101_ST−6, depth −102.70 till −103.25 GL

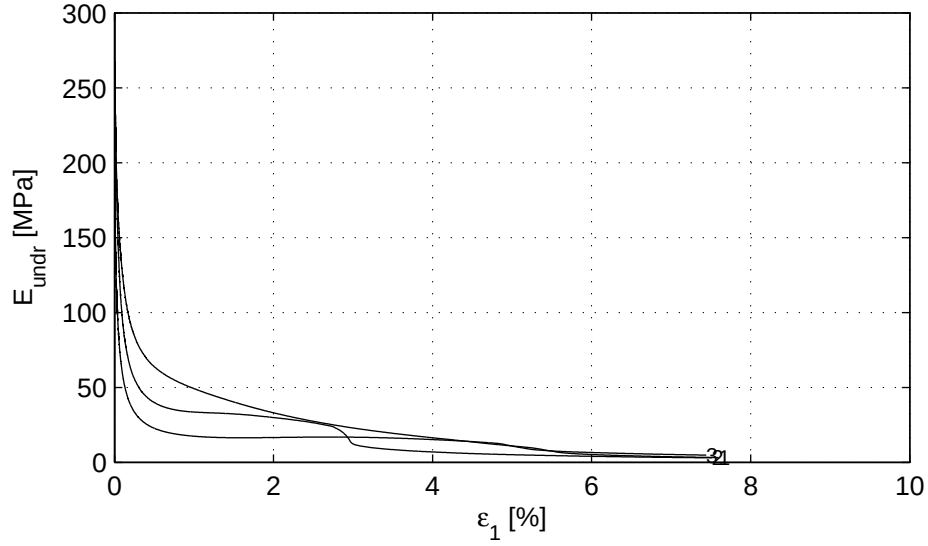
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−6	A4

) Vrijgegeven door Dui op 2011-08-10 13:52







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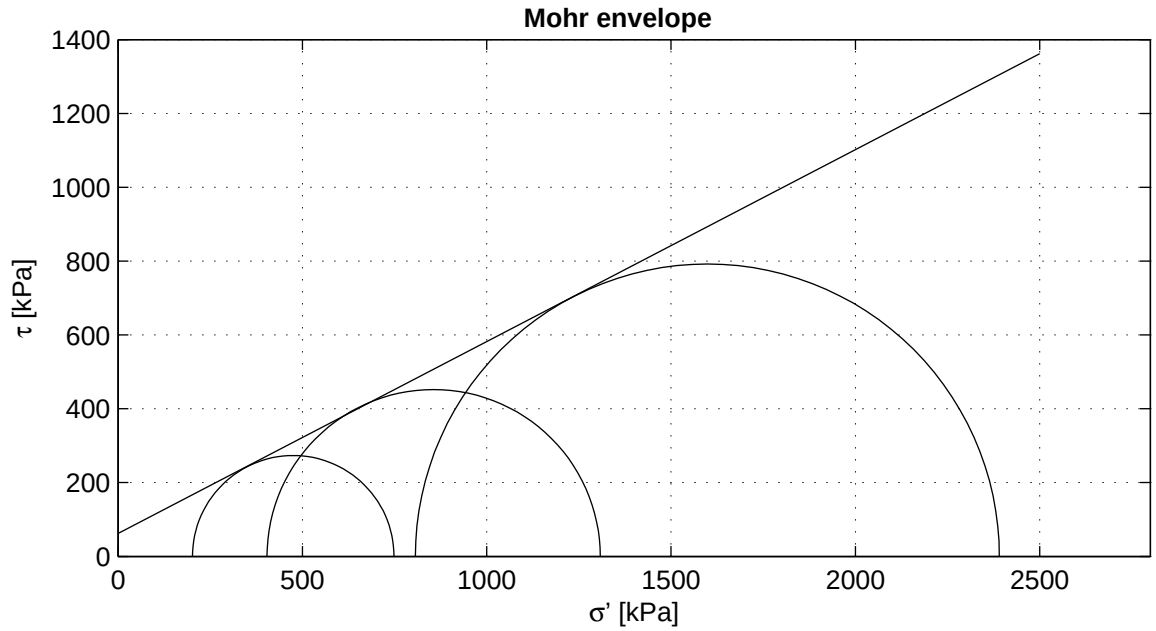
Project Middelburg Boring KB−101, Sample KB−101_ST−6, depth −102.70 till −103.25 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−101_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-10 13:52



Criterion	maximum t
ϕ' [°]	27.46
c' [kPa]	62.46

Start testing

Stage number	1	2	3
Sample name	KB−101_ST−7	KB−101_ST−7A	KB−101_ST−7B
m_i [g]	869.8	894.7	932.4
D_i [mm]	66.0	66.0	66.0
h_i [mm]	132.5	133.8	139.1
w_i [%]	21.8	22.6	23.1
ρ_i [kg/m^3]	1919	1955	1959
ρ_{dr} [kg/m^3]	1576	1594	1592
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 7
WF−B sample 7A
WF−C sample 7B

Consolidation period t100 follows from isotropic phase.

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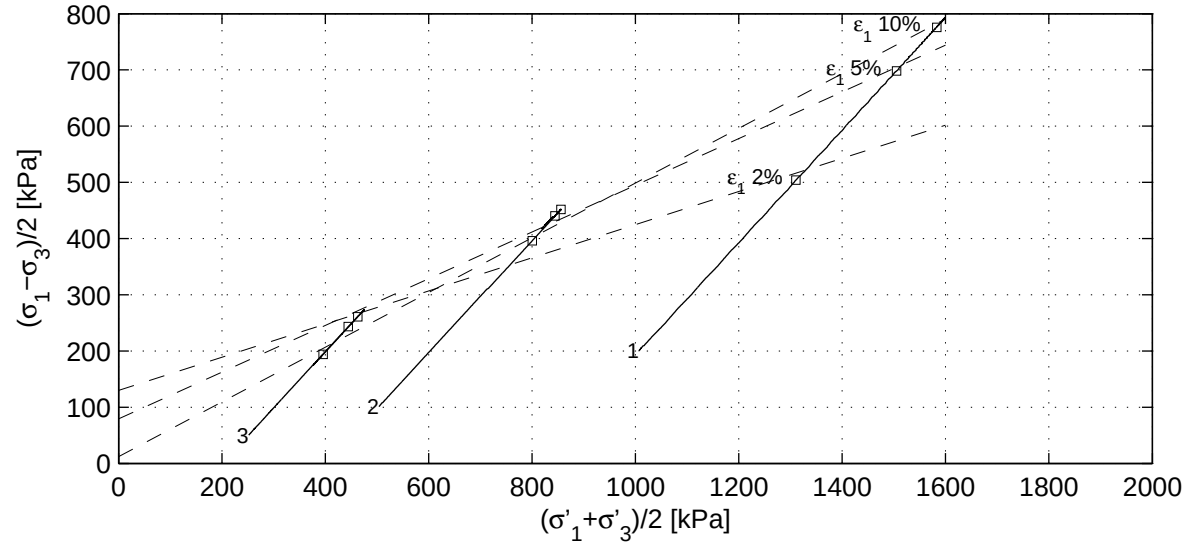
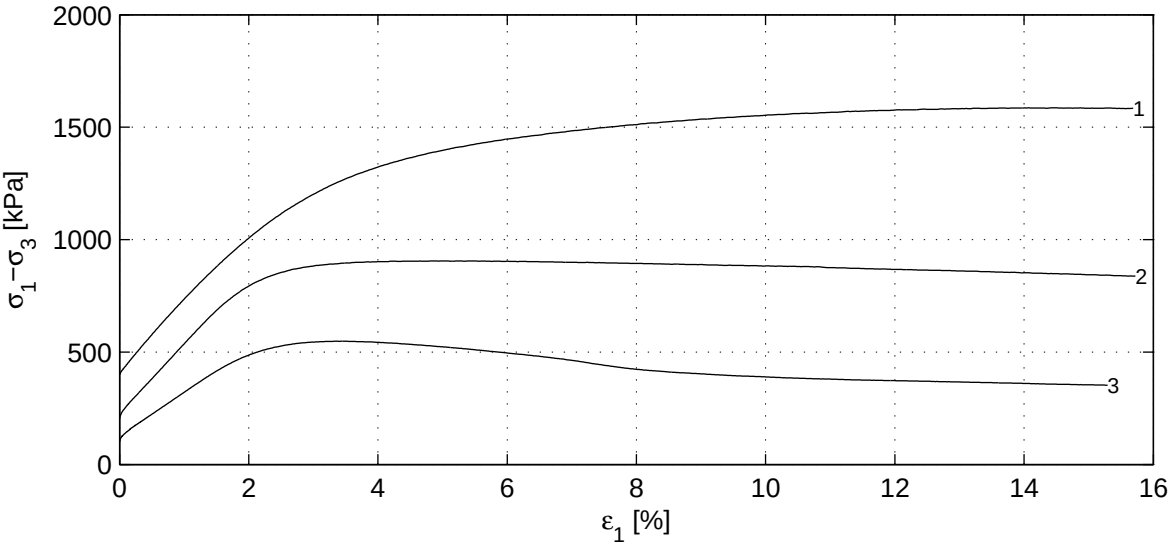
Boring KB−101, Sample KB−101_ST−7, depth −108.26 till −108.81 GL

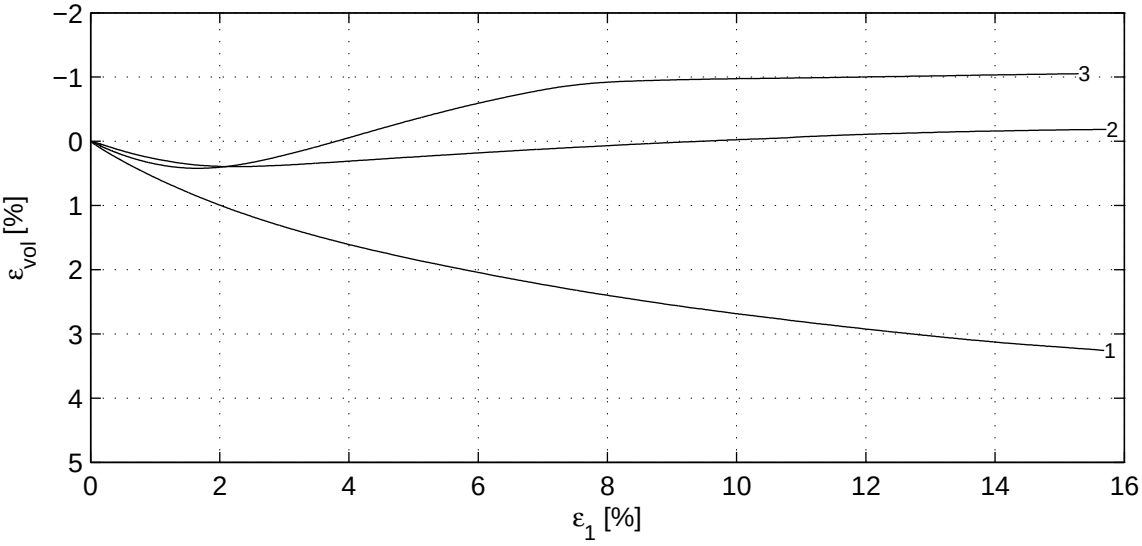
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−7	A4

) Vrijgegeven door Dui op 2011-08-08 13:12







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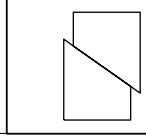
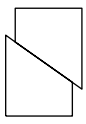
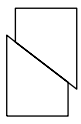
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−7	A4

) Vrijgegeven door Dui op 2011-08-08 13:12

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.40	0.70	0.58
	B_1 [−]	0.99	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1207.5	605.1	302.0
	t_{100} [min]	1.1	2.0	4.7
	h_c [mm]	128.3	131.0	136.2
	V_c [cm^3]	437.3	445.5	467.6
	$\rho_{n,c}$ [kg/m^3]	1952	1981	1976
	w_c [%]	19.5	20.9	22.0
	u_{bk} [kPa]	299	299	297
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−	0.004
	v_{max} [%/h]	31.2	17.5	7.5
Shear stage	v [%/h]	0.9	1.0	1.0
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1584.0	903.9	546.7
After testing	f_{undr} [kPa]	792.0	452.0	273.3
	$\varepsilon_{1,50}$ [%]	1.95	1.06	1.02
	E_{50} [MPa]	30.4	33.3	21.9
	w_e [%]	22.1	24.9	25.0
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1310.5	800.4	444.5	504.0	396.1	243.3	17.1	136.0
5.0	1505.1	855.9	462.9	698.1	452.0	260.8	24.6	87.0
10.0	1583.0	844.4	395.6	775.8	440.5	193.8	29.1	13.9
$\varepsilon_{1,tmax}$ [%]	1598.5	855.9	475.2	792.0	452.0	273.3	27.5	62.5

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Project Middelburg

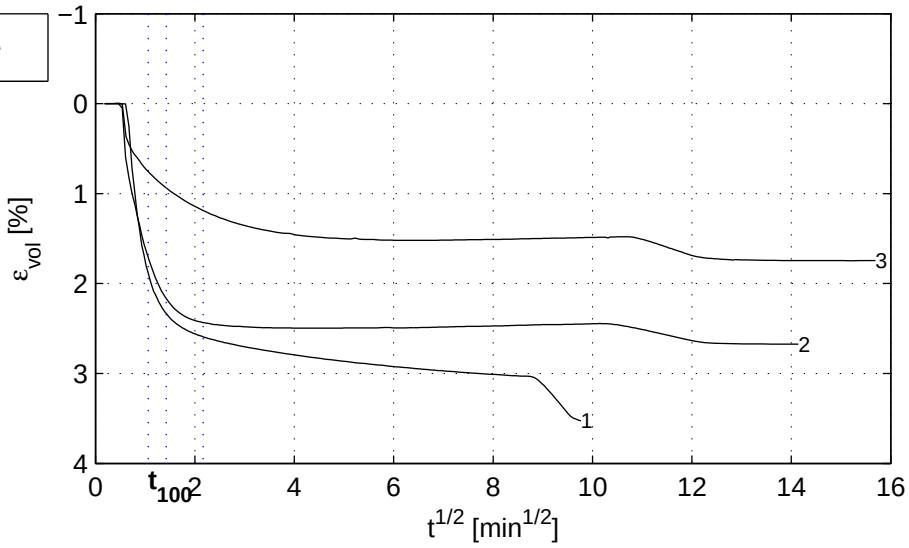
Boring KB−101, Sample KB−101_ST−7, depth −108.26 till −108.81 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

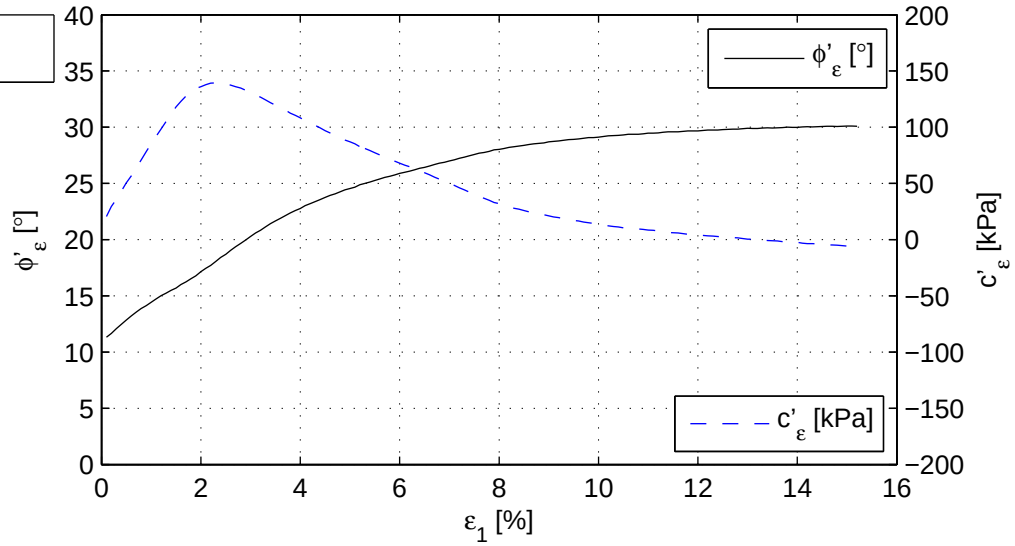
project	seen
1205088.1	Dui
appendix	type
KB−101_ST−7	A4

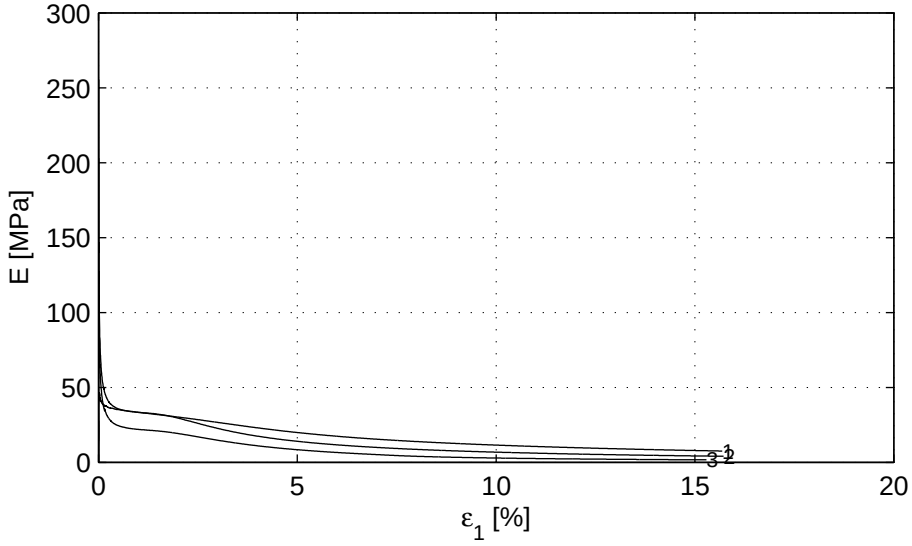
) Vrijgegeven door Dui op 2011-08-08 13:12

Consolidation stage



Shear stage





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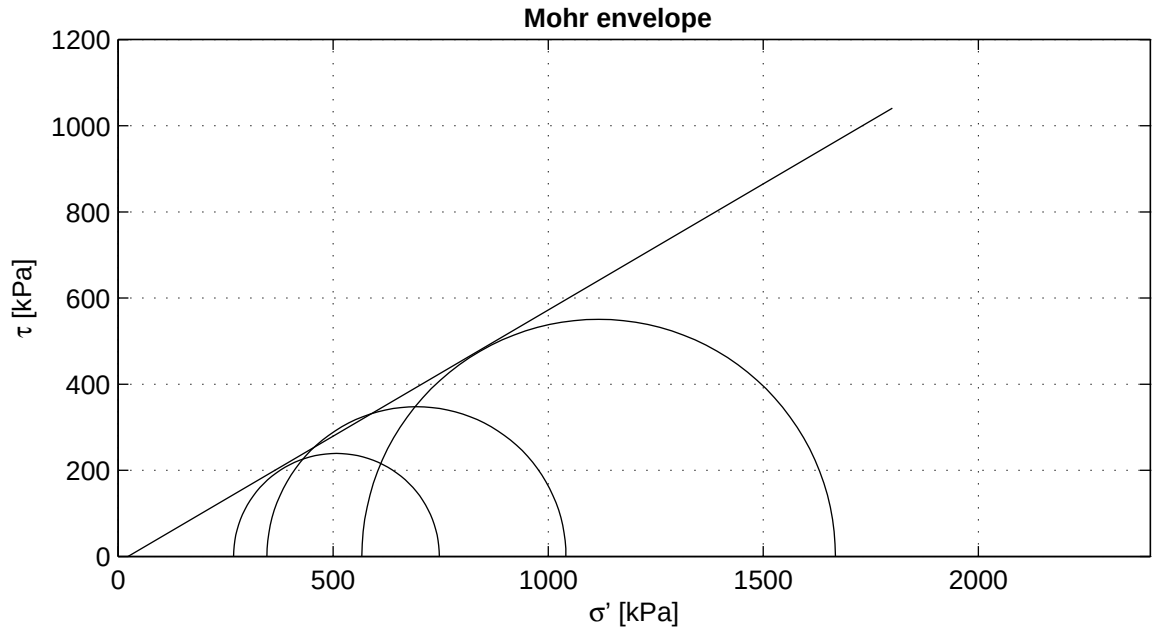
) Vrijgegeven door Dui op 2011-08-08 13:12



Criterion	maximum t
ϕ' [°]	30.35
c' [kPa]	−13.32

Start testing

Stage number	1	2	3
Sample name	KB−101_ST−8	KB−101_ST−8A	KB−101_ST−8B
m_i [g]	875.4	946.8	859.1
D_i [mm]	67.2	67.8	67.5
h_i [mm]	131.8	134.9	128.1
w_i [%]	22.5	23.9	21.3
ρ_i [kg/m^3]	1872	1944	1875
ρ_{dr} [kg/m^3]	1528	1569	1546
Description cf. ASTM	Silty clay (CL−ML)		

Setup: WF−A sample 8
WF−B sample 8A
WF−C sample 8B

Consolidation period t100 follows from isotropic phase.

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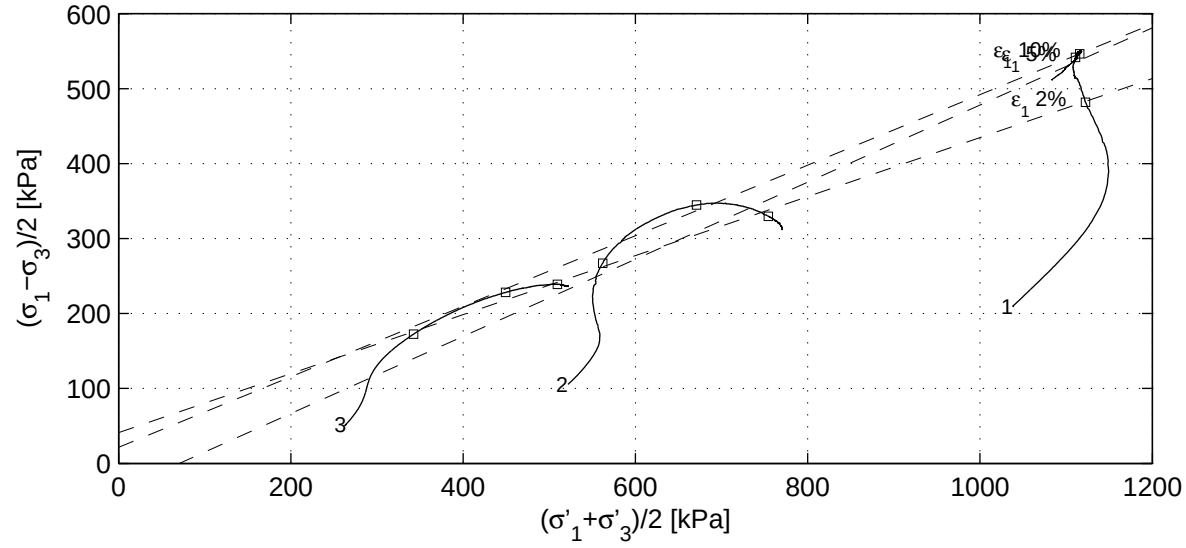
Project Middelburg

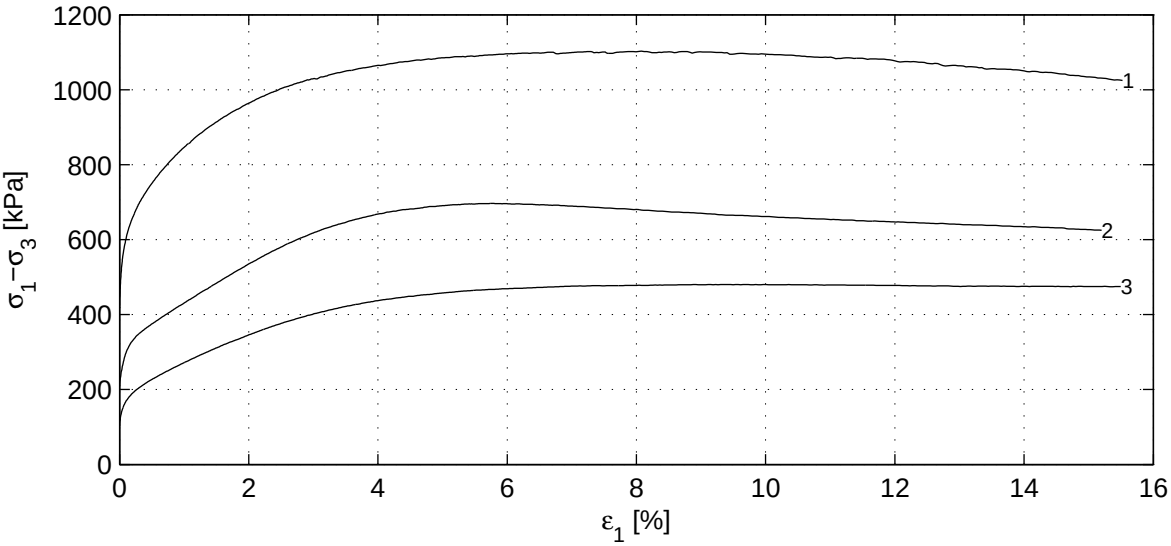
Boring KB−101, Sample KB−101_ST−8, depth −115.76 till −116.33 GL

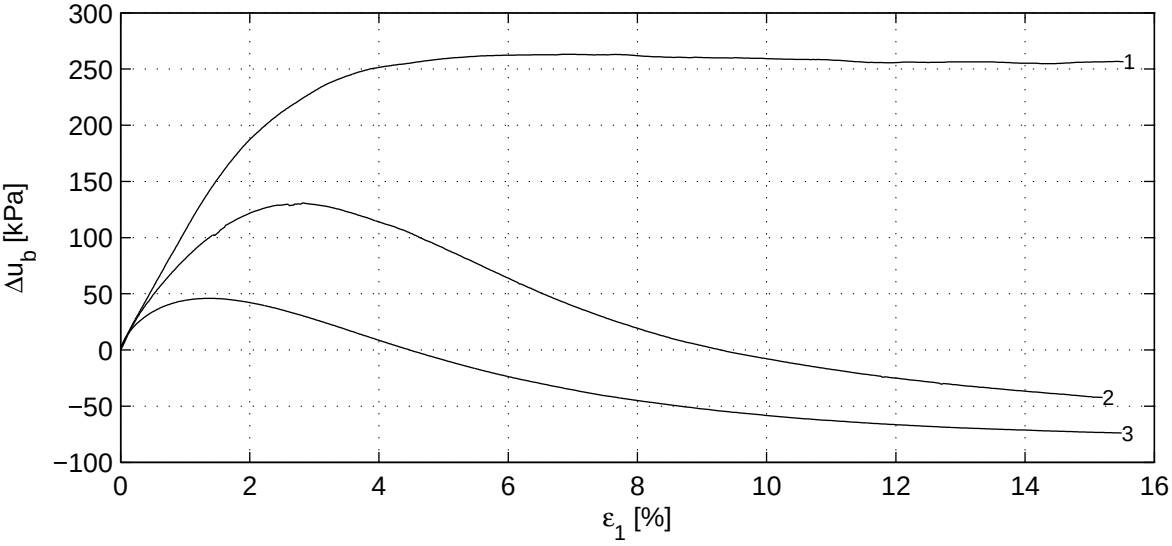
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−8	A4

) Vrijgegeven door Dui op 2011-08-08 13:37







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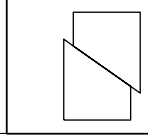
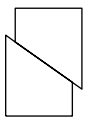
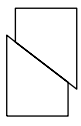
Project Middelburg

Boring KB−101, Sample KB−101_ST−8, depth −115.76 till −116.33 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−8	A4

) Vrijgegeven door Dui op 2011-08-08 13:37

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.56	0.75	0.53
	B_1 [−]	0.98	0.99	0.98
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1248.1	626.5	316.4
	t_{100} [min]	2.1	227.4	6.3
	h_c [mm]	125.5	129.0	124.0
	V_c [cm^3]	438.7	465.5	448.4
	$\rho_{n,c}$ [kg/m^3]	1930	1988	1894
	w_c [%]	18.5	21.1	19.9
	u_{bk} [kPa]	298	298	296
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	62.2	0.6	20.8
Shear stage	v [%/h]	4.7	4.3	4.6
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1101.1	695.1	478.4
After testing	f_{undr} [kPa]	550.6	347.6	239.2
	$\varepsilon_{1,50}$ [%]	0.56	1.22	1.26
	E_{50} [MPa]	61.6	20.0	14.9
	w_e [%]	22.7	22.7	24.1
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1122.5	562.0	342.4	481.7	267.2	172.4	23.2	44.7
5.0	1111.0	671.1	449.4	541.8	344.7	228.1	28.1	24.5
10.0	1115.6	754.4	509.5	546.5	329.8	239.0	31.0	−42.2
$\varepsilon_{1,tmax}$ [%]	1117.4	693.8	507.8	550.6	347.6	239.2	30.4	−13.3

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Project Middelburg

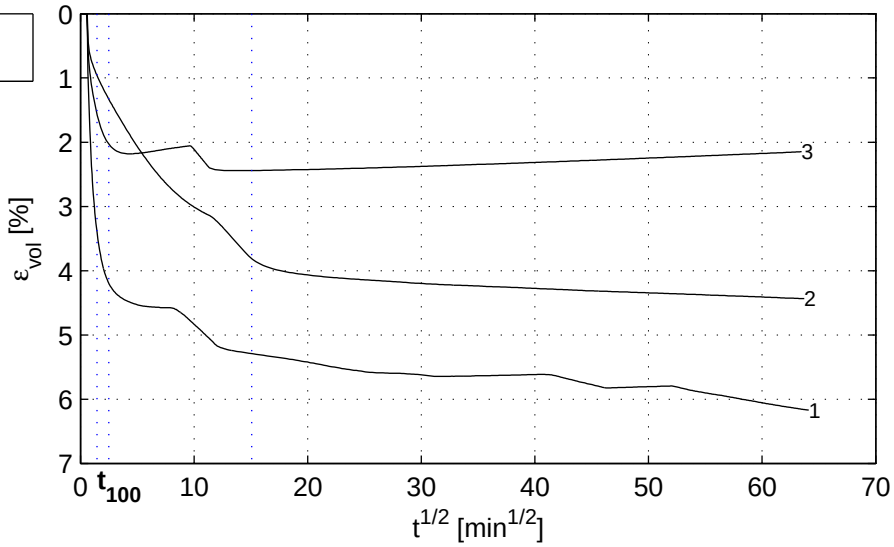
Boring KB−101, Sample KB−101_ST−8, depth −115.76 till −116.33 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

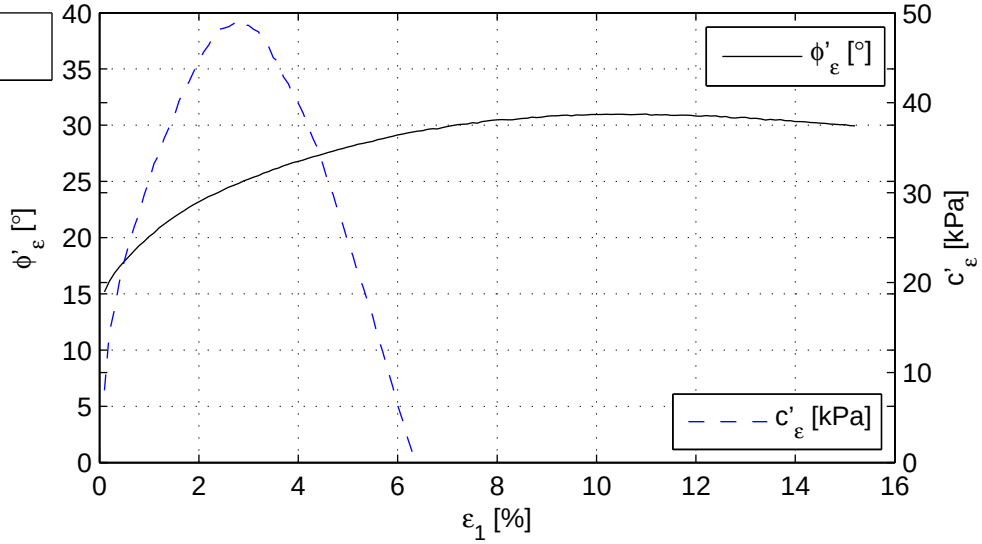
project	seen
1205088.1	Dui
appendix	type
KB−101_ST−8	A4

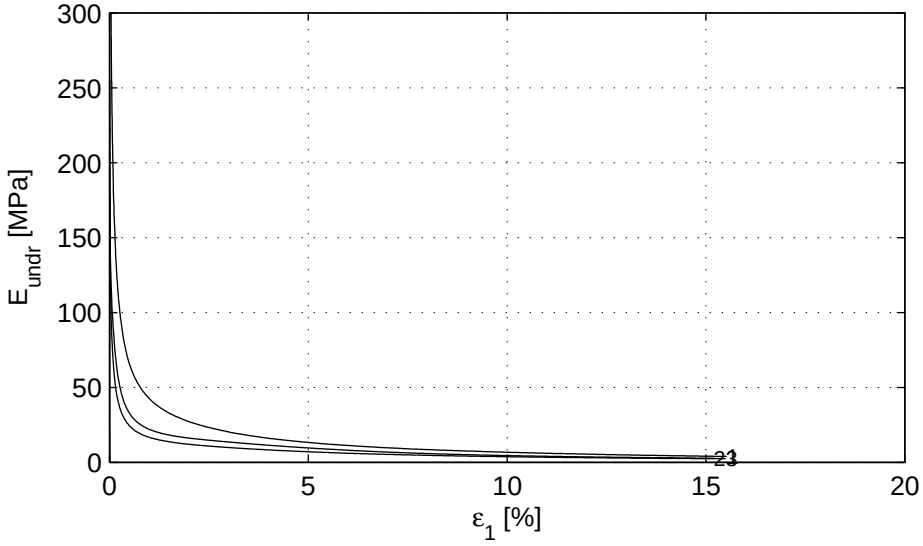
) Vrijgegeven door Dui op 2011-08-08 13:37

Consolidation stage



Shear stage





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Project Middelburg Boring KB−101, Sample KB−101_ST−8, depth −115.76 till −116.33 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−101_ST−8	seen Dui type A4

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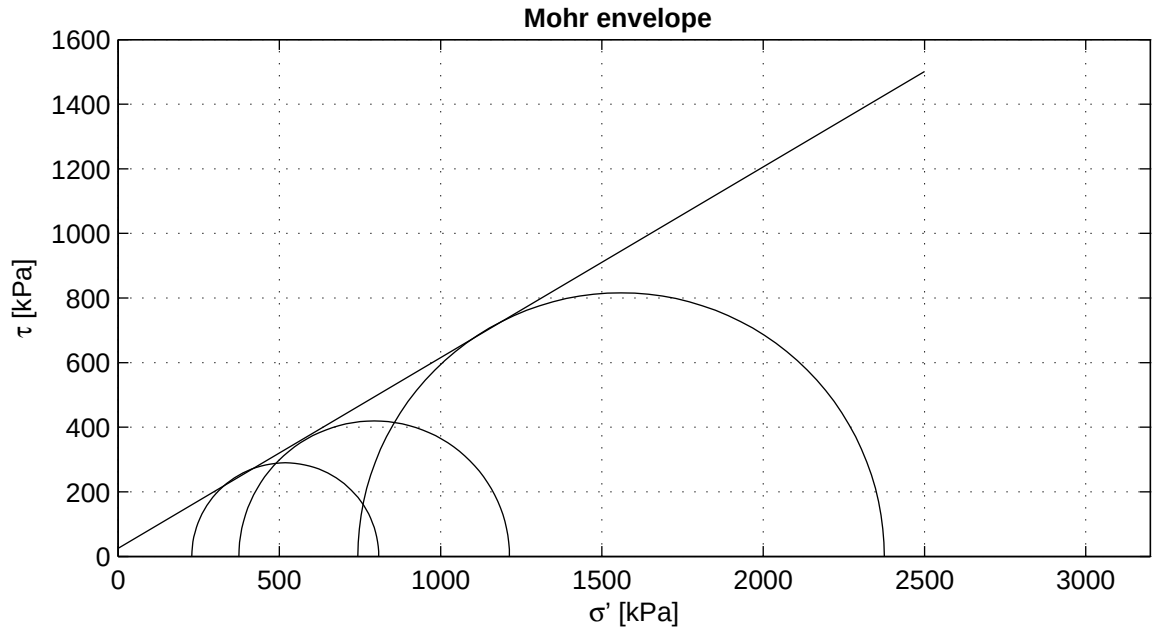

Criterion	maximum t
ϕ' [°]	30.55
c' [kPa]	25.39

Start testing

Stage number	1	2	3
Sample name	KB−101_ST−9	KB−101_ST−9A	KB−101_ST−9B
m_i [g]	957.0	947.8	963.7
D_i [mm]	66.7	66.8	66.8
h_i [mm]	140.5	141.1	141.5
w_i [%]	19.8	23.2	18.8
ρ_i [kg/m^3]	1950	1917	1943
ρ_{dr} [kg/m^3]	1627	1556	1636
Description cf. ASTM	Silty Sand (SM)		

Setup: ELE−A sample 9
ELE−B sample 9A
ELE−C sample 9B

Consolidation period t100 follows from isotropic phase

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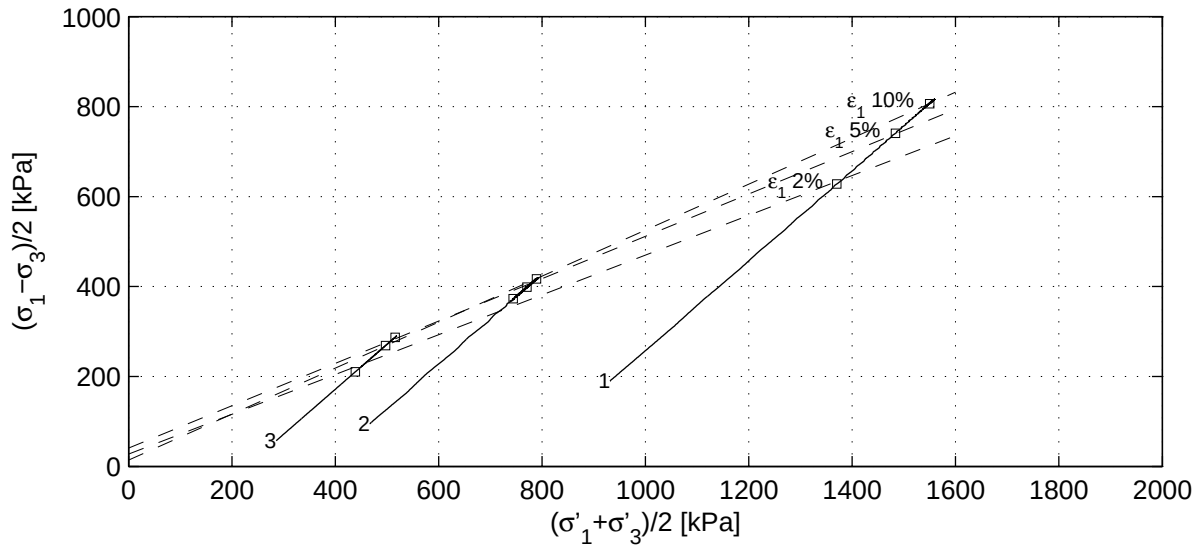
Project Middelburg

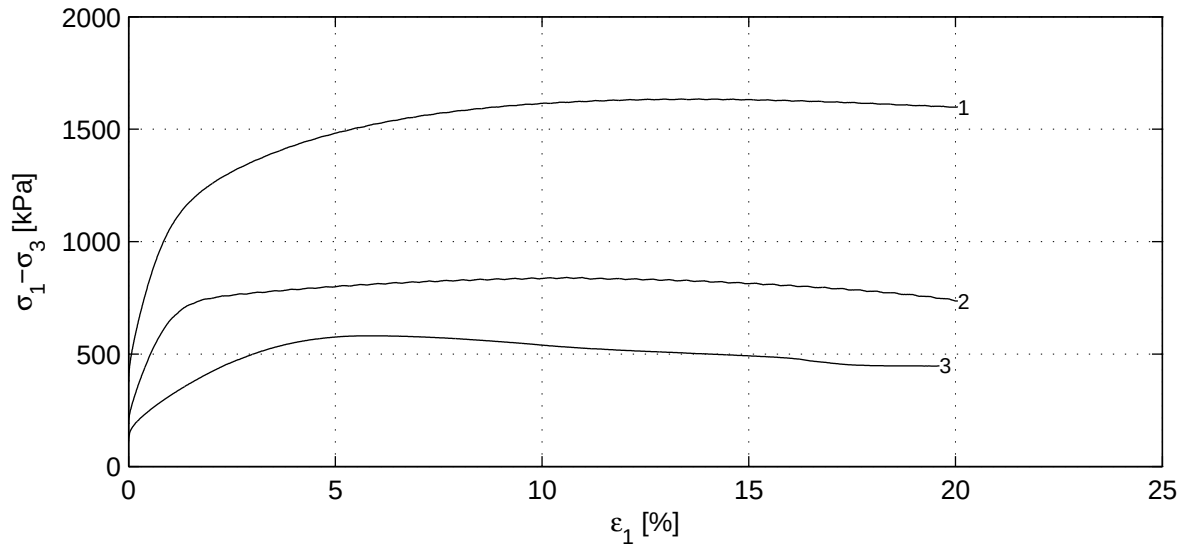
Boring KB−101, Sample KB−101_ST−9, depth −136.80 till −137.35 GL

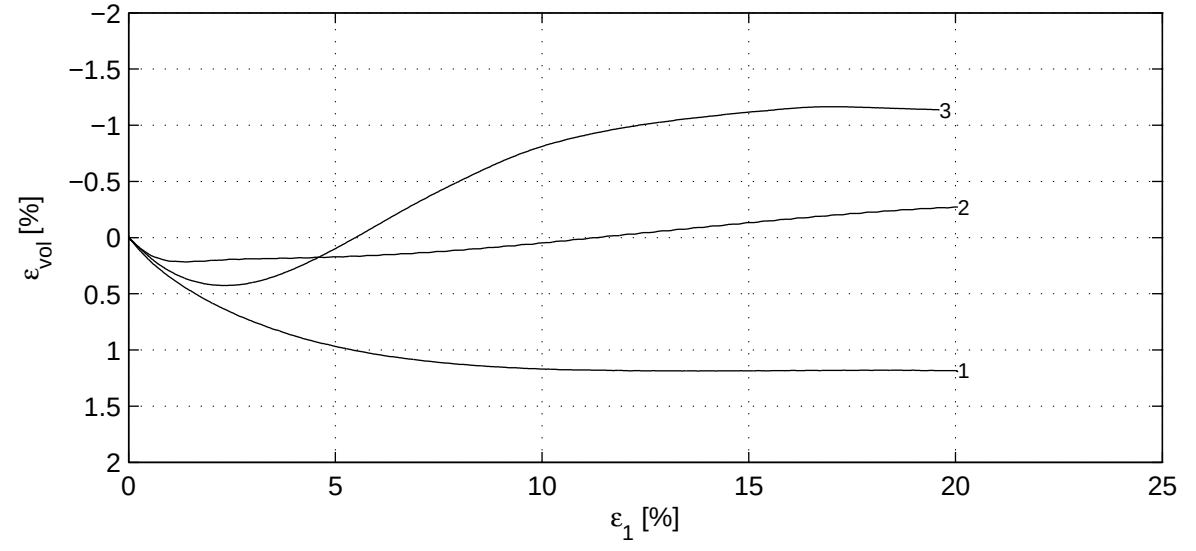
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−9	A4

) Vrijgegeven door Dui op 2011-08-08 18:16







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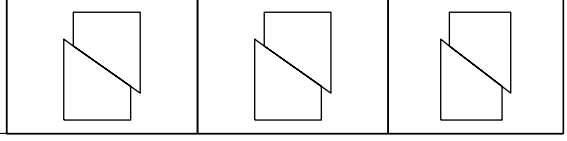
project	seen
1205088.1	Dui

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−101_ST−9	A4

) Vrijgegeven door Dui op 2011-08-08 18:16

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.45	0.57	0.93
	B_1 [−]	0.99	0.98	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1122.4	562.4	342.7
	t_{100} [min]	1.5	1.1	1.1
	h_c [mm]	137.4	137.1	139.0
	V_c [cm^3]	475.2	479.4	483.3
	$\rho_{n,c}$ [kg/m^3]	1981	1945	1968
	w_c [%]	17.8	21.2	17.2
	u_{bk} [kPa]	299	298	298
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	0.001	−
	v_{max} [%/h]	23.7	31.2	32.5
Shear stage	v [%/h]	1.0	1.0	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1632.2	838.8	579.6
After testing	f_{undr} [kPa]	816.1	419.4	289.8
	$\varepsilon_{1,50}$ [%]	0.86	0.58	1.29
	E_{50} [MPa]	72.4	56.6	18.0
	w_e [%]	21.4	22.3	22.0
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1370.4	744.2	438.9	628.2	373.2	210.4	26.3	30.6
5.0	1483.8	770.9	515.7	740.5	398.8	287.2	28.1	46.3
10.0	1550.1	789.1	497.3	806.6	417.0	268.8	30.7	16.6
$\varepsilon_{1,tmax}$ [%]	1559.3	793.9	518.4	816.1	419.4	289.8	30.6	25.4

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Project Middelburg

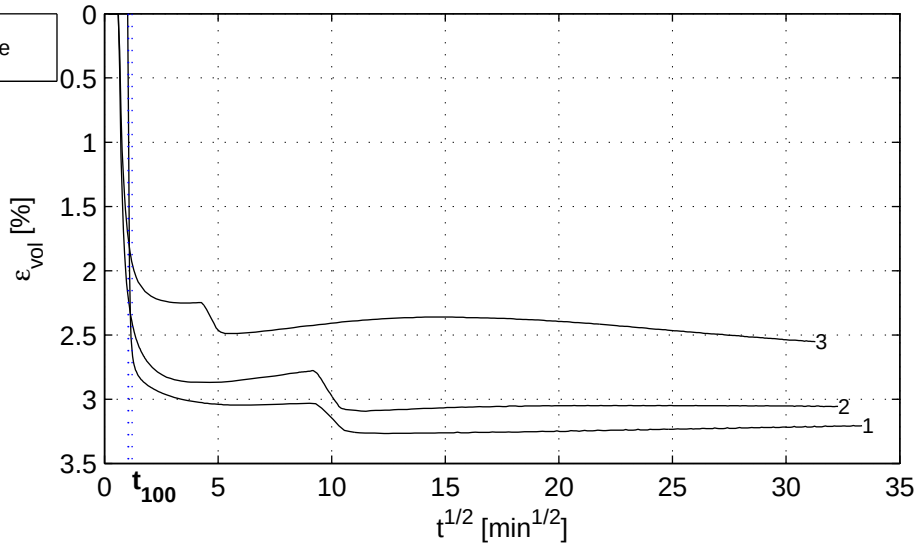
Boring KB−101, Sample KB−101_ST−9, depth −136.80 till −137.35 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

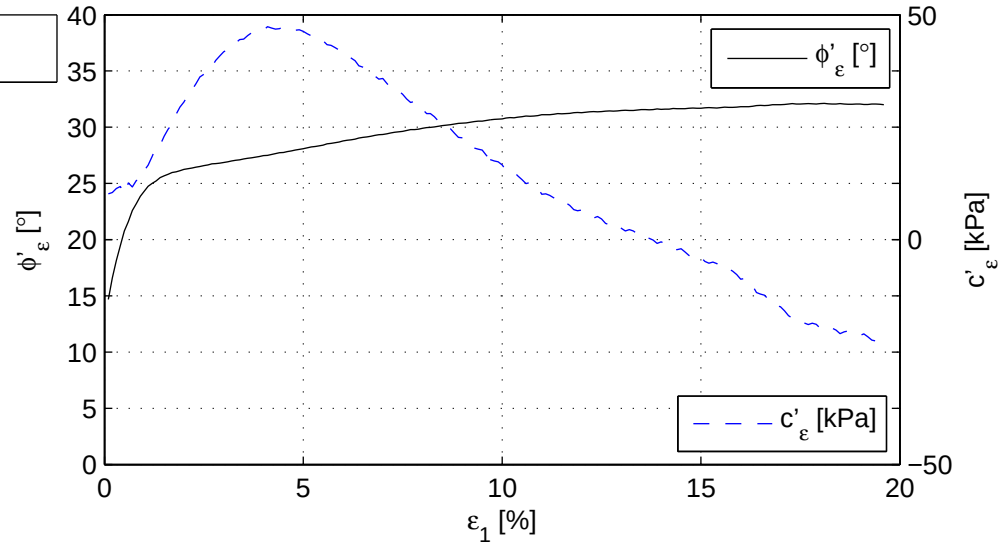
project	seen
1205088.1	Dui
appendix	type
KB−101_ST−9	A4

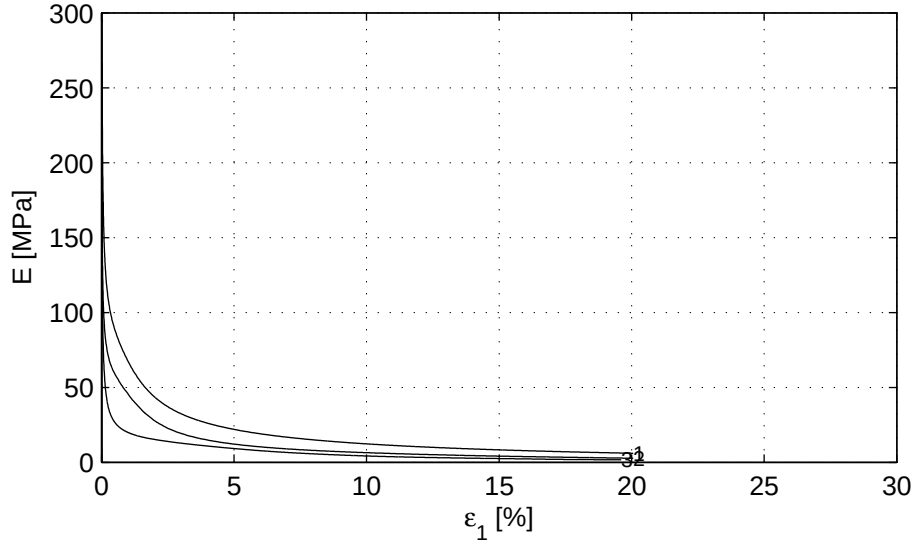
) Vrijgegeven door Dui op 2011-08-08 18:16

Consolidation stage



Shear stage





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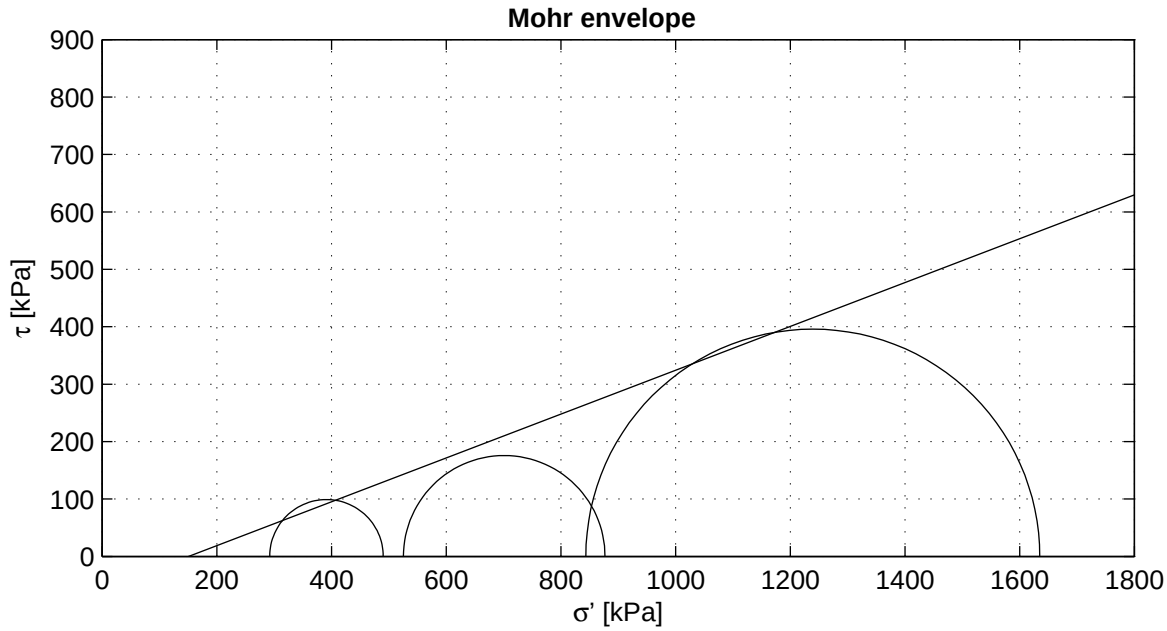
Boring KB−101, Sample KB−101_ST−9, depth −136.80 till −137.35 GL

project	seen
1205088.1	Dui

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−101_ST−9	A4

) Vrijgegeven door Dui op 2011-08-08 18:16



Criterion	maximum t
ϕ' [°]	20.89
c' [kPa]	−57.41

Start testing

Stage number	1	2	3
Sample name	KB−101_ST−11	KB−101_ST−11A	KB−101_ST−11B
m_i [g]	959.3	873.6	928.9
D_i [mm]	68.5	68.5	67.5
h_i [mm]	136.3	126.8	136.2
w_i [%]	29.7	31.1	30.0
ρ_i [kg/m^3]	1910	1869	1906
ρ_{dr} [kg/m^3]	1472	1426	1466
Description cf. ASTM	Silty clay (CL−ML)		

Setup: ELE−A sample 11A
ELE−B sample 11
ELE−C sample 11B

Consolidation period t100 follows from isotropic phase.

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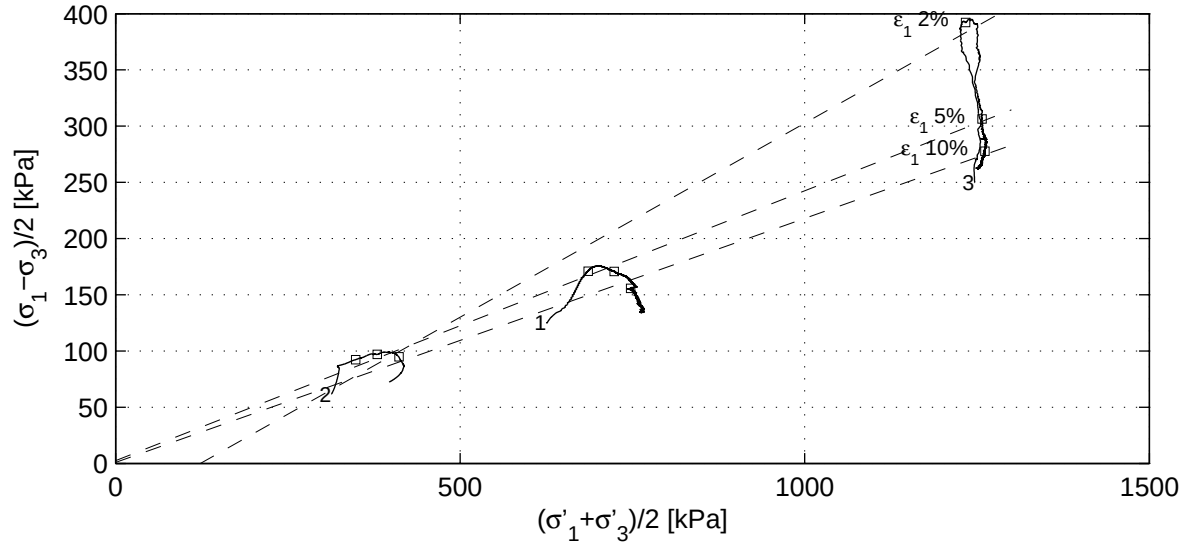
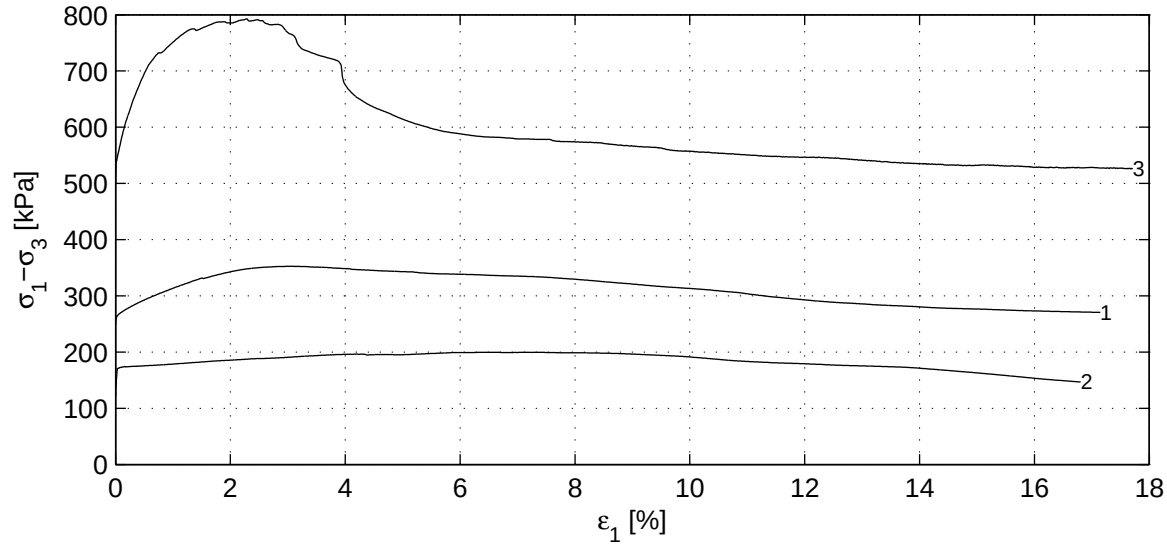
Boring KB−101, Sample KB−101_ST−11, depth −155.81 till −156.36 GL

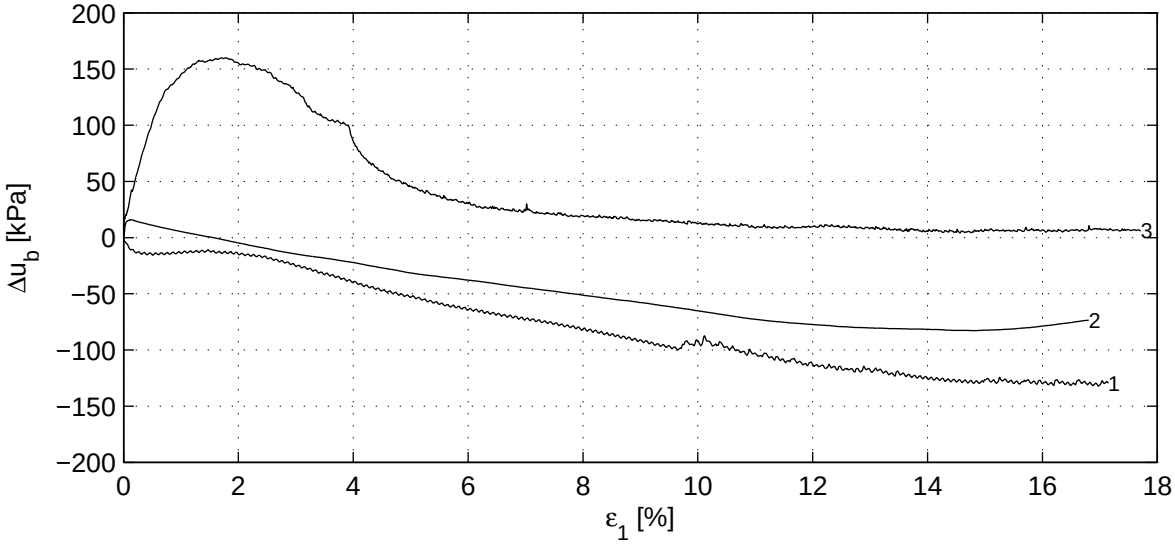
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−11	A4

) Vrijgegeven door Dui op 2011-08-09 21:16







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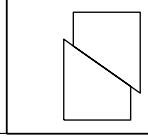
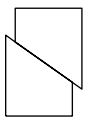
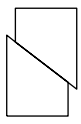
Boring KB−101, Sample KB−101_ST−11, depth −155.81 till −156.36 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−11	A4

) Vrijgegeven door Dui op 2011-08-09 21:16

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.33	0.30	0.50
	B_1 [−]	0.99	0.98	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	750.0	374.7	1496.0
	t_{100} [min]	1354.5	1412.5	2307.9
	h_c [mm]	134.3	126.7	133.7
	V_c [cm^3]	510.3	472.0	487.4
	$\rho_{n,c}$ [kg/m^3]	1896	1861	1906
	w_c [%]	30.8	31.8	30.0
	u_{bk} [kPa]	300	299	299
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	0.000	0.000	−
	v_{max} [%/h]	0.1	0.1	0.1
Shear stage	v [%/h]	0.2	0.2	0.2
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	351.4	198.0	791.6
After testing	f_{undr} [kPa]	175.7	99.0	395.8
	$\varepsilon_{1,50}$ [%]	0.70	0.02	0.30
	E_{50} [MPa]	7.3	166.9	48.6
	w_e [%]	34.3	36.1	33.2
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	685.7	348.3	1233.4	170.9	92.2	392.2	20.2	−45.3
5.0	723.4	379.8	1257.2	170.8	97.0	306.4	13.9	2.6
10.0	747.4	411.2	1261.4	155.7	94.7	277.7	12.5	1.0
$\varepsilon_{1,tmax}$ [%]	701.2	391.3	1239.4	175.7	99.0	395.8	20.9	−57.4

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Project Middelburg

Boring KB−101, Sample KB−101_ST−11, depth −155.81 till −156.36 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−101_ST−11	A4

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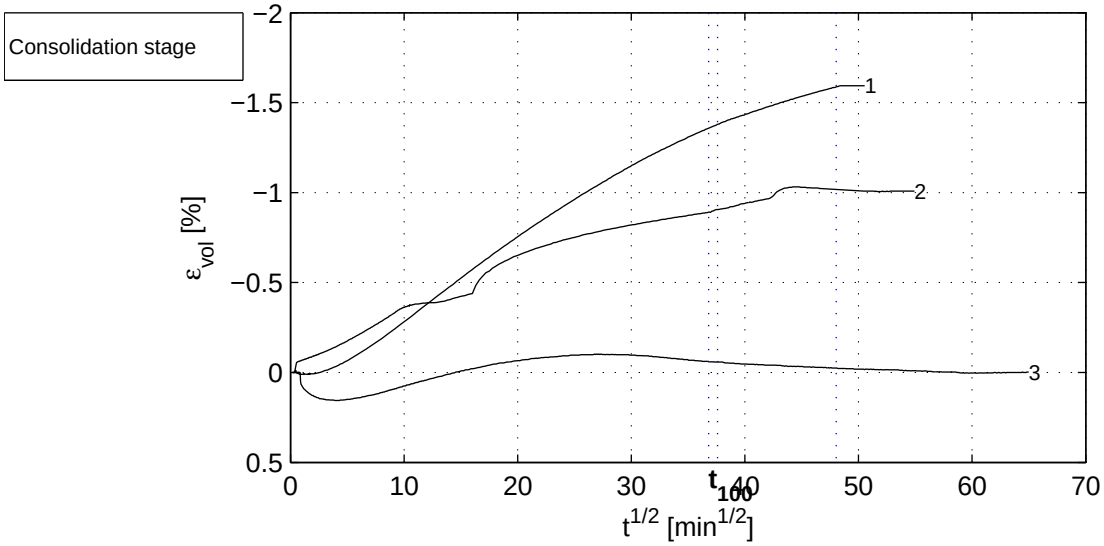

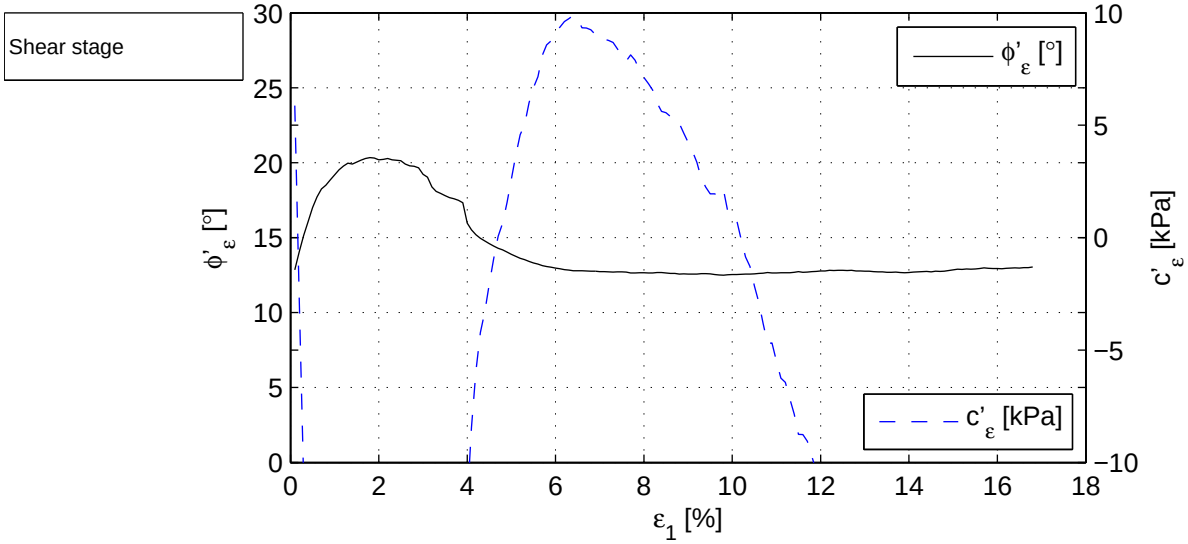

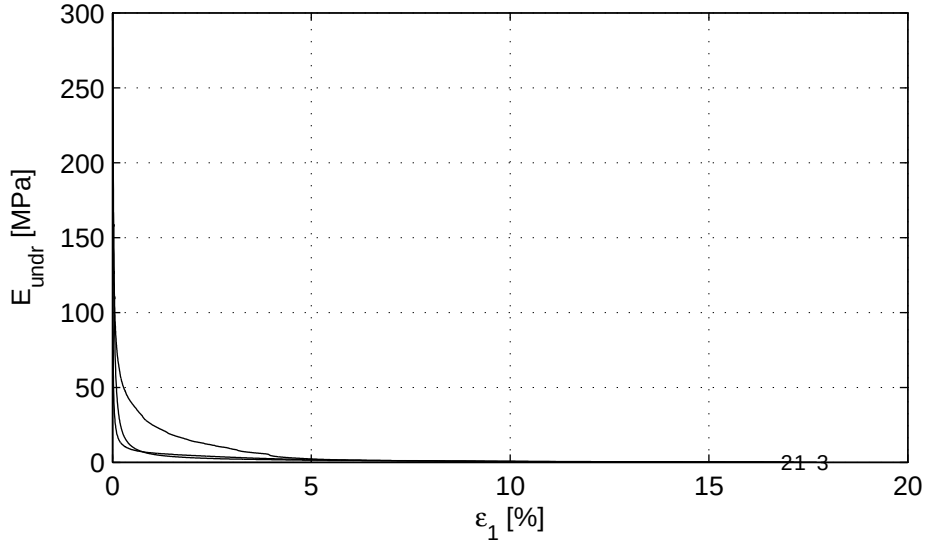

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Project Middelburg Boring KB−101, Sample KB−101_ST−11, depth −155.81 till −156.36 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−101_ST−11	seen Dui type A4

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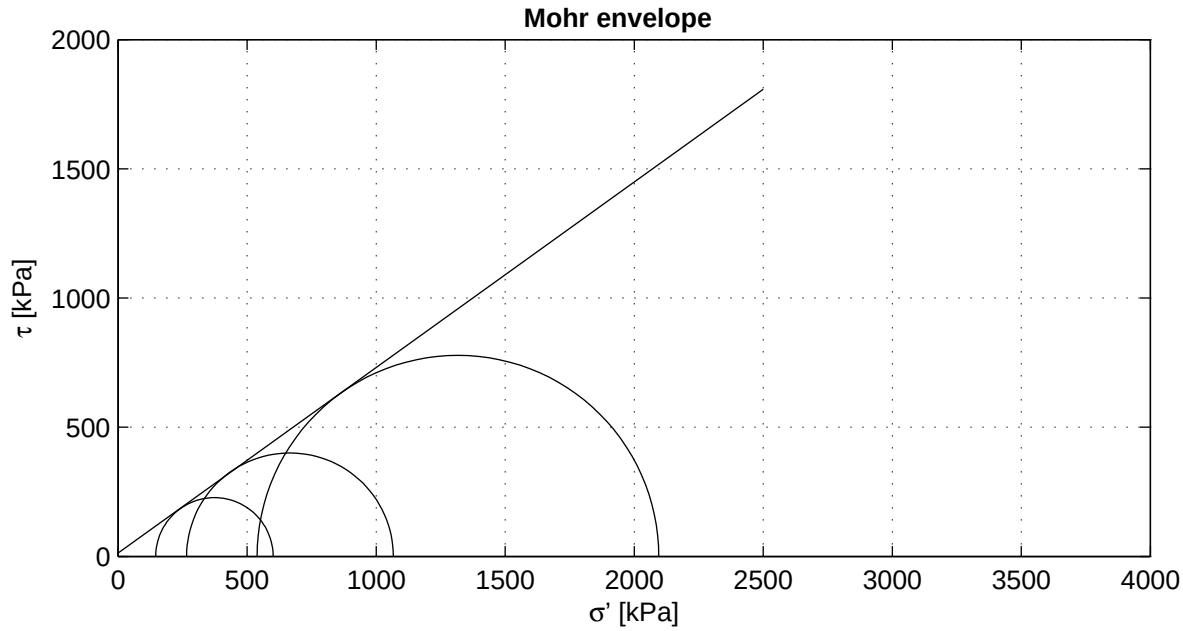

Criterion	maximum t
ϕ' [°]	35.68
c' [kPa]	13.09

Start testing

Stage number	1	2	3
Sample name	KB−102_ST−1A	KB−102_ST−1B	KB−102_ST−1C
m_i [g]	979.2	974.5	970.1
D_i [mm]	66.5	66.6	66.7
h_i [mm]	138.5	139.7	140.4
w_i [%]	23.6	23.3	23.0
ρ_i [kg/m^3]	2036	2003	1978
ρ_{dr} [kg/m^3]	1647	1624	1608
Description cf. ASTM	Silty sand (SM)		

Setup: WF−C sample 1A
WF−B sample 1B
WF−A sample 1C

Consolidation period t100 follows from isotropic phase.

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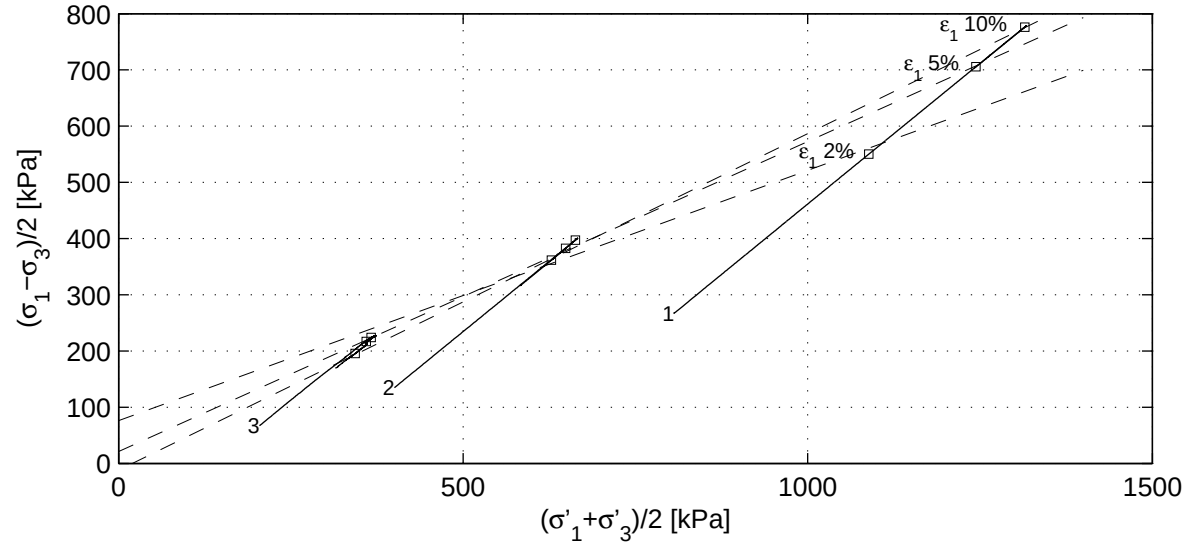
Project Middelburg

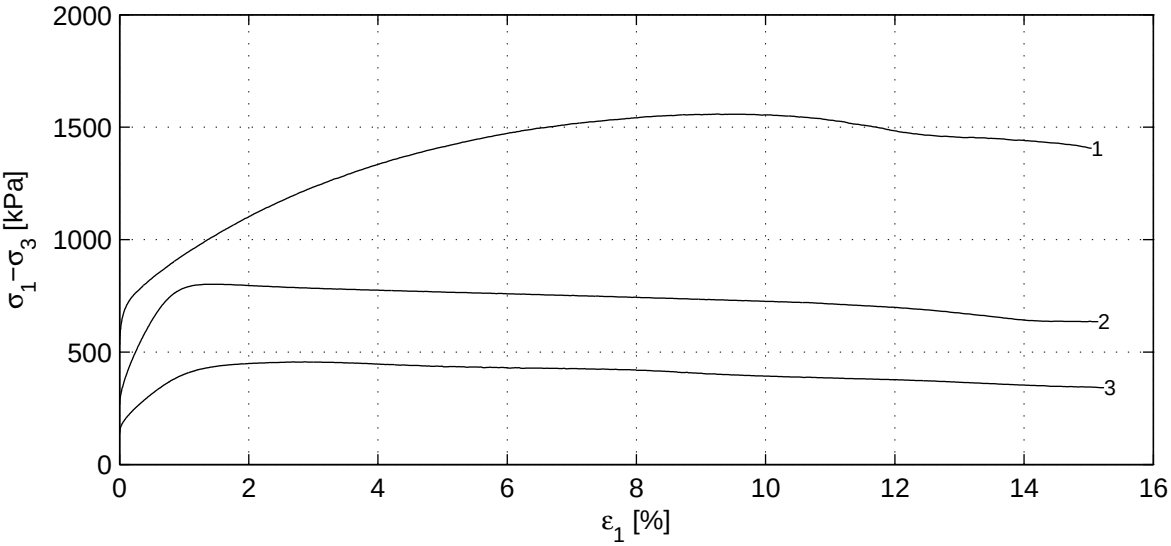
Boring KB−102, Sample KB−102_ST−1, depth −55.36 till −55.91 NAP

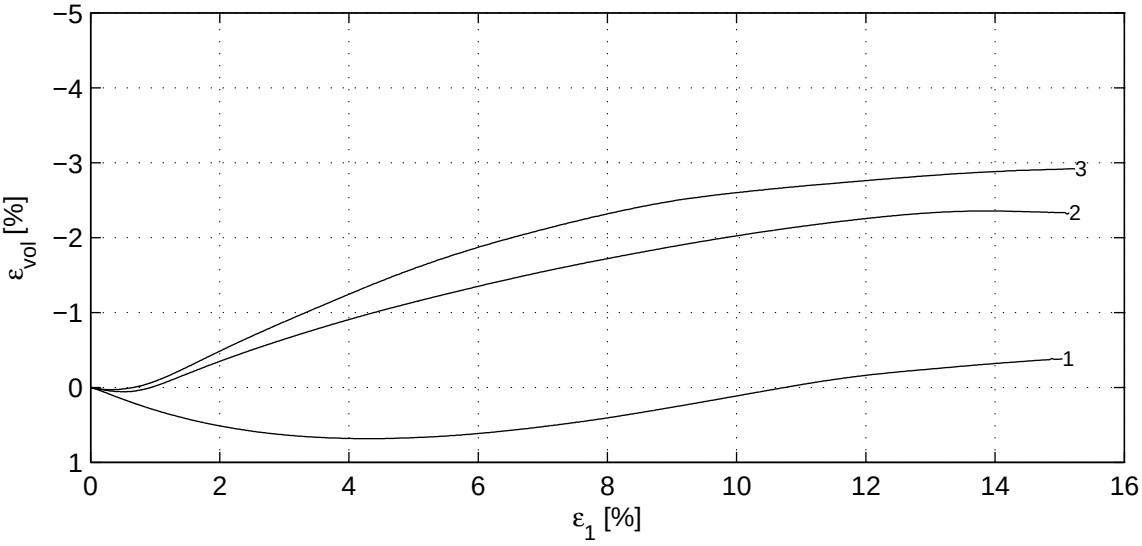
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−102_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 12:30







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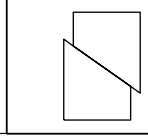
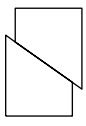
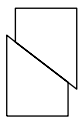
Project Middelburg

Boring KB−102, Sample KB−102_ST−1, depth −55.36 till −55.91 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−102_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 12:30

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.82	0.31	0.62
	B_1 [−]	0.97	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1073.7	535.1	272.7
	t_{100} [min]	0.5	0.6	0.4
	h_c [mm]	135.5	138.5	139.3
	V_c [cm^3]	464.5	481.8	485.4
	$\rho_{n,c}$ [kg/m^3]	2072	2013	1988
	w_c [%]	21.5	22.7	22.4
	u_{bk} [kPa]	297	299	298
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−0.001	−
	v_{max} [%/h]	68.2	63.3	93.8
Shear stage	v [%/h]	3.8	3.7	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1556.5	800.9	454.8
After testing	f_{undr} [kPa]	778.3	400.5	227.4
	$\varepsilon_{1,50}$ [%]	1.65	0.31	0.42
	E_{50} [MPa]	31.0	86.7	38.0
	w_e [%]	23.9	27.4	27.6
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1088.8	662.9	366.6	550.2	397.3	224.1	26.4	85.1
5.0	1244.2	648.8	359.5	705.7	382.7	216.8	33.4	25.4
10.0	1315.0	628.2	343.4	776.2	361.7	195.5	36.8	−14.9
$\varepsilon_{1,tmax}$ [%]	1317.0	666.0	373.4	778.3	400.5	227.4	35.7	13.1

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Project Middelburg

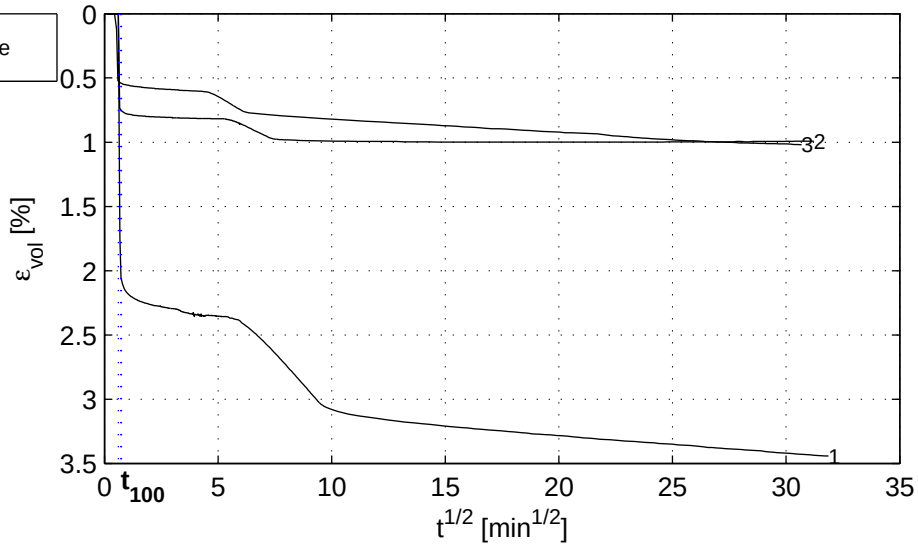
Boring KB−102, Sample KB−102_ST−1, depth −55.36 till −55.91 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

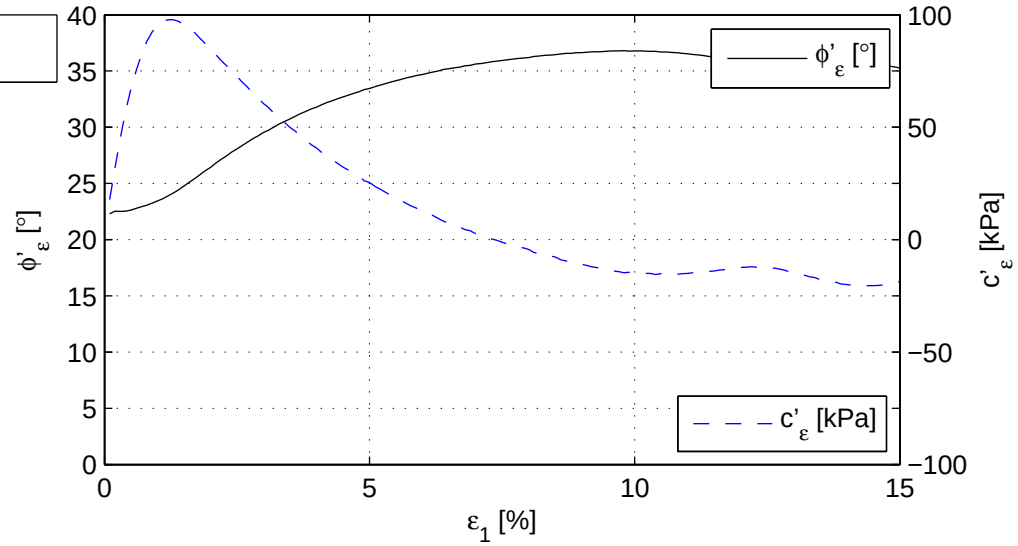
project	seen
1205088.1	Dui
appendix	type
KB−102_ST−1	A4

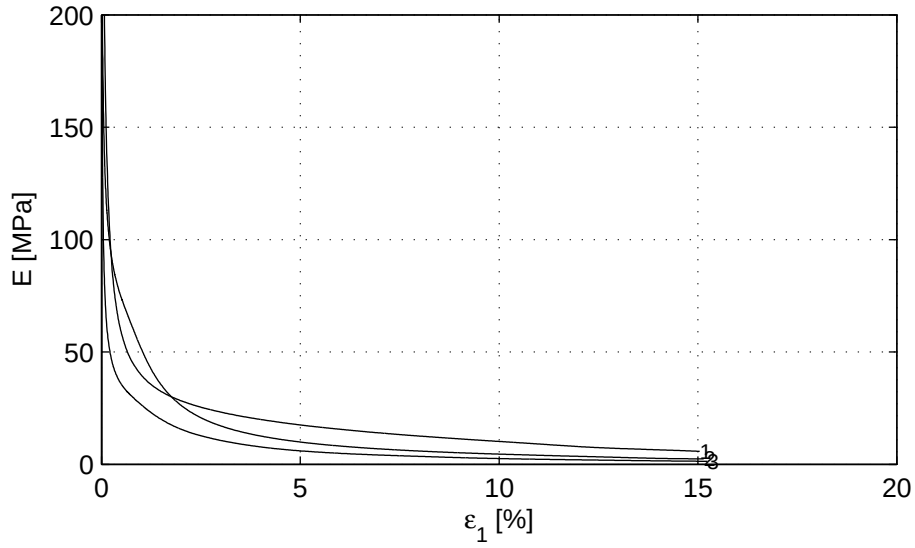
) Vrijgegeven door Dui op 2011-08-08 12:30

Consolidation stage



Shear stage





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Project Middelburg

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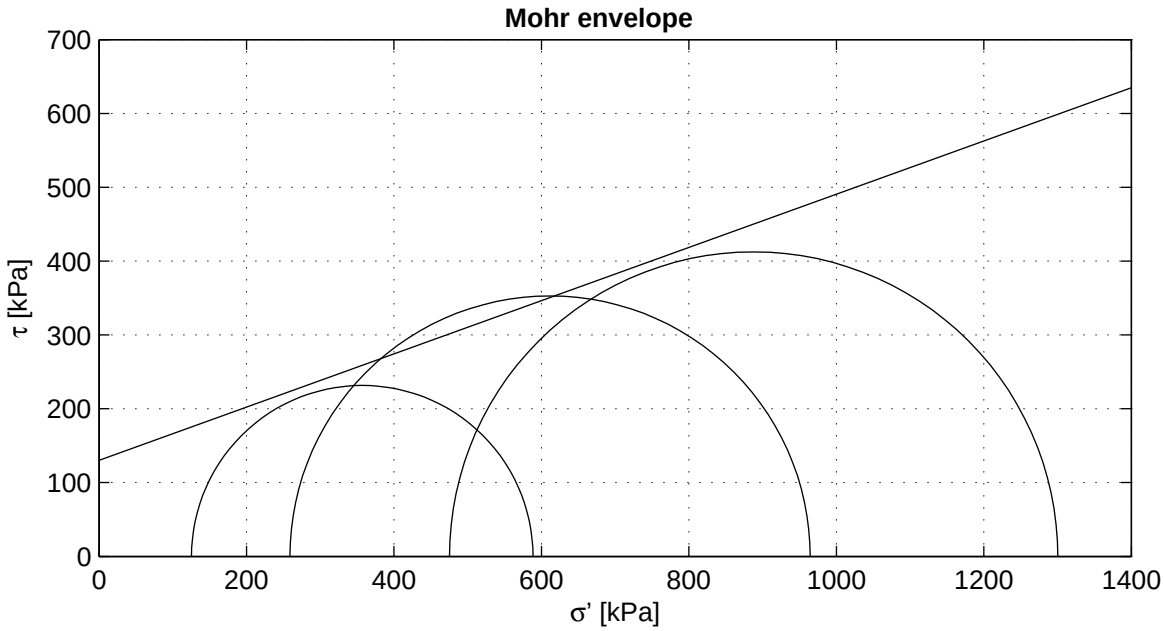
project	seen
1205088.1	Dui

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−102_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 12:30



Criterion	maximum t
ϕ' [°]	19.82
c' [kPa]	130.20

Start testing

Stage number	1	2	3
Sample name	KB−102_ST−2A	KB−102_ST−2B	KB−102_ST−2C
m_i [g]	1027.1	992.7	991.9
D_i [mm]	67.7	68.0	67.8
h_i [mm]	144.5	138.3	138.9
w_i [%]	25.1	25.1	24.8
ρ_i [kg/m^3]	1975	1976	1978
ρ_{dr} [kg/m^3]	1578	1580	1585
Description cf. ASTM	Silty clay (CL−ML)		

Setup: ELE−A sample 2A
ELE−B sample 2B
ELE−C sample 2C

Consolidation period t100 follows from isotropic phase.

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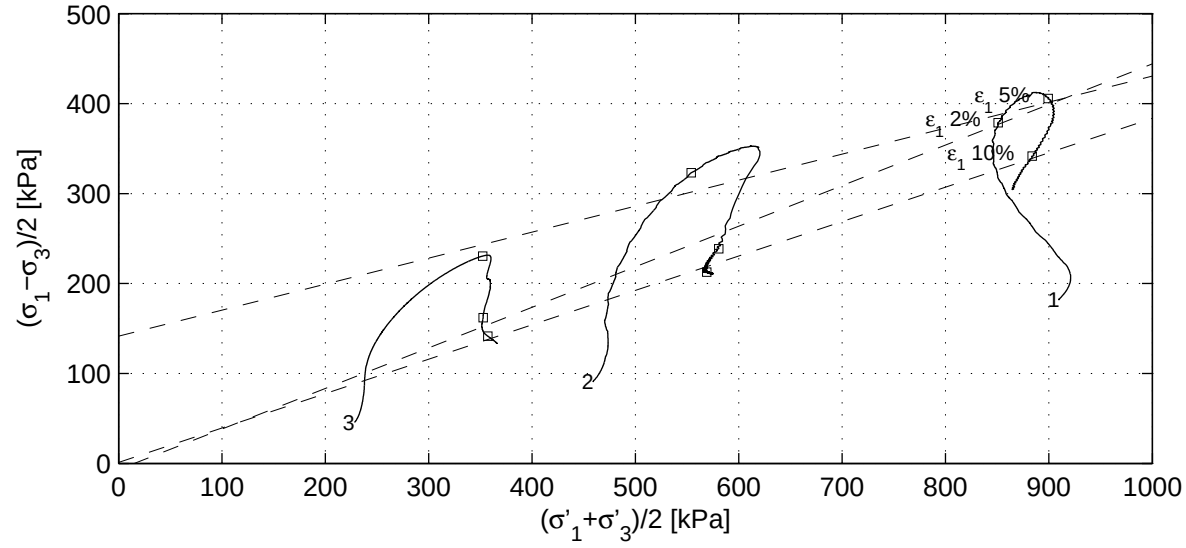
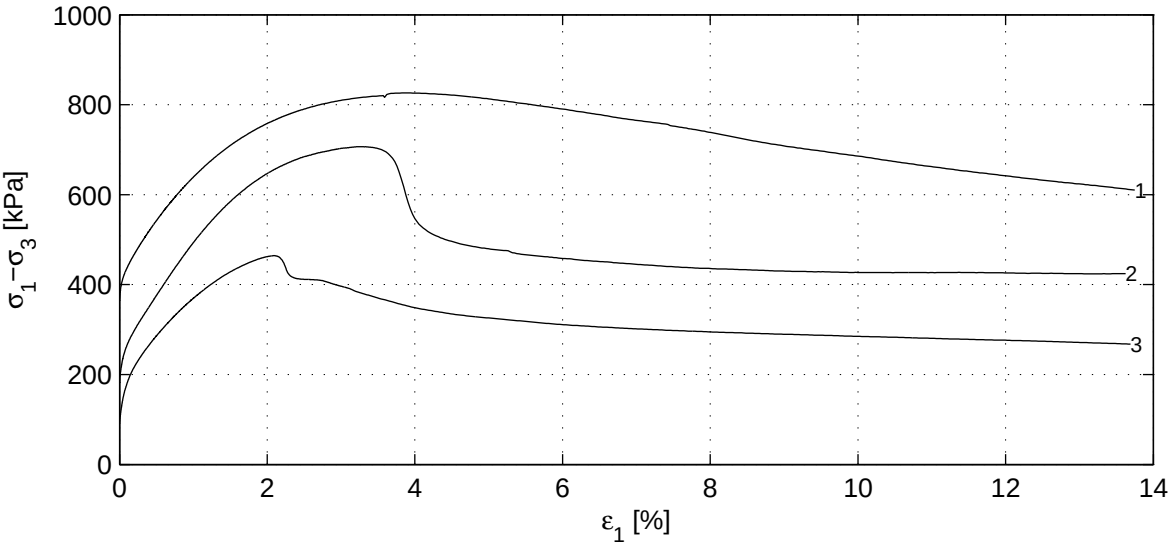
Boring KB−102, Sample KB−102_ST−2, depth −70.69 till −70.82 NAP

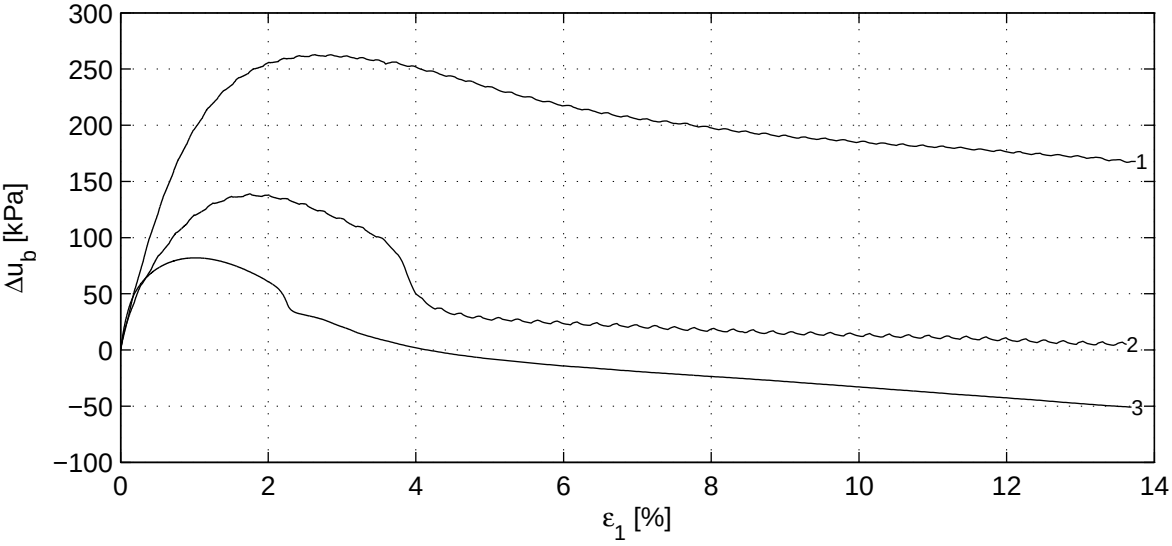
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−102_ST−2	A4

) Vrijgegeven door Dui op 2011-08-09 20:54







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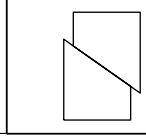
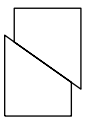
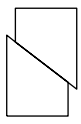
Project Middelburg Boring KB−102, Sample KB−102_ST−2, depth −70.69 till −70.82 NAP CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−102_ST−2	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 20:54

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.71	0.40	0.83
	B_1 [−]	0.98	0.98	0.98
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1093.1	550.6	273.9
	t_{100} [min]	42.9	2297.7	758.8
	h_c [mm]	140.1	135.5	137.7
	V_c [cm^3]	504.8	497.8	508.5
	$\rho_{n,c}$ [kg/m^3]	2004	1985	1964
	w_c [%]	23.2	24.6	25.7
	u_{bk} [kPa]	300	300	300
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	3.0	0.1	0.2
Shear stage	v [%/h]	0.6	0.6	0.6
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	824.9	705.6	463.1
After testing	f_{undr} [kPa]	412.5	352.8	231.6
	$\varepsilon_{1,50}$ [%]	0.76	0.78	0.46
	E_{50} [MPa]	30.3	33.5	40.6
	w_e [%]	26.0	27.5	27.7
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	850.8	553.9	352.4	378.8	323.2	230.5	16.8	147.8
5.0	899.2	580.7	352.6	405.8	238.7	161.9	26.8	−7.6
10.0	883.8	569.0	357.3	341.7	212.6	141.6	22.5	1.3
$\varepsilon_{1,tmax}$ [%]	887.8	611.7	356.9	412.5	352.8	231.6	19.8	130.2

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Project Middelburg

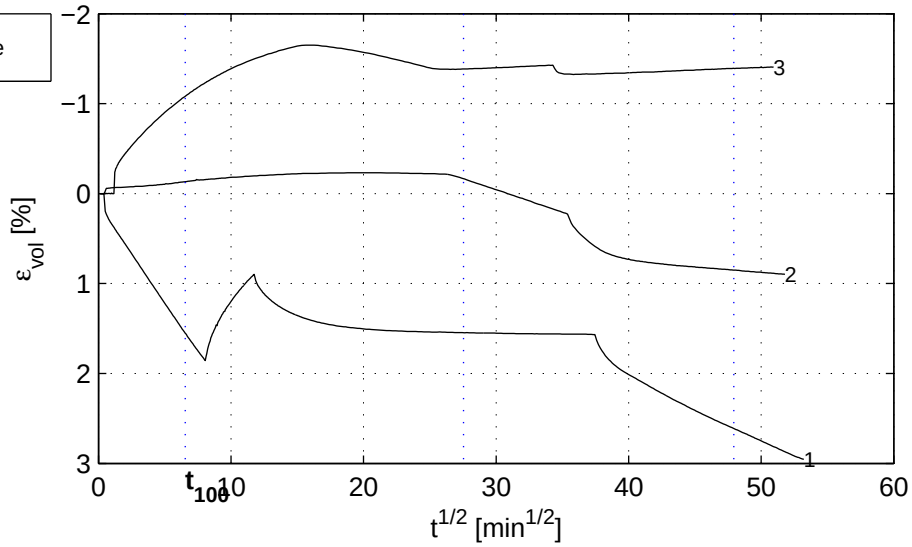
Boring KB−102, Sample KB−102_ST−2, depth −70.69 till −70.82 NAP

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

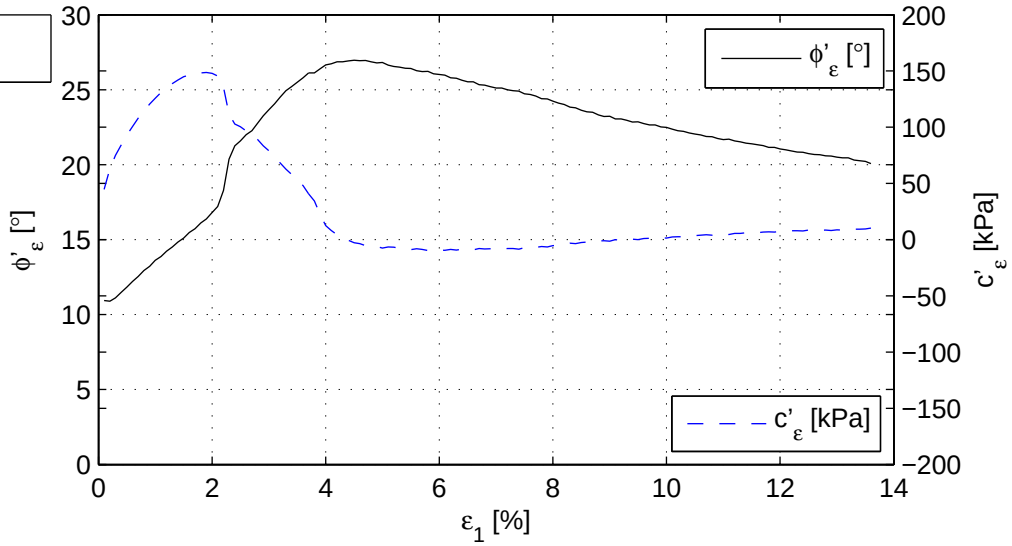
project	seen
1205088.1	Dui
appendix	type
KB−102_ST−2	A4

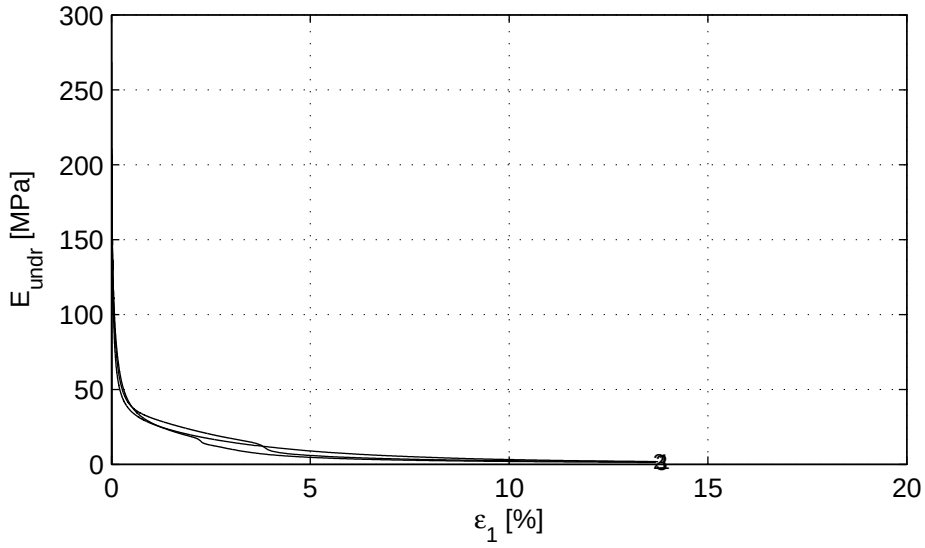
) Vrijgegeven door Dui op 2011-08-09 20:54

Consolidation stage



Shear stage





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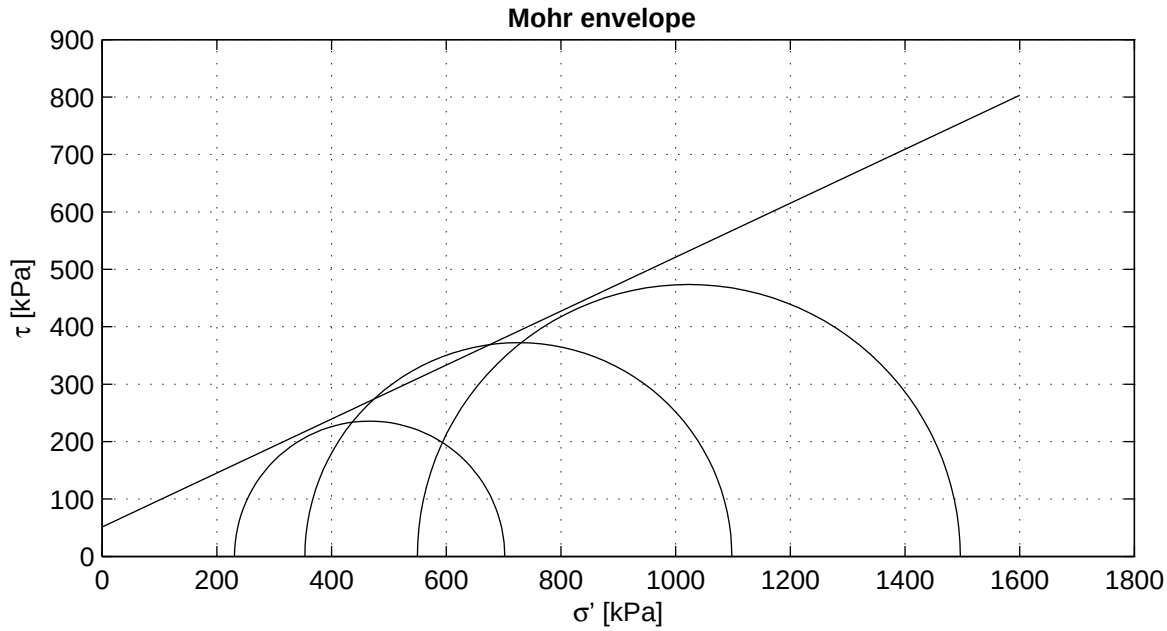
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−102_ST−2	A4

) Vrijgegeven door Dui op 2011-08-09 20:54



Criterion	maximum t
ϕ' [°]	25.16
c' [kPa]	51.24

Start testing

Stage number	1	2	3
Sample name	KB−102_ST−6A	KB−102_ST−6B	KB−102_ST−6C
m_i [g]	888.9	972.7	895.2
D_i [mm]	67.0	67.3	67.3
h_i [mm]	128.9	139.3	128.8
w_i [%]	24.1	23.3	23.3
ρ_i [kg/m^3]	1956	1964	1954
ρ_{dr} [kg/m^3]	1576	1592	1585
Description cf. ASTM	Silty clay (CL−ML)		

Setup: WF−A sample 6A
WF−B sample 6B
WF−C sample 6C

Consolidation period t100 follows from isotropic phase.

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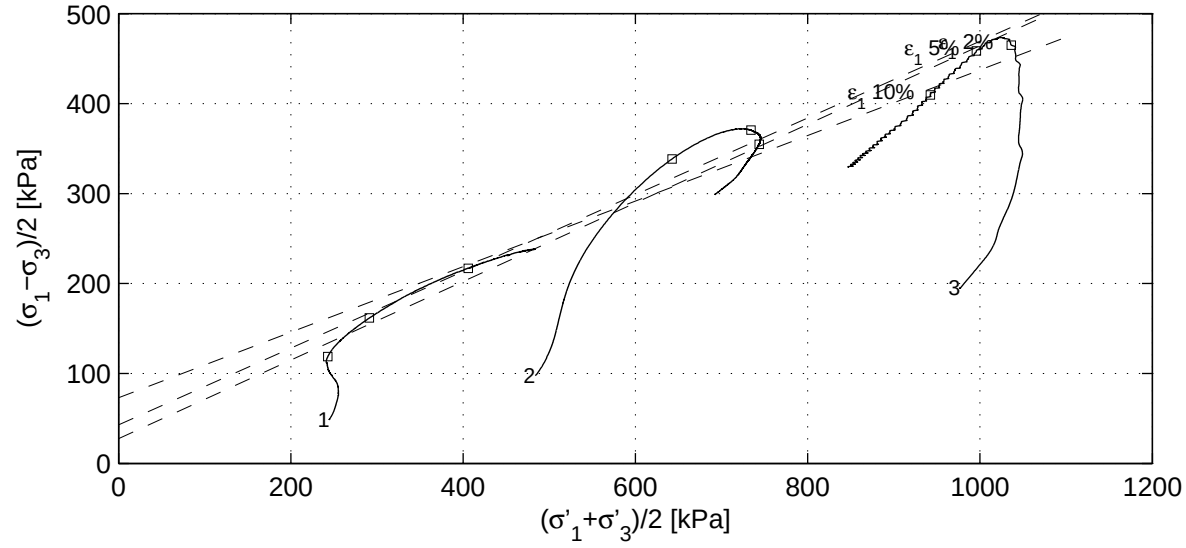
Project Middelburg

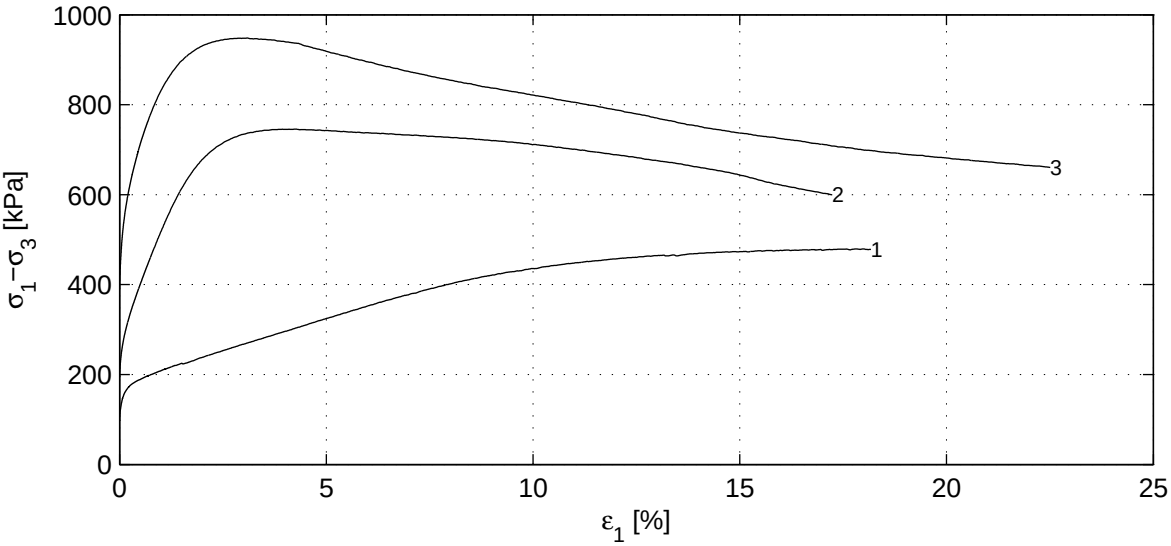
Boring KB−102, Sample KB−102_ST−6, depth −93.31 till −93.44 NAP

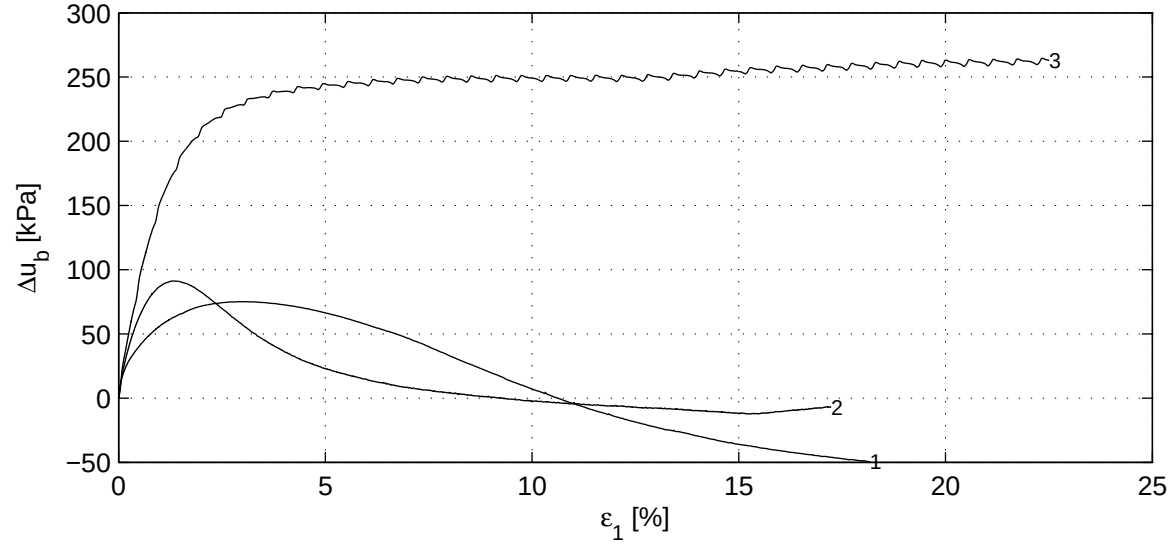
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−102_ST−6	A4

) Vrijgegeven door Dui op 2011-08-09 21:34







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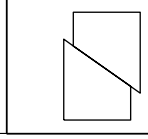
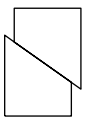
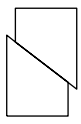
) Vrijgegeven door Dui op 2011-08-09 21:34

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.79	0.50	0.45
	B_1 [−]	0.97	0.98	0.98
Consolidation stage	$\sigma'_{1,c}$ [kPa]	293.9	581.3	1171.9
	t_{100} [min]	153.8	79.0	81.7
	h_c [mm]	124.3	136.1	123.9
	V_c [cm^3]	445.2	495.7	454.1
	$\rho_{n,c}$ [kg/m^3]	1976	1963	1963
	w_c [%]	22.8	23.4	22.7
	u_{bk} [kPa]	298	298	296
	P [−]	2.20	2.20	2.20
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	0.9	1.7	1.7
Shear stage	v [%/h]	0.8	0.9	1.1
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	477.1	744.5	946.9
After testing	f_{undr} [kPa]	235.6	372.2	473.5
	$\varepsilon_{1,50}$ [%]	3.75	0.79	0.37
	E_{50} [MPa]	5.1	34.9	74.7
	w_e [%]	25.7	24.0	24.4
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	242.9	642.6	1036.2	118.6	338.6	465.1	25.9	30.6
5.0	291.2	734.3	995.7	161.7	370.6	458.6	25.3	47.3
10.0	405.9	743.6	942.3	216.9	354.8	409.7	21.4	78.3
$\varepsilon_{1,tmax}$ [%]	466.5	725.9	1023.3	235.6	372.2	473.5	25.2	51.2

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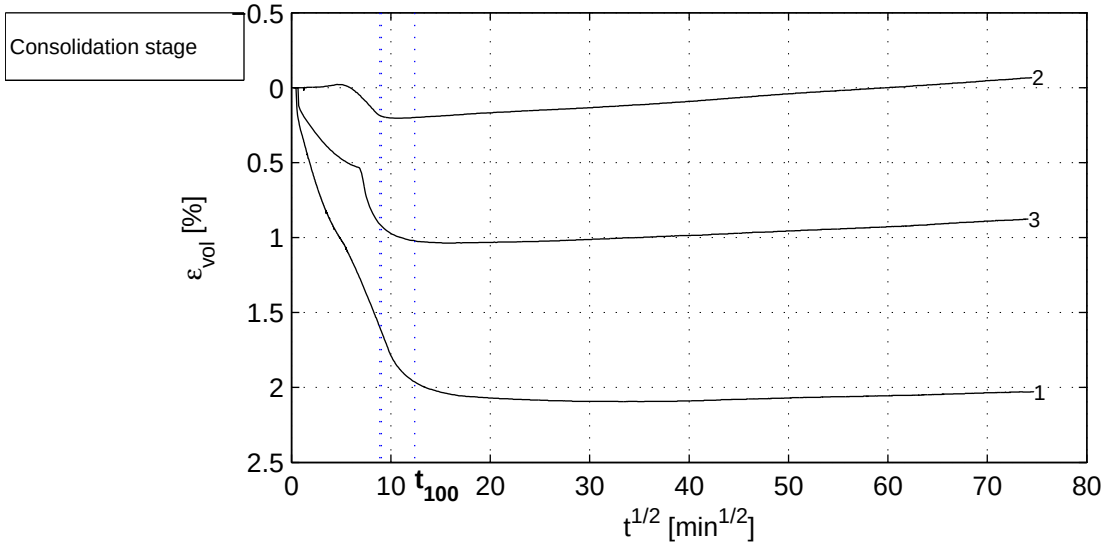
Project Middelburg

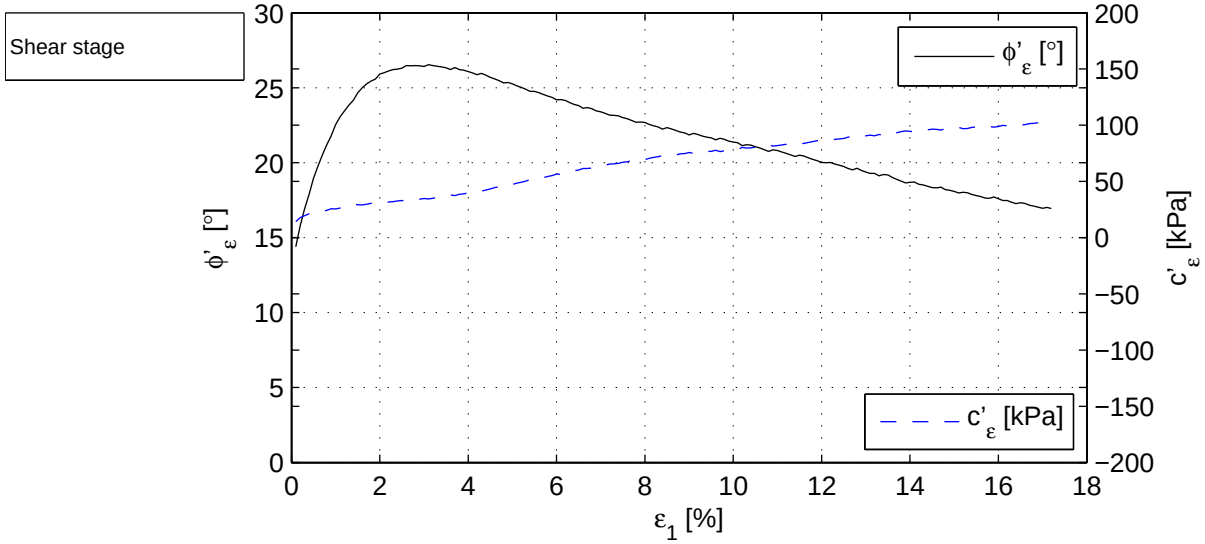
Boring KB−102, Sample KB−102_ST−6, depth −93.31 till −93.44 NAP

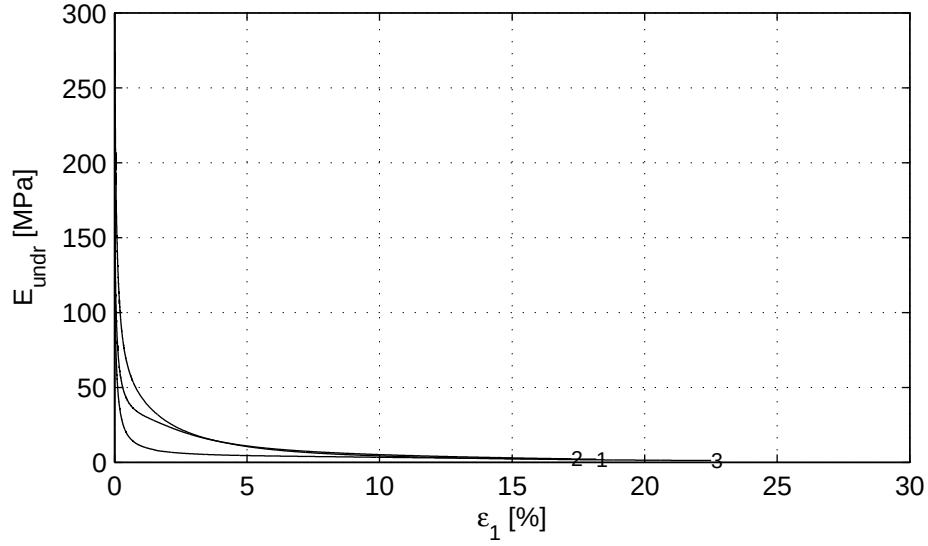
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−102_ST−6	A4

) Vrijgegeven door Dui op 2011-08-09 21:34







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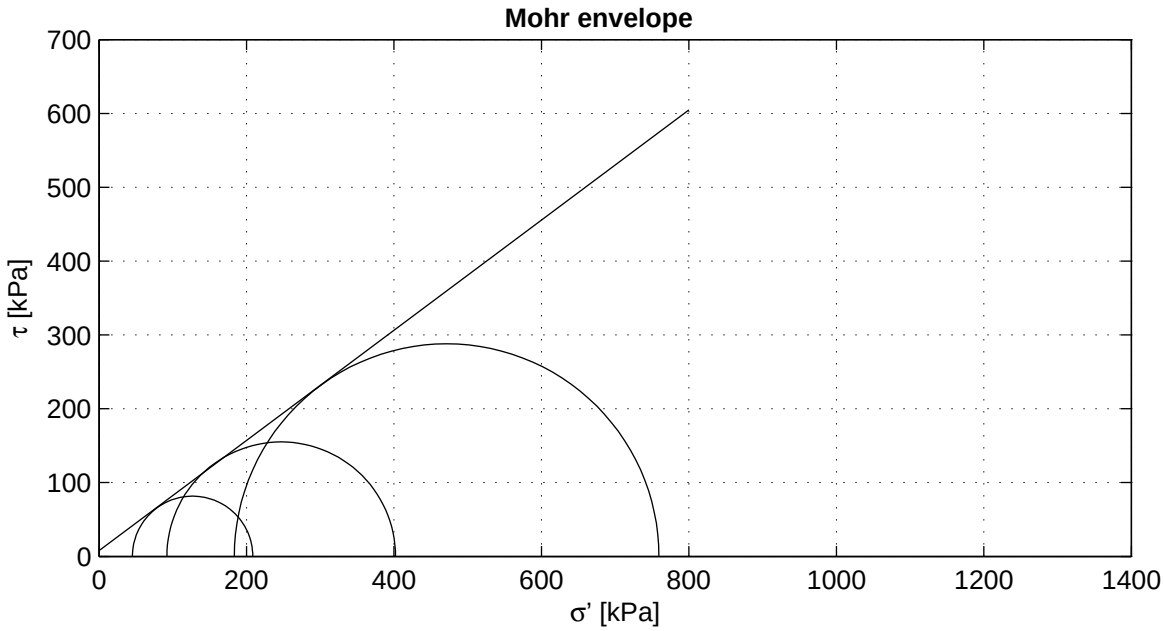
Project Middelburg Boring KB−102, Sample KB−102_ST−6, depth −93.31 till −93.44 NAP CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−102_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 21:34



Criterion	maximum t
ϕ' [°]	36.72
c' [kPa]	8.03

Start testing

Stage number	1	2	3
Sample name	KB−103_ST−1_a	KB−103_ST−1_b	KB−103_ST−1_c
m_i [g]	403.5	402.2	400.4
D_i [mm]	50.0	51.4	51.9
h_i [mm]	100.0	93.7	90.9
w_i [%]	26.7	26.7	26.7
ρ_i [kg/m^3]	2055	2069	2079
ρ_{dr} [kg/m^3]	1621	1633	1640
Description cf. ASTM	Silty sand (SM)		

Setup: WF−B sample ST−1a, ST−1b, and ST−1c.

Consolidation period t100 follows from isotropic phase.

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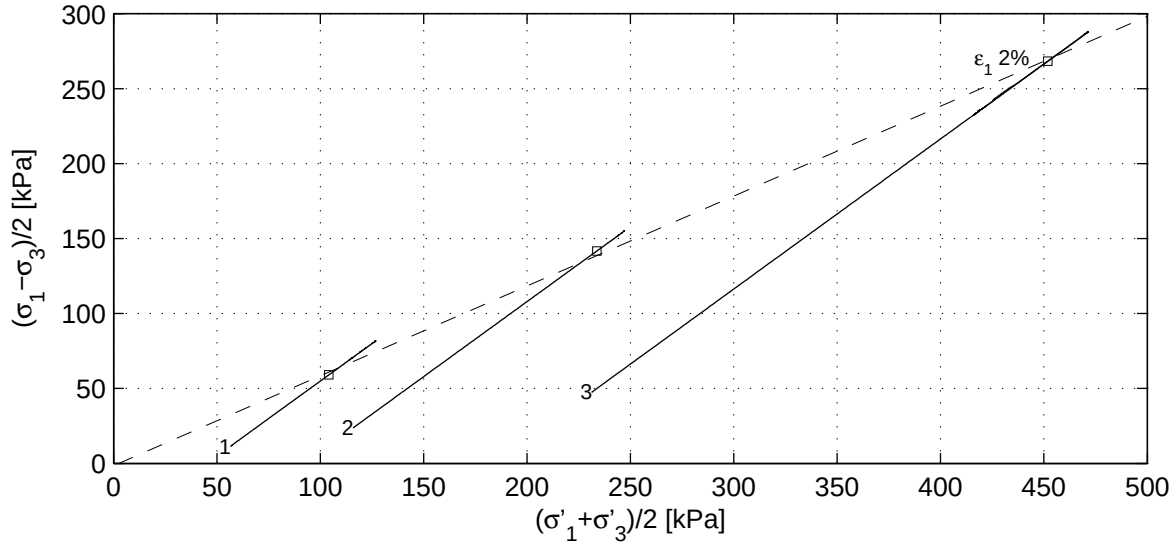
Project Middelburg

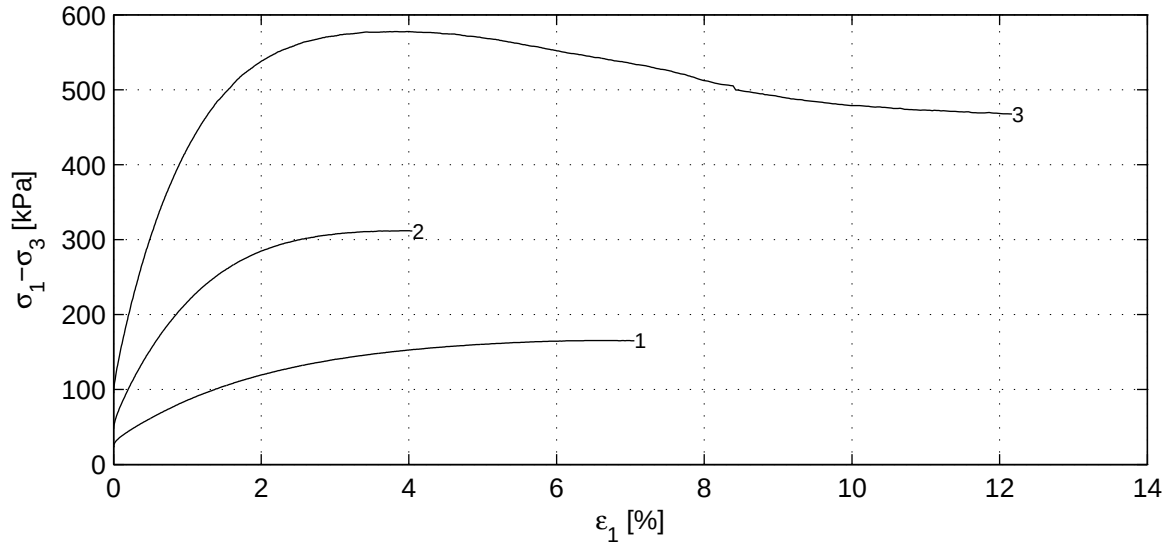
Boring KB−103, Sample KB−103_ST−1, depth −8.32 till −8.92 GL

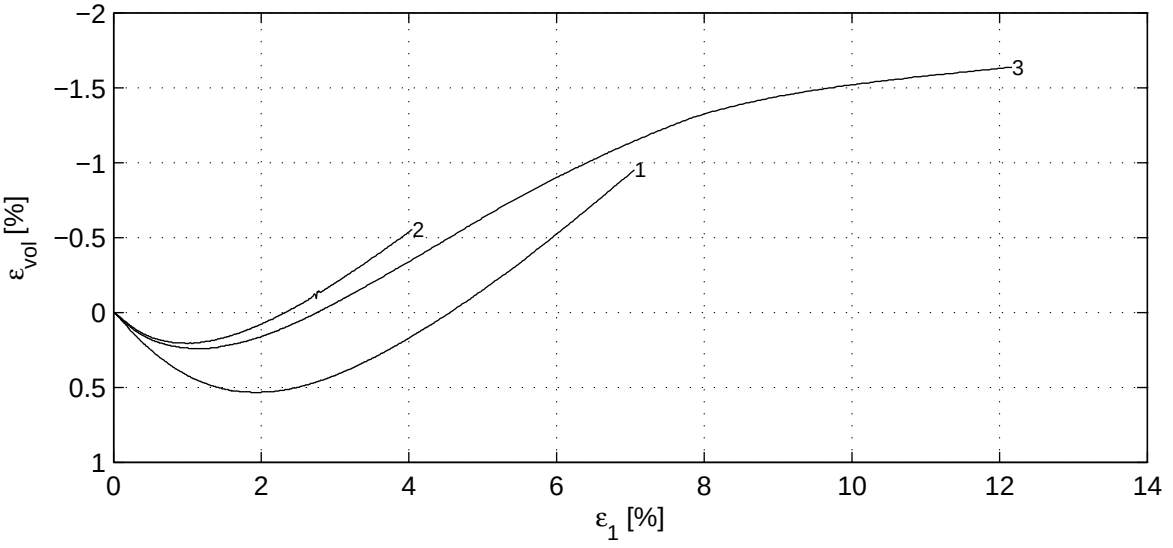
CD Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103_ST−1	A4

) Vrijgegeven door Dui op 2011-08-09 21:55







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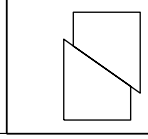
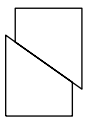
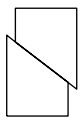
Project Middelburg Boring KB−103, Sample KB−103_ST−1, depth −8.32 till −8.92 GL CD Triaxial test (Multistage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103_ST−1	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 21:55

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.92	0.99	0.99
	B_1 [−]	0.99	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	68.6	139.9	279.2
	t_{100} [min]	0.6	0.5	0.5
	h_c [mm]	99.3	93.5	90.7
	V_c [cm^3]	194.5	193.0	191.4
	$\rho_{n,c}$ [kg/m^3]	2065	2077	2086
	w_c [%]	26.1	26.3	26.3
	u_{bk} [kPa]	298	298	298
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	56.3	74.1	76.9
Shear stage	v [%/h]	7.5	7.0	7.1
	Stop criterion	ε_1 8%	ε_1 8%	ε_1 8%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	163.3	310.1	575.9
After testing	f_{undr} [kPa]	81.6	155.1	288.0
	$\varepsilon_{1,50}$ [%]	1.21	0.69	0.62
	E_{50} [MPa]	5.8	19.2	38.9
	w_e [%]	22.7	22.7	22.7
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	104.1	233.8	451.9	59.1	141.7	268.3	36.8	−1.8
5.0								
8.0								
$\varepsilon_{1,tmax}$ [%]	126.8	247.0	471.4	81.6	155.1	288.0	36.7	8.0

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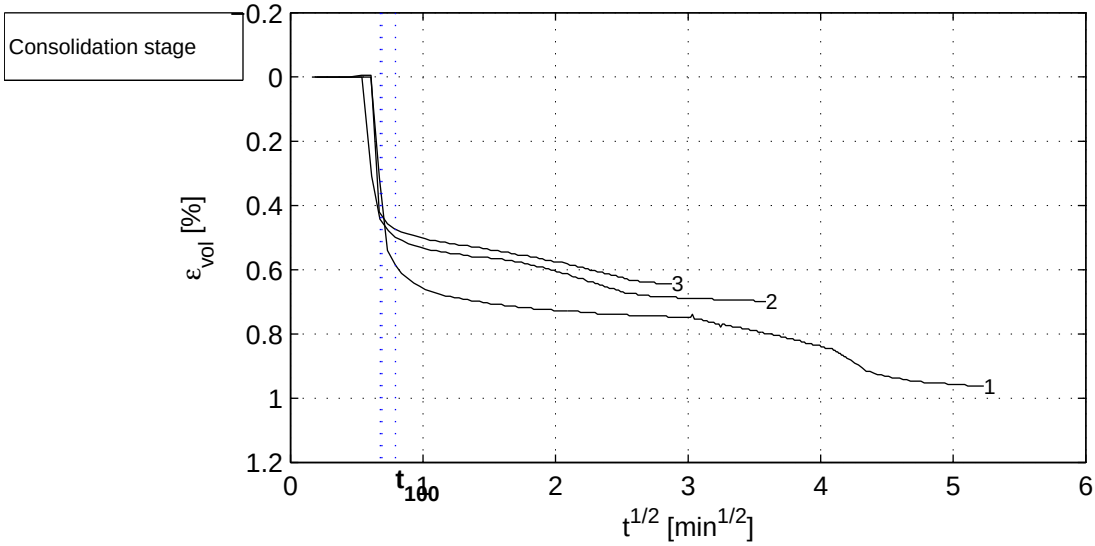
Project Middelburg

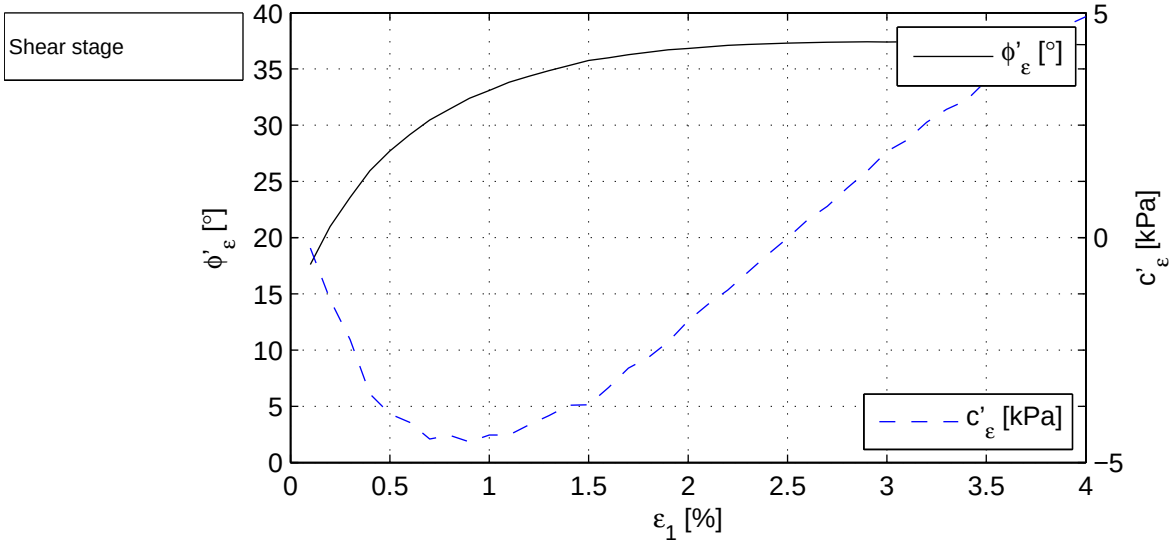
Boring KB−103, Sample KB−103_ST−1, depth −8.32 till −8.92 GL

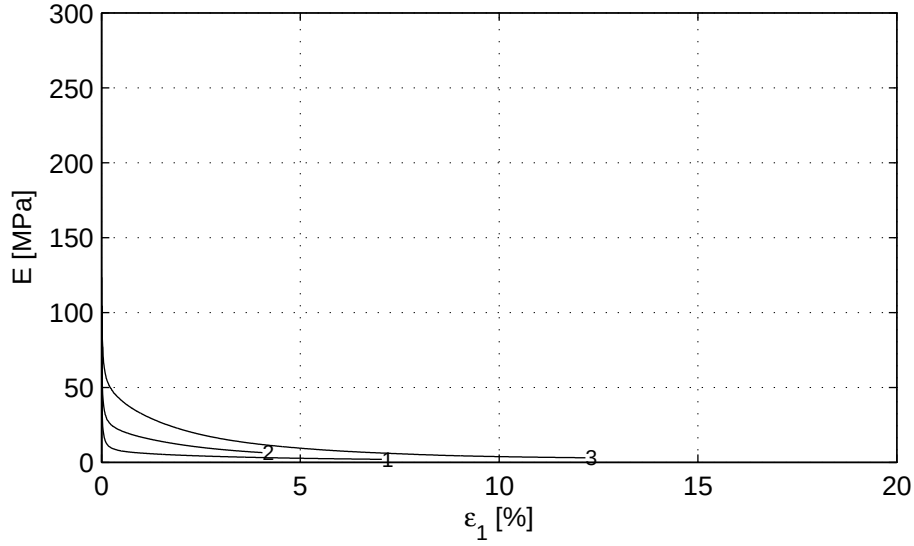
CD Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103_ST−1	A4

) Vrijgegeven door Dui op 2011-08-09 21:55







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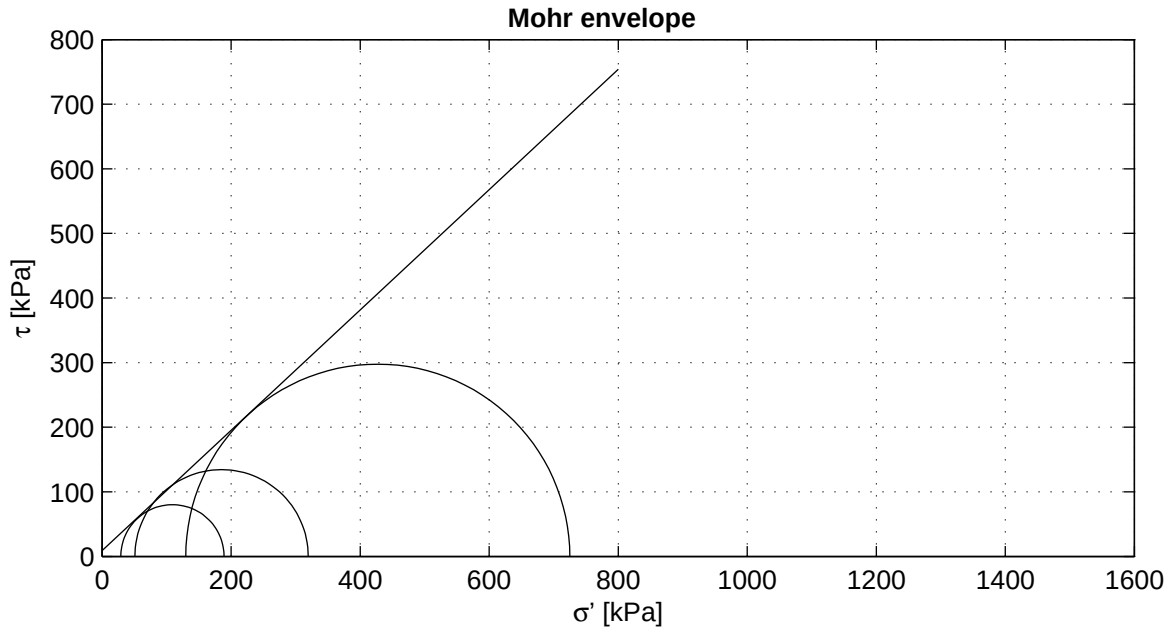
Project Middelburg Boring KB−103, Sample KB−103_ST−1, depth −8.32 till −8.92 GL CD Triaxial test (Multistage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103_ST−1	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 21:55



Criterion	maximum t
ϕ' [°]	42.96
c' [kPa]	9.19

Start testing

Stage number	1	2	3
Sample name	KB−103_ST−3	KB−103_ST−3A	KB−103_ST−3B
m_i [g]	315.5	315.5	315.5
D_i [mm]	50.0	50.0	50.0
h_i [mm]	100.0	100.0	100.0
w_i [%]	66.1	66.1	66.1
ρ_i [kg/m^3]	1607	1607	1607
ρ_{dr} [kg/m^3]	968	968	968
Description cf. ASTM	Silty clay (CL−ML)		

Setup: WF−C sample ST−3, ST−3A, and ST−3B.

Consolidation period t100 follows from isotropic phase.

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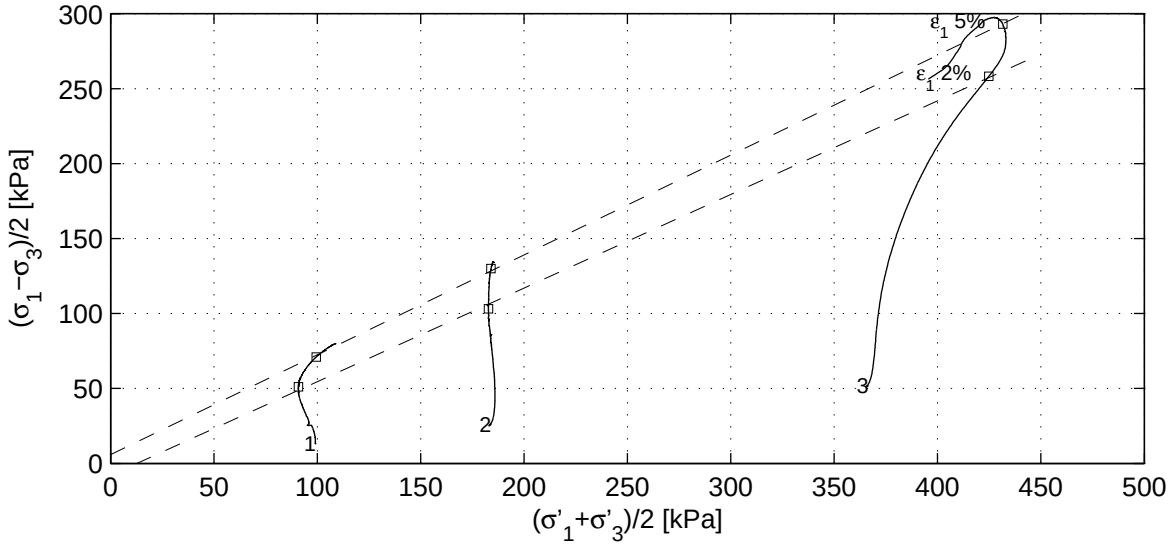
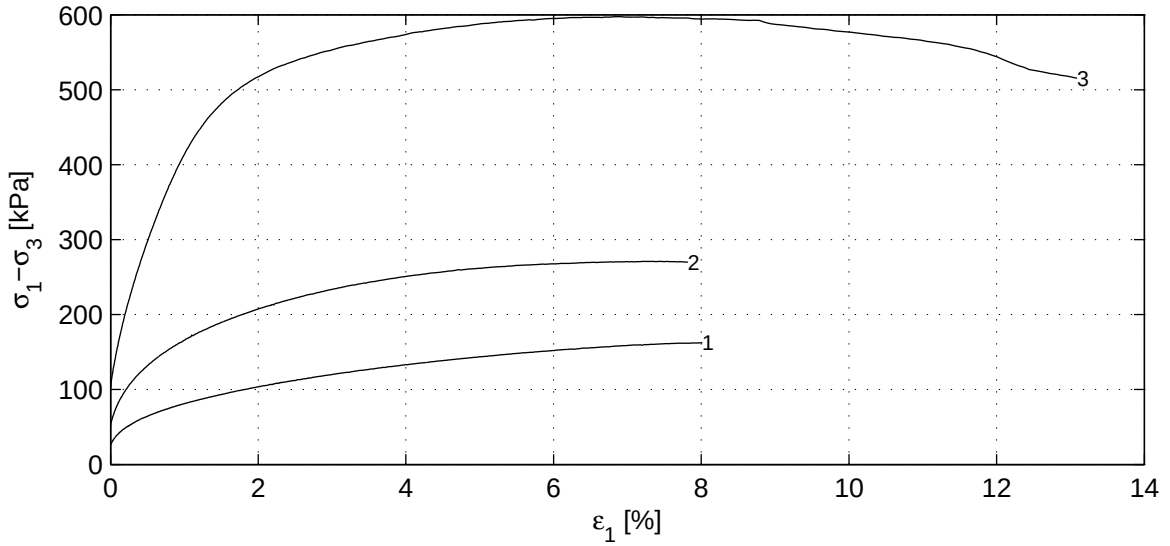
Boring KB−103, Sample KB−103_ST−3, depth −12.37 till −12.97 GL

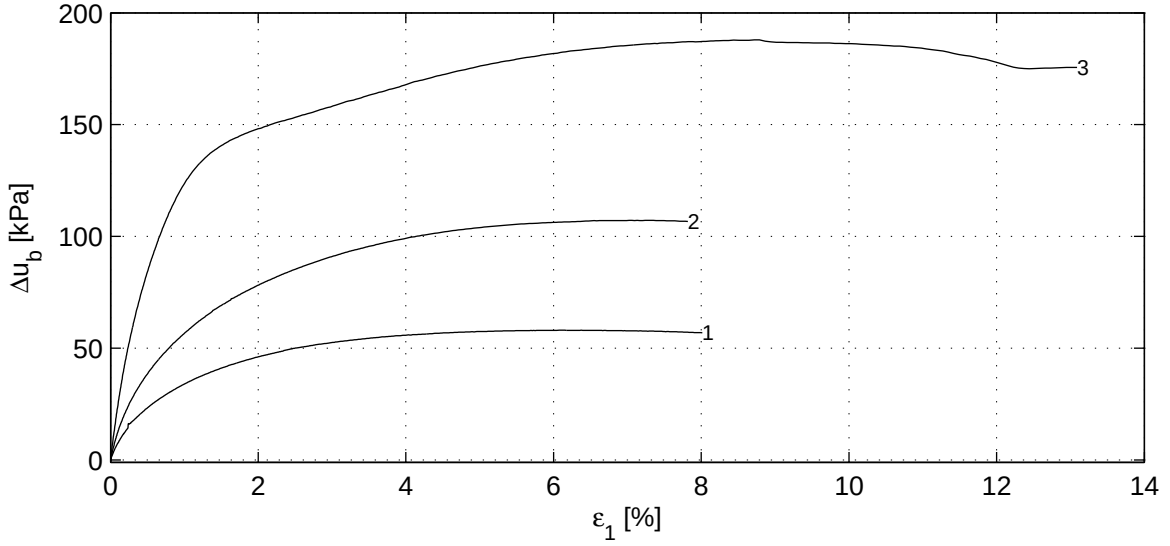
CU Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Ess
appendix	type
KB−103_ST−3	A4

) Vrijgegeven door Ess op 2011-08-23 16:21







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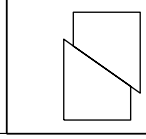
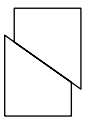
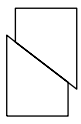
Project Middelburg

Boring KB−103, Sample KB−103_ST−3, depth −12.37 till −12.97 GL

CU Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Ess
appendix	type
KB−103_ST−3	A4

) Vrijgegeven door Ess op 2011-08-23 16:21

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.84	0.84	0.84
	B_1 [−]	0.99	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	112.5	209.6	417.8
	t_{100} [min]	9.8	9.4	33.3
	h_c [mm]	96.4	98.1	96.2
	V_c [cm^3]	189.2	187.4	182.9
	$\rho_{n,c}$ [kg/m^3]	1630	1636	1651
	w_c [%]	62.3	61.3	59.0
	u_{bk} [kPa]	297	296	295
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	0.000	−	−
	v_{max} [%/h]	13.3	13.9	3.9
Shear stage	v [%/h]	1.1	2.1	2.1
	Stop criterion	ε_1 8%	ε_1 8%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	160.0	268.7	595.3
After testing	f_{undr} [kPa]	80.0	134.3	297.6
	$\varepsilon_{1,50}$ [%]	1.55	0.92	0.70
	E_{50} [MPa]	4.3	11.8	35.1
	w_e [%]	45.2	45.2	45.2
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	90.9	182.8	424.8	51.1	103.1	258.2	38.6	−10.1
5.0	99.4	184.0	431.6	70.9	130.0	293.1	41.8	7.8
8.0								
$\varepsilon_{1,tmax}$ [%]	109.1	185.2	427.3	80.0	134.3	297.6	43.0	9.2

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Project Middelburg

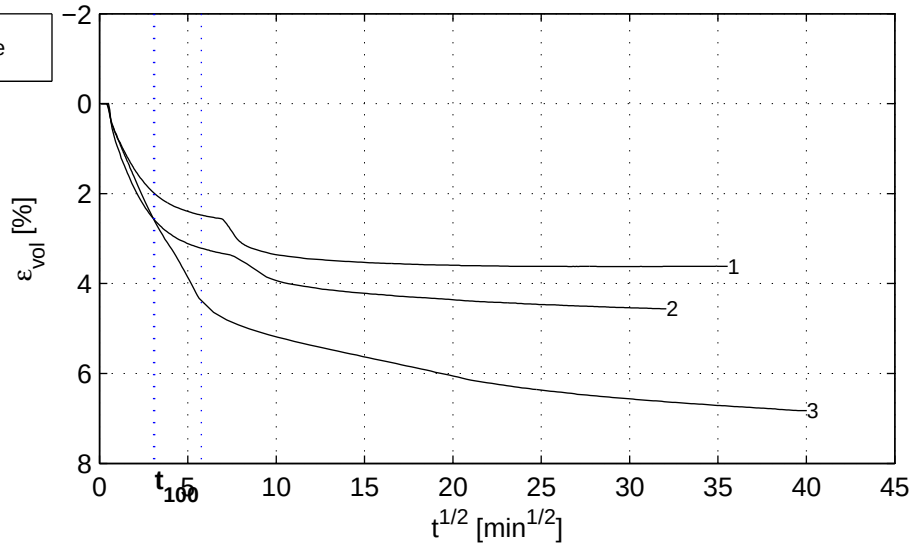
Boring KB−103, Sample KB−103_ST−3, depth −12.37 till −12.97 GL

CU Triaxial test (Multistage) acc. to CEN17892−9:2004

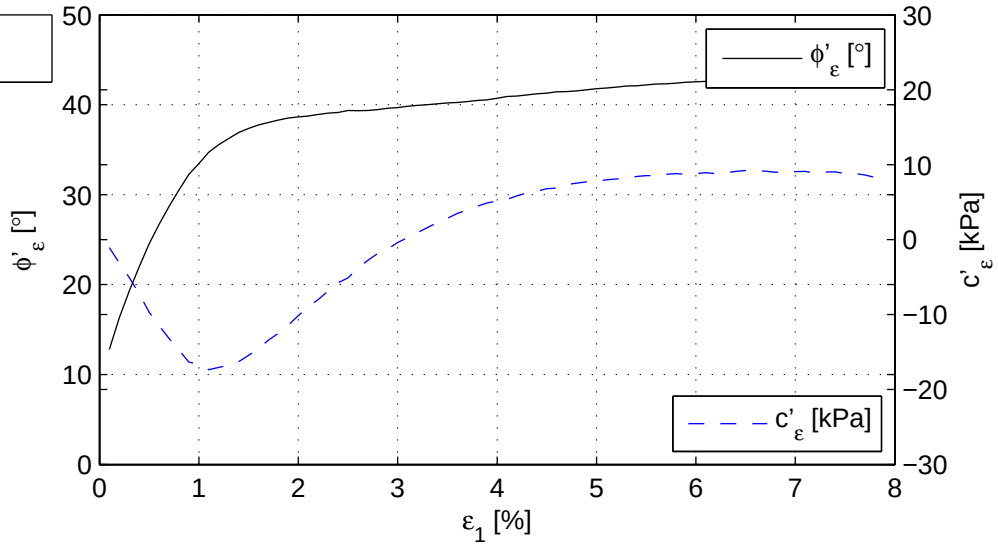
project	seen
1205088.1	Ess
appendix	type
KB−103_ST−3	A4

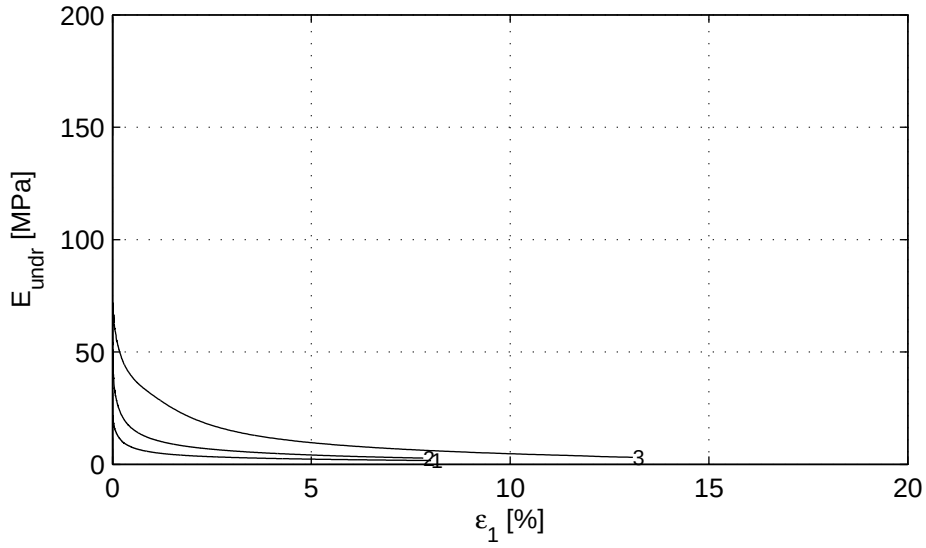
) Vrijgegeven door Ess op 2011-08-23 16:21

Consolidation stage



Shear stage





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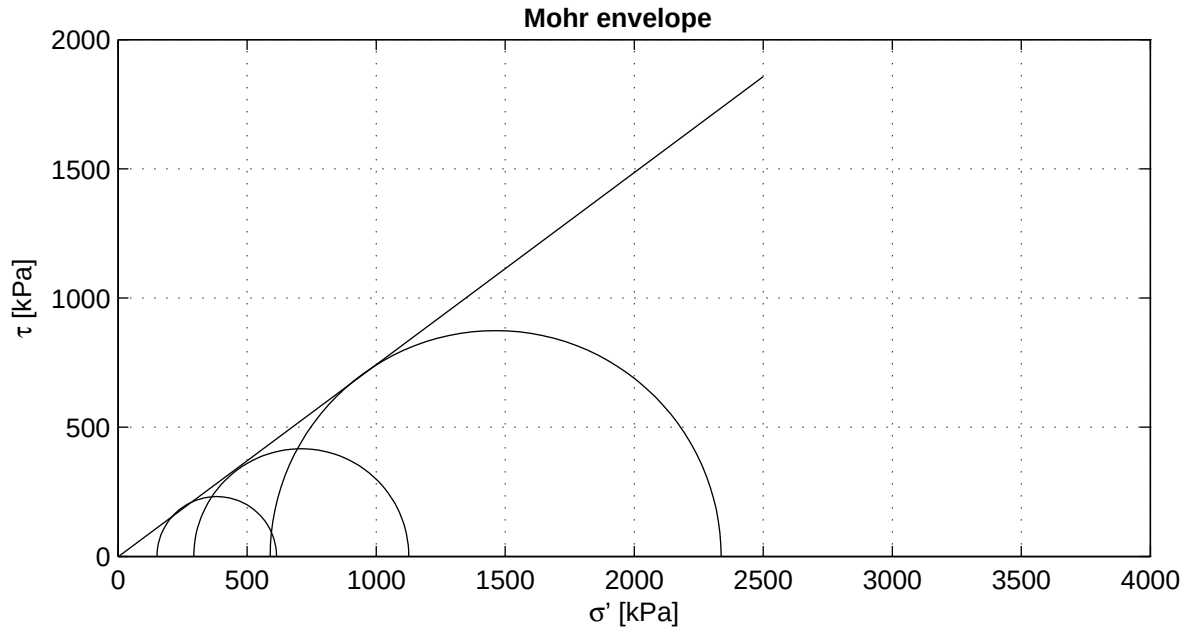
Project Middelburg Boring KB−103, Sample KB−103_ST−3, depth −12.37 till −12.97 GL CU Triaxial test (Multistage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103_ST−3	seen Ess type A4

) Vrijgegeven door Ess op 2011-08-23 16:21



Criterion	maximum t
ϕ' [°]	36.62
c' [kPa]	−0.89

Start testing

Stage number	1	2	3
Sample name	KB−103_ST−5B	KB−103_ST−5C	KB−103_ST−5D
m_i [g]	380.9	369.8	384.0
D_i [mm]	50.5	50.5	50.5
h_i [mm]	100.3	100.5	98.4
w_i [%]	26.3	30.8	28.0
ρ_i [kg/m^3]	1897	1837	1949
ρ_{dr} [kg/m^3]	1502	1404	1523
Description cf. ASTM	Silty sand (SM)		

Setup: WF−C sample 5B
WF−B sample 5C
WF−A sample 5D

Consolidation period t100 follows from isotropic phase.

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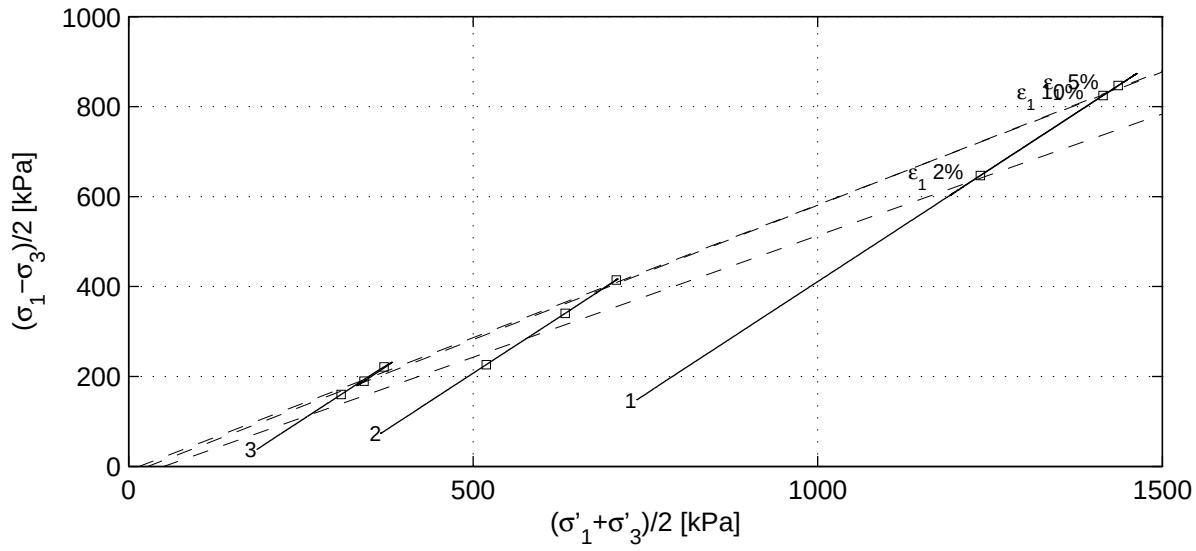
Project Middelburg

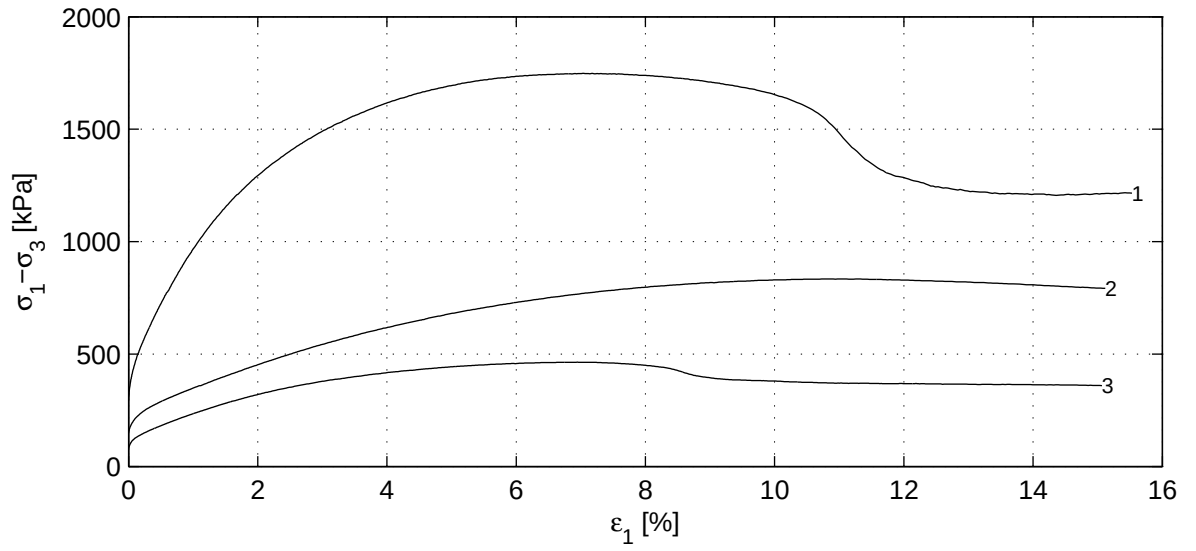
Boring KB−103, Sample KB−103_ST−5, depth −18.98 till −19.08 GL

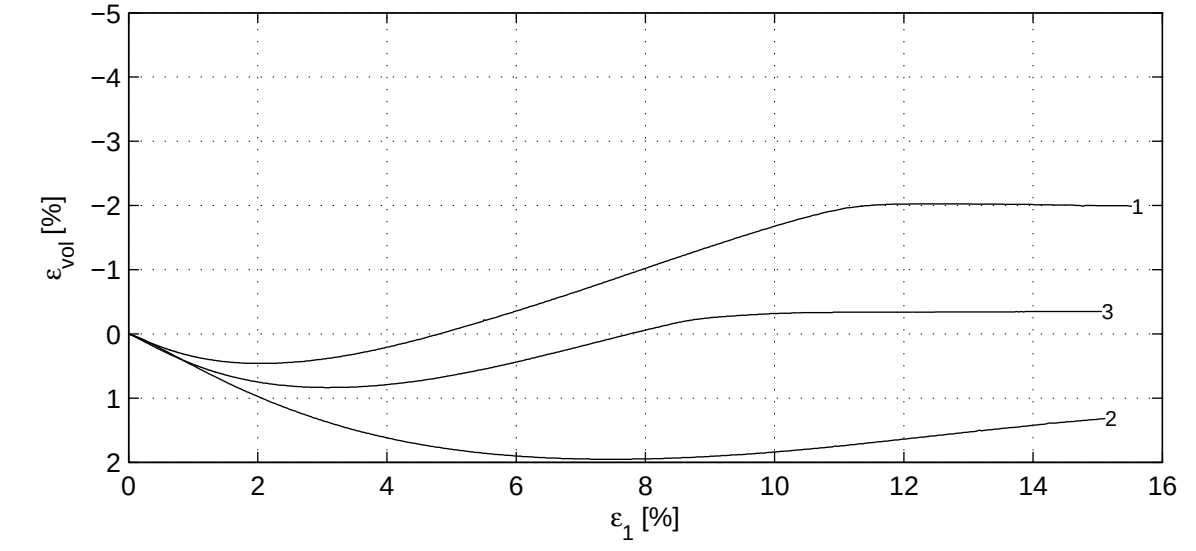
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103_ST−5	A4

) Vrijgegeven door Dui op 2011-08-08 18:23







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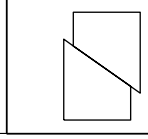
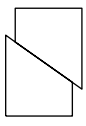
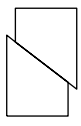
Project Middelburg Boring KB−103, Sample KB−103_ST−5, depth −18.98 till −19.08 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103_ST−5	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:23

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.58	0.74	0.99
	B_1 [−]	0.99	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	884.8	440.6	223.5
	t_{100} [min]	0.4	0.6	0.3
	h_c [mm]	98.9	98.0	96.8
	V_c [cm^3]	198.4	193.5	192.2
	$\rho_{n,c}$ [kg/m^3]	1907	1871	1973
	w_c [%]	25.5	28.1	26.3
	u_{bk} [kPa]	297	299	298
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−0.004	0.005	0.008
	v_{max} [%/h]	98.3	59.6	110.1
Shear stage	v [%/h]	4.2	4.0	4.3
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	M (Deltares)	M (Deltares)	M (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1747.7	833.3	463.0
After testing	f_{undr} [kPa]	873.8	416.6	231.5
	$\varepsilon_{1,50}$ [%]	1.14	2.41	1.37
	E_{50} [MPa]	63.8	14.2	14.2
	w_e [%]	22.8	23.4	26.0
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1235.9	519.1	308.6	646.9	226.3	160.1	32.7	−32.7
5.0	1436.0	633.6	370.8	846.8	340.4	221.4	36.7	−20.6
10.0	1414.1	707.6	341.6	824.8	414.4	189.4	36.2	−11.1
$\varepsilon_{1,tmax}$ [%]	1463.2	709.9	382.3	873.8	416.6	231.5	36.6	−0.9

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Project Middelburg

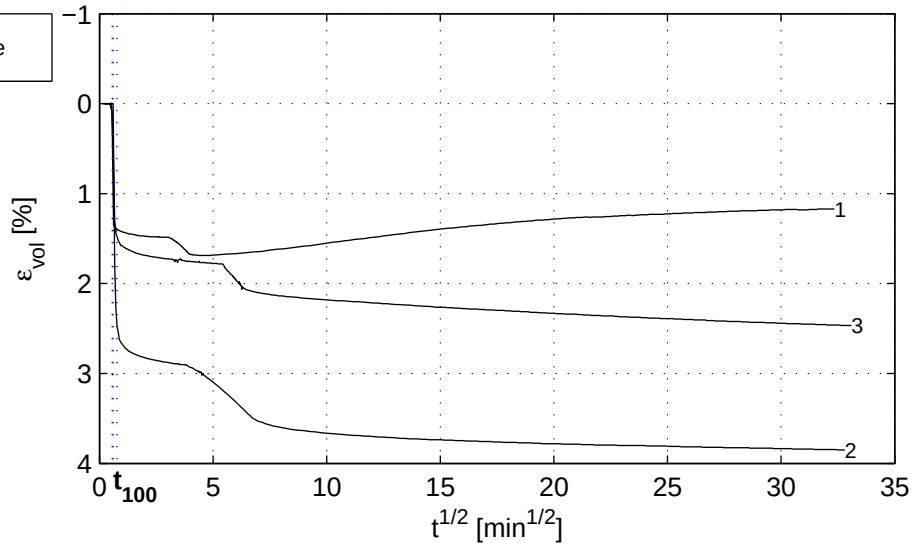
Boring KB−103, Sample KB−103_ST−5, depth −18.98 till −19.08 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

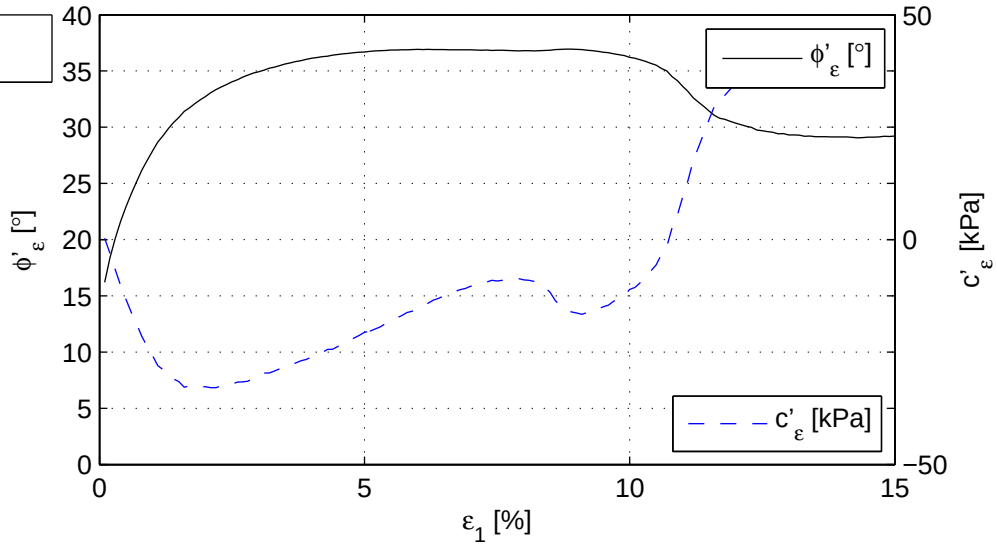
project	seen
1205088.1	Dui
appendix	type
KB−103_ST−5	A4

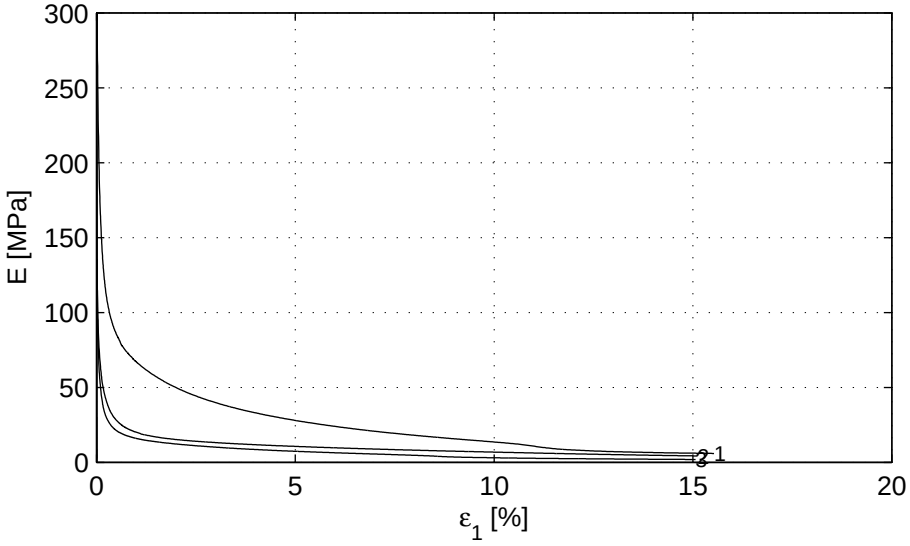
) Vrijgegeven door Dui op 2011-08-08 18:23

Consolidation stage



Shear stage





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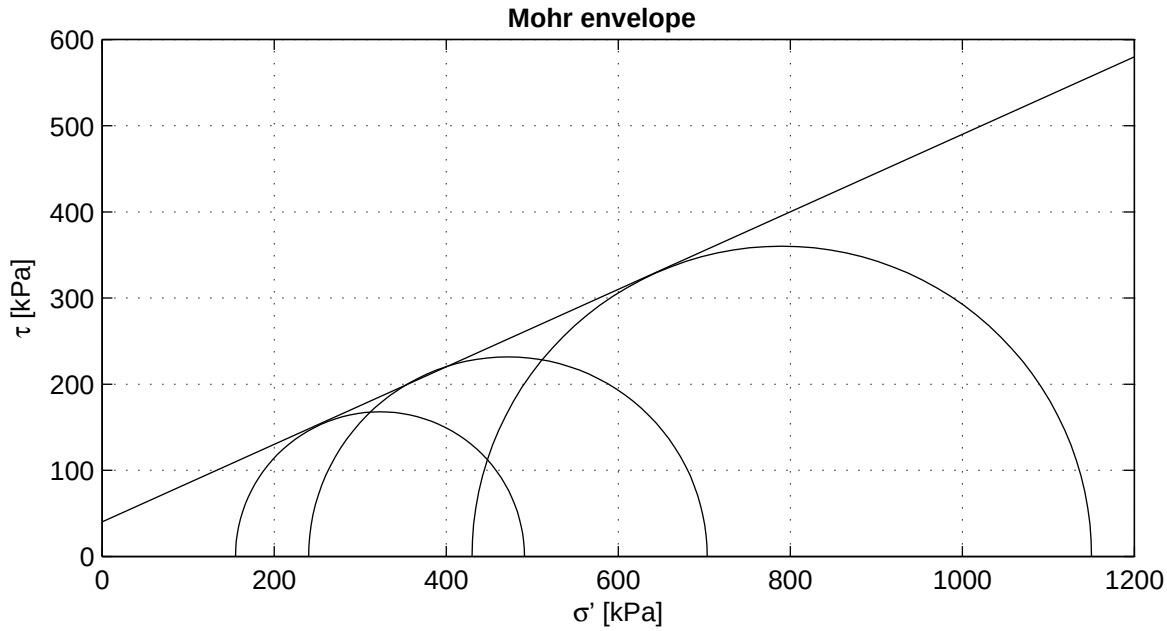
Project Middelburg Boring KB−103, Sample KB−103_ST−5, depth −18.98 till −19.08 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103_ST−5	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:23



Criterion	maximum t
ϕ' [°]	24.22
c' [kPa]	40.02

Start testing

Stage number	1	2	3
Sample name	KB−103_ST−6	KB−103_ST−6	KB−103_ST−6
m_i [g]	1009.8	1009.8	1009.8
D_i [mm]	66.5	66.5	66.5
h_i [mm]	140.0	140.0	140.0
w_i [%]	20.4	20.4	20.4
ρ_i [kg/m^3]	2076	2076	2076
ρ_{dr} [kg/m^3]	1724	1724	1724
Description cf. ASTM	Sandy silty clay (CL−ML)		

Setup: ELE−C sample 6

Consolidation period t100 follows from isotropic phase.

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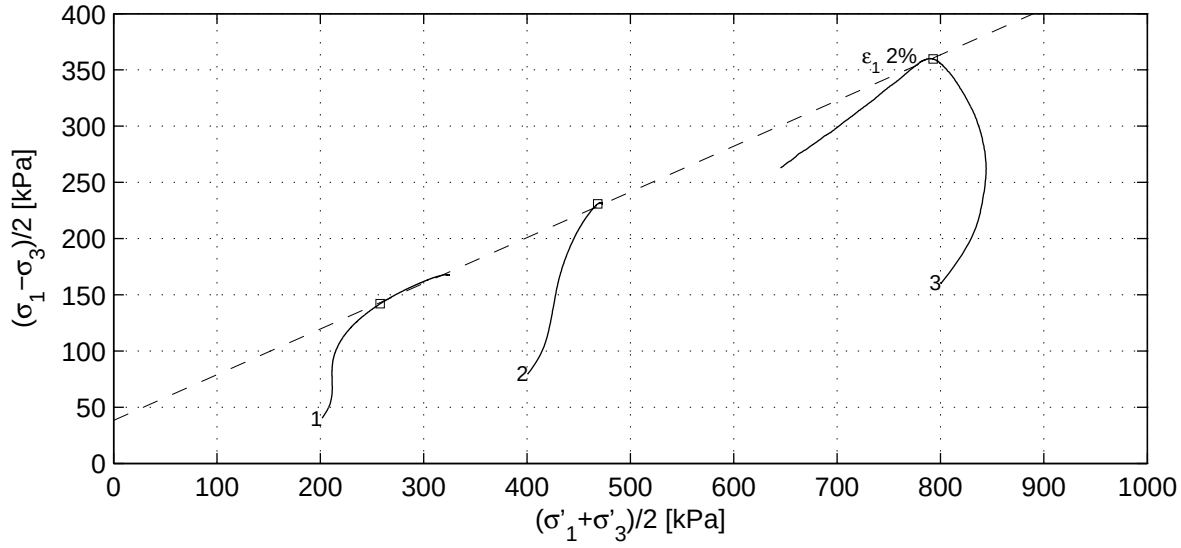
Project Middelburg

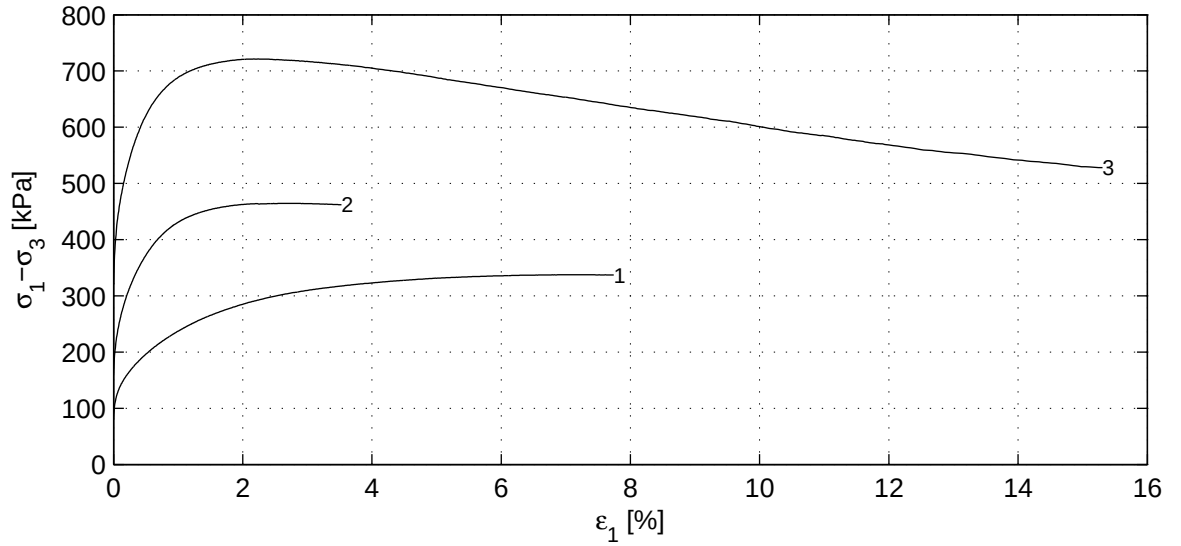
Boring KB−103, Sample KB−103_ST−6, depth −26.67 till −27.27 GL

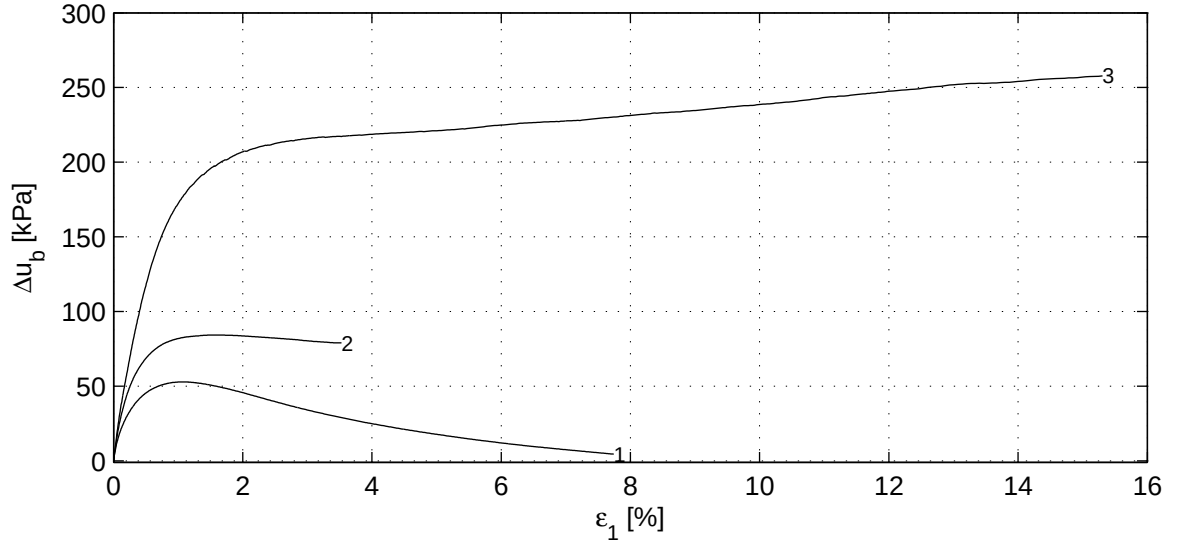
CU Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103_ST−6	A4

) Vrijgegeven door Dui op 2011-08-08 18:40







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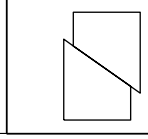
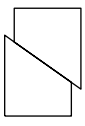
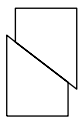
Project Middelburg

Boring KB−103, Sample KB−103_ST−6, depth −26.67 till −27.27 GL

CU Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103_ST−6	A4

) Vrijgegeven door Dui op 2011-08-08 18:40

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.99	0.99	0.99
	B_1 [−]	0.98	0.98	0.98
Consolidation stage	$\sigma'_{1,c}$ [kPa]	242.0	480.6	961.3
	t_{100} [min]	5.6	29.9	22.5
	h_c [mm]	137.9	139.4	139.0
	V_c [cm^3]	469.4	480.2	477.2
	$\rho_{n,c}$ [kg/m^3]	2115	2090	2097
	w_c [%]	18.4	19.7	19.3
	u_{bk} [kPa]	299	299	299
	P [−]	2.30	2.30	2.30
Shear stage	Creep rate [%/h]	−	−0.001	0.001
	v_{max} [%/h]	23.5	4.4	5.8
	v [%/h]	3.9	3.9	4.0
	Stop criterion	ε_1 8%	ε_1 8%	ε_1 8%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
After testing	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	335.9	463.4	720.4
	f_{undr} [kPa]	167.9	231.7	360.2
	$\varepsilon_{1,50}$ [%]	0.63	0.24	0.20
	E_{50} [MPa]	20.3	63.3	100.2
	w_e [%]	17.6	17.6	17.6
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	257.9	468.4	792.8	142.0	230.8	359.8	24.0	42.0
5.0								
8.0								
$\varepsilon_{1,tmax}$ [%]	323.0	471.8	790.2	167.9	231.7	360.2	24.2	40.0

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Project Middelburg

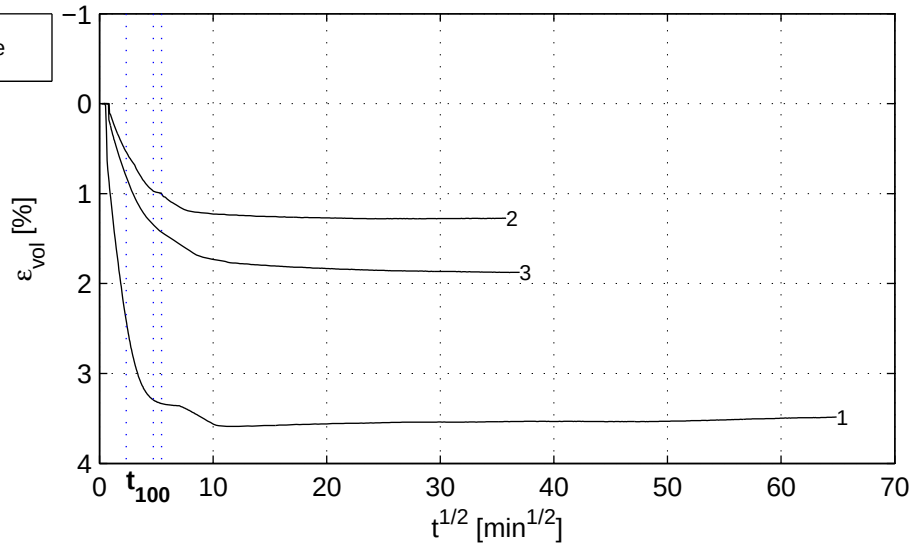
Boring KB−103, Sample KB−103_ST−6, depth −26.67 till −27.27 GL

CU Triaxial test (Multistage) acc. to CEN17892−9:2004

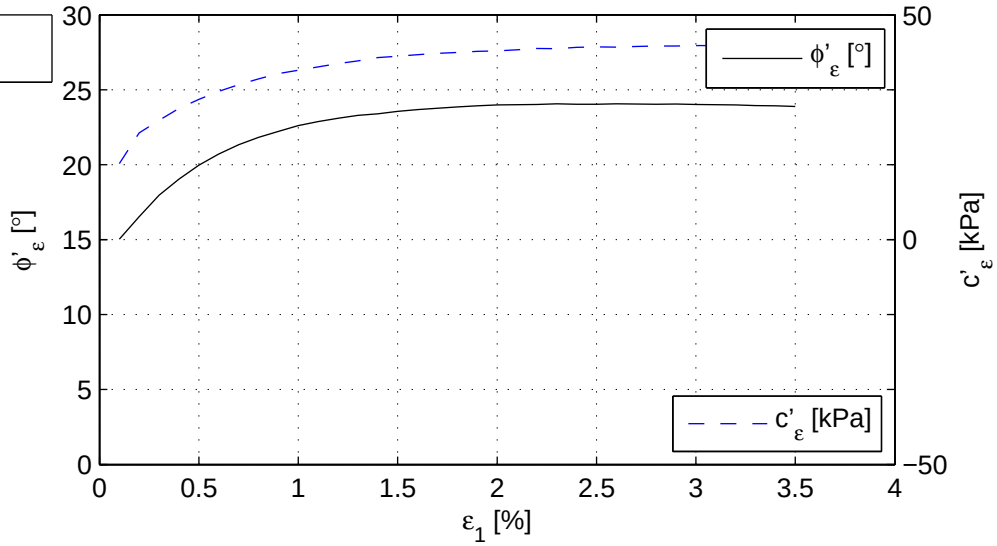
project	seen
1205088.1	Dui
appendix	type
KB−103_ST−6	A4

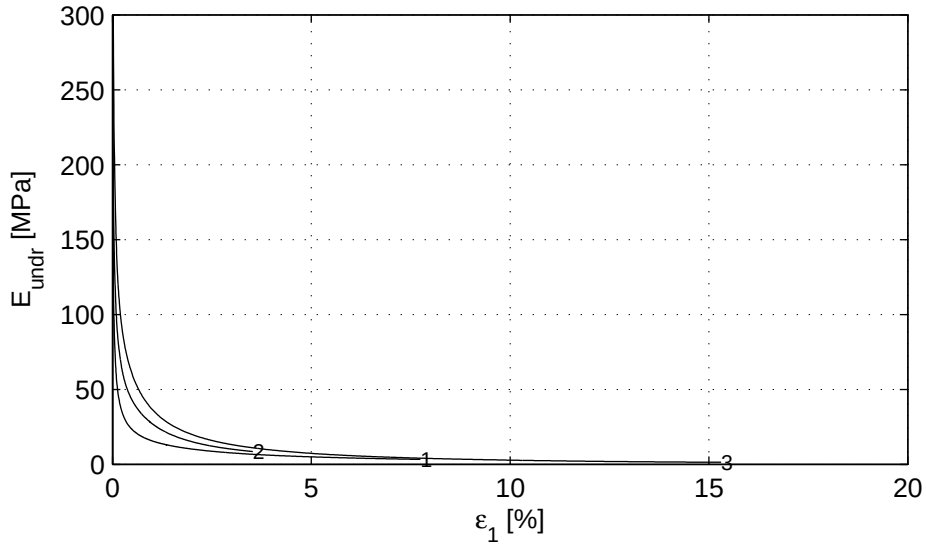
) Vrijgegeven door Dui op 2011-08-08 18:40

Consolidation stage



Shear stage





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Project Middelburg

Boring KB−103, Sample KB−103_ST−6, depth −26.67 till −27.27 GL

CU Triaxial test (Multistage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103_ST−6	A4

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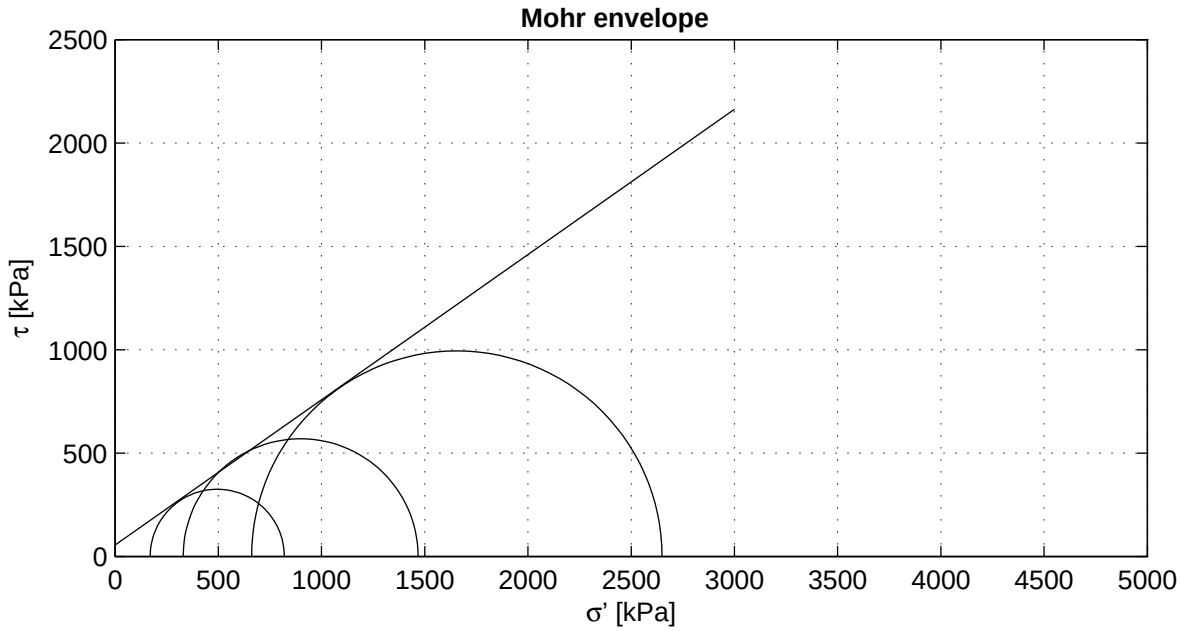

Criterion	maximum t
ϕ' [°]	35.09
c' [kPa]	54.99

Start testing

Stage number	1	2	3
Sample name	KB−103A_ST−1	KB−103A_ST−1A	KB−103A_ST−1B
m_i [g]	960.7	809.5	939.7
D_i [mm]	66.5	67.1	66.1
h_i [mm]	140.1	122.1	140.1
w_i [%]	22.9	22.3	22.9
ρ_i [kg/m^3]	1974	1875	1955
ρ_{dr} [kg/m^3]	1606	1533	1591
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 1
WF−B sample 1A
WF−C sample 1B

Consolidation period t100 follows from isotropic phase.

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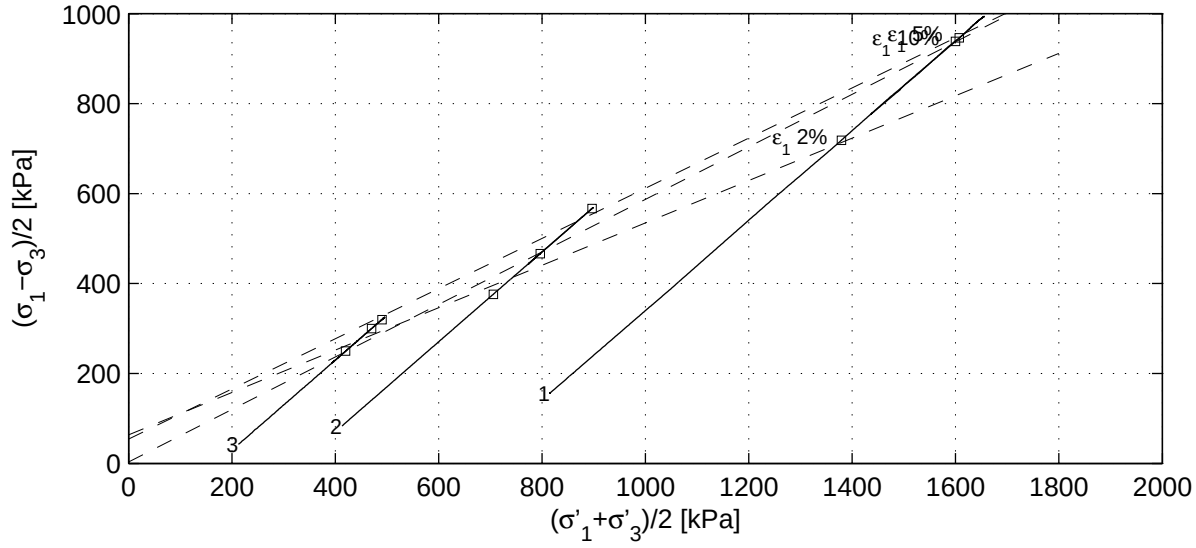
Project Middelburg

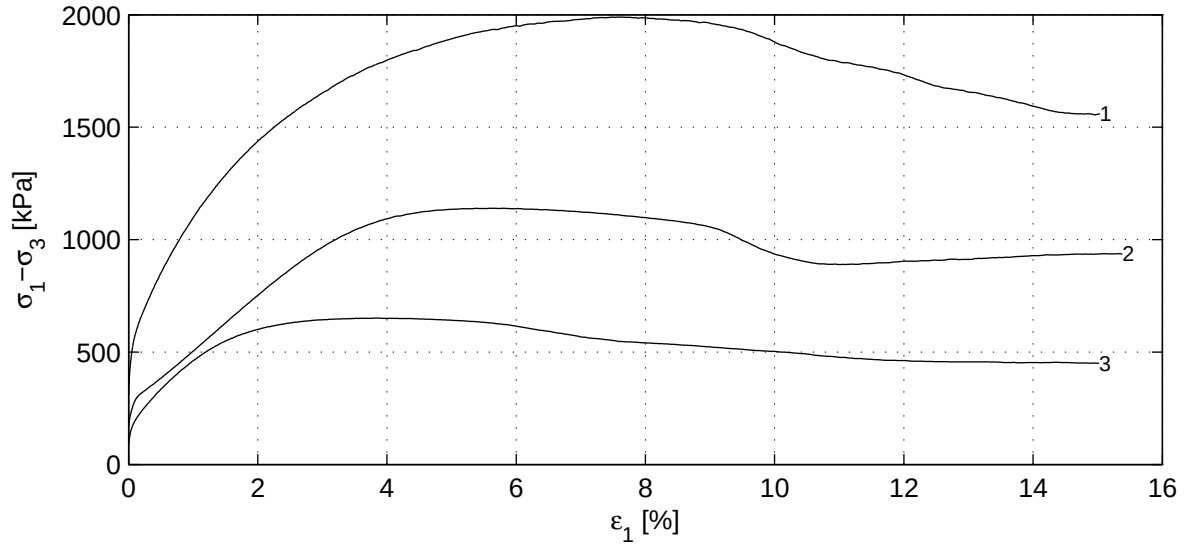
Boring KB−103A, Sample KB−103A_ST−1, depth −31.74 till −32.27 GL

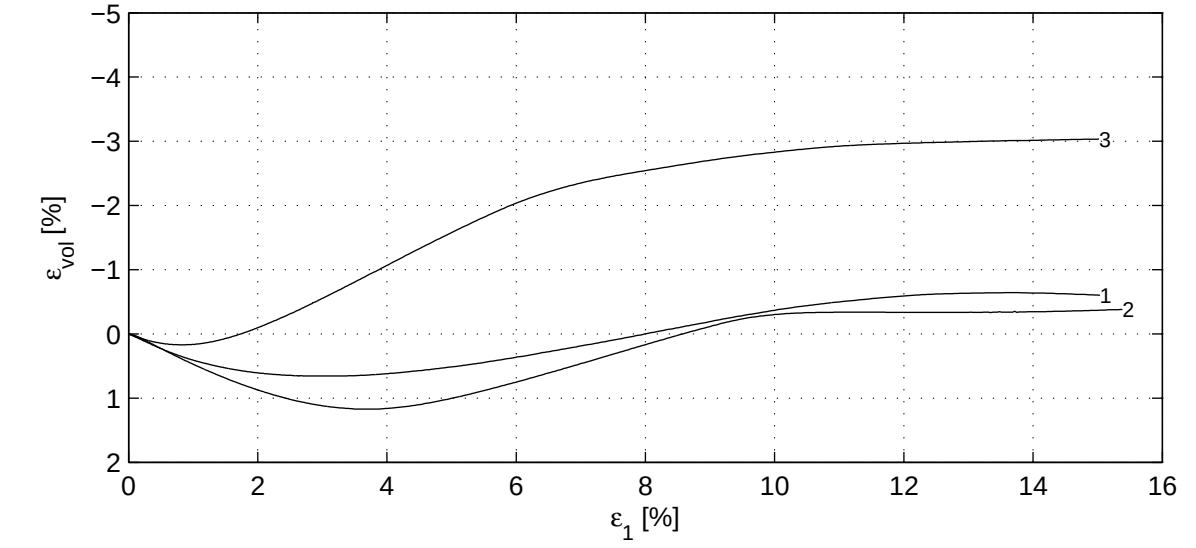
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 18:34







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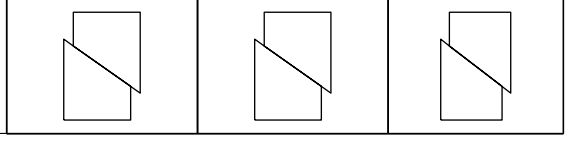
Project Middelburg Boring KB−103A, Sample KB−103A_ST−1, depth −31.74 till −32.27 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103A_ST−1	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:34

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.60	0.30	0.33
	B_1 [−]	0.99	0.96	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	971.5	496.0	254.6
	t_{100} [min]	0.4	0.8	0.4
	h_c [mm]	138.7	119.8	139.3
	V_c [cm^3]	474.6	426.8	480.5
	$\rho_{n,c}$ [kg/m^3]	1999	1885	1955
	w_c [%]	21.4	21.5	22.9
	u_{bk} [kPa]	299	299	296
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	0.000	−	−
	v_{max} [%/h]	84.5	45.9	87.7
Shear stage	v [%/h]	4.3	3.9	4.6
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1988.1	1137.9	649.6
After testing	f_{undr} [kPa]	994.1	568.9	324.8
	$\varepsilon_{1,50}$ [%]	1.13	1.60	0.63
	E_{50} [MPa]	74.1	30.5	45.6
	w_e [%]	18.4	25.0	26.8
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1379.2	705.7	470.1	718.7	376.1	299.8	28.1	72.0
5.0	1607.1	896.7	490.3	946.2	566.9	319.7	33.9	65.1
10.0	1600.0	796.4	420.0	938.4	466.4	249.9	35.7	4.1
$\varepsilon_{1,tmax}$ [%]	1655.2	898.7	495.0	994.1	568.9	324.8	35.1	55.0

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Project Middelburg

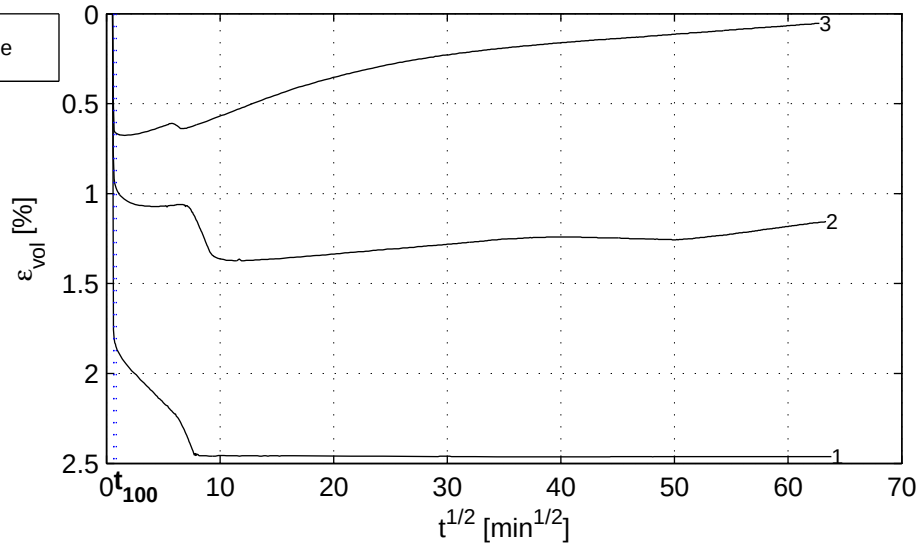
Boring KB−103A, Sample KB−103A_ST−1, depth −31.74 till −32.27 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

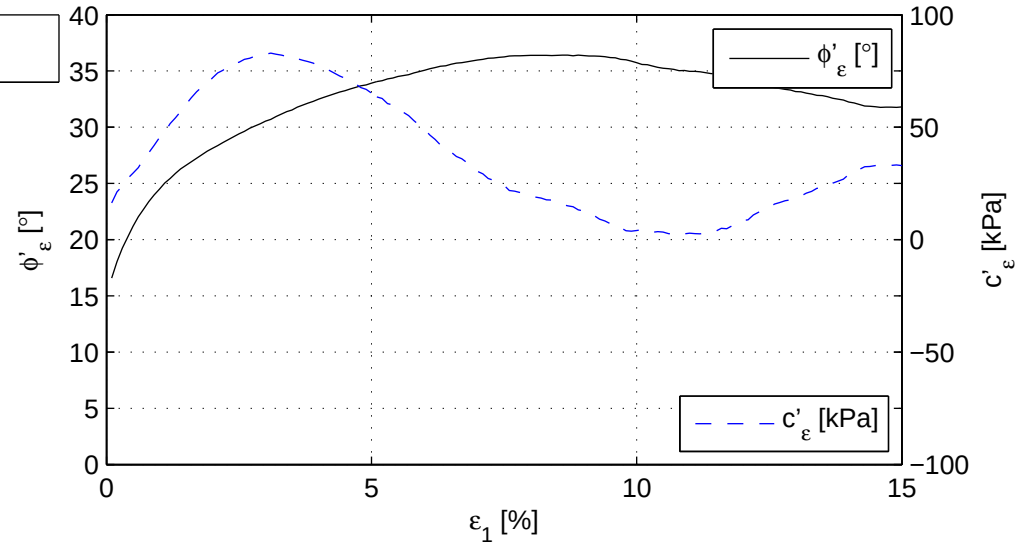
project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−1	A4

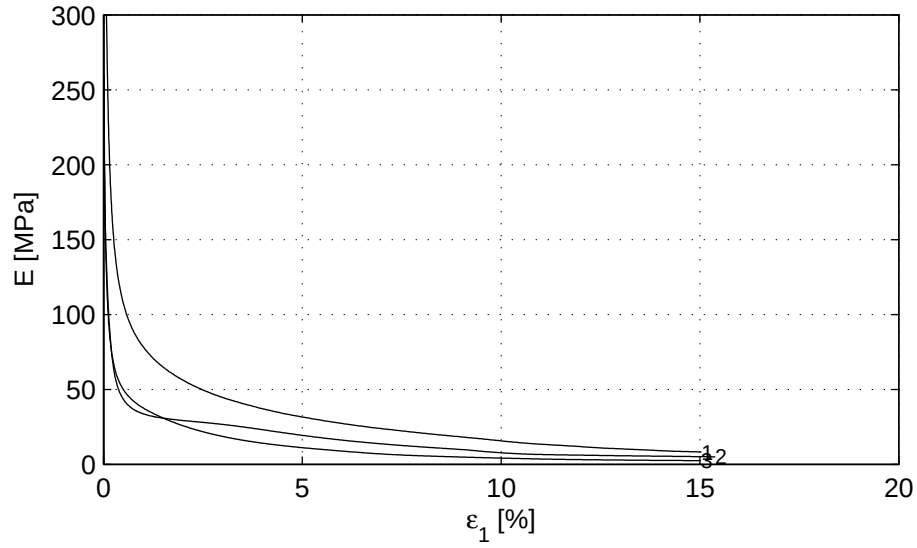
) Vrijgegeven door Dui op 2011-08-08 18:34

Consolidation stage



Shear stage





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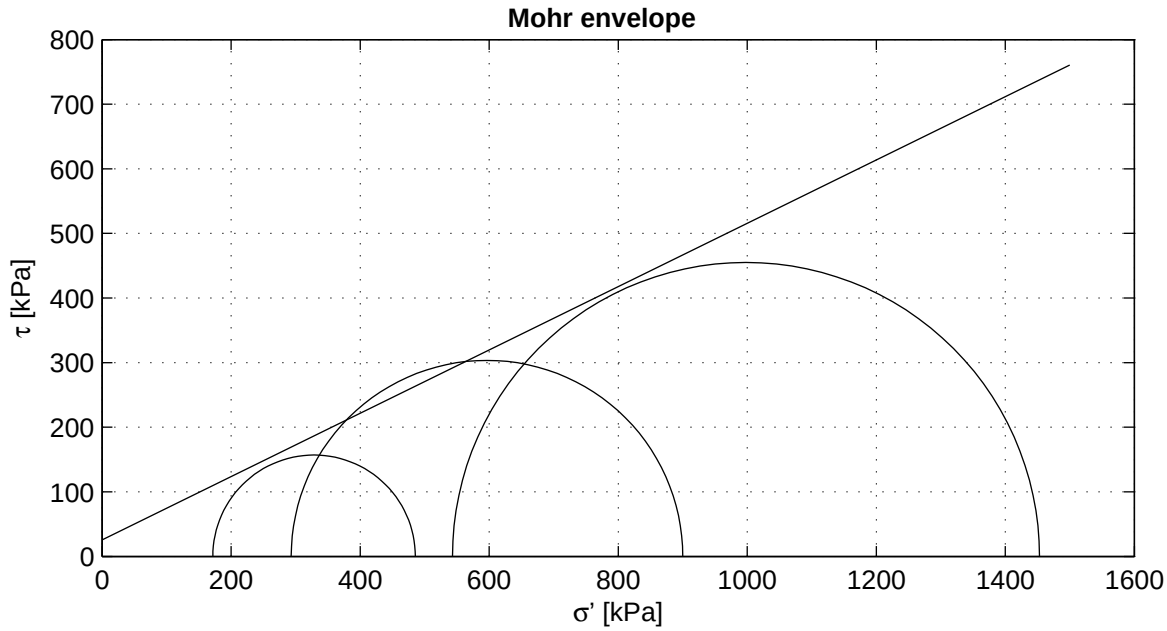
Project Middelburg Boring KB−103A, Sample KB−103A_ST−1, depth −31.74 till −32.27 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103A_ST−1	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:34



Criterion	maximum t
ϕ' [°]	26.10
c' [kPa]	25.77

Start testing

Stage number	1	2	3
Sample name	KB−103A_ST−6	KB−103A_ST−6A	KB−103A_ST−6B
m_i [g]	865.0	832.7	921.4
D_i [mm]	65.8	67.1	68.0
h_i [mm]	131.6	122.1	128.5
w_i [%]	26.1	26.6	26.5
ρ_i [kg/m^3]	1933	1929	1975
ρ_{dr} [kg/m^3]	1532	1524	1561
Description cf. ASTM	Silty clay (CL−ML)		

Setup: ELE−B sample 6
ELE−A sample 6A
ELE−C sample 6B

Consolidation period t100 follows from isotropic phase.

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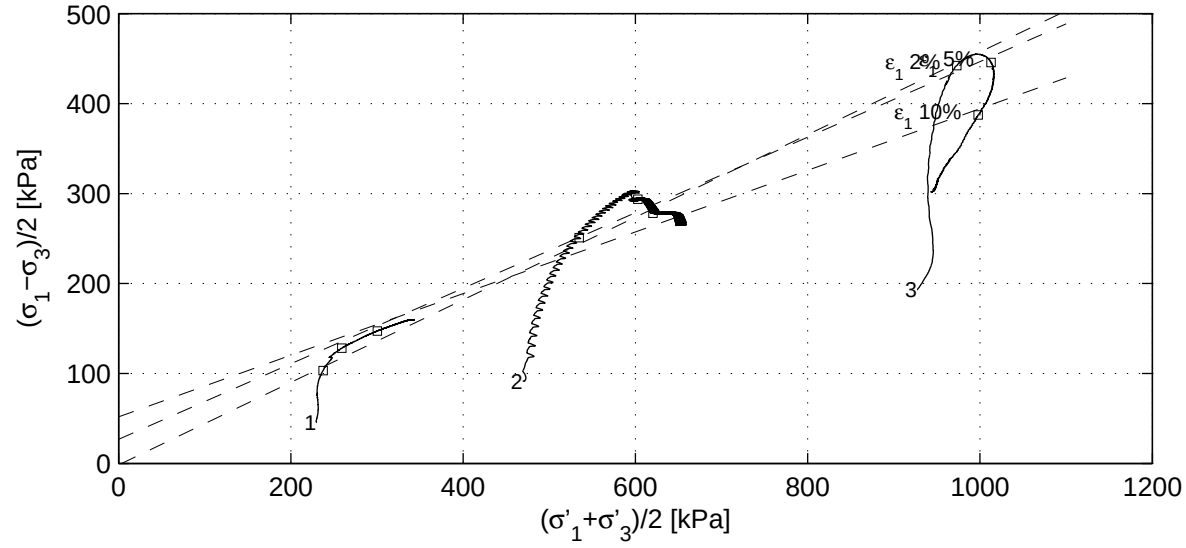
Project Middelburg

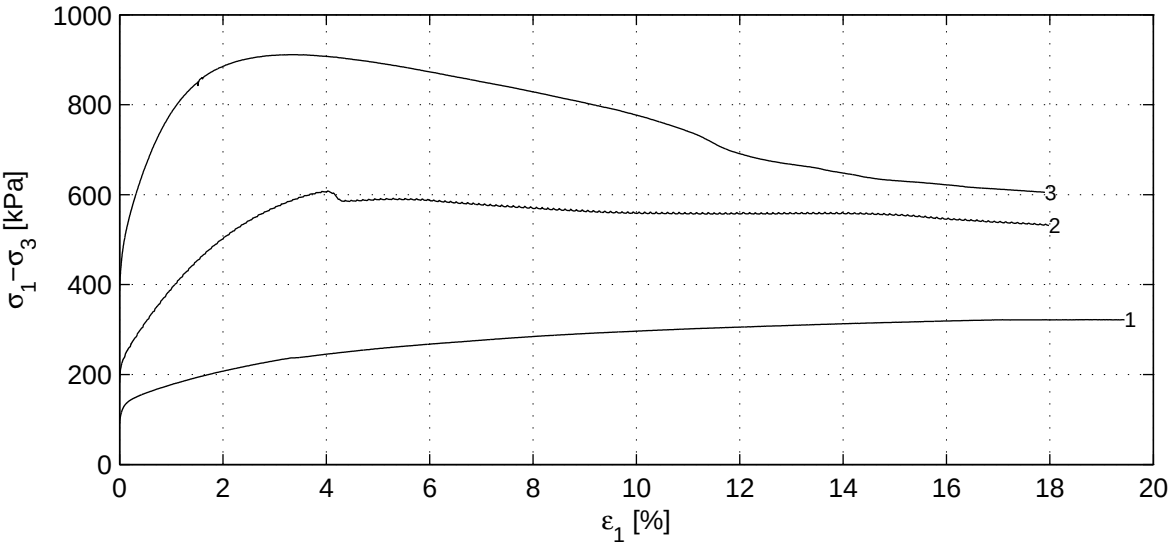
Boring KB−103A, Sample KB−103A_ST−6, depth −78.17 till −78.72 GL

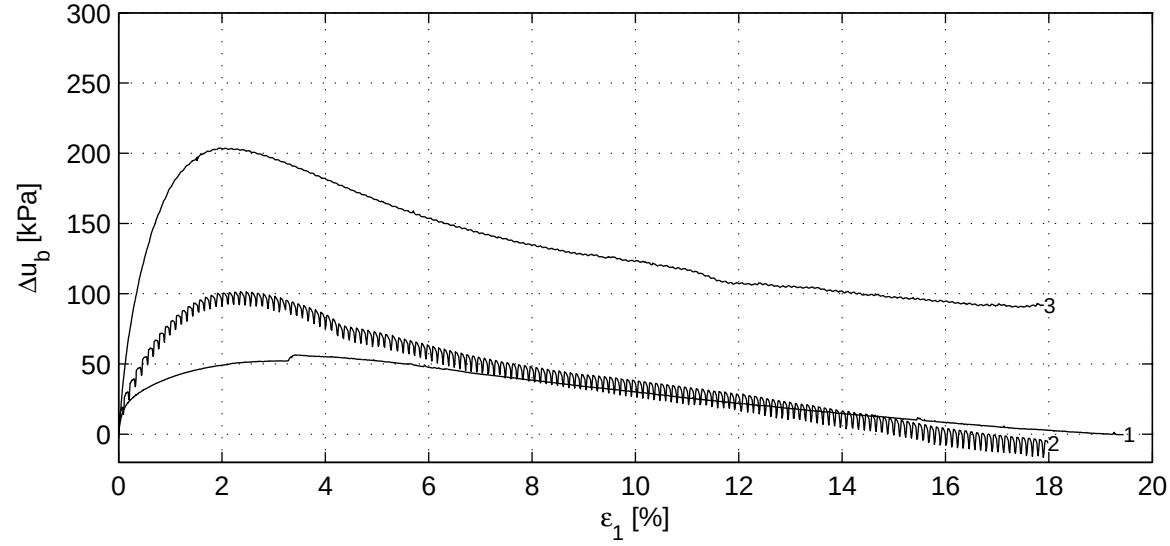
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−6	A4

) Vrijgegeven door Dui op 2011-08-09 21:31







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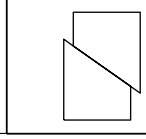
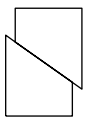
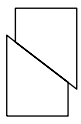
Project Middelburg

Boring KB−103A, Sample KB−103A_ST−6, depth −78.17 till −78.72 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−6	A4

) Vrijgegeven door Dui op 2011-08-09 21:31

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.99	0.61	0.70
	B_1 [−]	0.98	0.99	0.97
Consolidation stage	$\sigma'_{1,c}$ [kPa]	275.8	560.9	1120.0
	t_{100} [min]	2995.4	601.7	319.6
	h_c [mm]	128.3	117.7	124.9
	V_c [cm^3]	440.9	429.9	457.5
	$\rho_{n,c}$ [kg/m^3]	1947	1933	1994
	w_c [%]	25.2	26.3	25.3
	u_{bk} [kPa]	300	299	299
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−0.001	−	−0.001
	v_{max} [%/h]	0.0	0.2	0.4
Shear stage	v [%/h]	0.2	0.2	0.2
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	319.6	606.9	910.0
After testing	f_{undr} [kPa]	157.0	303.5	455.0
	$\varepsilon_{1,50}$ [%]	1.99	1.03	0.46
	E_{50} [MPa]	5.7	20.5	57.3
	w_e [%]	29.4	27.6	26.3
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	237.4	534.7	973.1	103.2	251.0	442.3	27.3	−1.8
5.0	259.1	602.8	1012.9	128.1	293.7	445.8	24.8	29.6
10.0	300.5	620.3	998.0	147.2	278.3	387.5	20.0	55.1
$\varepsilon_{1,tmax}$ [%]	328.6	596.6	998.1	157.0	303.5	455.0	26.1	25.8

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Project Middelburg

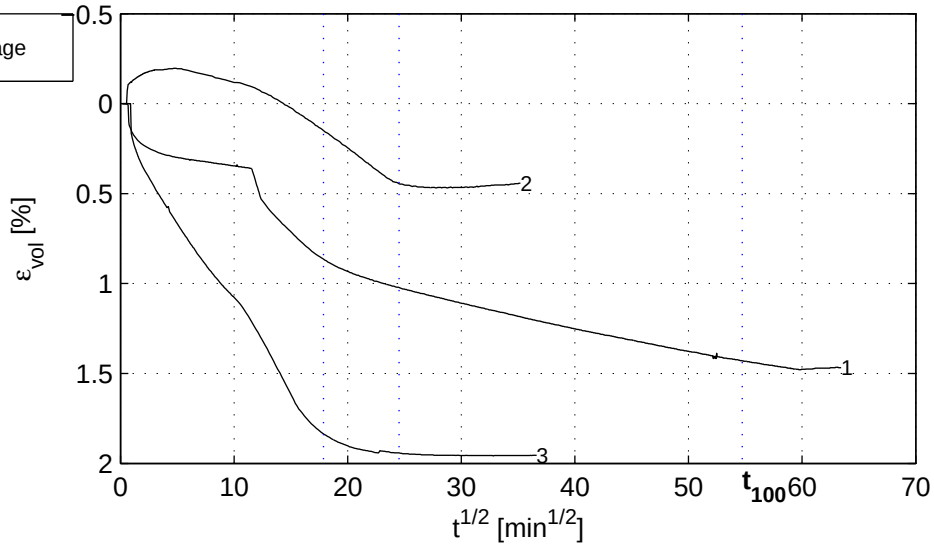
Boring KB−103A, Sample KB−103A_ST−6, depth −78.17 till −78.72 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

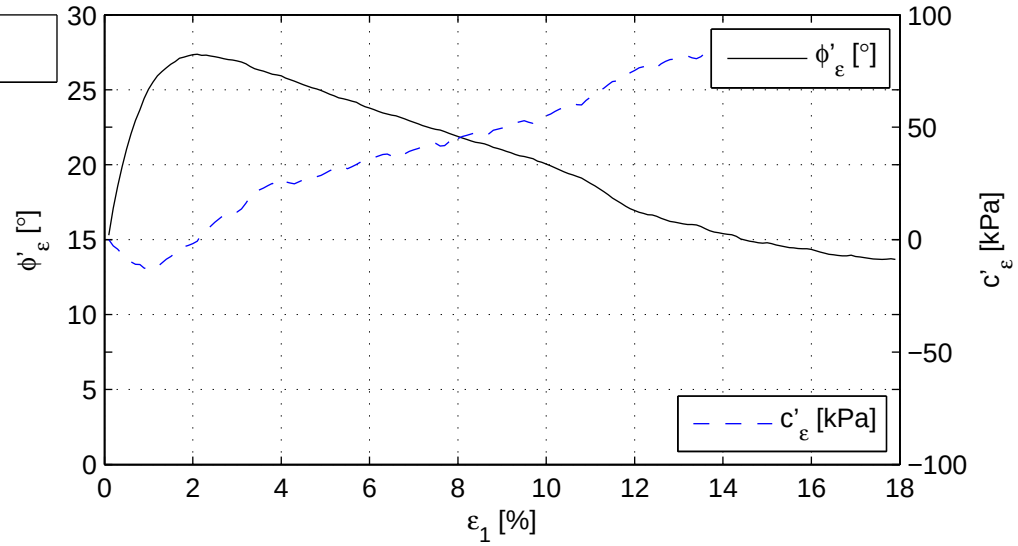
project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−6	A4

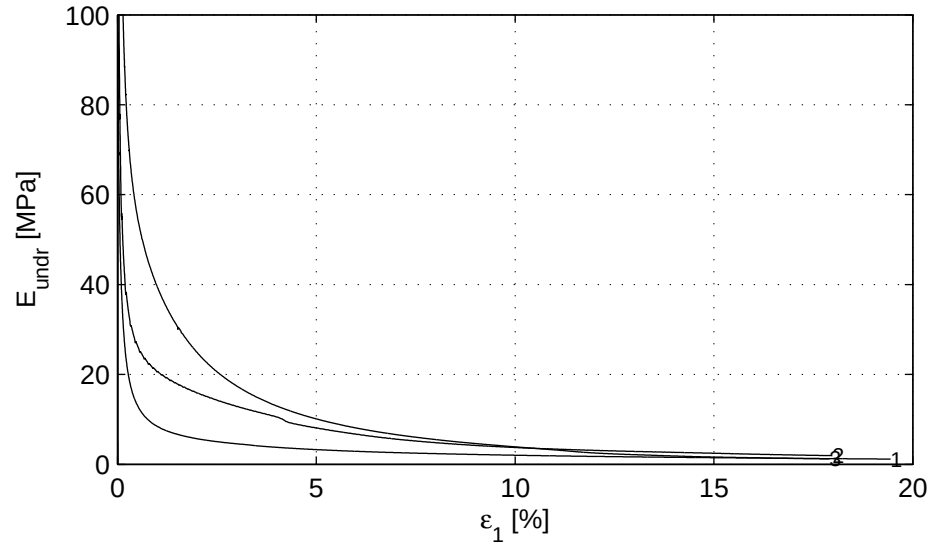
) Vrijgegeven door Dui op 2011-08-09 21:31

Consolidation stage



Shear stage





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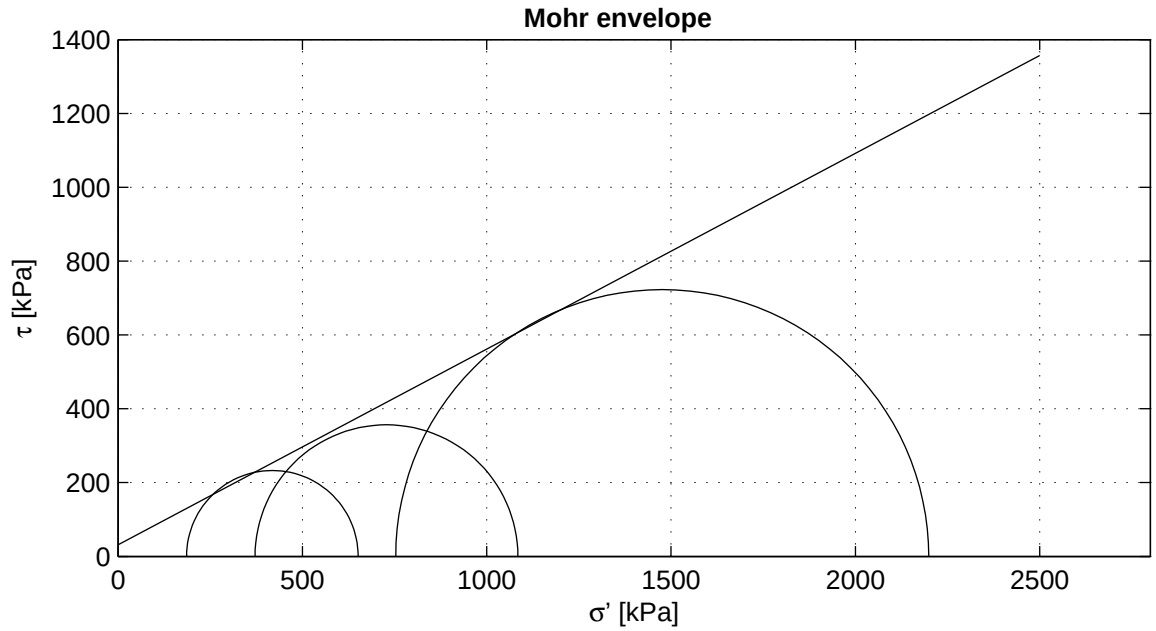
Project Middelburg Boring KB−103A, Sample KB−103A_ST−6, depth −78.17 till −78.72 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103A_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 21:31



Criterion	maximum t
ϕ' [°]	27.93
c' [kPa]	31.66

Start testing

Stage number	1	2	3
Sample name	KB−103A_ST−9	KB−103A_ST−9A	KB−103A_ST−9B
m_i [g]	971.3	984.0	1015.0
D_i [mm]	66.7	66.0	66.0
h_i [mm]	140.9	149.7	149.9
w_i [%]	23.5	23.2	21.1
ρ_i [kg/m^3]	1972	1921	1979
ρ_{dr} [kg/m^3]	1597	1560	1635
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 9
WF−B sample 9A
WF−C sample 9B

Consolidation period t100 follows from isotropic phase.

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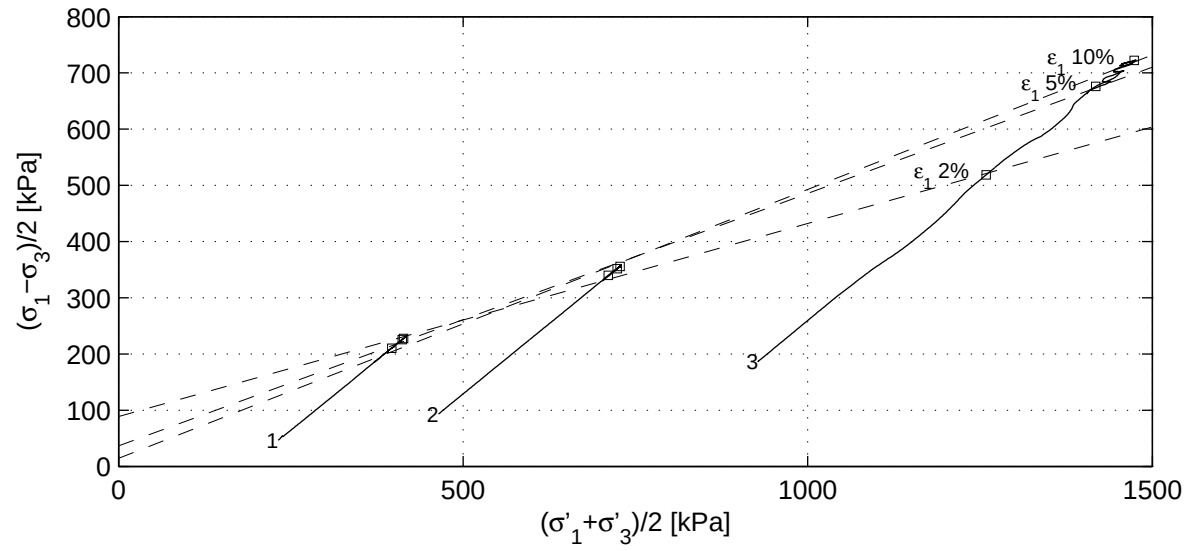
Project Middelburg

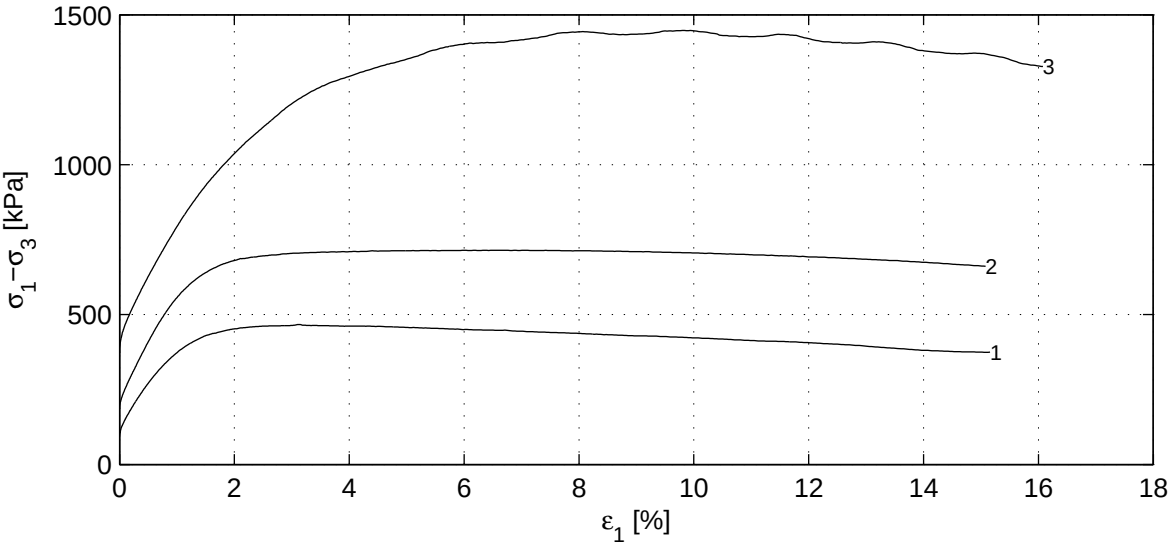
Boring KB−103A, Sample KB−103A_ST−9, depth −84.76 till −85.31 GL

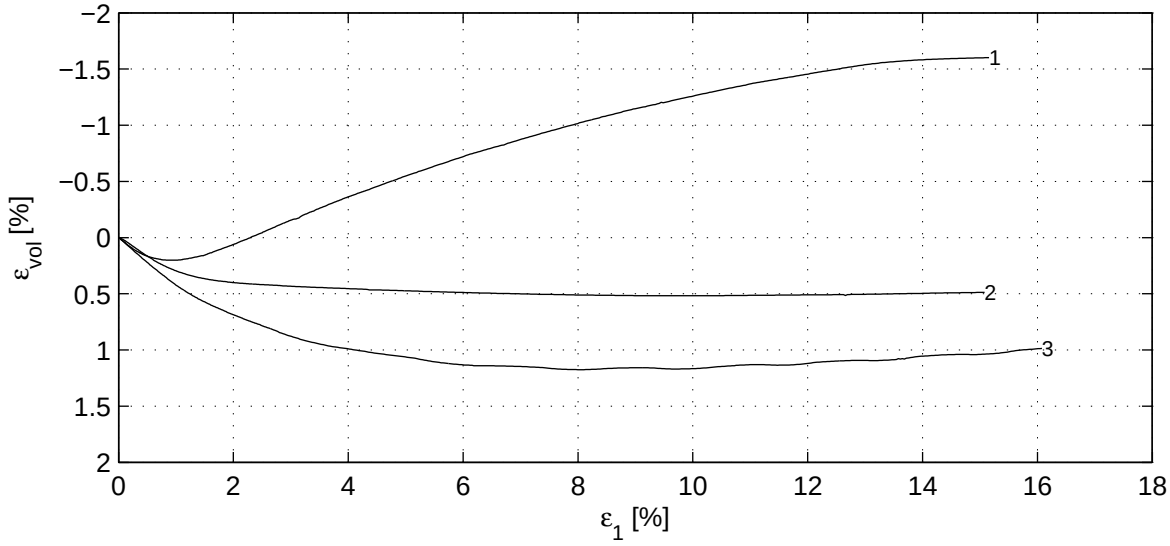
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−9	A4

) Vrijgegeven door Dui op 2011-08-09 21:59







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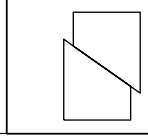
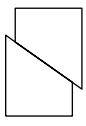
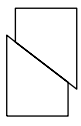
Project Middelburg

Boring KB−103A, Sample KB−103A_ST−9, depth −84.76 till −85.31 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−9	A4

) Vrijgegeven door Dui op 2011-08-09 21:59

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.88	0.92	0.84
	B_1 [−]	0.98	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	278.4	557.3	1114.9
	t_{100} [min]	0.4	0.5	2.5
	h_c [mm]	139.7	147.7	146.0
	V_c [cm^3]	484.9	500.5	488.8
	$\rho_{n,c}$ [kg/m^3]	1987	1943	2027
	w_c [%]	22.5	21.7	18.2
	u_{bk} [kPa]	298	298	296
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−0.020	0.039
	v_{max} [%/h]	79.1	66.0	14.2
Shear stage	v [%/h]	4.0	4.0	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	465.5	713.1	1445.7
After testing	f_{undr} [kPa]	232.7	356.6	722.9
	$\varepsilon_{1,50}$ [%]	0.55	0.62	1.42
	E_{50} [MPa]	34.6	42.6	37.8
	w_e [%]	25.2	23.9	21.1
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	411.6	710.6	1259.0	225.6	340.0	518.8	20.1	94.6
5.0	413.8	727.9	1417.9	227.8	355.7	675.9	26.7	40.9
10.0	396.4	723.5	1473.8	210.3	351.7	722.2	28.6	16.5
$\varepsilon_{1,tmax}$ [%]	418.5	728.1	1476.0	232.7	356.6	722.9	27.9	31.7

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Project Middelburg

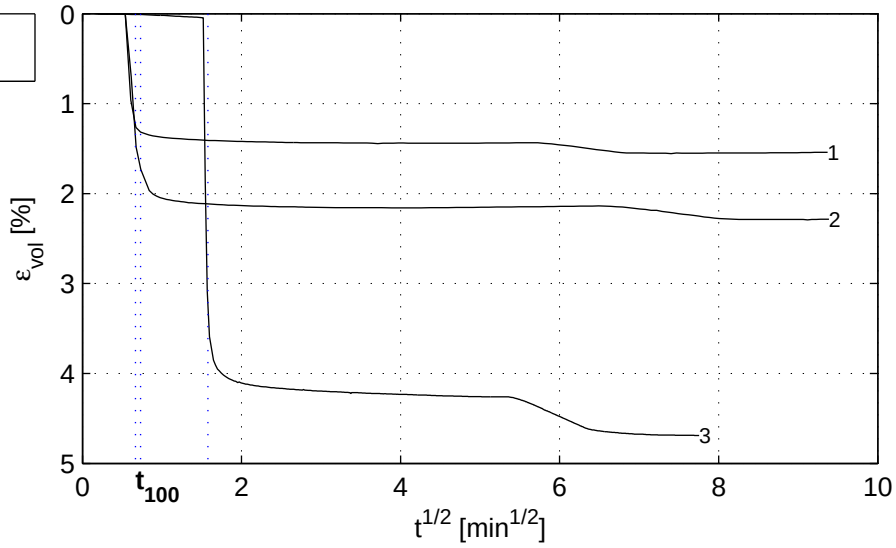
Boring KB−103A, Sample KB−103A_ST−9, depth −84.76 till −85.31 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

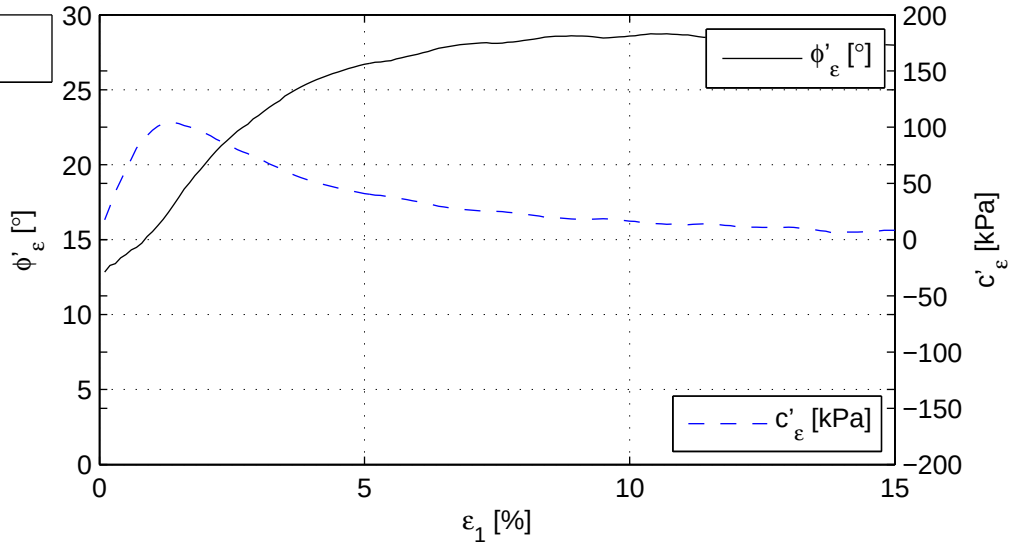
project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−9	A4

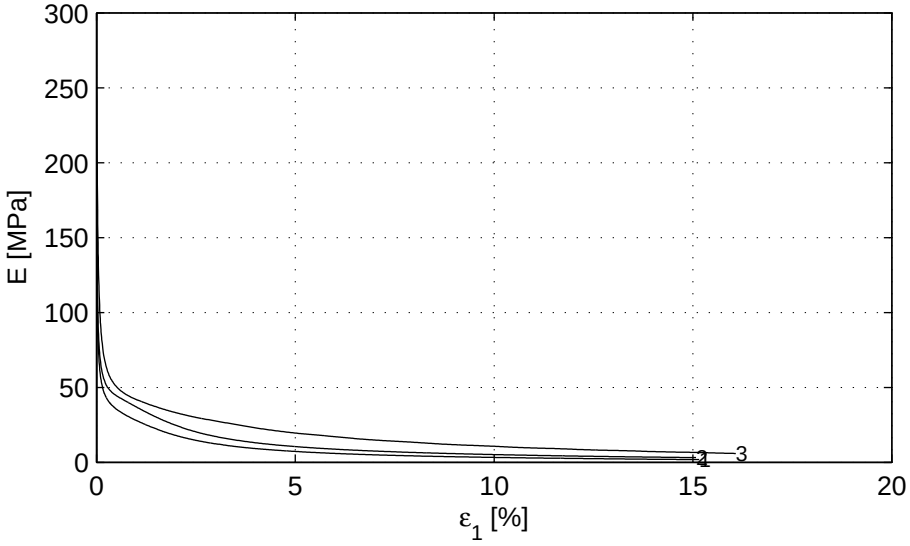
) Vrijgegeven door Dui op 2011-08-09 21:59

Consolidation stage



Shear stage





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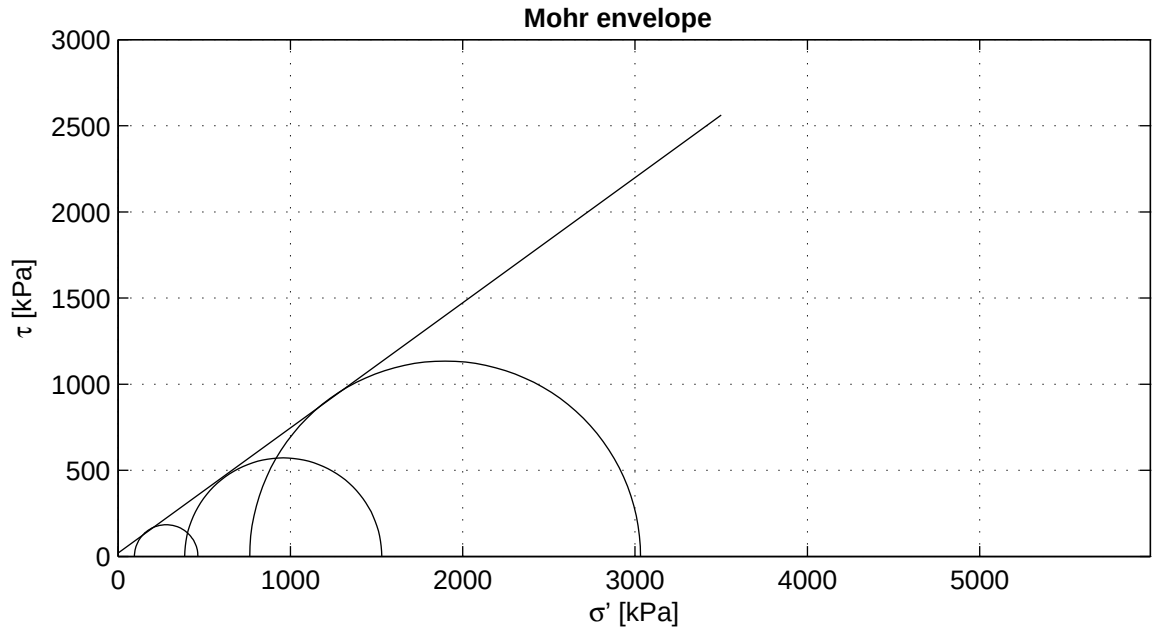
Project Middelburg Boring KB−103A, Sample KB−103A_ST−9, depth −84.76 till −85.31 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103A_ST−9	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 21:59



Criterion	maximum t
ϕ' [°]	35.99
c' [kPa]	19.58

Start testing

Stage number	1	2	3
Sample name	KB−103A_ST−10	KB−103A_ST−10A	KB−103A_ST−10B
m_i [g]	909.0	905.9	899.8
D_i [mm]	66.7	67.4	66.3
h_i [mm]	128.7	128.2	128.1
w_i [%]	21.5	20.4	20.6
ρ_i [kg/m^3]	2021	1981	2035
ρ_{dr} [kg/m^3]	1664	1646	1688
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 10
WF−B sample 10A
WF−C sample 10B

Consolidation period t100 follows from isotropic phase.

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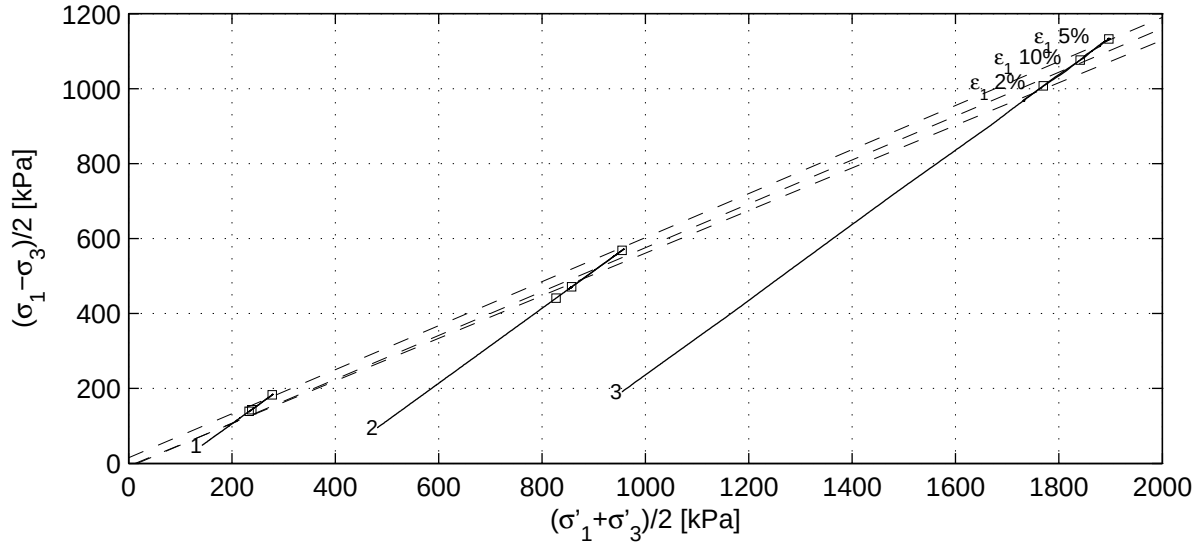
Project Middelburg

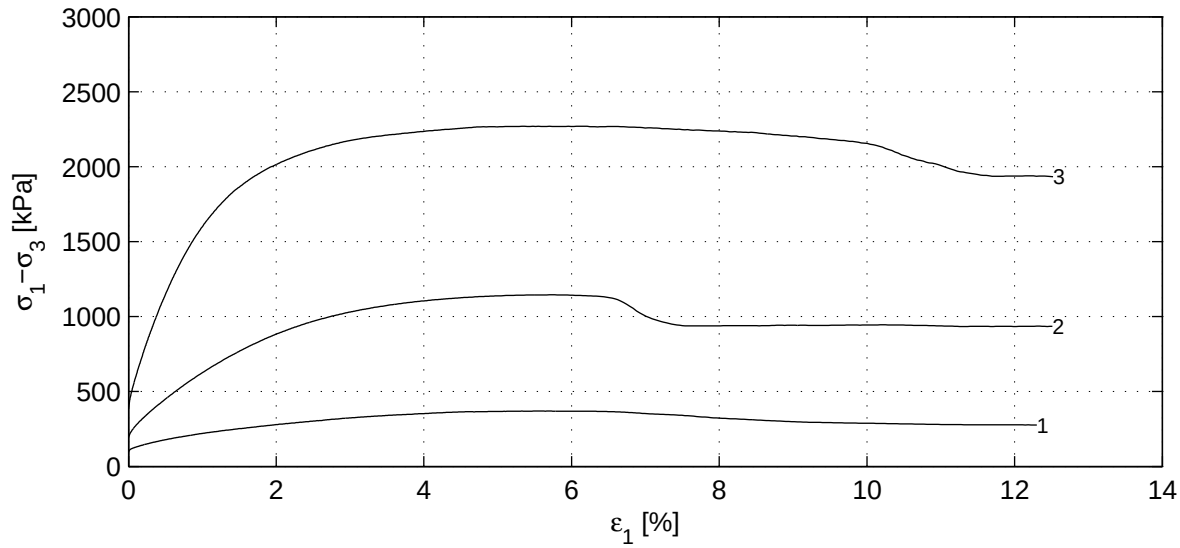
Boring KB−103A, Sample KB−103A_ST−10, depth −93.73 till −93.86 GL

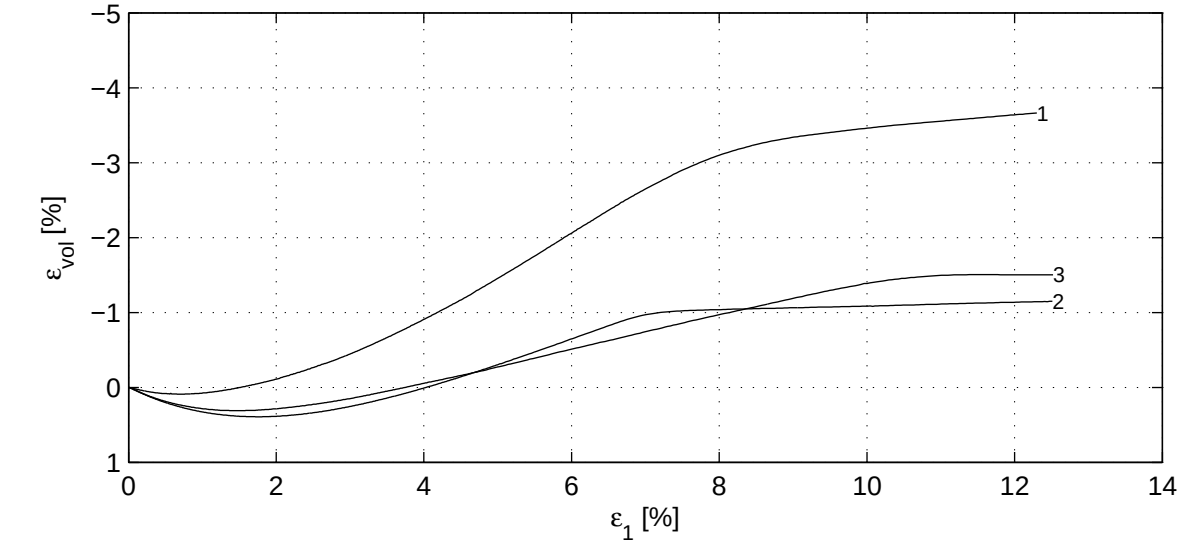
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−10	A4

) Vrijgegeven door Dui op 2011-08-08 18:27







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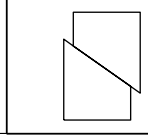
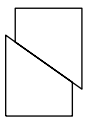
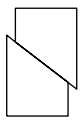
Project Middelburg Boring KB−103A, Sample KB−103A_ST−10, depth −93.73 till −93.86 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103A_ST−10	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:27

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.86	0.64	0.81
	B_1 [−]	0.98	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	189.9	578.2	1146.0
	t_{100} [min]	0.8	0.5	0.7
	h_c [mm]	127.7	126.8	127.0
	V_c [cm^3]	446.7	450.9	435.1
	$\rho_{n,c}$ [kg/m^3]	2028	1995	2052
	w_c [%]	21.1	19.5	19.6
	u_{bk} [kPa]	298	298	297
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−	−0.019
	v_{max} [%/h]	43.2	77.8	53.5
Shear stage	v [%/h]	4.6	4.0	4.0
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	368.2	1143.5	2268.2
After testing	f_{undr} [kPa]	184.1	571.8	1134.1
	$\varepsilon_{1,50}$ [%]	1.19	1.14	0.67
	E_{50} [MPa]	11.5	41.8	140.7
	w_e [%]	23.1	21.9	21.9
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	233.5	827.3	1769.9	139.1	441.2	1007.6	34.6	−8.7
5.0	278.2	954.7	1896.4	182.9	568.4	1132.6	36.0	18.5
10.0	238.4	857.4	1841.0	143.3	471.0	1076.6	35.8	−11.7
$\varepsilon_{1,tmax}$ [%]	279.1	958.4	1897.8	184.1	571.8	1134.1	36.0	19.6

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Project Middelburg

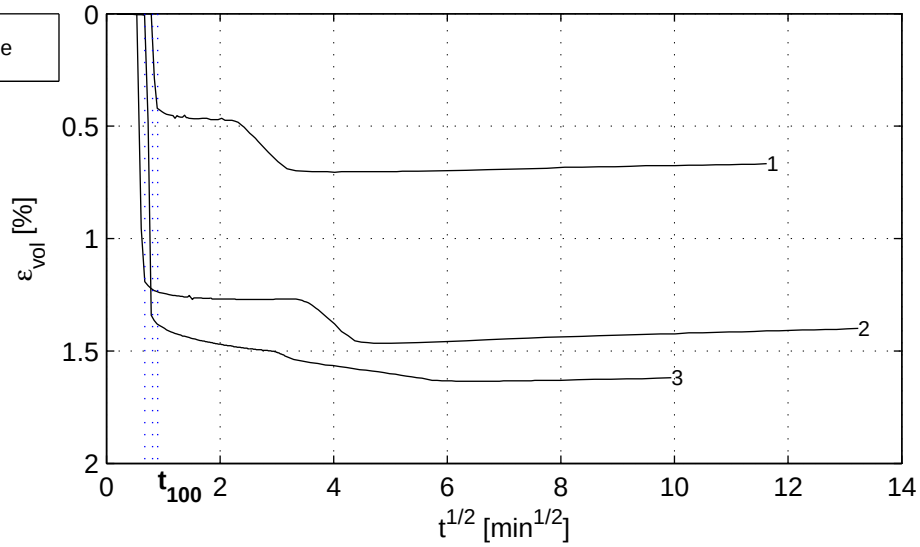
Boring KB−103A, Sample KB−103A_ST−10, depth −93.73 till −93.86 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

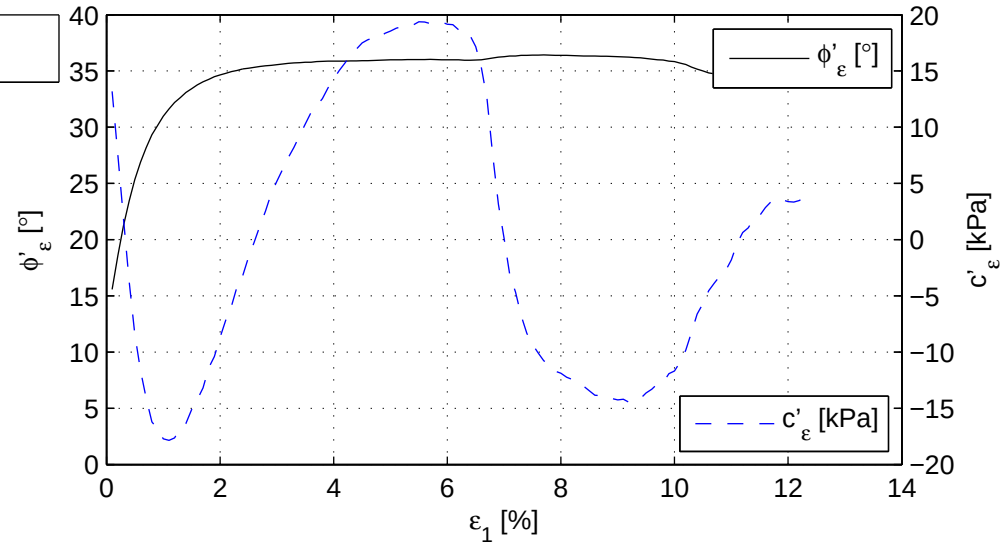
project	seen
1205088.1	Dui
appendix	type
KB−103A_ST−10	A4

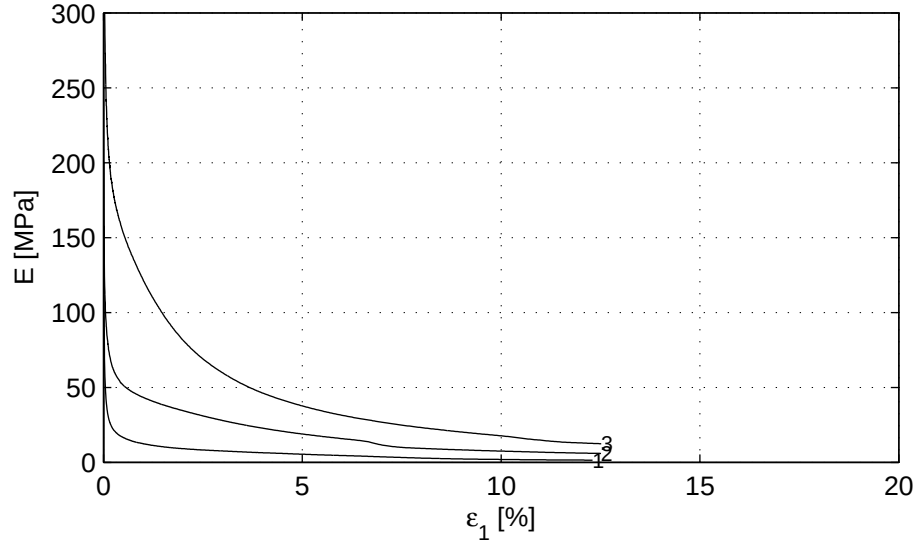
) Vrijgegeven door Dui op 2011-08-08 18:27

Consolidation stage



Shear stage





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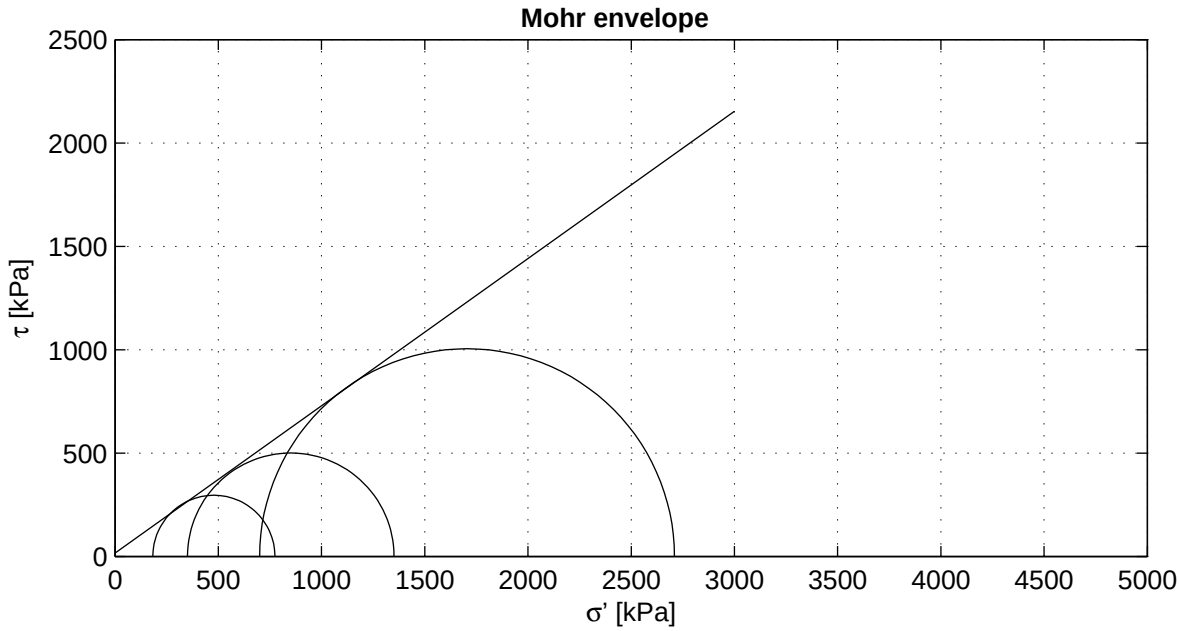
Project Middelburg Boring KB−103A, Sample KB−103A_ST−10, depth −93.73 till −93.86 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−103A_ST−10	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 18:27



Criterion	maximum t
ϕ' [°]	35.46
c' [kPa]	16.34

Start testing

Stage number	1	2	3
Sample name	KB−104_ST−2A	KB−104_ST−2B	KB−104_ST−2C
m_i [g]	947.1	927.3	944.8
D_i [mm]	66.6	66.6	66.6
h_i [mm]	133.0	133.1	135.5
w_i [%]	21.7	24.0	26.2
ρ_i [kg/m^3]	2044	2000	2002
ρ_{dr} [kg/m^3]	1679	1613	1586
Description cf. ASTM	Silty sand (SM)		

Setup: WF−C sample 2A
WF−B sample 2B
WF−A sample 2C

Consolidation period t100 follows from isotropic phase.

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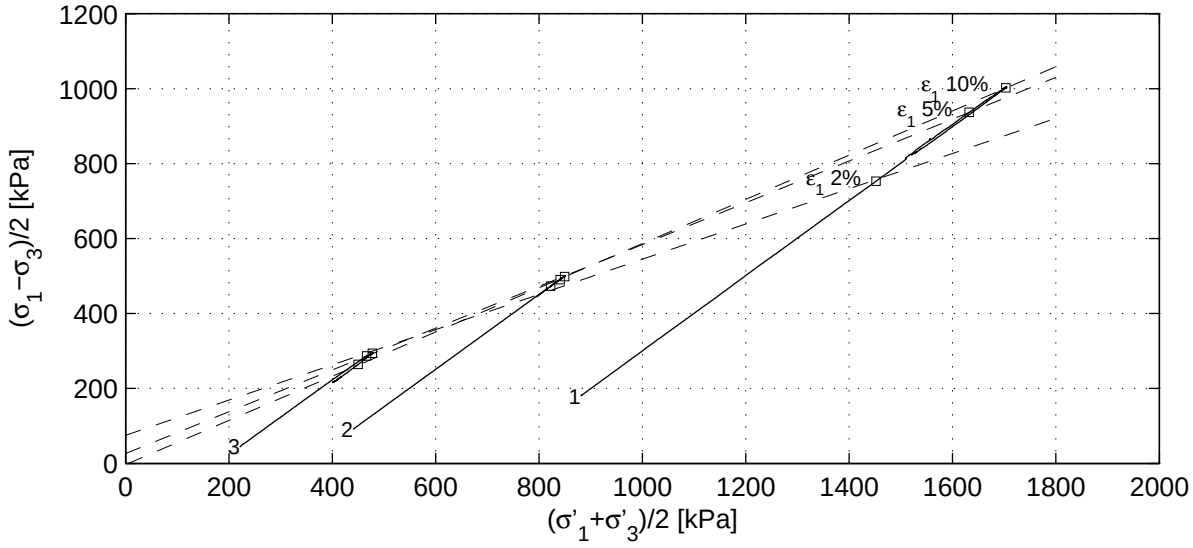
Project Middelburg

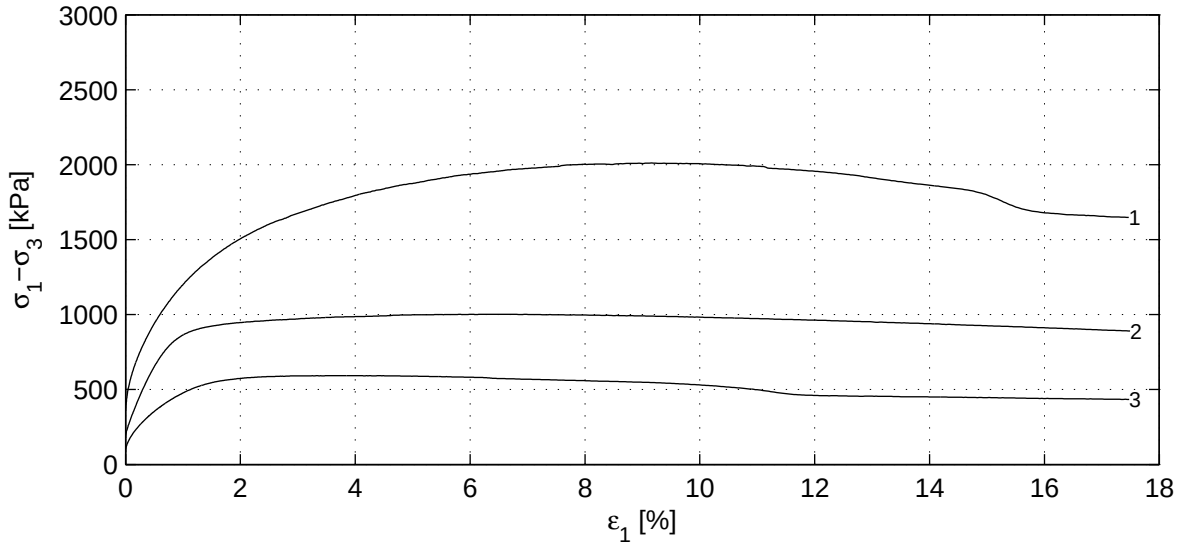
Boring KB−104, Sample KB−104_ST−2, depth −49.34 till −49.84 NAP

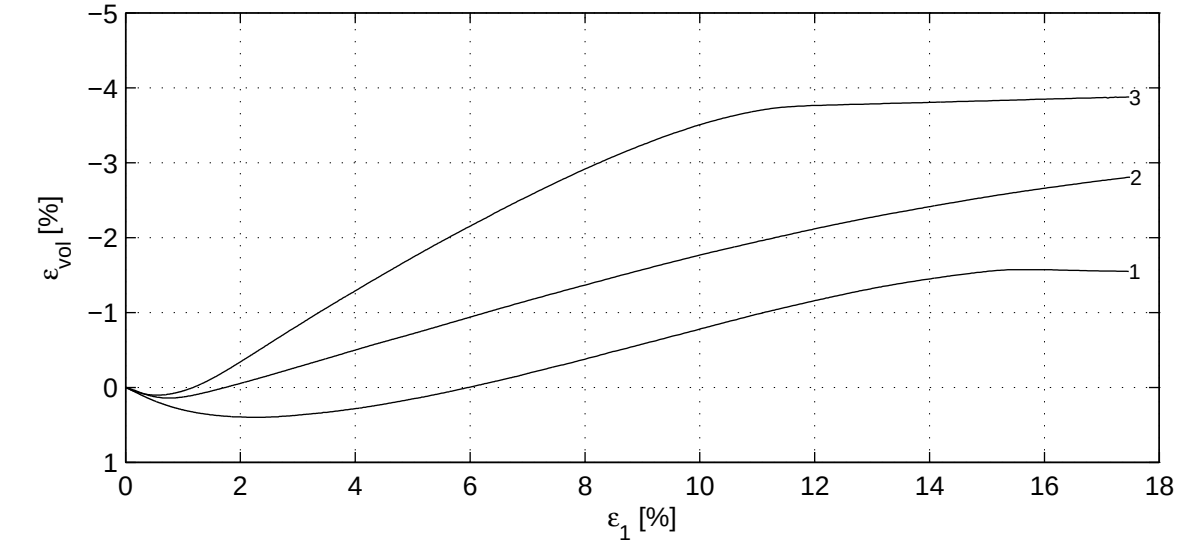
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−104_ST−2	A4

) Vrijgegeven door Dui op 2011-08-08 12:31







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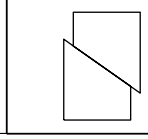
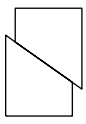
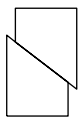
Project Middelburg

Boring KB−104, Sample KB−104_ST−2, depth −49.34 till −49.84 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−104_ST−2	A4

) Vrijgegeven door Dui op 2011-08-08 12:31

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.53	0.35	0.50
	B_1 [−]	0.98	0.98	0.98
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1060.8	531.1	266.9
	t_{100} [min]	0.4	0.6	0.3
	h_c [mm]	131.6	132.3	135.0
	V_c [cm^3]	454.2	458.5	467.8
	$\rho_{n,c}$ [kg/m^3]	2065	2011	2011
	w_c [%]	20.6	23.3	25.6
	u_{bk} [kPa]	298	299	299
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	0.000	−0.001	0.001
	v_{max} [%/h]	90.7	54.5	105.3
Shear stage	v [%/h]	3.8	4.0	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	2009.1	1000.2	591.6
After testing	f_{undr} [kPa]	1004.5	500.1	295.8
	$\varepsilon_{1,50}$ [%]	0.96	0.42	0.46
	E_{50} [MPa]	85.5	98.8	54.5
	w_e [%]	21.0	26.6	27.4
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1451.8	822.2	466.5	753.0	472.8	286.6	28.0	84.7
5.0	1632.3	849.4	477.6	936.8	498.5	293.7	33.9	31.9
10.0	1702.9	840.8	449.9	1001.9	490.3	264.0	36.1	−3.8
$\varepsilon_{1,tmax}$ [%]	1704.9	851.1	478.5	1004.5	500.1	295.8	35.5	16.3

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Project Middelburg

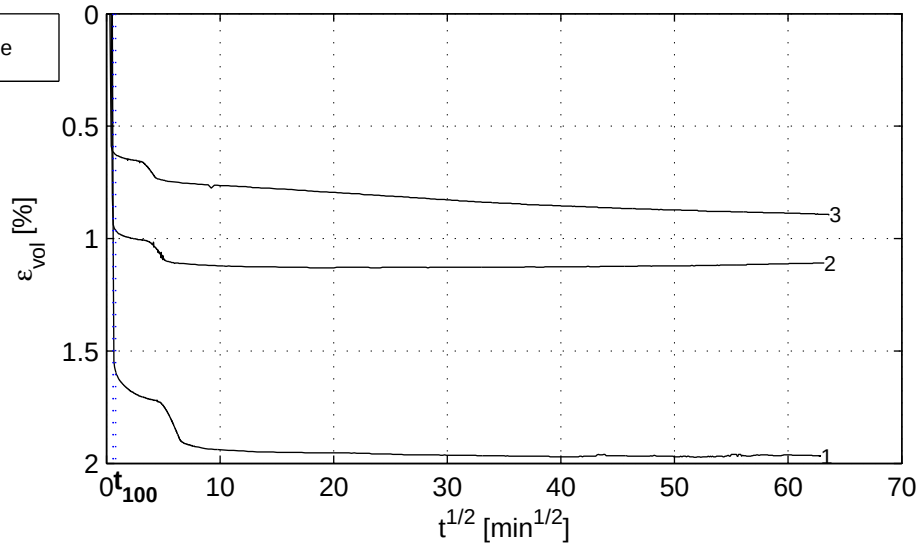
Boring KB−104, Sample KB−104_ST−2, depth −49.34 till −49.84 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

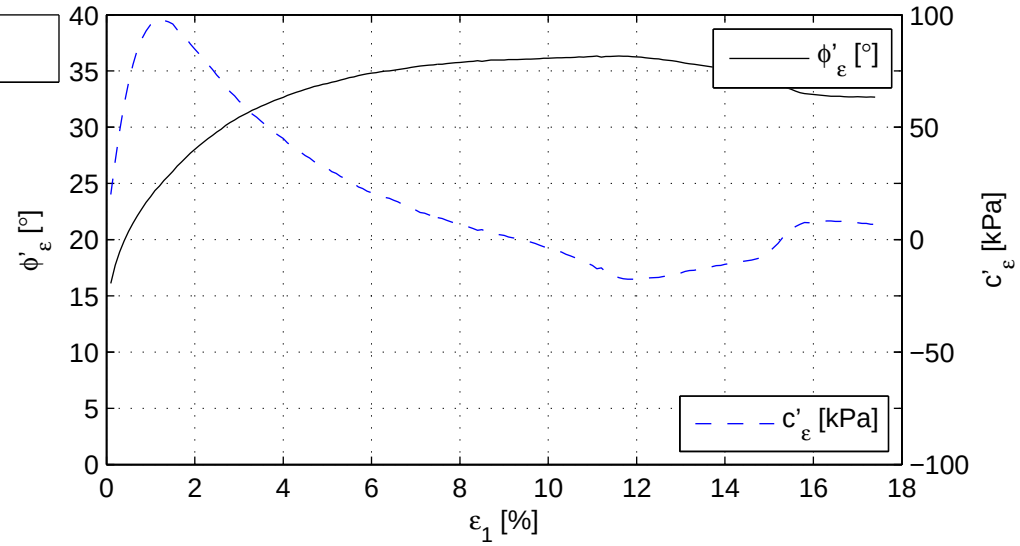
project	seen
1205088.1	Dui
appendix	type
KB−104_ST−2	A4

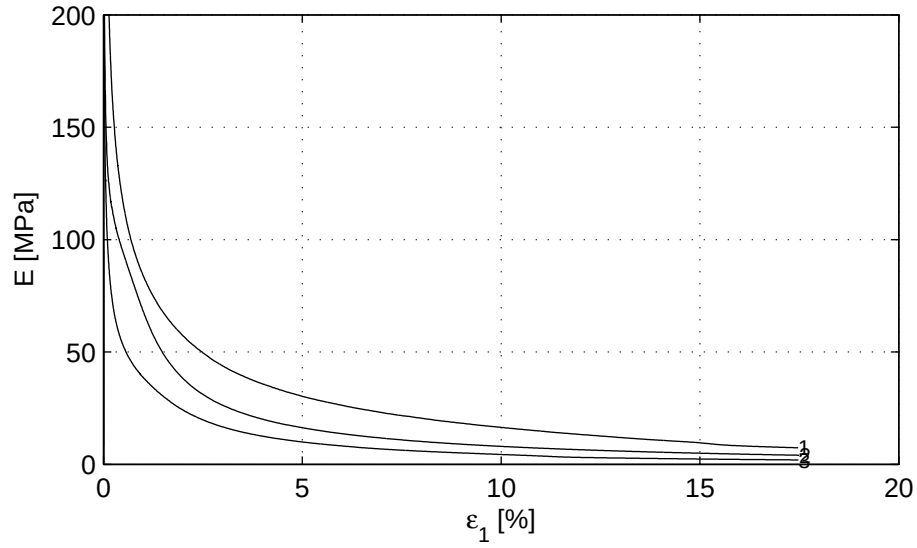
) Vrijgegeven door Dui op 2011-08-08 12:31

Consolidation stage



Shear stage





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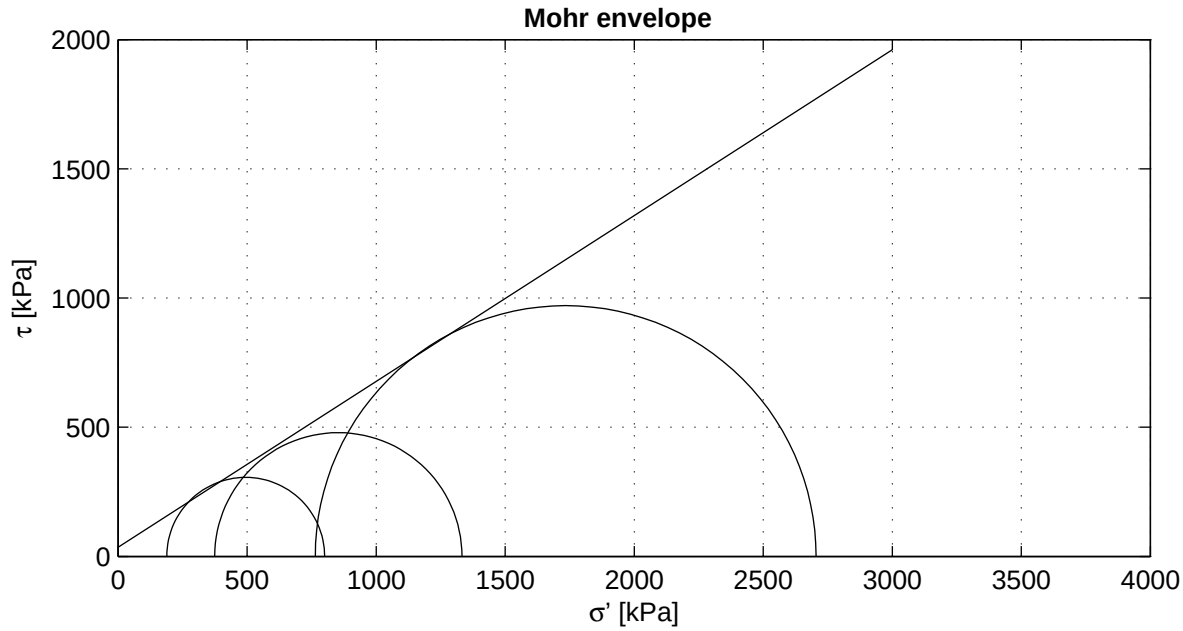
Boring KB−104, Sample KB−104_ST−2, depth −49.34 till −49.84 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−104_ST−2	A4

) Vrijgegeven door Dui op 2011-08-08 12:31



Criterion	maximum t
ϕ' [°]	32.69
c' [kPa]	35.73

Start testing

Stage number	1	2	3
Sample name	KB−104_ST−7	KB−104_ST−7A	KB−104_ST−7B
m_i [g]	989.9	957.5	971.0
D_i [mm]	66.5	66.6	66.6
h_i [mm]	140.9	139.9	140.5
w_i [%]	21.0	19.3	22.5
ρ_i [kg/m^3]	2023	1965	1984
ρ_{dr} [kg/m^3]	1671	1647	1620
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 7
WF−B sample 7A
WF−C sample 7B

Consolidation period t100 follows from isotropic phase.

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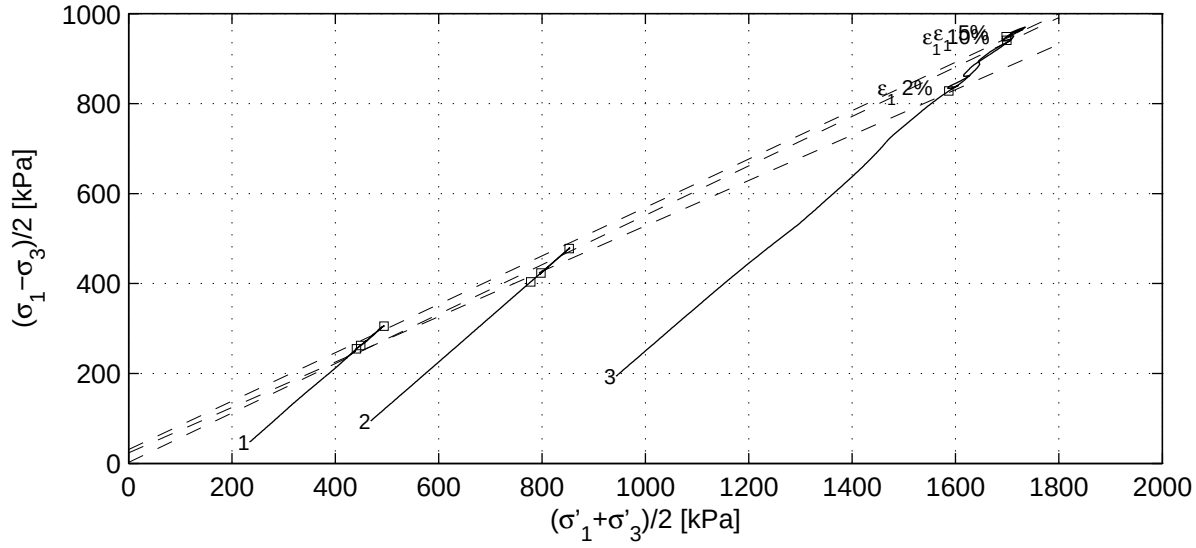
Project Middelburg

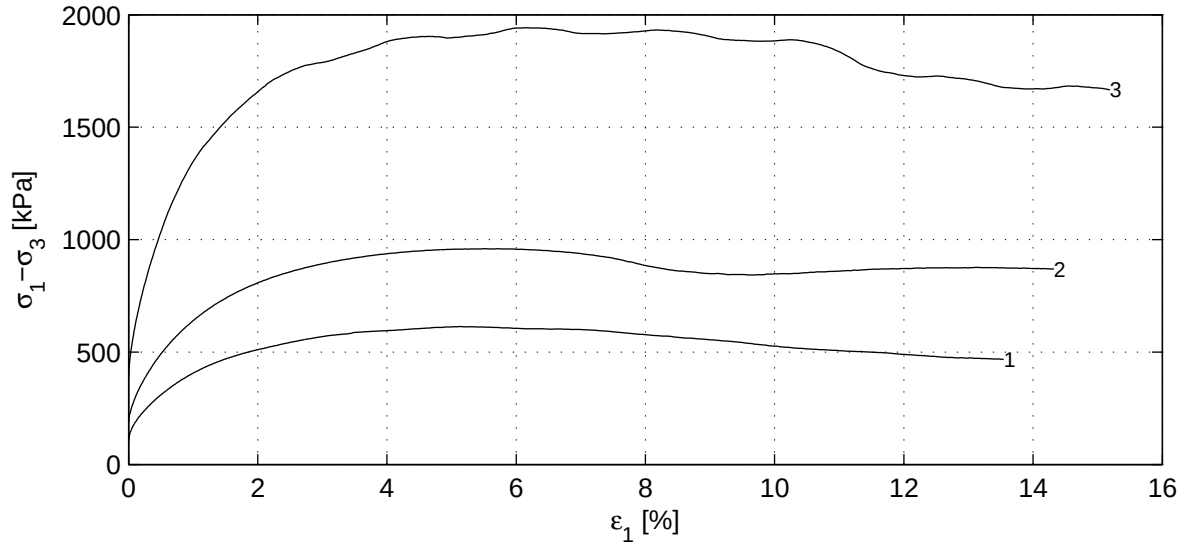
Boring KB−104, Sample KB−104_ST−7, depth −83.44 till −83.94 NAP

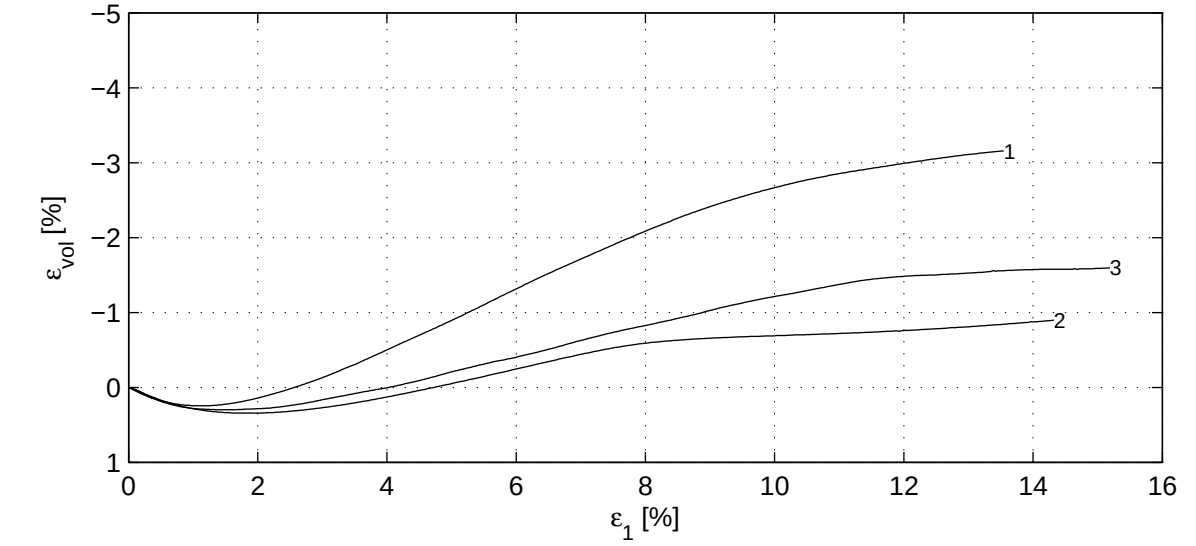
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−104_ST−7	A4

) Vrijgegeven door Dui op 2011-08-08 12:28







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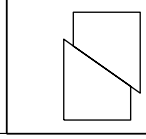
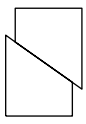
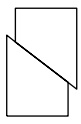
Project Middelburg Boring KB−104, Sample KB−104_ST−7, depth −83.44 till −83.94 NAP CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−104_ST−7	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 12:28

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.63	0.20	0.46
	B_1 [−]	0.98	0.98	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	282.2	562.6	1137.1
	t_{100} [min]	0.4	3.7	0.3
	h_c [mm]	140.4	138.7	139.5
	V_c [cm^3]	483.3	485.4	481.7
	$\rho_{n,c}$ [kg/m^3]	2036	1969	2000
	w_c [%]	20.3	19.0	21.5
	u_{bk} [kPa]	298	299	297
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	0.001	−	−
	v_{max} [%/h]	86.9	9.5	113.2
Shear stage	v [%/h]	4.1	3.7	4.0
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	611.6	958.0	1940.9
After testing	f_{undr} [kPa]	305.8	479.0	970.4
	$\varepsilon_{1,50}$ [%]	0.71	0.75	0.68
	E_{50} [MPa]	36.6	51.3	114.6
	w_e [%]	21.1	22.5	22.3
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	441.0	778.1	1587.0	254.9	403.8	828.1	30.3	27.4
5.0	494.1	852.3	1698.0	305.3	477.8	948.7	32.6	36.6
10.0	449.3	798.0	1699.4	262.1	423.2	941.1	33.3	3.0
$\varepsilon_{1,tmax}$ [%]	494.6	853.5	1734.5	305.8	479.0	970.4	32.7	35.7

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Project Middelburg

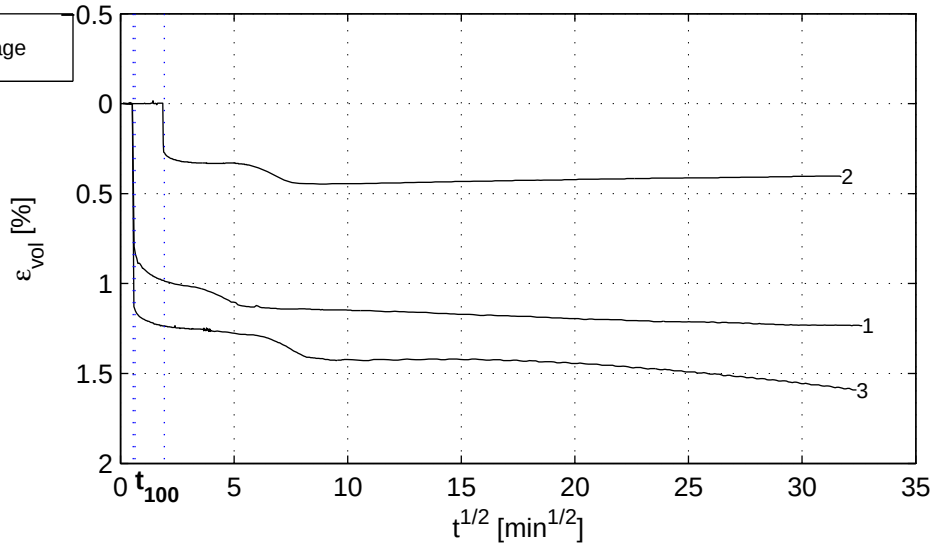
Boring KB−104, Sample KB−104_ST−7, depth −83.44 till −83.94 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

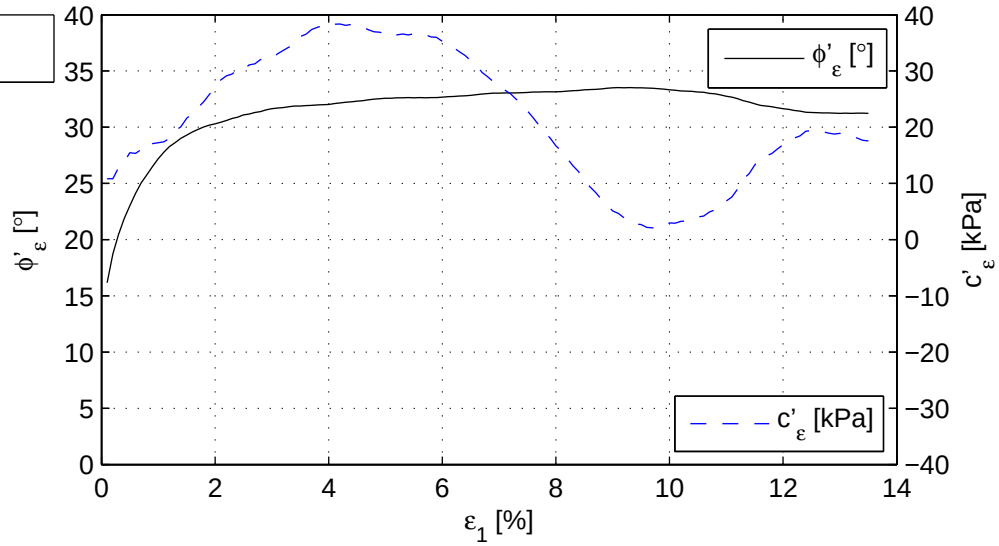
project	seen
1205088.1	Dui
appendix	type
KB−104_ST−7	A4

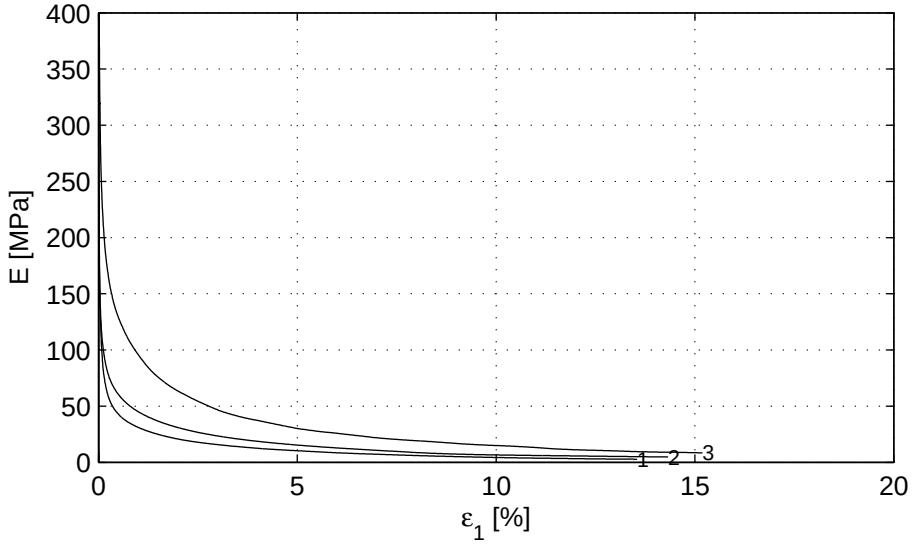
) Vrijgegeven door Dui op 2011-08-08 12:28

Consolidation stage



Shear stage





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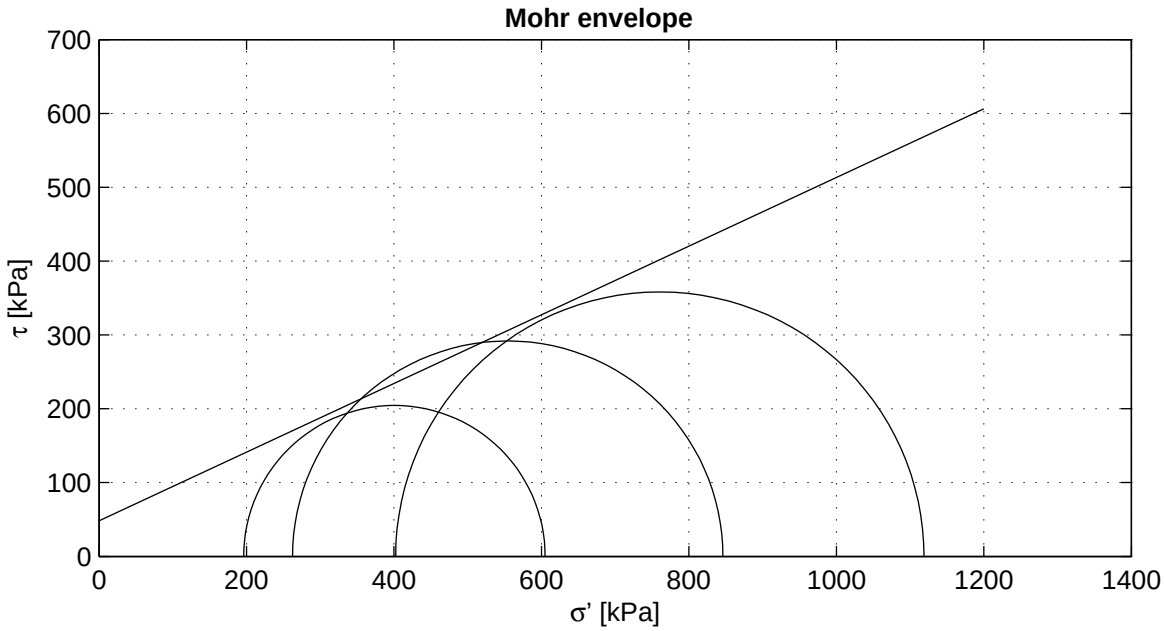
Project Middelburg

Boring KB−104, Sample KB−104_ST−7, depth −83.44 till −83.94 NAP

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−104_ST−7	A4

) Vrijgegeven door Dui op 2011-08-08 12:28



Criterion	maximum t
ϕ' [°]	24.93
c' [kPa]	48.34

Start testing

Stage number	1	2	3
Sample name	KB−104A_ST−6	KB−104A_ST−6A	KB−104A_ST−6B
m_i [g]	926.1	922.8	925.9
D_i [mm]	67.3	67.2	67.5
h_i [mm]	128.7	128.2	128.4
w_i [%]	17.6	16.4	18.9
ρ_i [kg/m^3]	2022	2030	2015
ρ_{dr} [kg/m^3]	1719	1744	1695
Description cf. ASTM	Sandy fat clay (CH)		

Setup: ELE−A sample 6
ELE−B sample 6A
ELE−A sample 6B

Consolidation period t100 follows from isotropic phase.

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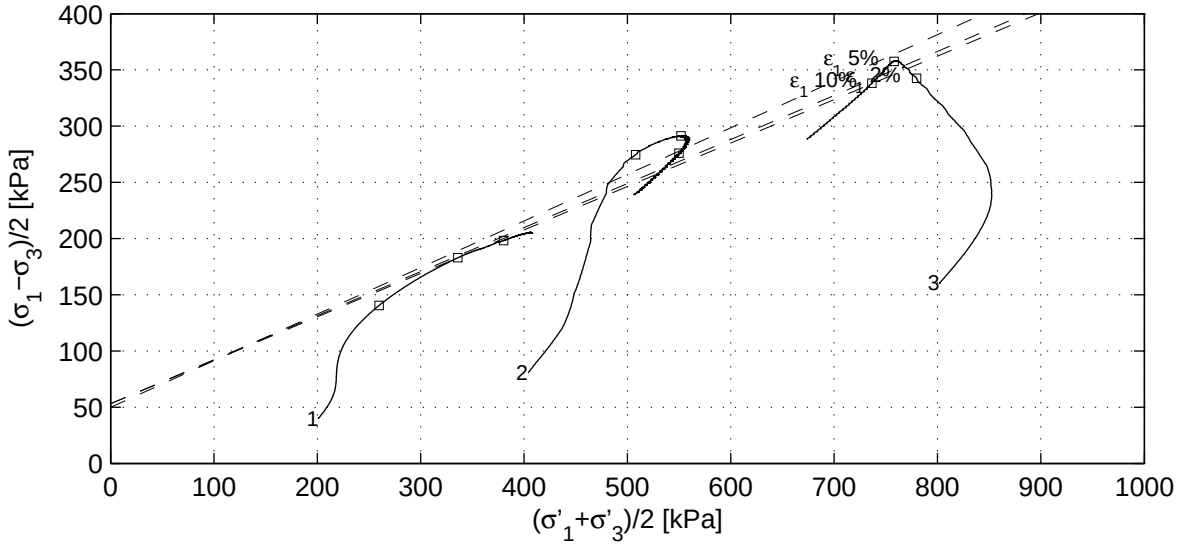
Project Middelburg

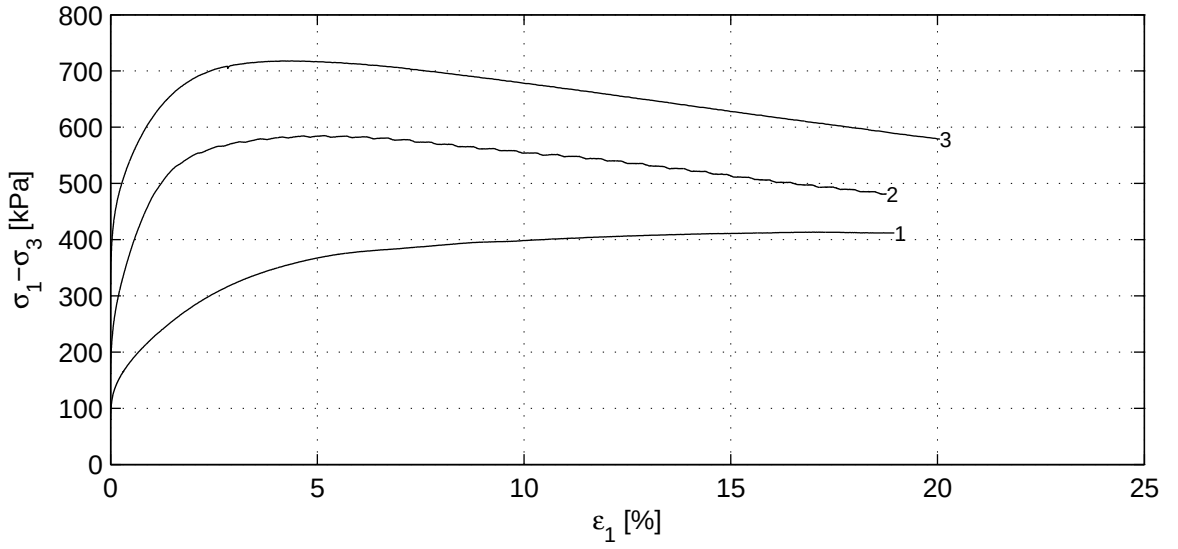
Boring KB−104A, Sample KB−104A_ST−6, depth −27.00 till −27.60 GL

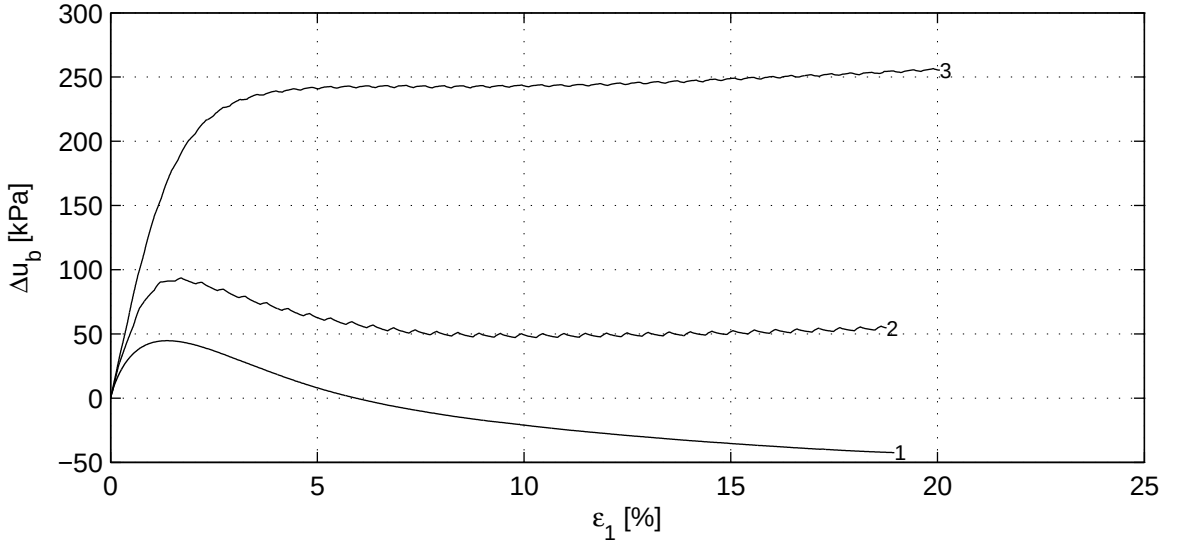
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−104A_ST−6	A4

) Vrijgegeven door Dui op 2011-08-08 13:39







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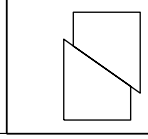
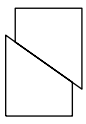
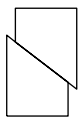
Project Middelburg Boring KB−104A, Sample KB−104A_ST−6, depth −27.00 till −27.60 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−104A_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 13:39

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.98	0.94	0.97
	B_1 [−]	0.99	0.98	0.97
Consolidation stage	$\sigma'_{1,c}$ [kPa]	241.3	484.5	962.9
	t_{100} [min]	1.5	101.2	1.1
	h_c [mm]	126.8	125.7	122.5
	V_c [cm^3]	446.4	451.4	429.3
	$\rho_{n,c}$ [kg/m^3]	2049	2037	2086
	w_c [%]	16.2	16.0	15.0
	u_{bk} [kPa]	299	300	299
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−	0.000	−
	v_{max} [%/h]	89.3	1.3	116.6
Shear stage	v [%/h]	1.0	1.0	1.0
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	411.1	583.7	716.5
After testing	f_{undr} [kPa]	204.4	291.8	358.3
	$\varepsilon_{1,50}$ [%]	1.37	0.46	0.36
	E_{50} [MPa]	12.2	46.2	55.1
	w_e [%]	18.0	17.5	17.6
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	259.8	508.0	779.6	140.5	274.6	342.6	22.7	57.6
5.0	336.0	551.9	758.0	182.9	291.4	357.5	24.5	54.8
10.0	380.3	549.9	736.5	198.2	276.0	338.2	23.1	57.6
$\varepsilon_{1,tmax}$ [%]	400.6	554.3	760.5	204.4	291.8	358.3	24.9	48.3

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Project Middelburg

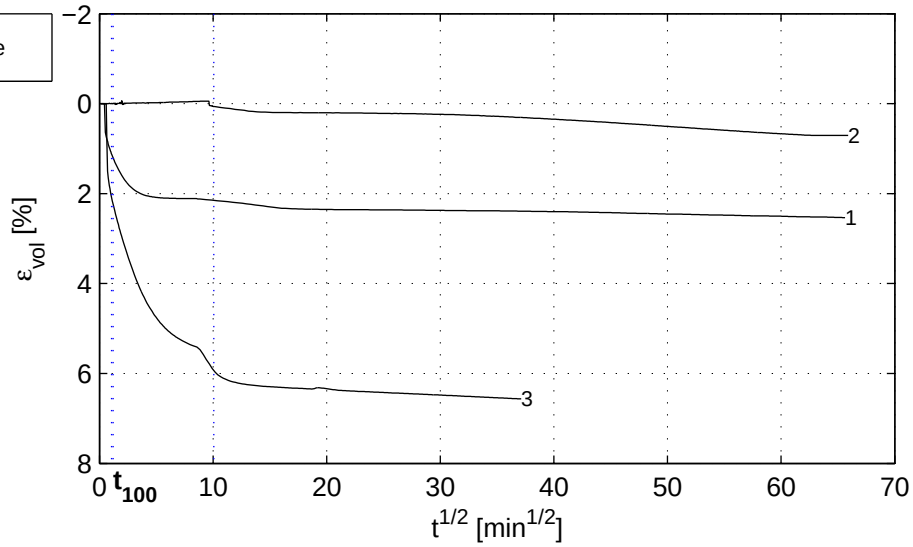
Boring KB−104A, Sample KB−104A_ST−6, depth −27.00 till −27.60 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

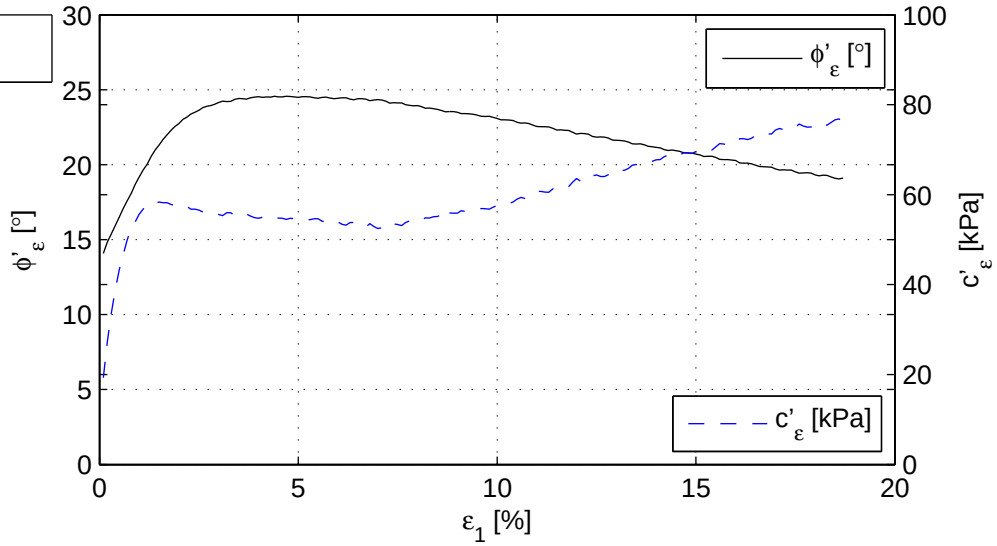
project	seen
1205088.1	Dui
appendix	type
KB−104A_ST−6	A4

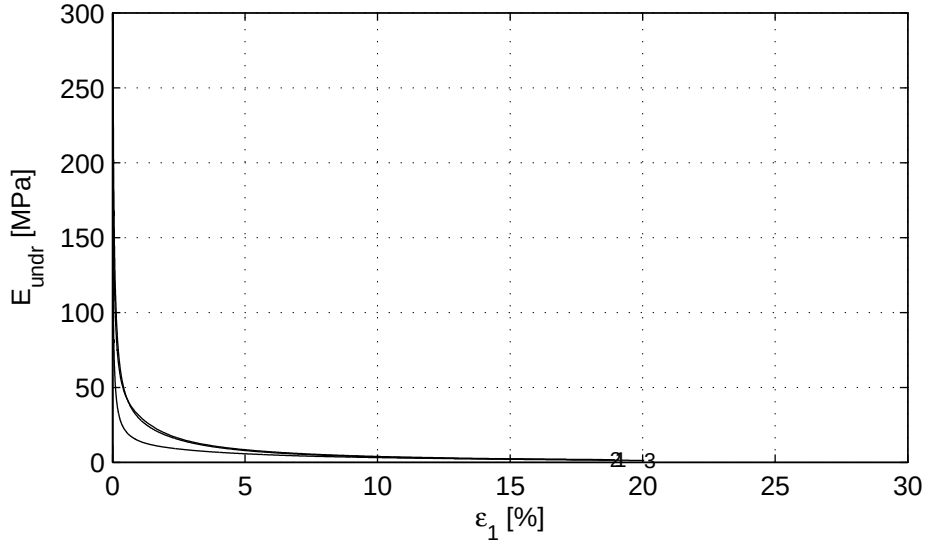
) Vrijgegeven door Dui op 2011-08-08 13:39

Consolidation stage



Shear stage





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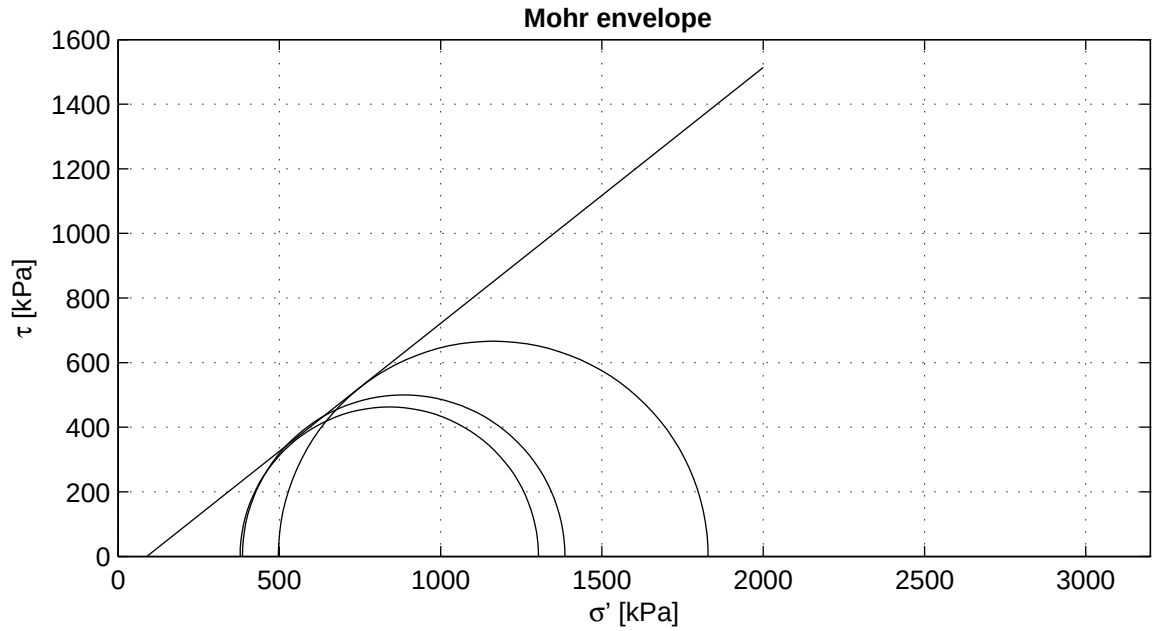
Project Middelburg Boring KB−104A, Sample KB−104A_ST−6, depth −27.00 till −27.60 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−104A_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 13:39



Criterion	maximum t
ϕ' [°]	38.37
c' [kPa]	−70.01

Start testing

Stage number	1	2	3
Sample name	KB−105_ST−4	KB−105_ST−4A	KB−105_ST−4B
m_i [g]	1021.4	1053.1	998.0
D_i [mm]	66.0	66.0	66.0
h_i [mm]	149.9	149.3	148.3
w_i [%]	23.4	18.7	21.7
ρ_i [kg/m^3]	1991	2061	1967
ρ_{dr} [kg/m^3]	1614	1737	1616
Description cf. ASTM	Sandy fat clay (CH), very silty		

Setup: WF−A sample 4
WF−B sample 4A
WF−C sample 4B

Consolidation period t100 follows from isotropic phase.

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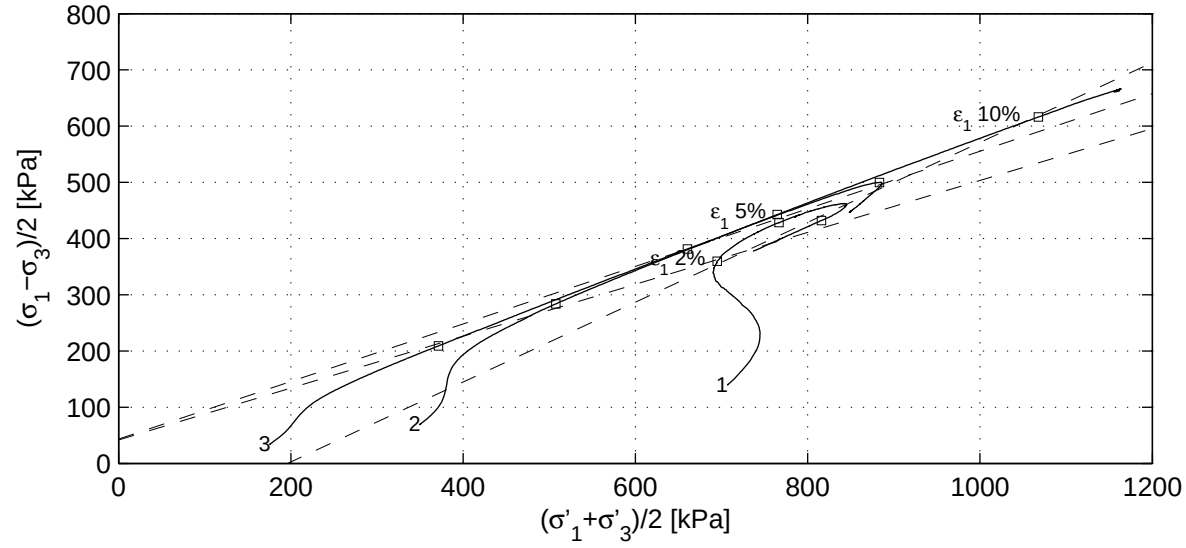
Project Middelburg

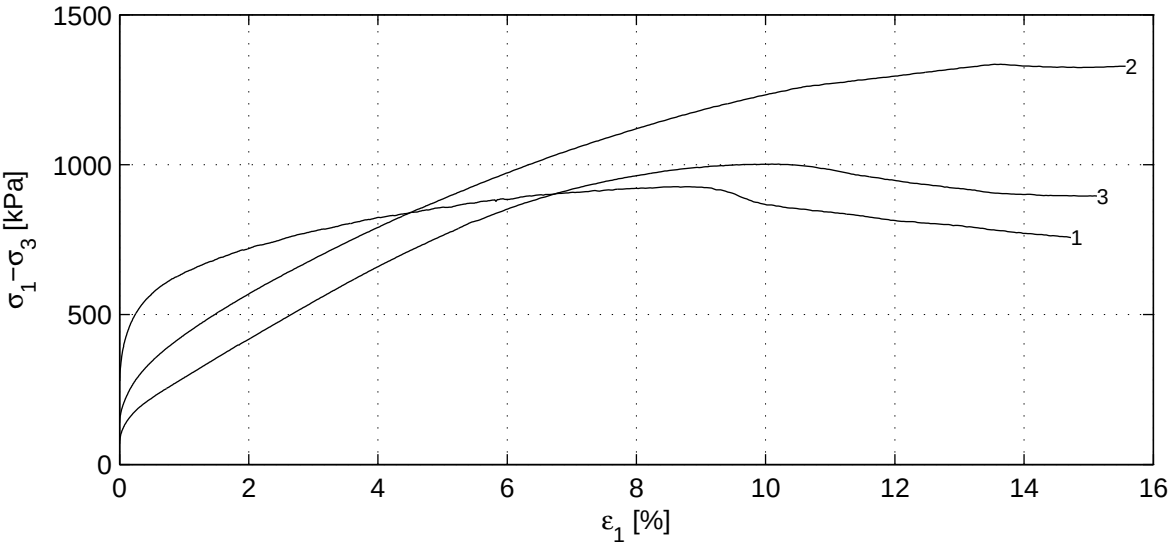
Boring KB−105, Sample KB−105_ST−4, depth −12.42 till −13.04 GL

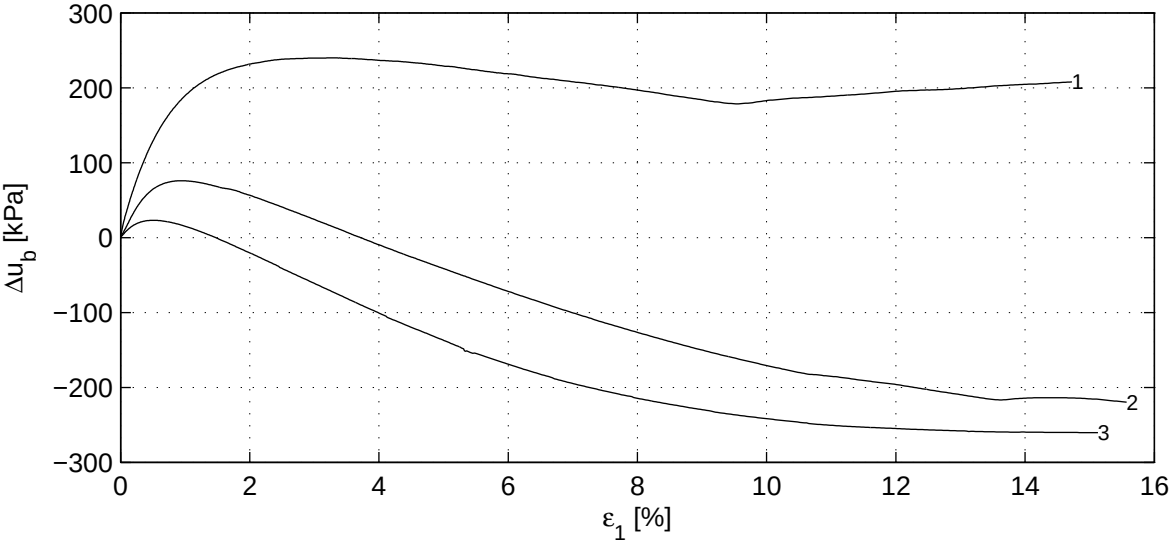
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105_ST−4	A4

) Vrijgegeven door Dui op 2011-08-09 21:01







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Project Middelburg

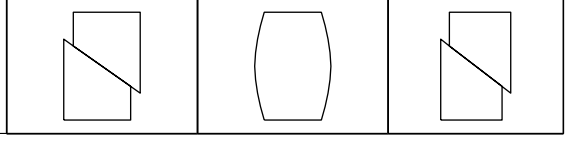
Boring KB−105, Sample KB−105_ST−4, depth −12.42 till −13.04 GL

project	seen
1205088.1	Dui

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−105_ST−4	A4

) Vrijgegeven door Dui op 2011-08-09 21:01

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.98	0.98	0.90
	B_1 [−]	0.99	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	847.3	421.1	211.0
	t_{100} [min]	3.3	0.9	5.2
	h_c [mm]	146.0	148.4	147.9
	V_c [cm^3]	481.7	497.3	501.8
	$\rho_{n,c}$ [kg/m^3]	2055	2090	1978
	w_c [%]	19.6	17.2	21.1
	u_{bk} [kPa]	298	298	297
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	40.0	150.1	25.2
Shear stage	v [%/h]	4.1	3.6	4.0
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	924.9	1332.7	1000.0
After testing	f_{undr} [kPa]	462.5	666.4	500.0
	$\varepsilon_{1,50}$ [%]	0.70	3.49	2.96
	E_{50} [MPa]	46.1	17.1	15.8
	w_e [%]	20.3	16.9	21.3
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	695.0	507.7	371.5	359.5	283.9	209.0	27.5	47.2
5.0	766.6	764.6	660.4	428.5	442.6	381.5	30.8	50.5
10.0	816.0	1067.8	883.4	432.0	616.2	499.8	45.3	−197.9
$\varepsilon_{1,tmax}$ [%]	840.8	1163.0	885.3	462.5	666.4	500.0	38.4	−70.0

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Project Middelburg

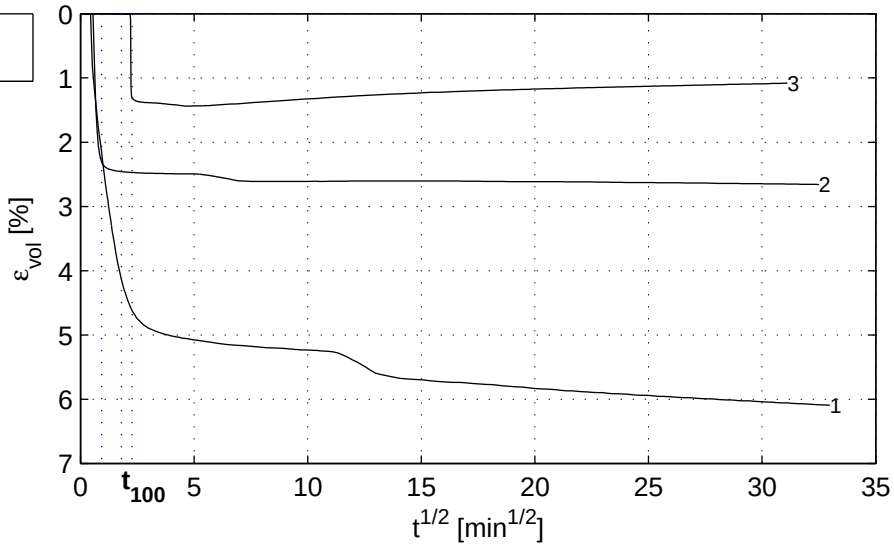
Boring KB−105, Sample KB−105_ST−4, depth −12.42 till −13.04 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

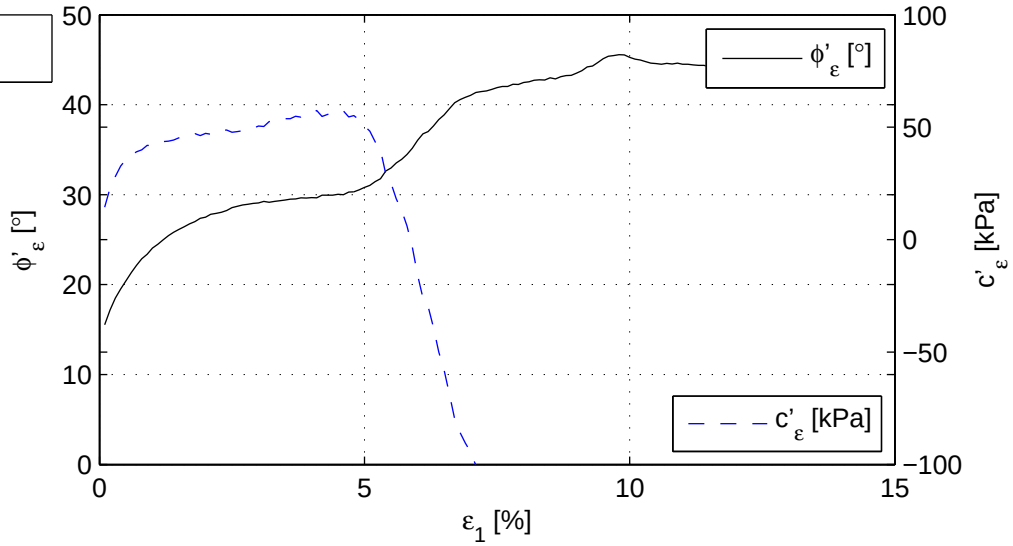
project	seen
1205088.1	Dui
appendix	type
KB−105_ST−4	A4

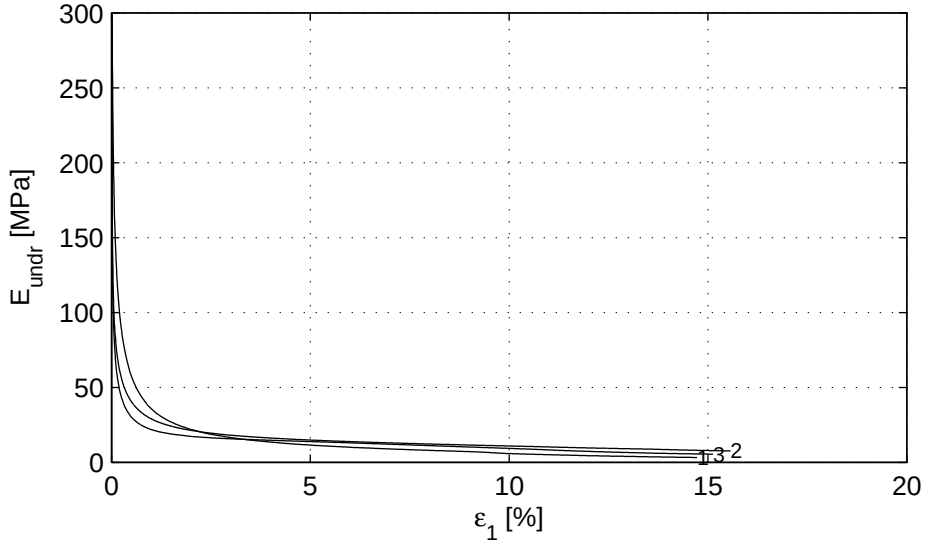
) Vrijgegeven door Dui op 2011-08-09 21:01

Consolidation stage



Shear stage





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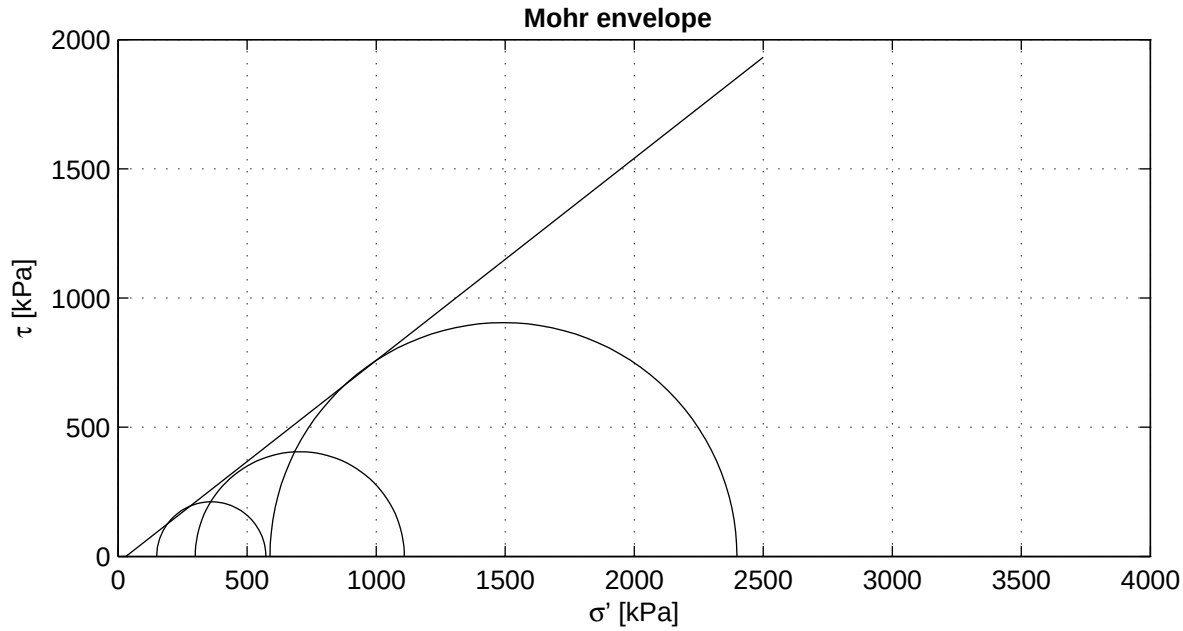
Project Middelburg Boring KB−105, Sample KB−105_ST−4, depth −12.42 till −13.04 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105_ST−4	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-09 21:01



Criterion	maximum t
ϕ' [°]	38.03
c' [kPa]	−23.32

Start testing

Stage number	1	2	3
Sample name	KB−105_ST−7	KB−105_ST−7A	KB−105_ST−7B
m_i [g]	976.2	943.2	945.3
D_i [mm]	66.0	66.0	66.0
h_i [mm]	146.1	142.6	149.8
w_i [%]	23.6	21.2	17.5
ρ_i [kg/m^3]	1953	1933	1845
ρ_{dr} [kg/m^3]	1581	1595	1570
Description cf. ASTM	Silty sand (SM)		

Setup: ELE−A sample 7B
ELE−B sample 7A
ELE−C sample 7

Consolidation period t100 follows from isotropic phase.

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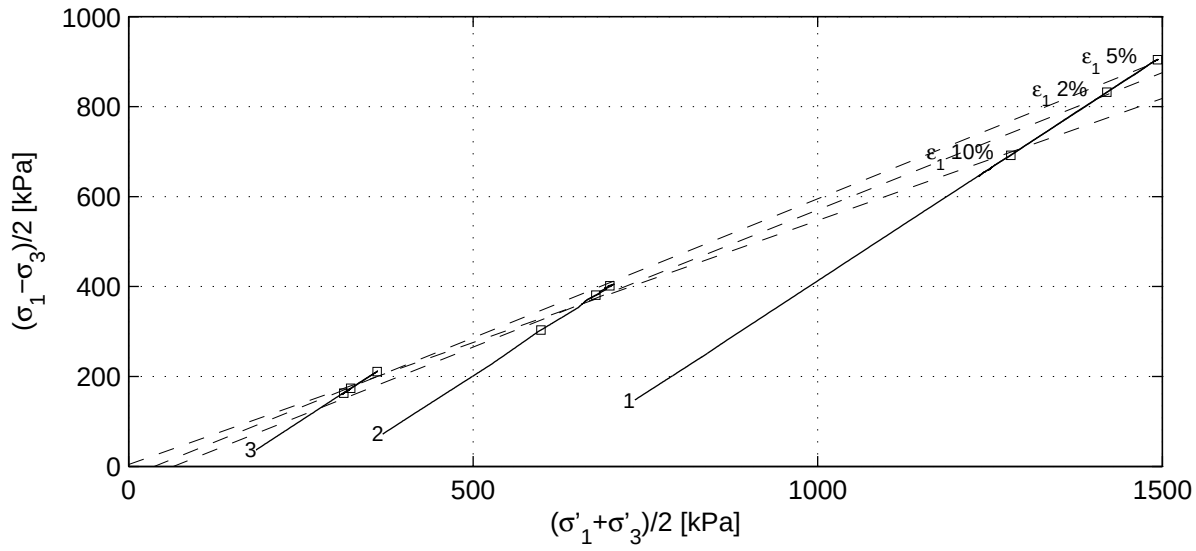
Project Middelburg

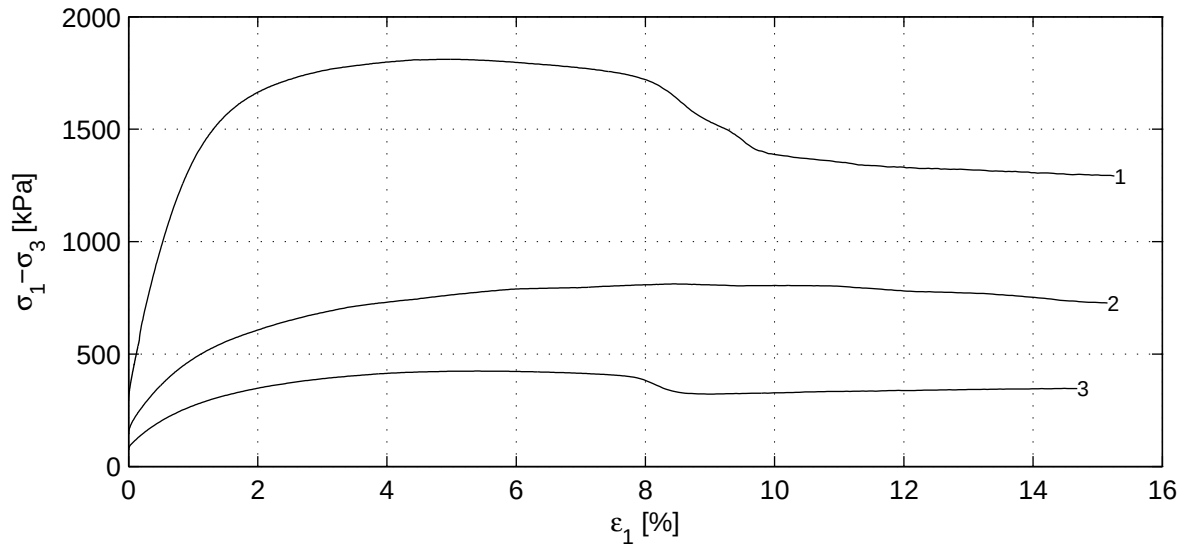
Boring KB−105, Sample KB−105_ST−7, depth −19.15 till −19.65 GL

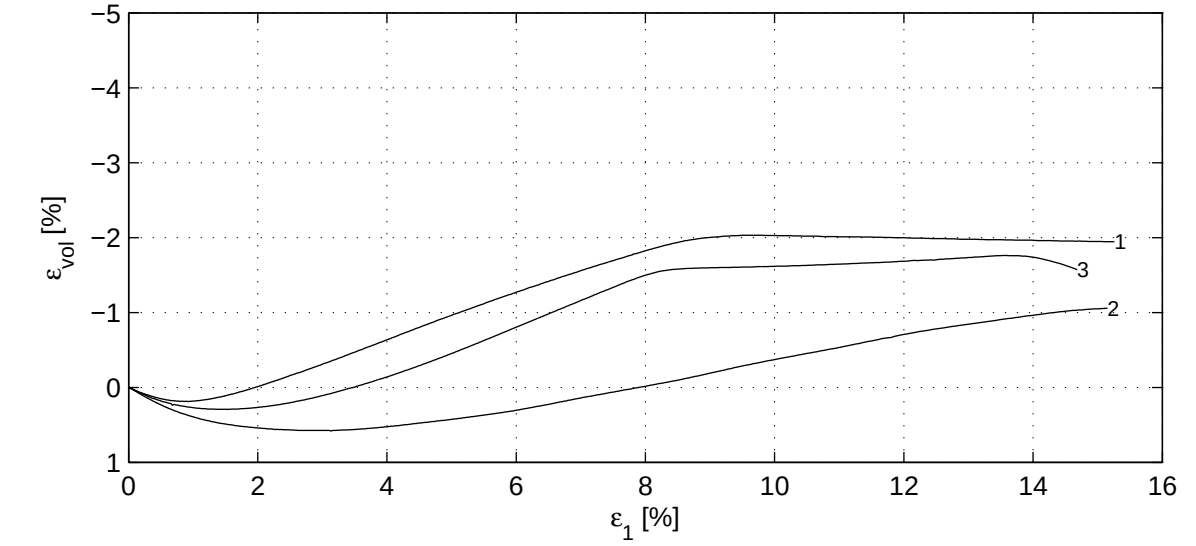
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105_ST−7	A4

) Vrijgegeven door Dui op 2011-08-08 13:36







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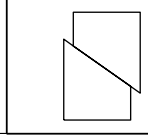
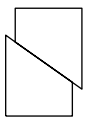
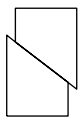
Project Middelburg Boring KB−105, Sample KB−105_ST−7, depth −19.15 till −19.65 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105_ST−7	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 13:36

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.90	0.85	0.20
	B_1 [−]	0.99	0.99	0.97
Consolidation stage	$\sigma'_{1,c}$ [kPa]	882.5	443.6	223.2
	t_{100} [min]	0.4	0.6	0.4
	h_c [mm]	145.0	141.5	149.1
	V_c [cm^3]	491.2	480.1	509.3
	$\rho_{n,c}$ [kg/m^3]	1970	1948	1850
	w_c [%]	22.5	20.2	17.1
	u_{bk} [kPa]	298	299	299
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	80.2	63.7	96.5
Shear stage	v [%/h]	5.3	5.8	5.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1809.5	810.0	422.7
After testing	f_{undr} [kPa]	904.8	405.0	211.3
	$\varepsilon_{1,50}$ [%]	0.59	1.04	0.85
	E_{50} [MPa]	129.4	32.5	20.9
	w_e [%]	25.0	21.1	21.0
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1419.6	598.4	322.2	832.1	303.3	173.7	37.6	−49.9
5.0	1493.0	678.0	360.6	904.5	381.1	210.9	38.2	−29.2
10.0	1280.3	698.5	312.2	691.8	401.6	162.8	32.9	5.1
$\varepsilon_{1,tmax}$ [%]	1493.3	704.2	361.1	904.8	405.0	211.3	38.0	−23.3

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Project Middelburg

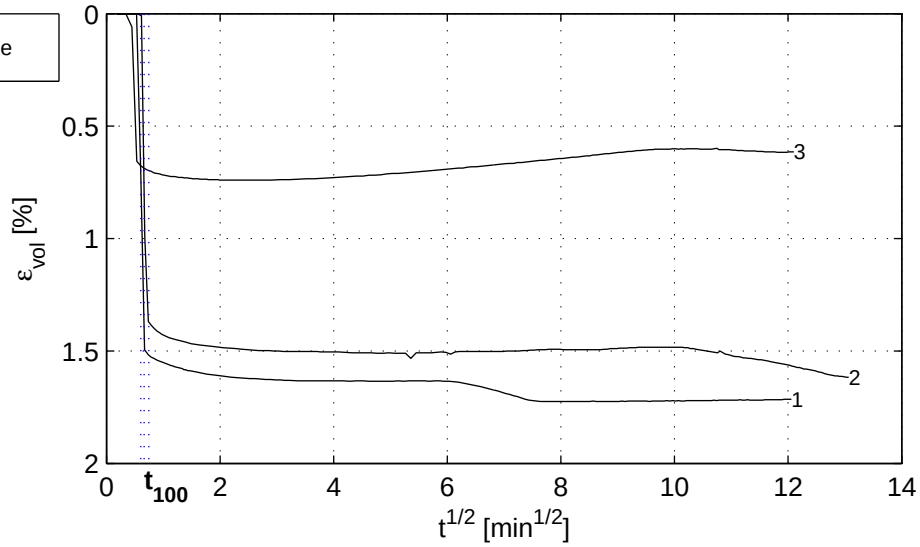
Boring KB−105, Sample KB−105_ST−7, depth −19.15 till −19.65 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

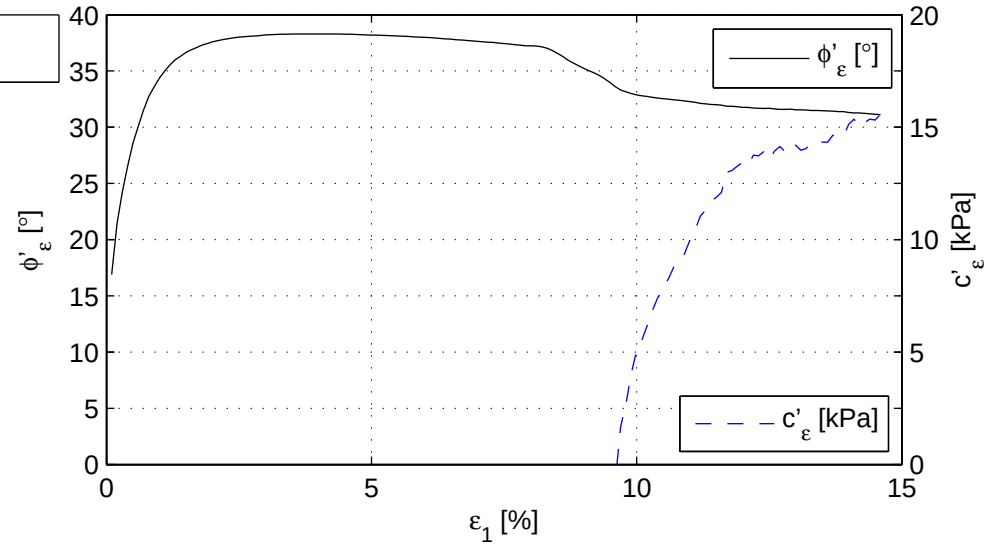
project	seen
1205088.1	Dui
appendix	type
KB−105_ST−7	A4

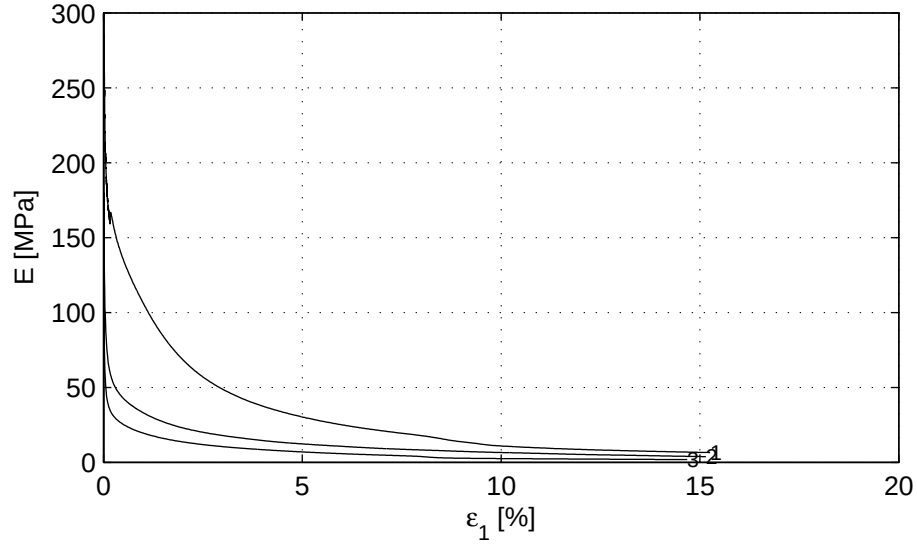
) Vrijgegeven door Dui op 2011-08-08 13:36

Consolidation stage



Shear stage





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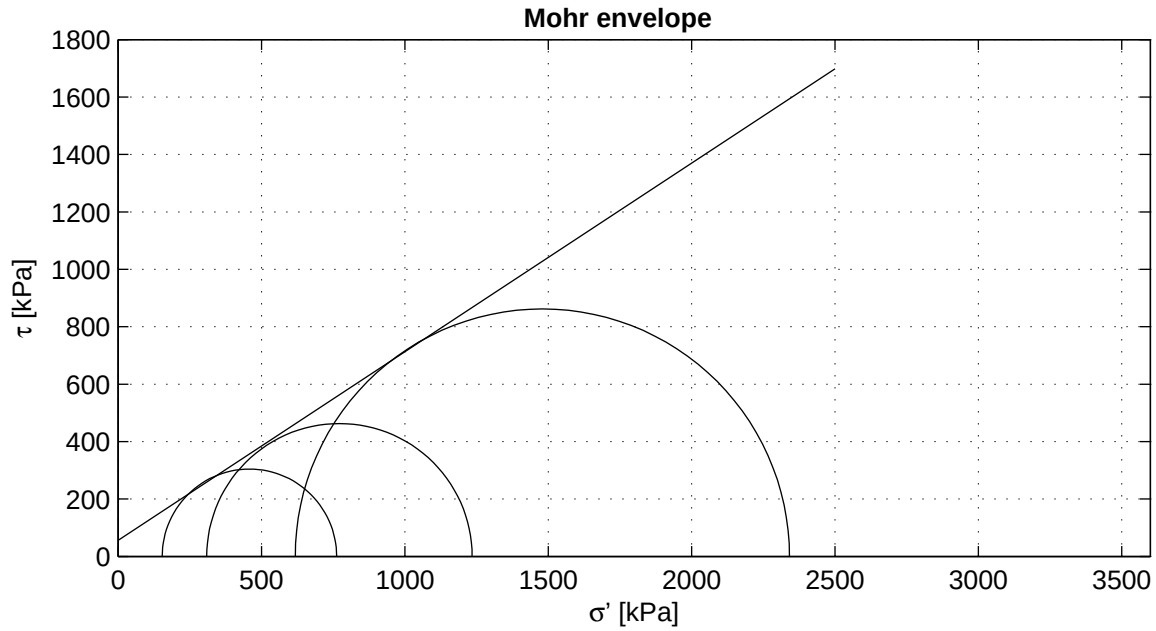
Project Middelburg Boring KB−105, Sample KB−105_ST−7, depth −19.15 till −19.65 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105_ST−7	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 13:36



Criterion	maximum t
ϕ' [°]	33.30
c' [kPa]	56.32

Start testing

Stage number	1	2	3
Sample name	KB−105_ST−8	KB−105_ST−8A	KB−105_ST−8B
m_i [g]	989.7	999.9	1026.1
D_i [mm]	66.0	66.0	66.0
h_i [mm]	149.8	149.9	150.0
w_i [%]	28.0	26.2	21.6
ρ_i [kg/m^3]	1931	1950	1999
ρ_{dr} [kg/m^3]	1509	1545	1645
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 8
WF−B sample 8A
WF−C sample 8B

Consolidation period t100 follows from isotropic phase.

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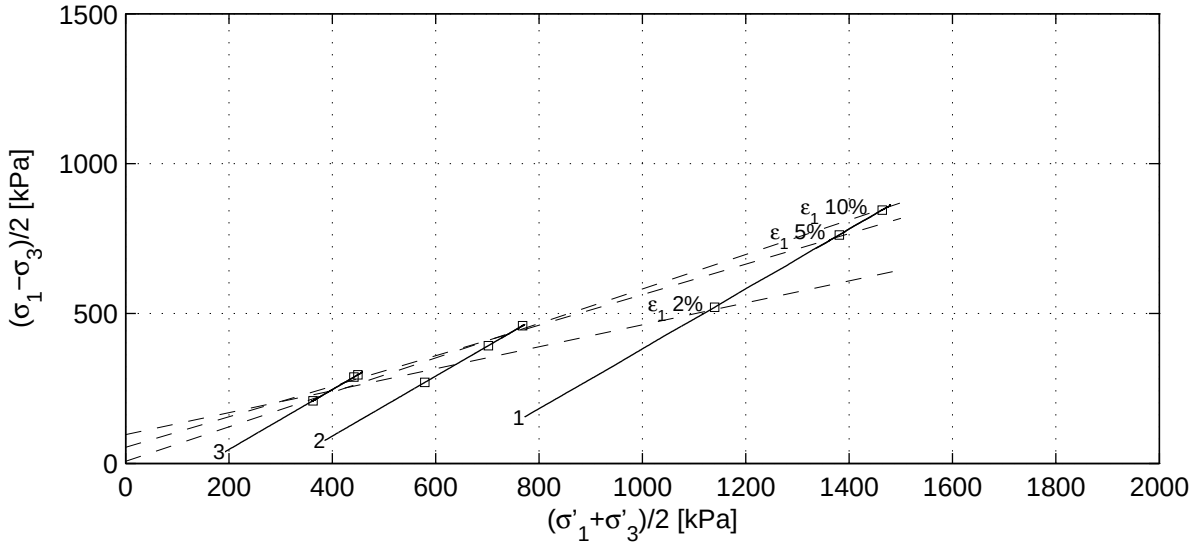
Project Middelburg

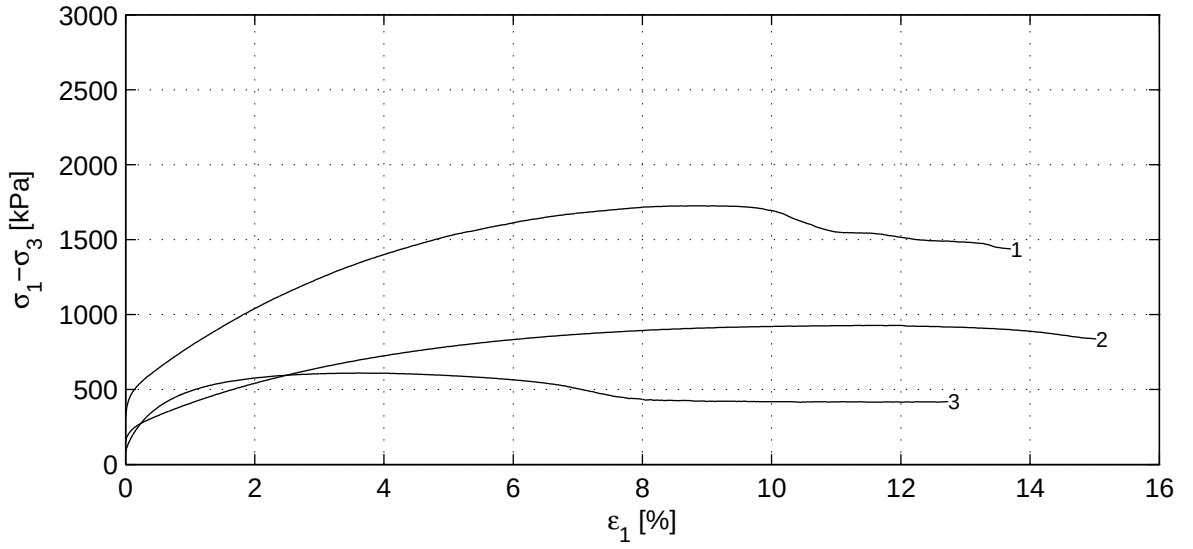
Boring KB−105, Sample KB−105_ST−8, depth −21.50 till −22.00 GL

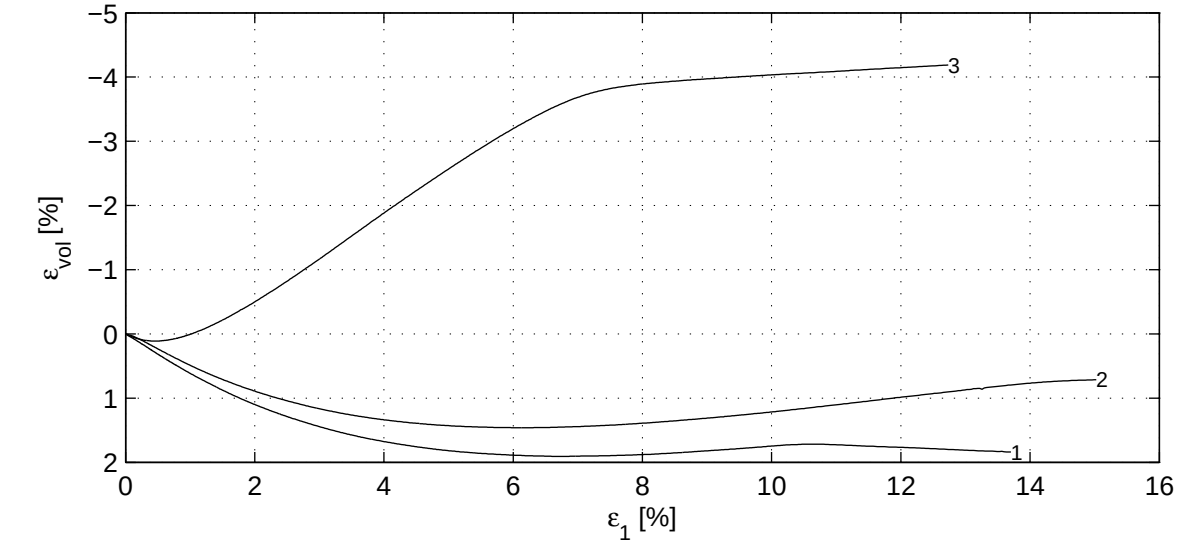
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105_ST−8	A4

) Vrijgegeven door Dui op 2011-08-08 13:40







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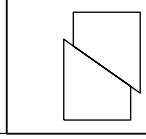
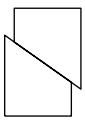
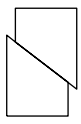
Project Middelburg Boring KB−105, Sample KB−105_ST−8, depth −21.50 till −22.00 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105_ST−8	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 13:40

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.88	0.95	0.40
	B_1 [−]	0.98	0.99	0.97
Consolidation stage	$\sigma'_{1,c}$ [kPa]	926.7	463.3	230.9
	t_{100} [min]	0.9	0.7	0.5
	h_c [mm]	145.6	147.3	149.6
	V_c [cm^3]	473.1	492.1	509.6
	$\rho_{n,c}$ [kg/m^3]	2009	1990	2007
	w_c [%]	22.9	23.6	21.1
	u_{bk} [kPa]	298	298	297
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	–	–	–
	v_{max} [%/h]	39.7	53.5	76.6
Shear stage	v [%/h]	3.9	3.9	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1723.8	925.6	608.3
After testing	f_{undr} [kPa]	861.9	462.8	304.1
	$\varepsilon_{1,50}$ [%]	1.91	2.00	0.39
	E_{50} [MPa]	37.1	19.3	68.1
	w_e [%]	21.7	22.7	21.7
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1139.9	579.1	441.9	520.8	270.2	287.9	21.5	102.9
5.0	1380.9	702.1	449.4	761.7	392.9	295.6	30.6	62.2
10.0	1464.1	768.3	362.5	845.1	459.3	208.8	35.1	8.5
$\varepsilon_{1,tmax}$ [%]	1479.7	772.0	458.1	861.9	462.8	304.1	33.3	56.3

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Project Middelburg

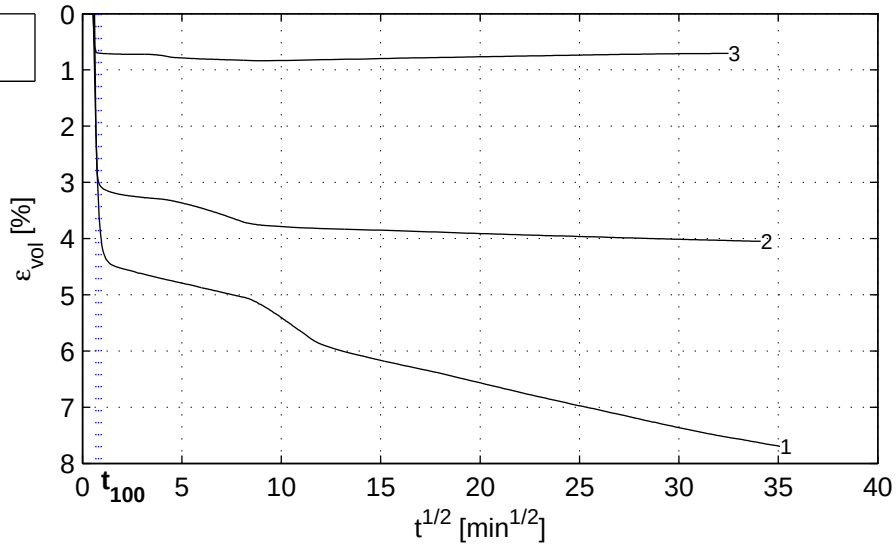
Boring KB−105, Sample KB−105_ST−8, depth −21.50 till −22.00 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

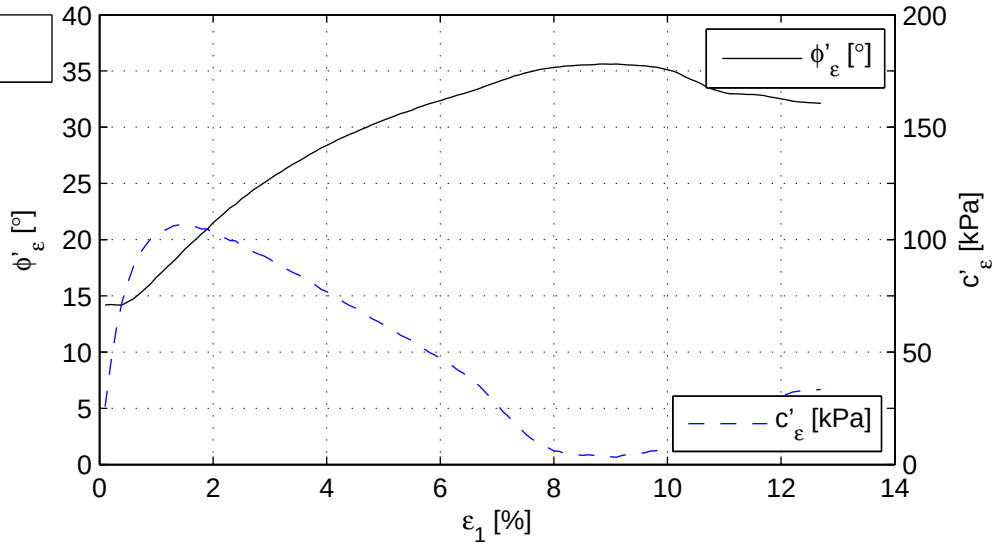
project	seen
1205088.1	Dui
appendix	type
KB−105_ST−8	A4

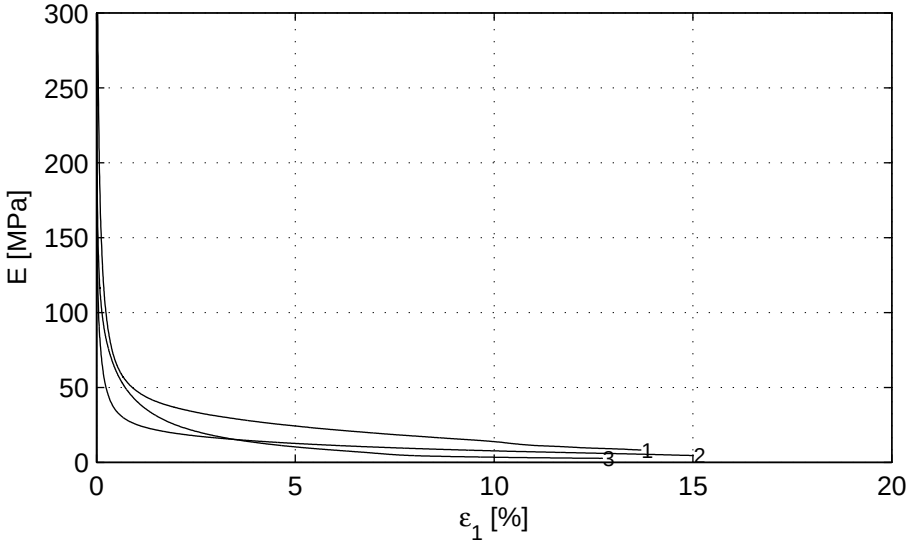
) Vrijgegeven door Dui op 2011-08-08 13:40

Consolidation stage



Shear stage





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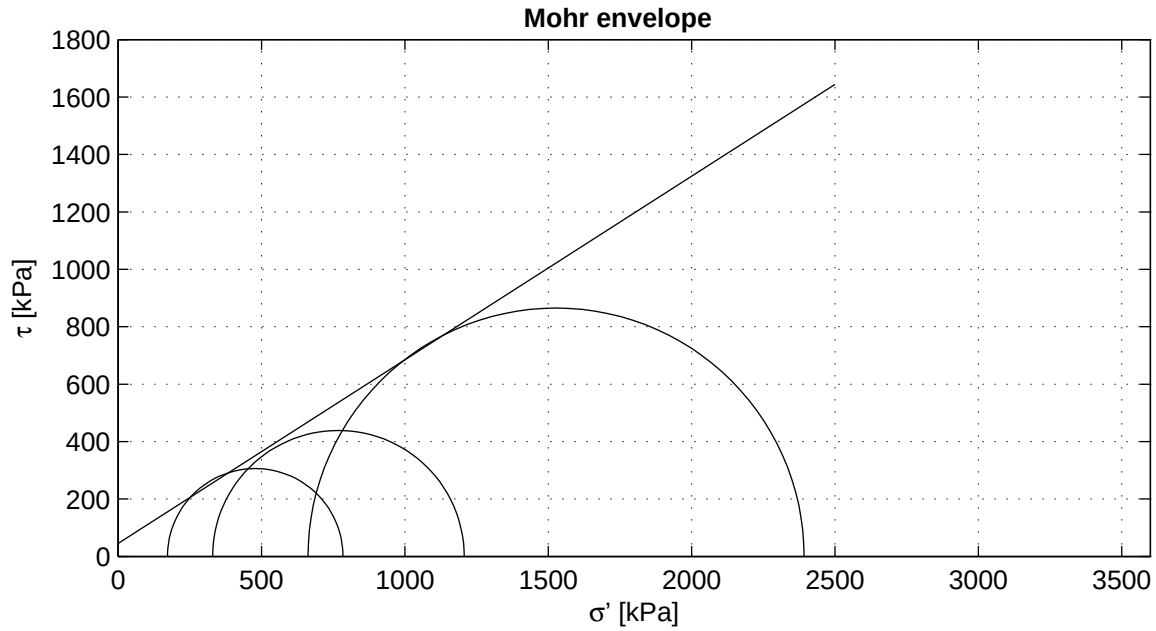
Project Middelburg Boring KB−105, Sample KB−105_ST−8, depth −21.50 till −22.00 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105_ST−8	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 13:40



Criterion	maximum t
ϕ' [°]	32.59
c' [kPa]	45.65

Start testing

Stage number	1	2	3
Sample name	KB−105A_ST−1B	KB−105A_ST−1A	KB−105A_ST−1
m_i [g]	407.0	386.1	402.9
D_i [mm]	50.0	50.0	50.0
h_i [mm]	99.8	100.3	99.3
w_i [%]	21.4	22.9	23.5
ρ_i [kg/m^3]	2076	1961	2069
ρ_{dr} [kg/m^3]	1710	1595	1676
Description cf. ASTM	Silty sand (SM)		

Setup: WF−A sample 1B
WF−B sample 1A
WF−C sample 1

Consolidation period t100 follows from isotropic phase.

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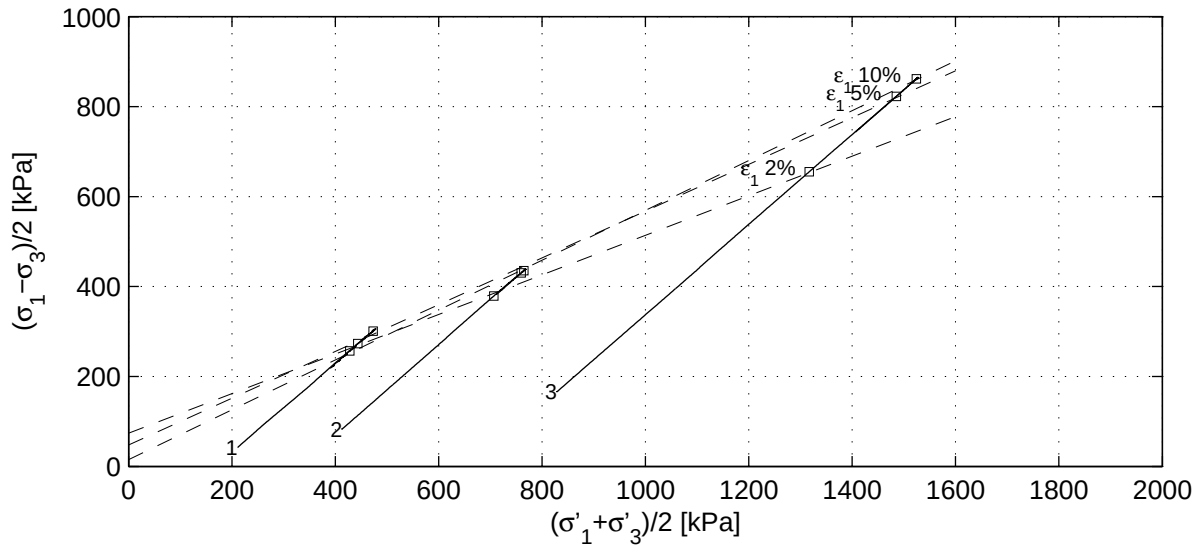
Project Middelburg

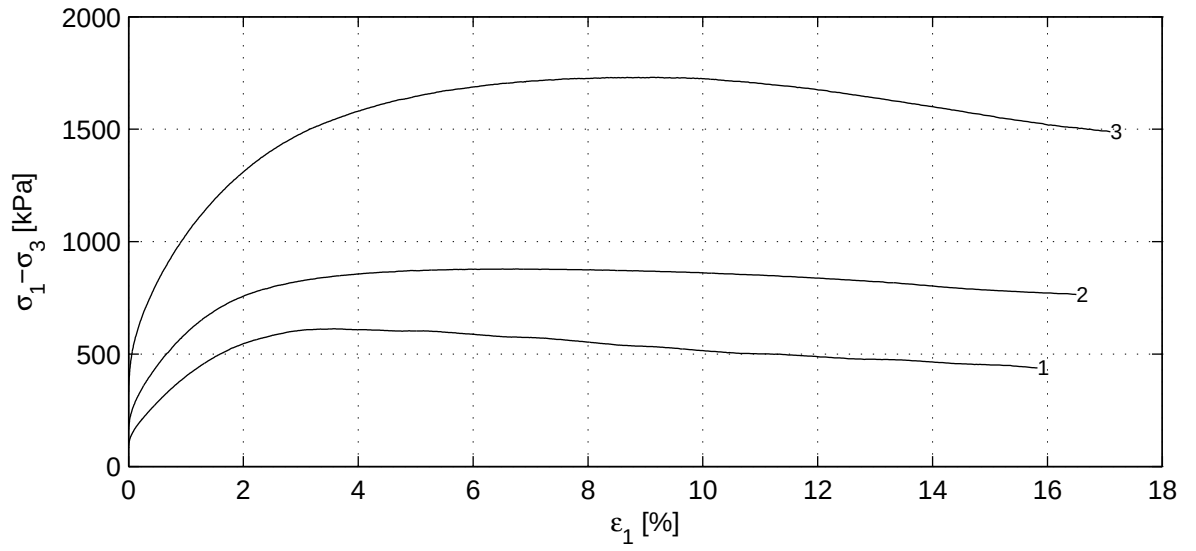
Boring KB−105A, Sample KB−105A_ST−1, depth −33.89 till −34.44 GL

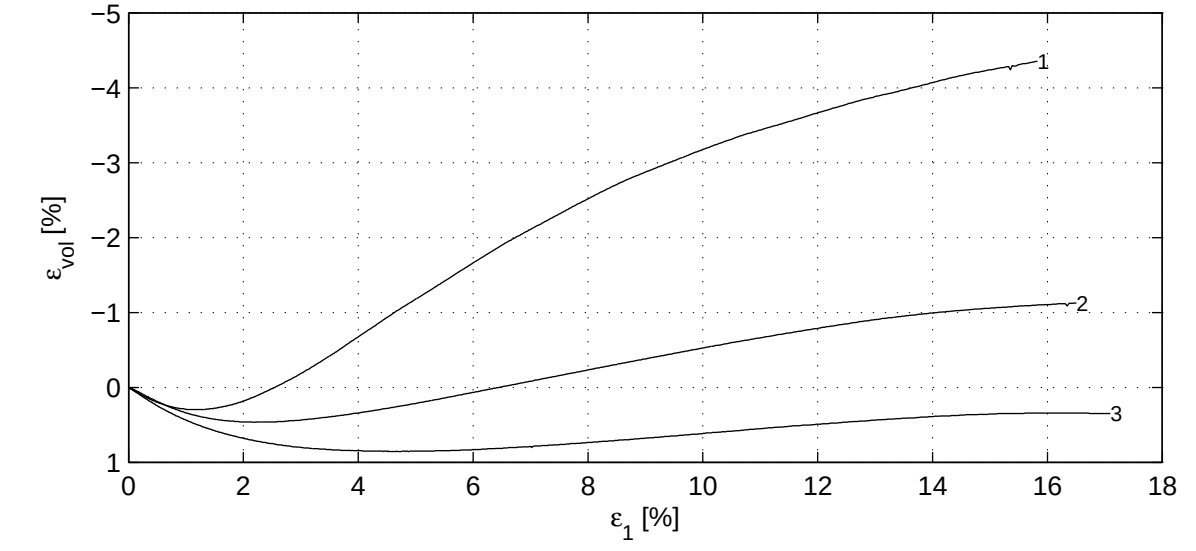
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−1	A4

) Vrijgegeven door Dui op 2011-08-08 12:29







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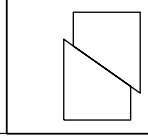
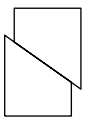
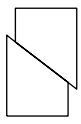
Project Middelburg Boring KB−105A, Sample KB−105A_ST−1, depth −33.89 till −34.44 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project: 1205088.1 / seen: Dui appendix: KB−105A_ST−1 / type: A4

) Vrijgegeven door Dui op 2011-08-08 12:29

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.36	0.41	0.54
	B_1 [−]	0.99	0.98	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	253.1	496.4	994.8
	t_{100} [min]	0.5	0.7	0.2
	h_c [mm]	99.1	99.4	98.2
	V_c [cm^3]	194.0	193.4	189.3
	$\rho_{n,c}$ [kg/m^3]	2088	1978	2100
	w_c [%]	20.8	21.8	21.8
	u_{bk} [kPa]	298	298	297
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	0.005	0.004	0.000
	v_{max} [%/h]	64.2	50.9	180.3
Shear stage	v [%/h]	3.6	3.8	4.1
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	M (Deltares)	M (Deltares)	M (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	611.9	877.5	1730.1
After testing	f_{undr} [kPa]	306.0	438.7	865.0
	$\varepsilon_{1,50}$ [%]	0.76	0.74	1.01
	E_{50} [MPa]	34.9	48.1	69.6
	w_e [%]	20.5	25.4	21.2
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	443.5	706.8	1316.7	273.1	379.0	655.1	26.1	82.2
5.0	473.3	764.8	1485.4	301.0	435.1	822.8	31.3	55.8
10.0	428.2	759.8	1524.2	256.7	430.2	861.6	33.6	18.3
$\varepsilon_{1,tmax}$ [%]	478.3	768.4	1527.5	306.0	438.7	865.0	32.6	45.7

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Project Middelburg

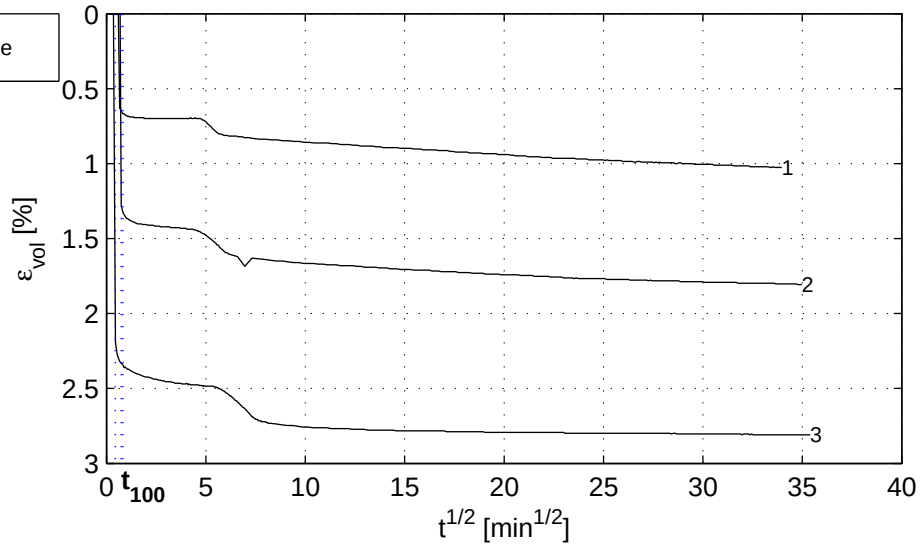
Boring KB−105A, Sample KB−105A_ST−1, depth −33.89 till −34.44 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

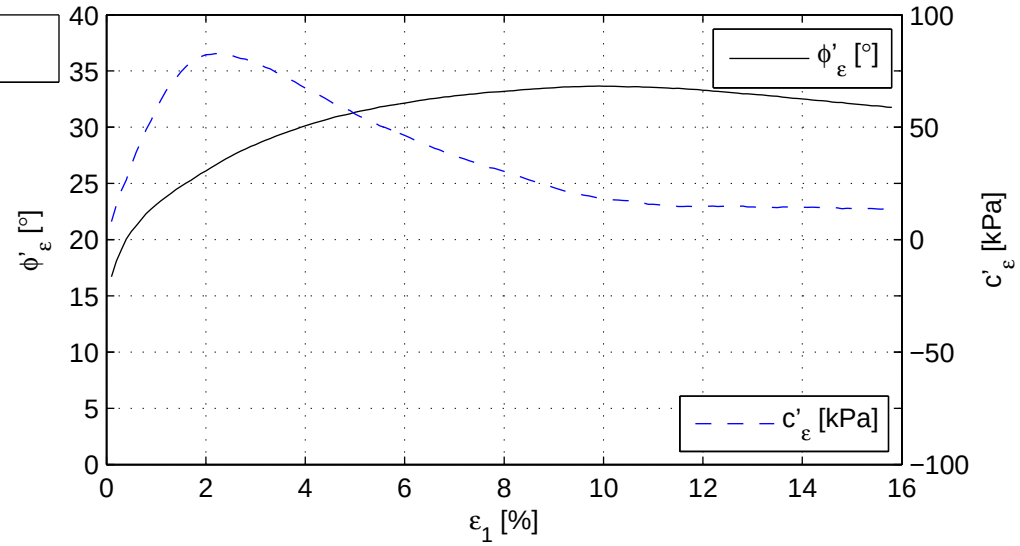
project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−1	A4

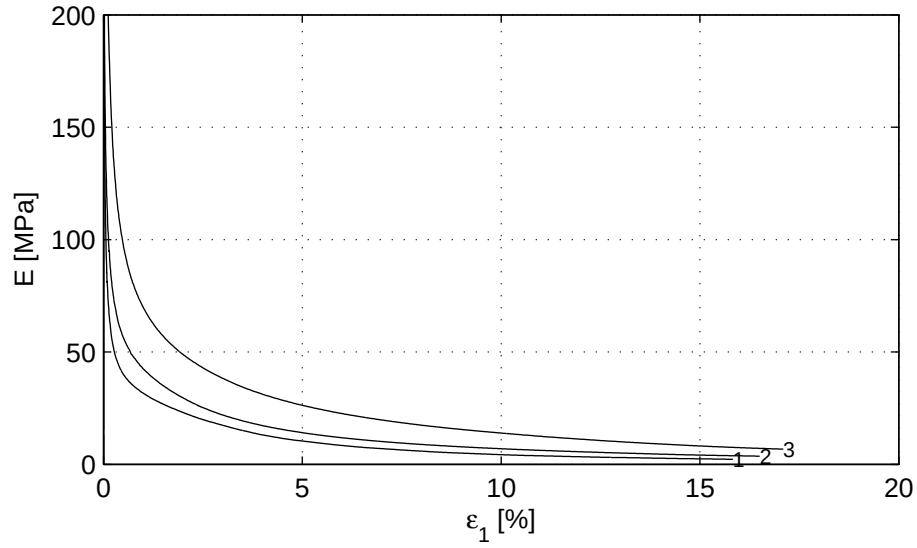
) Vrijgegeven door Dui op 2011-08-08 12:29

Consolidation stage



Shear stage





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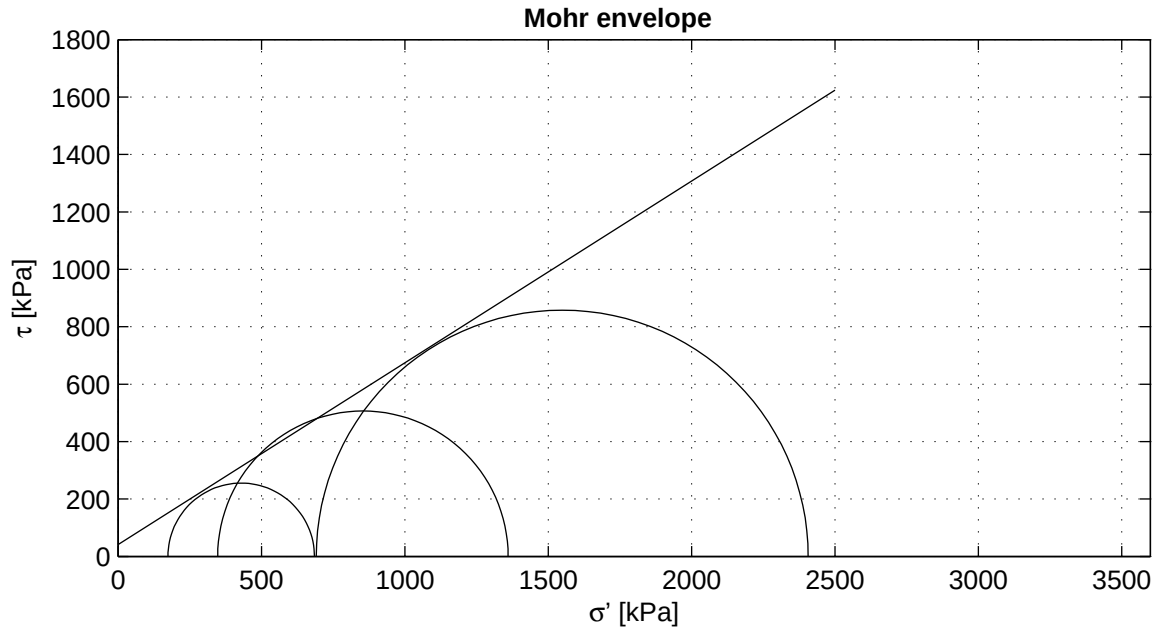
Project Middelburg Boring KB−105A, Sample KB−105A_ST−1, depth −33.89 till −34.44 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105A_ST−1	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-08 12:29



Criterion	maximum t
ϕ' [°]	32.33
c' [kPa]	41.47

Start testing

Stage number	1	2	3
Sample name	KB−105A_ST−2	KB−105A_ST−2A	KB−105A_ST−2B
m_i [g]	1016.3	979.3	1051.1
D_i [mm]	66.0	66.0	66.0
h_i [mm]	149.8	149.8	149.9
w_i [%]	22.0	22.6	19.9
ρ_i [kg/m^3]	1983	1911	2049
ρ_{dr} [kg/m^3]	1626	1558	1709
Description cf. ASTM	Silty sand (SM)		

Setup: ELE−A sample 2B
ELE−B sample 2A
ELE−C sample 2

Consolidation period t100 follows from isotropic phase.

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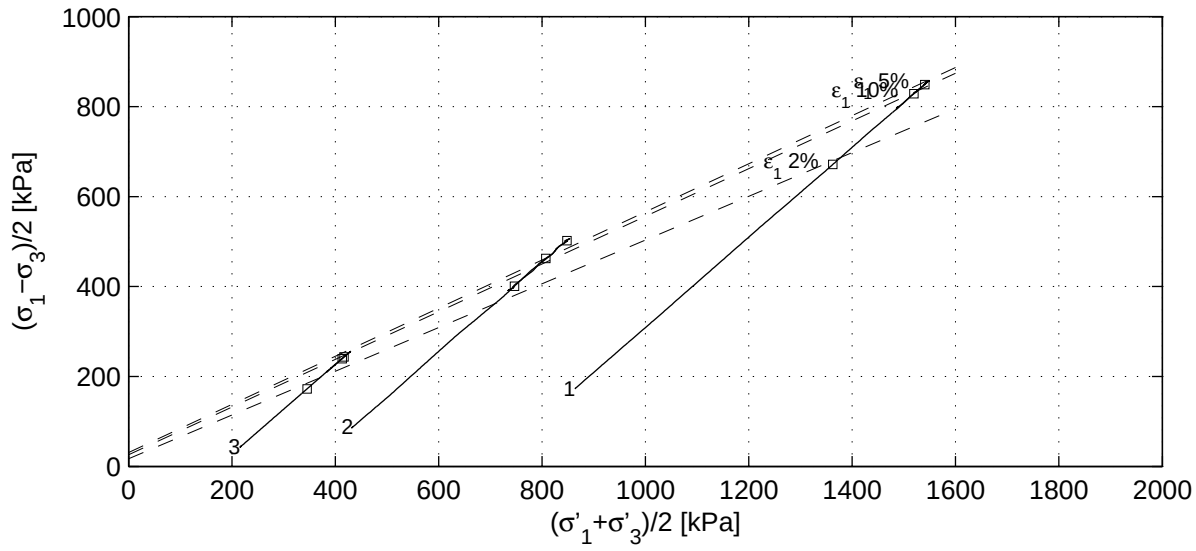
Project Middelburg

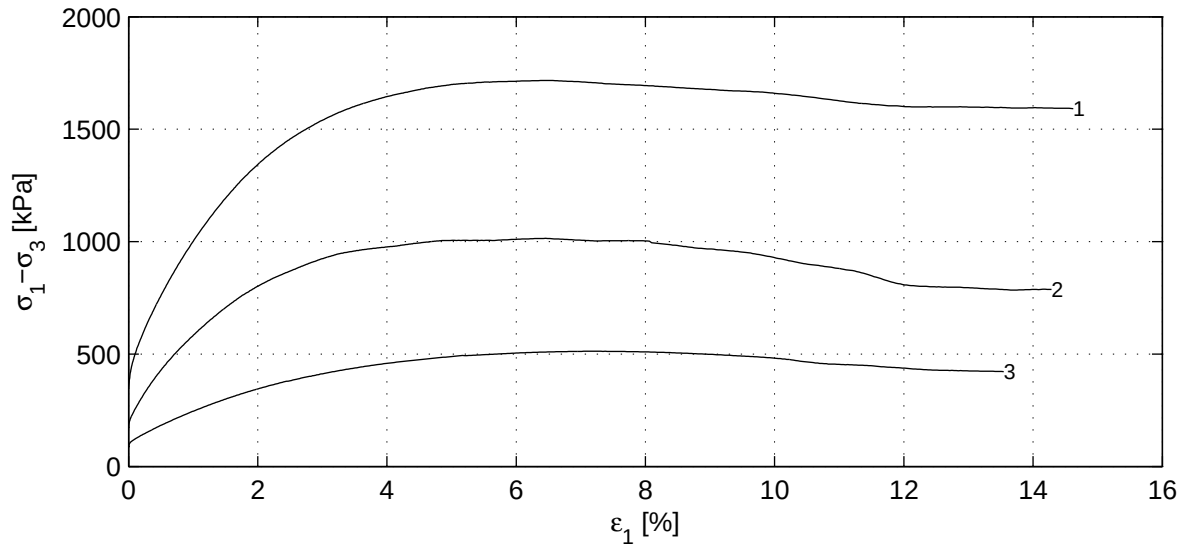
Boring KB−105A, Sample KB−105A_ST−2, depth −42.56 till −43.04 GL

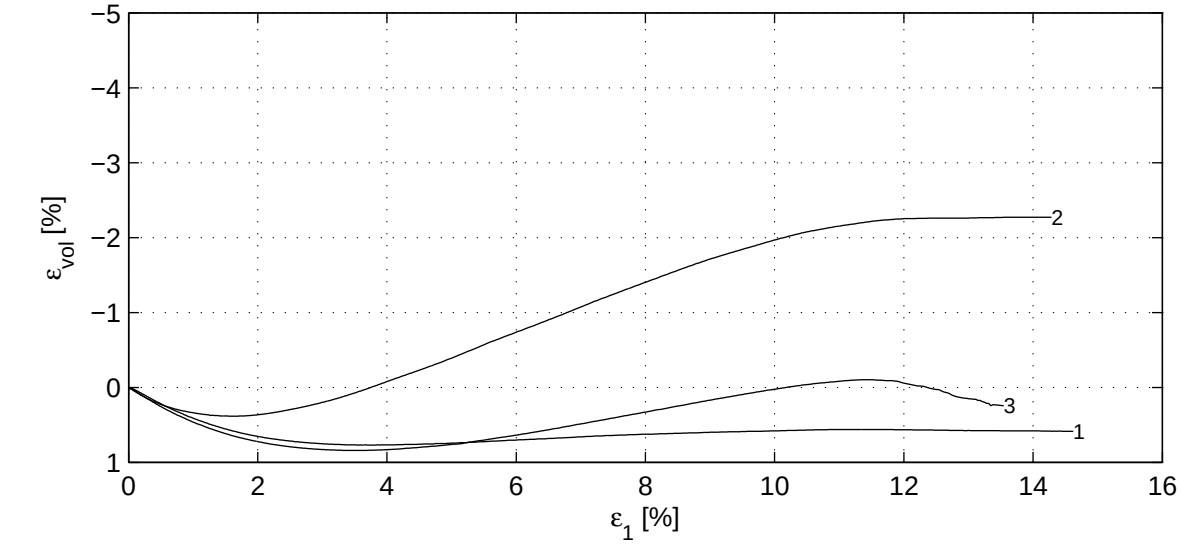
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−2	A4

) Vrijgegeven door Dui op 2011-08-08 13:11







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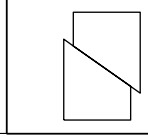
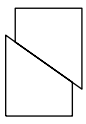
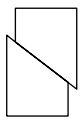
Project Middelburg

Boring KB−105A, Sample KB−105A_ST−2, depth −42.56 till −43.04 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−2	A4

) Vrijgegeven door Dui op 2011-08-08 13:11

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.83	0.52	0.85
	B_1 [−]	0.99	0.98	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1038.0	522.2	262.0
	t_{100} [min]	0.4	0.6	3.2
	h_c [mm]	148.1	148.4	148.4
	V_c [cm^3]	497.2	504.4	500.9
	$\rho_{n,c}$ [kg/m^3]	2013	1925	2074
	w_c [%]	20.1	21.6	18.6
	u_{bk} [kPa]	298	299	299
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	–	–	–
	v_{max} [%/h]	79.8	62.2	11.1
Shear stage	v [%/h]	3.9	3.9	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1715.6	1013.1	510.9
After testing	f_{undr} [kPa]	857.8	506.5	255.4
	$\varepsilon_{1,50}$ [%]	1.08	1.05	1.51
	E_{50} [MPa]	63.6	39.8	14.0
	w_e [%]	24.9	26.0	19.1
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1362.3	746.6	345.3	671.3	400.8	172.4	29.1	19.5
5.0	1540.3	848.3	416.8	848.8	502.0	243.6	32.4	36.8
10.0	1519.3	807.4	413.6	828.6	462.4	239.7	32.0	30.4
$\varepsilon_{1,tmax}$ [%]	1548.9	853.9	429.3	857.8	506.5	255.4	32.3	41.5

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Project Middelburg

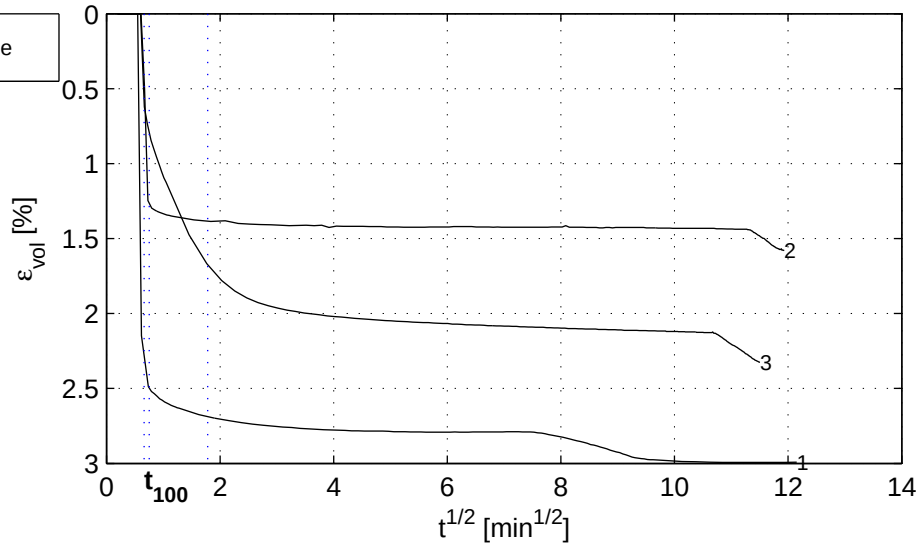
Boring KB−105A, Sample KB−105A_ST−2, depth −42.56 till −43.04 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

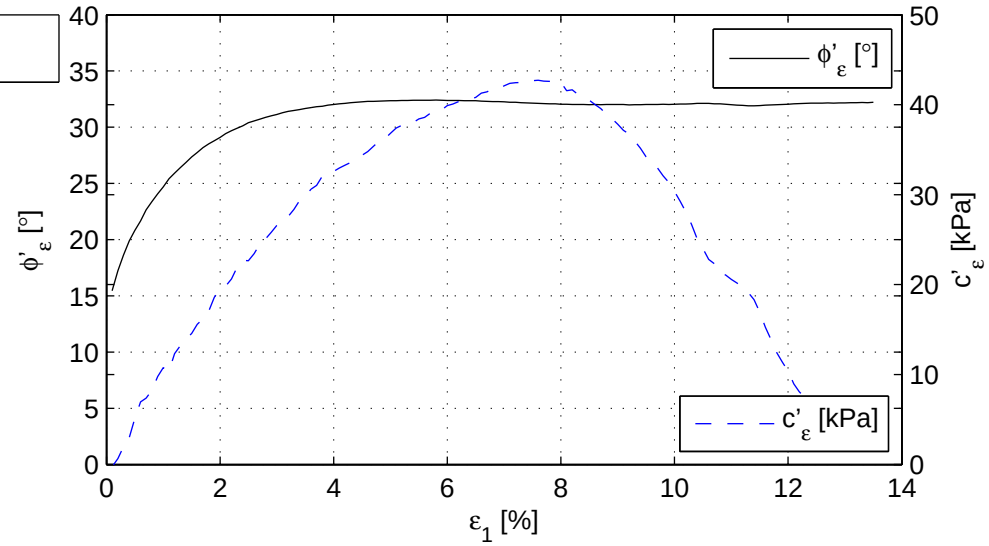
project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−2	A4

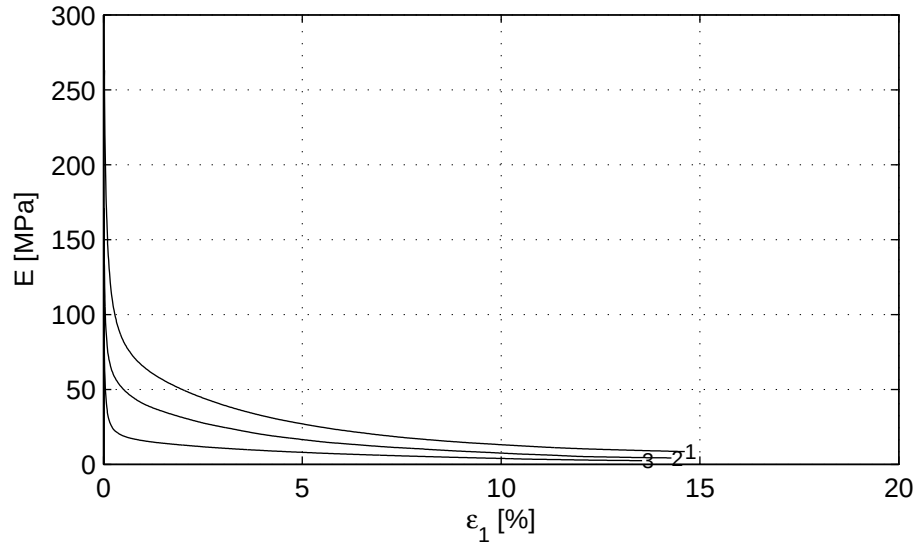
) Vrijgegeven door Dui op 2011-08-08 13:11

Consolidation stage



Shear stage





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2011−08−08	setiawan

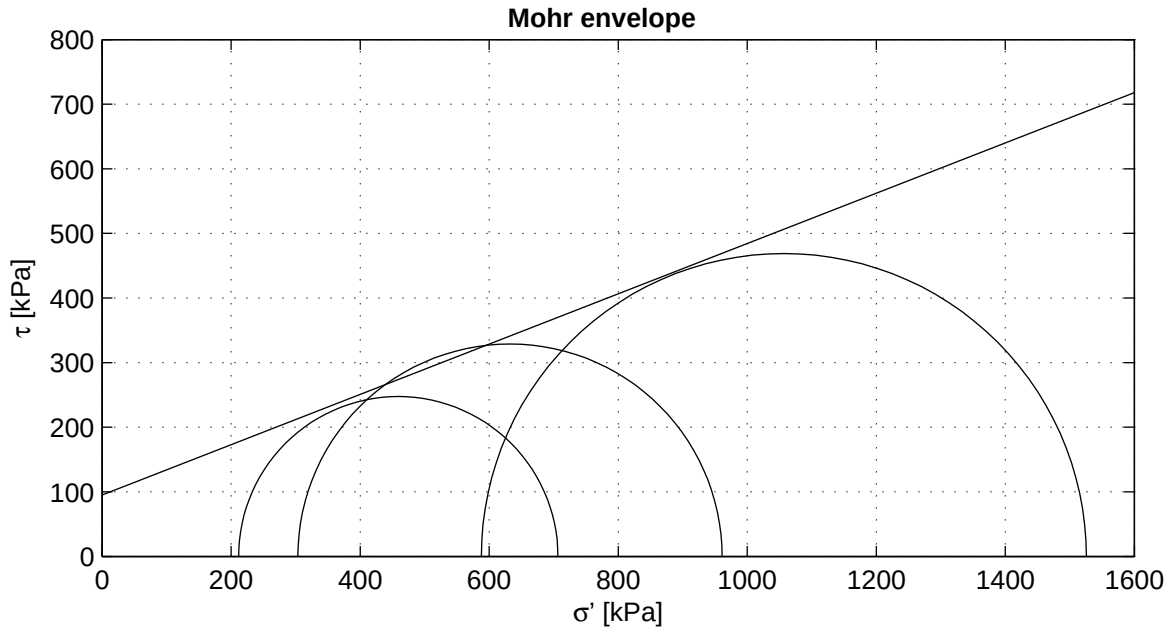
Project Middelburg

Boring KB−105A, Sample KB−105A_ST−2, depth −42.56 till −43.04 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−2	A4

) Vrijgegeven door Dui op 2011-08-08 13:11



Criterion	maximum t
ϕ' [°]	21.27
c' [kPa]	95.01

Start testing

Stage number	1	2	3
Sample name	KB−105A_ST−3	KB−105A_ST−3A	KB−105A_ST−3B
m_i [g]	963.0	944.0	988.9
D_i [mm]	66.0	67.5	66.0
h_i [mm]	150.1	140.0	149.9
w_i [%]	23.5	24.0	25.0
ρ_i [kg/m^3]	1875	1884	1928
ρ_{dr} [kg/m^3]	1519	1519	1542
Description cf. ASTM	Sandy silty clay (CL−ML)		

Setup: WF−A sample 3B
WF−B sample 3
WF−C sample 3A

Consolidation period t100 follows from isotropic phase.

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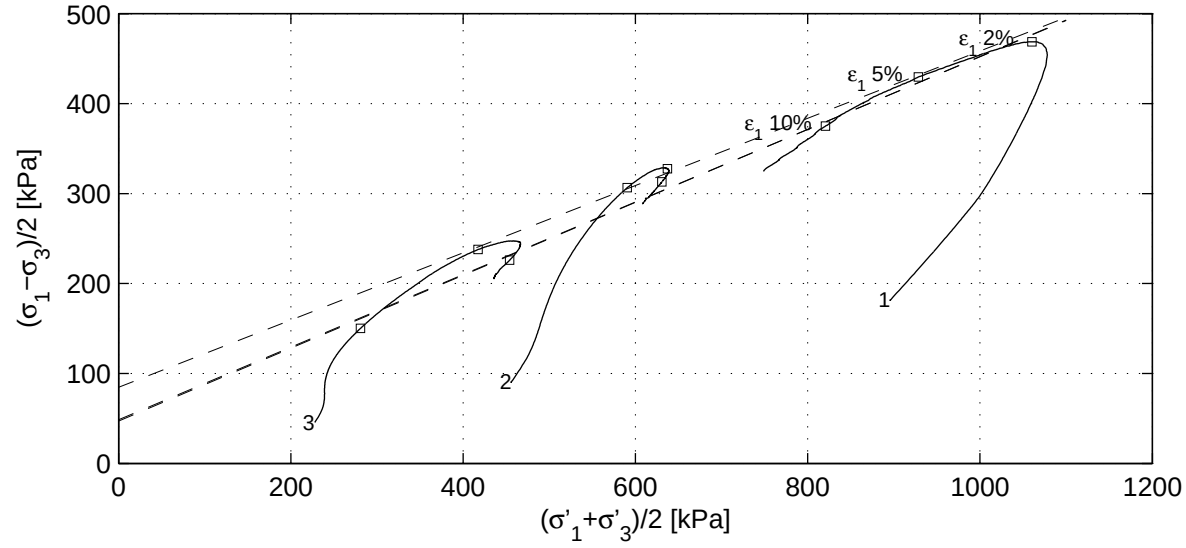
Project Middelburg

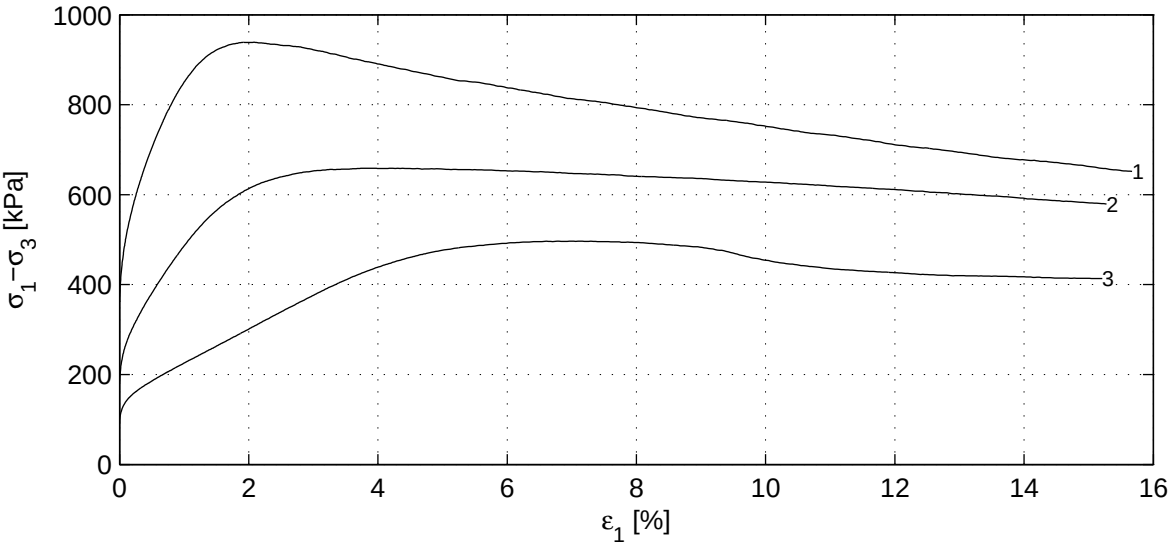
Boring KB−105A, Sample KB−105A_ST−3, depth −69.89 till −70.43 GL

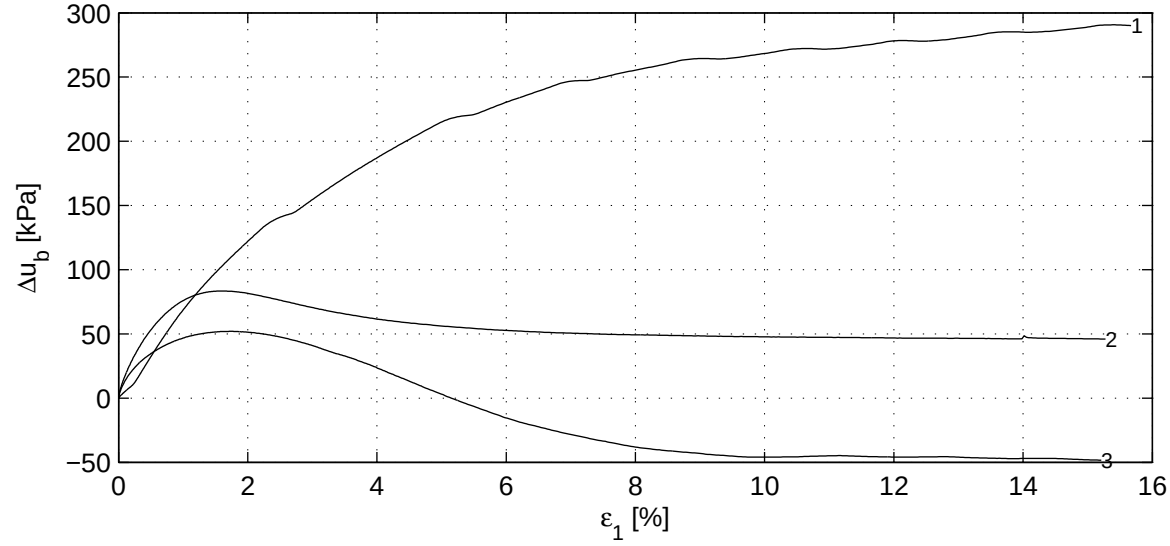
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−3	A4

) Vrijgegeven door Dui op 2011-08-10 14:53







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Project Middelburg

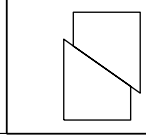
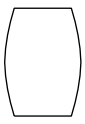
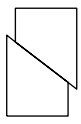
Boring KB−105A, Sample KB−105A_ST−3, depth −69.89 till −70.43 GL

project	seen
1205088.1	Dui

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

appendix	type
KB−105A_ST−3	A4

) Vrijgegeven door Dui op 2011-08-10 14:53

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.49	0.68	0.93
	B_1 [−]	0.97	0.97	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1077.5	546.8	273.2
	t_{100} [min]	1.6	1.8	5.6
	h_c [mm]	145.2	135.7	145.9
	V_c [cm^3]	496.6	487.2	499.4
	$\rho_{n,c}$ [kg/m^3]	1905	1909	1953
	w_c [%]	21.3	22.2	23.3
	u_{bk} [kPa]	298	297	298
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	–	–	–
	v_{max} [%/h]	80.7	70.6	23.3
Shear stage	v [%/h]	3.7	4.2	3.9
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	937.7	657.6	494.9
After testing	f_{undr} [kPa]	468.8	328.8	247.4
	$\varepsilon_{1,50}$ [%]	0.37	0.68	1.92
	E_{50} [MPa]	77.9	35.3	10.6
	w_e [%]	25.6	25.6	25.4
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1060.2	590.6	280.9	468.7	306.5	150.1	23.8	53.1
5.0	928.5	637.2	417.4	429.7	327.7	237.9	22.0	91.2
10.0	820.7	630.8	454.1	374.9	312.9	226.0	23.9	51.6
$\varepsilon_{1,tmax}$ [%]	1056.8	632.3	459.2	468.8	328.8	247.4	21.3	95.0

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Project Middelburg

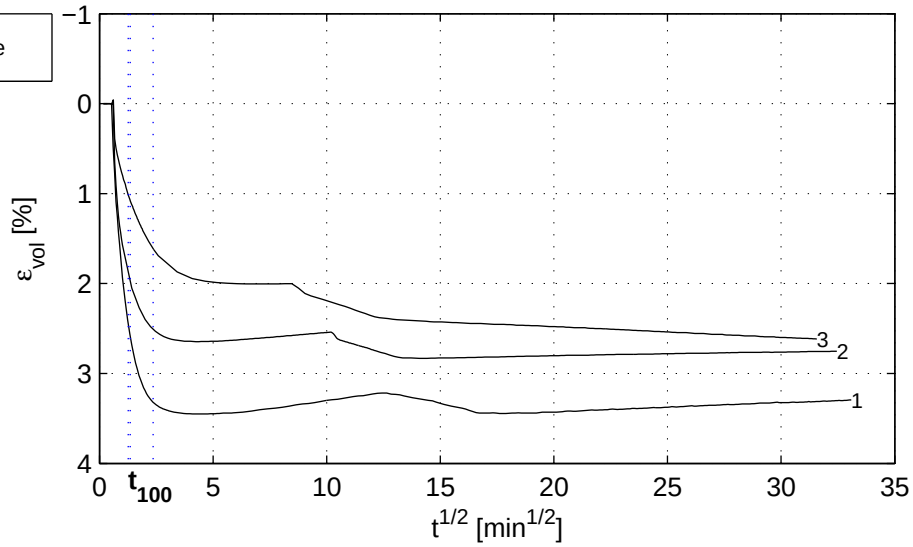
Boring KB−105A, Sample KB−105A_ST−3, depth −69.89 till −70.43 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

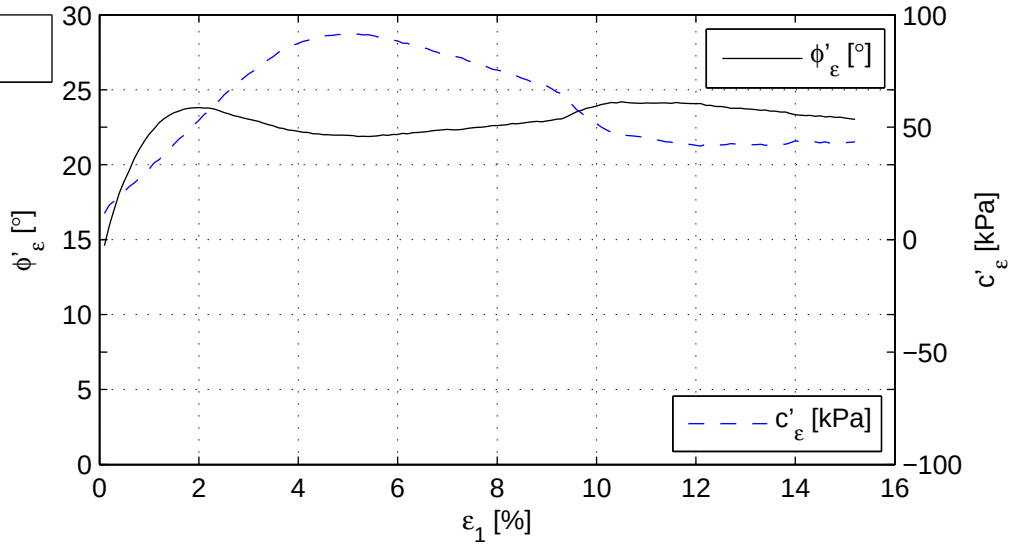
project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−3	A4

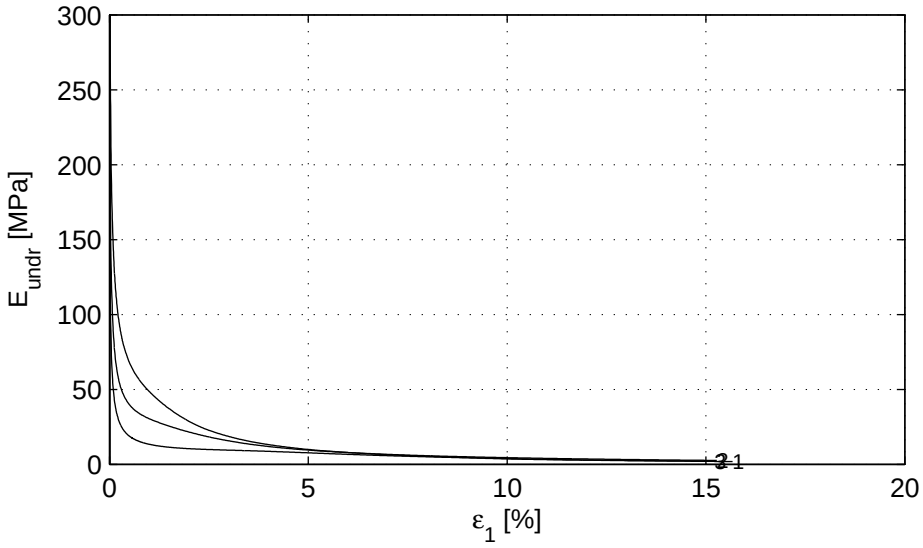
) Vrijgegeven door Dui op 2011-08-10 14:53

Consolidation stage



Shear stage





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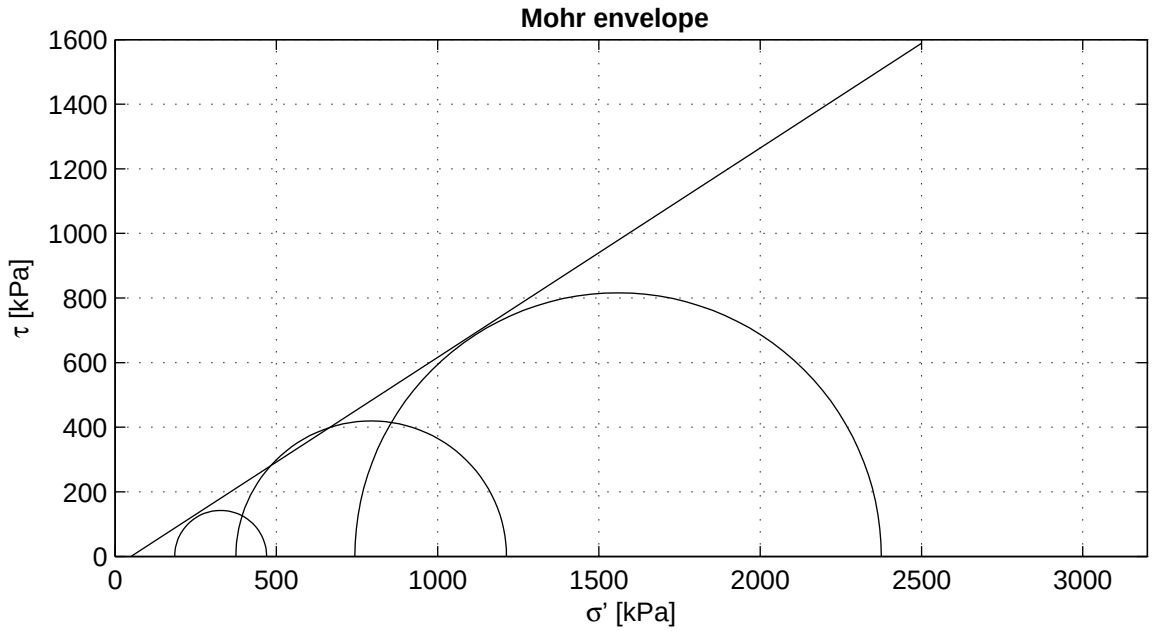
Project Middelburg

Boring KB−105A, Sample KB−105A_ST−3, depth −69.89 till −70.43 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−3	A4

) Vrijgegeven door Dui op 2011-08-10 14:53



Criterion	maximum t
ϕ' [°]	32.95
c' [kPa]	−31.80

Start testing

Stage number	1	2	3
Sample name	KB−105A_ST−5	KB−105A_ST−5A	KB−105A_ST−5B
m_i [g]	1040.8	1007.6	1016.2
D_i [mm]	66.8	66.0	66.0
h_i [mm]	150.0	149.9	149.7
w_i [%]	21.3	22.0	21.3
ρ_i [kg/m^3]	1980	1965	1984
ρ_{dr} [kg/m^3]	1632	1610	1635
Description cf. ASTM	Sity sand (SM)		

Setup: ELE−A sample 5
ELE−B sample 5A
ELE−C sample 5B

Consolidation period t100 follows from isotropic phase.

A layer of clay was observed in the top of sample 5B.

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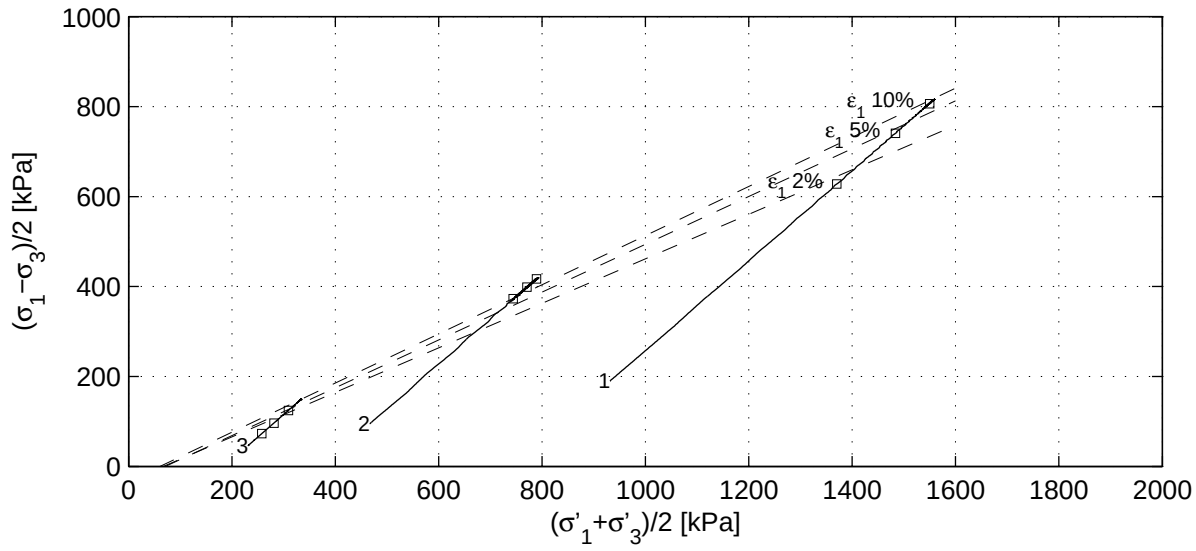
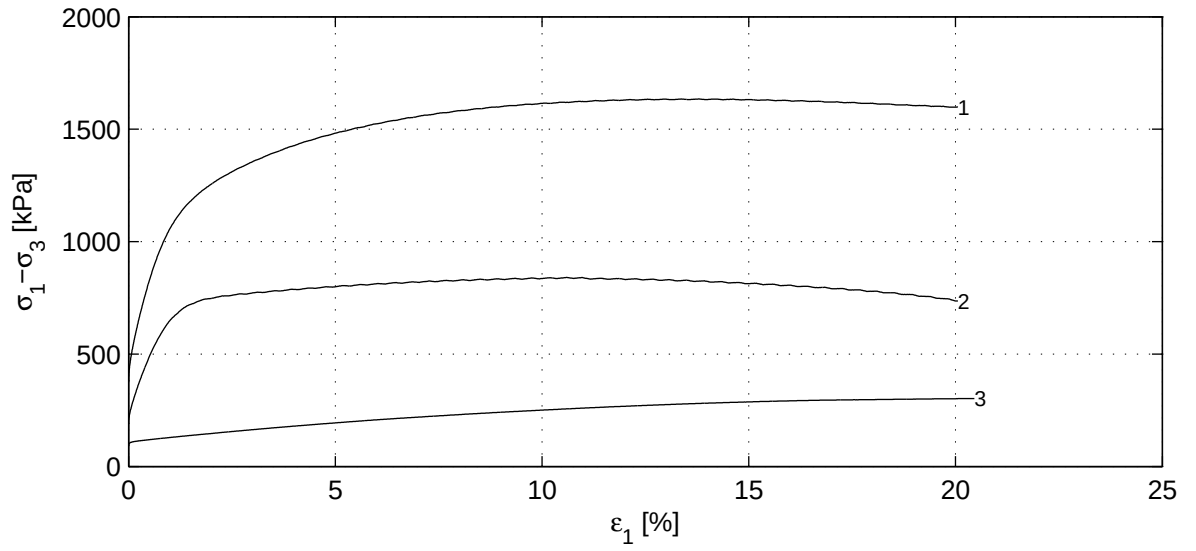
Boring KB−105A, Sample KB−105A_ST−5, depth −84.57 till −85.12 GL

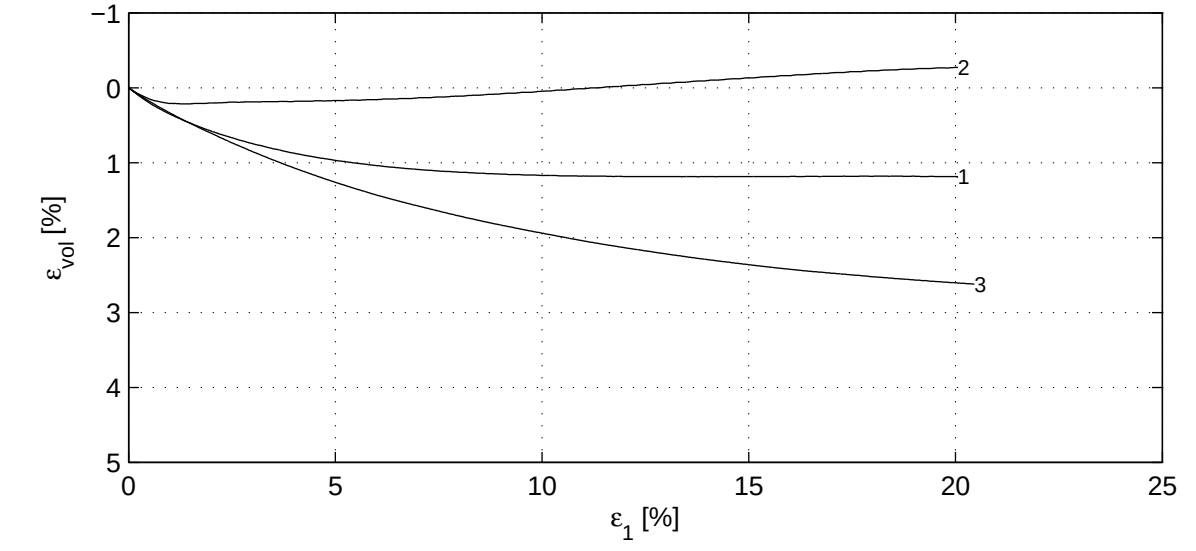
CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−5	A4

) Vrijgegeven door Dui op 2011-08-10 13:38







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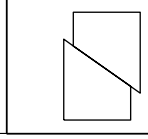
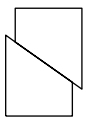
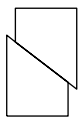
Project Middelburg Boring KB−105A, Sample KB−105A_ST−5, depth −84.57 till −85.12 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project: 1205088.1 / seen: Dui appendix: KB−105A_ST−5 / type: A4

) Vrijgegeven door Dui op 2011-08-10 13:38

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.72	0.96	0.91
	B_1 [−]	0.98	0.99	0.99
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1122.4	562.4	278.4
	t_{100} [min]	0.6	0.6	117.0
	h_c [mm]	148.3	148.5	142.9
	V_c [cm^3]	513.9	505.2	489.8
	$\rho_{n,c}$ [kg/m^3]	2002	1979	2029
	w_c [%]	20.0	21.1	18.7
	u_{bk} [kPa]	299	298	298
	P [−]	8.50	8.50	8.50
	Creep rate [%/h]	0.000	−	0.005
	v_{max} [%/h]	54.4	61.0	0.3
Shear stage	v [%/h]	1.0	1.0	1.0
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	1632.2	838.8	299.8
After testing	f_{undr} [kPa]	816.1	419.4	142.4
	$\varepsilon_{1,50}$ [%]	0.86	0.58	5.31
	E_{50} [MPa]	72.4	56.6	1.9
	w_e [%]	23.0	22.7	22.3
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1370.4	744.2	257.9	628.2	373.2	72.9	29.7	−38.2
5.0	1483.8	770.9	281.3	740.5	398.8	96.3	32.1	−44.3
10.0	1550.1	789.1	309.3	806.6	417.0	124.4	33.1	−39.4
$\varepsilon_{1,tmax}$ [%]	1559.3	793.9	327.2	816.1	419.4	142.4	33.0	−31.8

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Project Middelburg

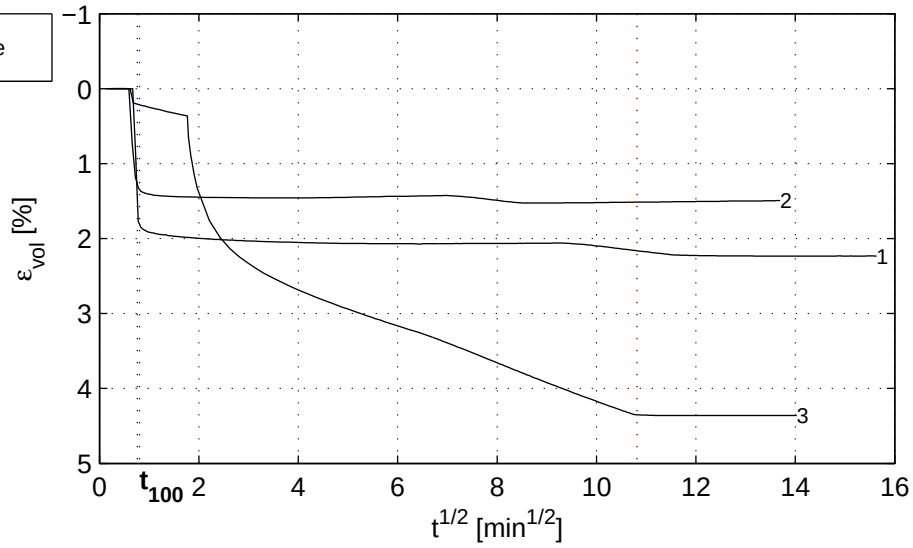
Boring KB−105A, Sample KB−105A_ST−5, depth −84.57 till −85.12 GL

CD Triaxial test (Singlestage) acc. to CEN17892−9:2004

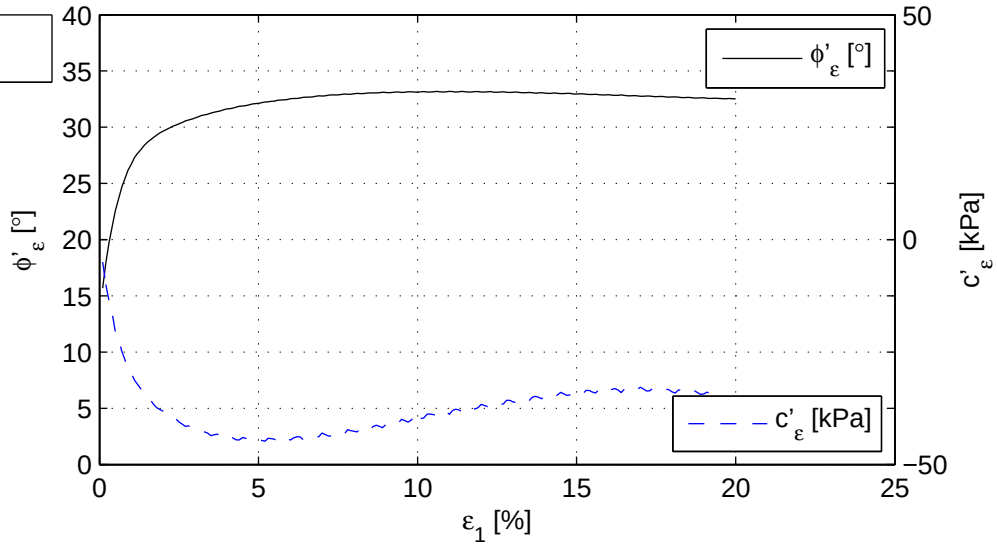
project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−5	A4

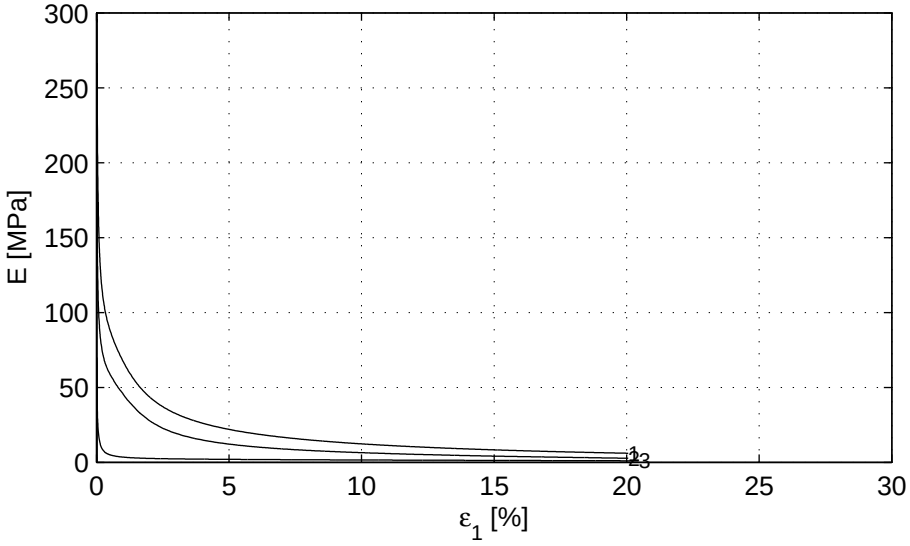
) Vrijgegeven door Dui op 2011-08-10 13:38

Consolidation stage



Shear stage





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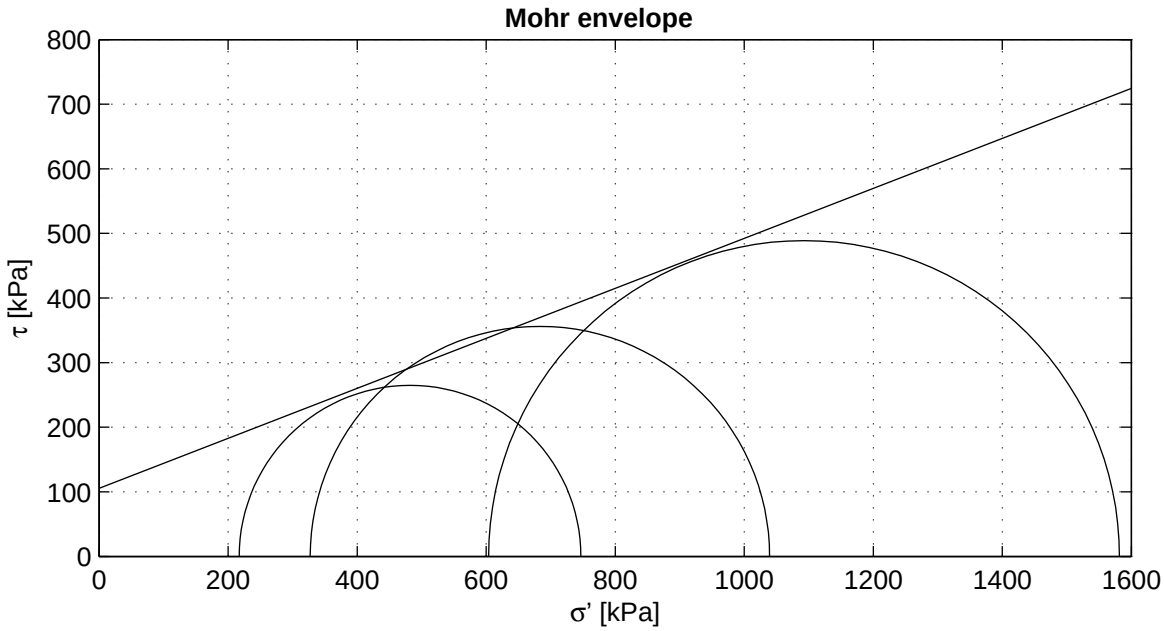
Project Middelburg Boring KB−105A, Sample KB−105A_ST−5, depth −84.57 till −85.12 GL CD Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105A_ST−5	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-10 13:38



Criterion	maximum t
ϕ' [°]	21.15
c' [kPa]	105.51

Start testing

Stage number	1	2	3
Sample name	KB−105A_ST−6	KB−105A_ST−6A	KB−105A_ST−6B
m_i [g]	984.5	968.7	1010.2
D_i [mm]	67.2	67.3	66.0
h_i [mm]	141.1	140.3	150.3
w_i [%]	27.1	26.5	24.5
ρ_i [kg/m^3]	1968	1941	1965
ρ_{dr} [kg/m^3]	1548	1534	1579
Description cf. ASTM	Silty clay (CL−ML)		

Setup: WF−A sample 6B
WF−B sample 6A
WF−C sample 6

Consolidation period t100 follows from isotropic phase.

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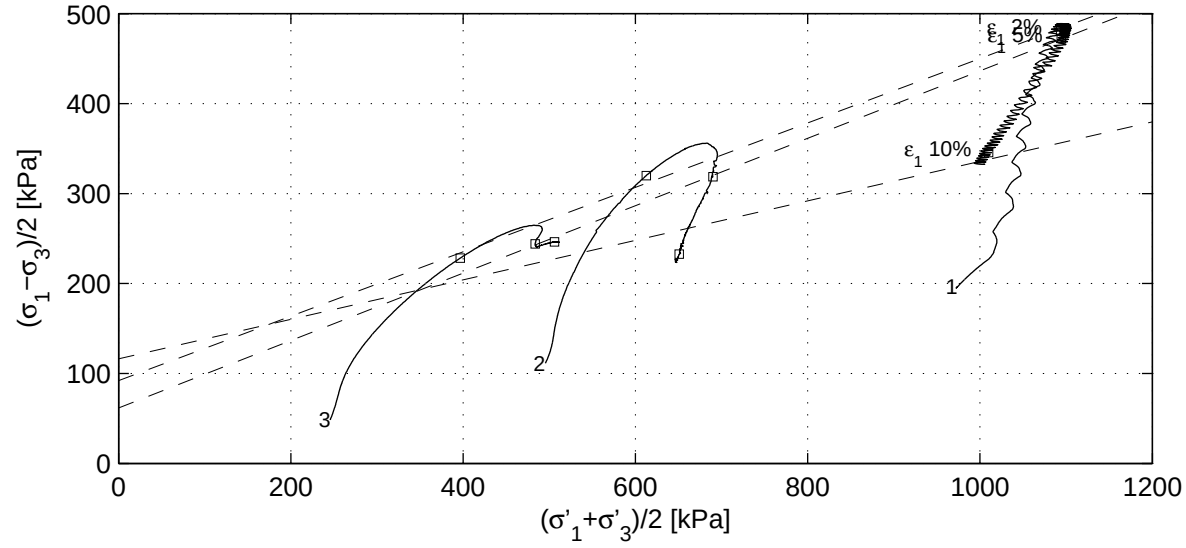
Project Middelburg

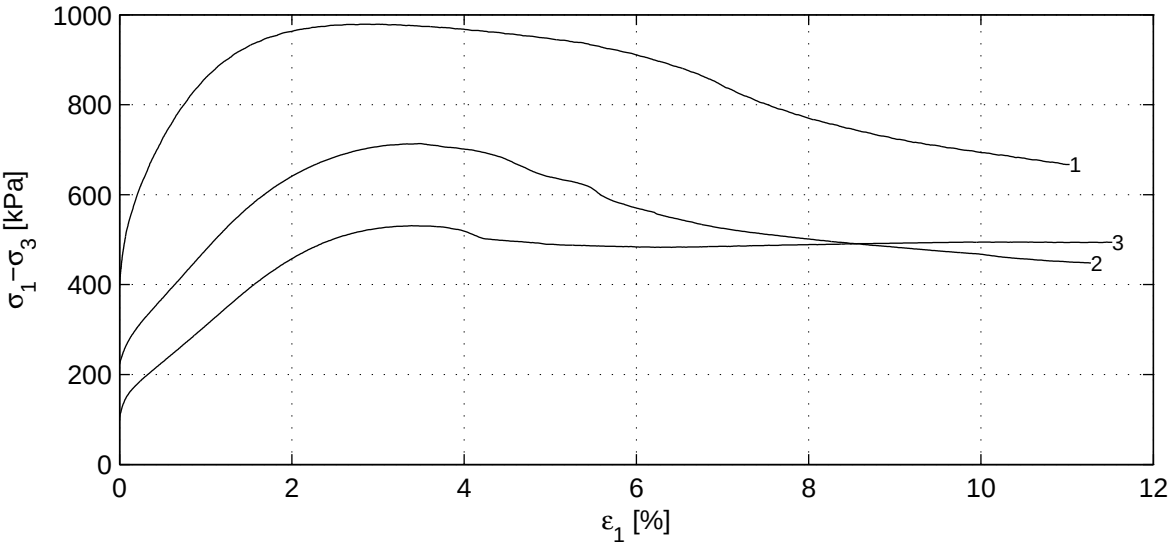
Boring KB−105A, Sample KB−105A_ST−6, depth −95.74 till −96.29 GL

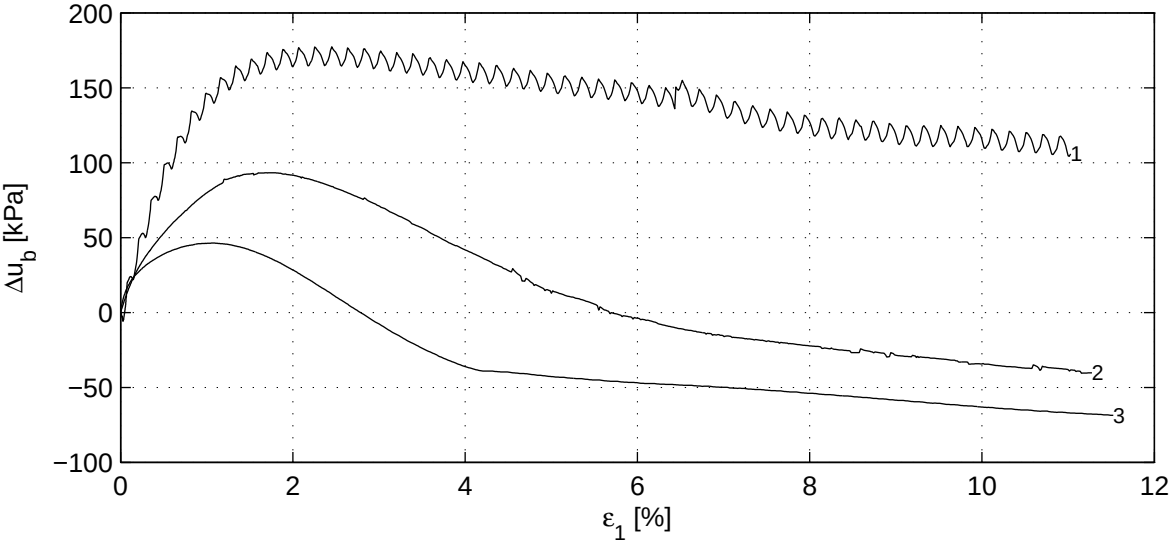
CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−6	A4

) Vrijgegeven door Dui op 2011-08-10 14:55







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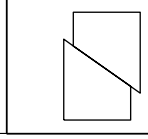
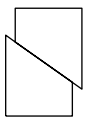
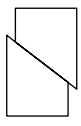
Project Middelburg Boring KB−105A, Sample KB−105A_ST−6, depth −95.74 till −96.29 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105A_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-10 14:55

	Stage number	1	2	3
Saturation stage	B_0 [−]	0.49	0.42	0.67
	B_1 [−]	0.97	0.98	0.98
Consolidation stage	$\sigma'_{1,c}$ [kPa]	1170.6	607.6	295.3
	t_{100} [min]	1.7	632.1	326.7
	h_c [mm]	137.4	137.2	147.9
	V_c [cm^3]	491.0	501.3	518.1
	$\rho_{n,c}$ [kg/m^3]	1986	1937	1958
	w_c [%]	25.9	26.8	25.0
	u_{bk} [kPa]	296	302	297
	P [−]	2.30	2.30	2.30
	Creep rate [%/h]	−	−	−
	v_{max} [%/h]	75.2	0.2	0.4
Shear stage	v [%/h]	0.4	0.4	0.5
	Stop criterion	ε_1 15%	ε_1 15%	ε_1 15%
	Correction text	MP (Deltares)	MP (Deltares)	MP (Deltares)
	$\sigma_{1,u}-\sigma_{3,u}$ [kPa]	977.9	712.1	529.6
After testing	f_{undr} [kPa]	488.9	356.1	264.8
	$\varepsilon_{1,50}$ [%]	0.40	0.96	1.04
	E_{50} [MPa]	73.2	25.6	20.8
	w_e [%]	26.9	30.2	25.7
	Fail figure			

Vertical strain [%]	$(\sigma'_1+\sigma'_3)/2$ [kPa]			$(\sigma_1-\sigma_3)/2$ [kPa]			ϕ' [°]	c' [kPa]
2.0	1093.6	612.5	396.8	481.2	320.0	228.3	21.0	98.7
5.0	1094.4	690.0	483.6	472.5	318.8	244.0	22.0	66.6
10.0	1009.9	650.8	506.2	345.7	232.7	246.3	12.7	119.1
$\varepsilon_{1,tmax}$ [%]	1092.7	683.3	482.0	488.9	356.1	264.8	21.1	105.5

Deltares
PO Box 177, NL 2600 MH Delft
Stieltjesweg 2, 2628 CK Delft
Telephone +31 (0)88 335 7200 Homepage:
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date	signed
2011−08−10	setiawan

Project Middelburg

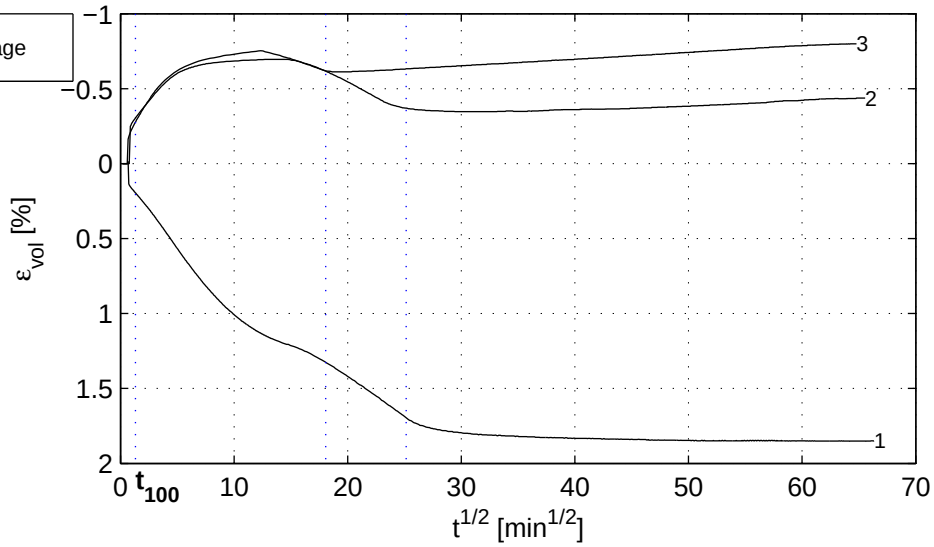
Boring KB−105A, Sample KB−105A_ST−6, depth −95.74 till −96.29 GL

CU Triaxial test (Singlestage) acc. to CEN17892−9:2004

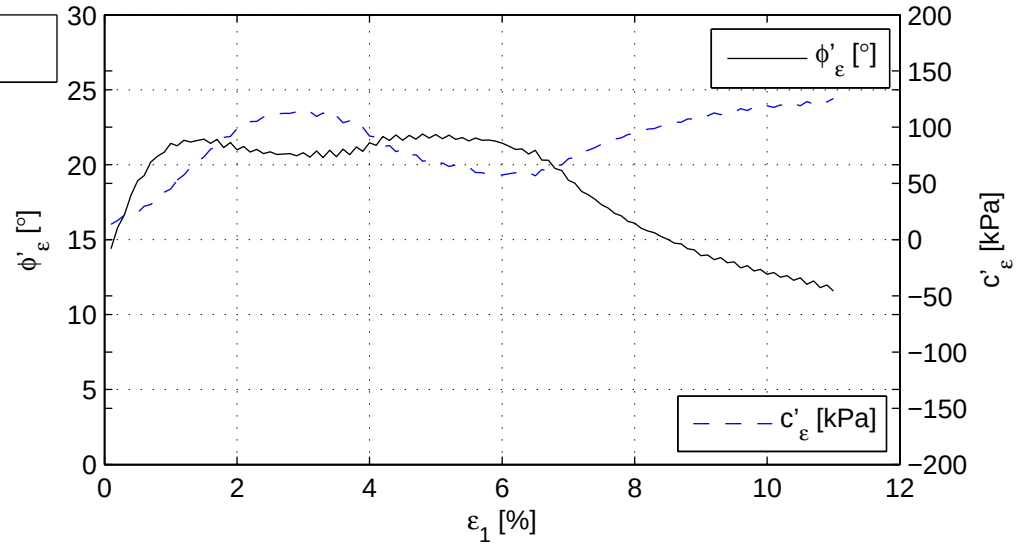
project	seen
1205088.1	Dui
appendix	type
KB−105A_ST−6	A4

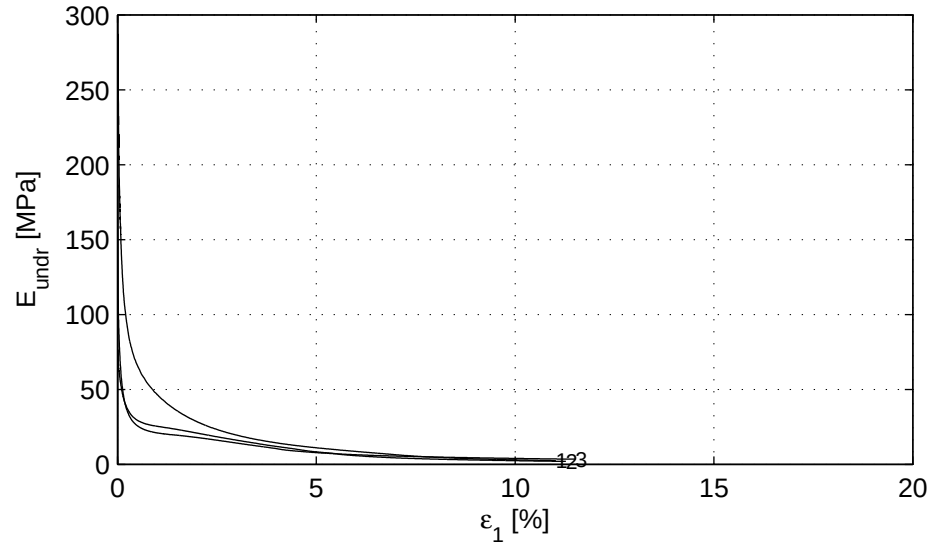
) Vrijgegeven door Dui op 2011-08-10 14:55

Consolidation stage



Shear stage





Deltares	PO Box 177, NL 2600 MH Delft Stieltjesweg 2, 2628 CK Delft	Telephone +31 (0)88 335 7200 Homepage: Telefax +31 (0)15 261 0821 www.deltares.nl	date 2011−08−10	signed setiawan
Project Middelburg Boring KB−105A, Sample KB−105A_ST−6, depth −95.74 till −96.29 GL CU Triaxial test (Singlestage) acc. to CEN17892−9:2004			project 1205088.1 appendix KB−105A_ST−6	seen Dui type A4

) Vrijgegeven door Dui op 2011-08-10 14:55

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..... GEOTECHNICAL, GEOENVIRONMENTAL, AND GEOSYNTHETIC LABORATORIES

August 10, 2011

Project No. 2011-373-01

Dr. Melissa Zubinsky
Paul C. Rizzo & Associates, Inc.
Penn Center East
500 Penn Center Blvd., Suite 100
Pittsburgh, PA 15235

Transmittal
Laboratory Test Results
KCB-2 DELTA 104472

Please find attached the laboratory test results for the above referenced project that were outlined on the Project Verification Form that was faxed to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

David R. Backstrom
Laboratory Director

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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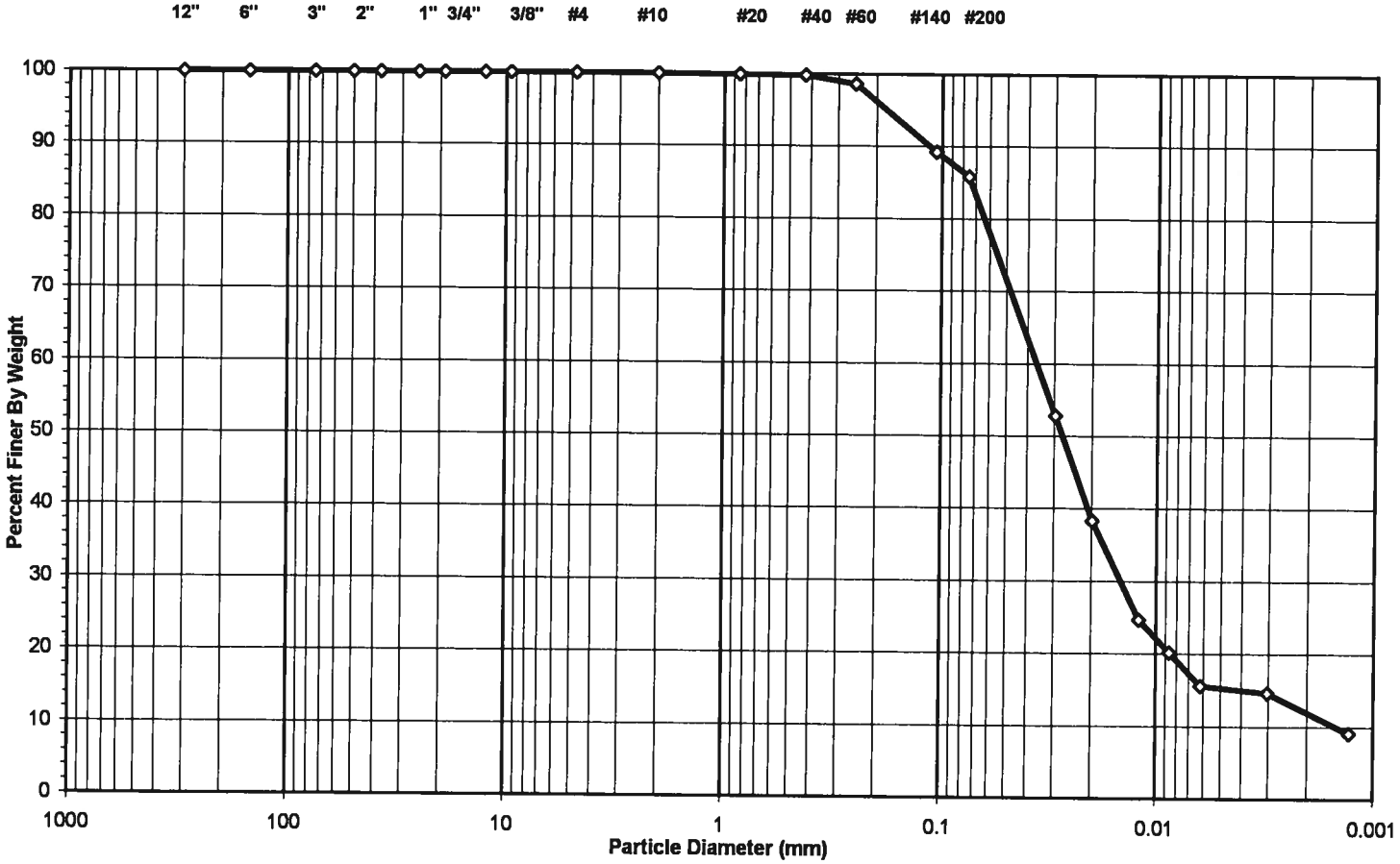
INTEGRITY IN TESTING

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID	2011-373-01-01	Soil Color	**GRAY**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	14.13
Finer Than #200	*Silt & Clay*	85.87

USCS Symbol ***CL-ML, TESTED***

USCS Classification ***SILTY CLAY***

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID	2011-373-01-01	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		**Hydrometer Specimen Data**	
Tare No.	43	Air Dried - #10 Hydrometer Material (gm)	54.90
Wgt.Tare + Wet Soil (gm)	20.13	Corrected Dry Wt. of - #10 Material (gm)	54.58
Wgt.Tare + Dry Soil (gm)	20.06		
Weight of Tare (gm)	8.25	Weight of - #200 Material (gm)	46.87
Weight of Water (gm)	0.07	Weight of - #10 ; + #200 Material (gm)	7.71
Weight of Dry Soil (gm)	11.81		
Moisture Content (%)	**0.6**	**J-FACTOR (%FINER THAN #10)**	**1.0000**
Soil Specimen Data			
Tare No.	2341		
Wgt.Tare + Air Dry Soil (gm)	326.53		
Weight of Tare (gm)	95.77		
Air Dried Wgt. Total Sample (gm)	230.76	Dry Weight of Material Retained on #10 (gm)	0.00
Total Dry Sample Weight (gm)	229.40	Corrected Dry Sample Wt - #10 (gm)	229.40

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.00	0.0	0.0	100.0	**100.0**
#20	0.85	0.03	0.1	0.1	99.9	**99.9**
#40	0.425	0.04	0.1	0.1	99.9	**99.9**
#60	0.250	0.69	1.3	1.4	98.6	**98.6**
#140	0.106	5.09	9.3	10.7	89.3	**89.3**
#200	0.075	1.86	3.4	14.1	85.9	**85.9**
Pan	-	46.87	85.9	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By [illegible] Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID	2011-373-01-01	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	34.0	24.4	4.88	29.1	52.8	0.01276	0.0296	**52.8**
5	26.0	24.4	4.88	21.1	38.3	0.01276	0.0198	**38.3**
15	18.5	24.4	4.88	13.6	24.7	0.01276	0.0120	**24.7**
30	16.0	24.4	4.88	11.1	20.2	0.01276	0.0086	**20.2**
60	13.5	24.3	4.92	8.6	15.6	0.01278	0.0062	**15.6**
250	13.0	24.3	4.92	8.1	14.6	0.01278	0.0030	**14.6**
1440	10.0	24.2	4.97	5.0	9.1	0.01279	0.0013	**9.1**

Soil Specimen Data		**Other Corrections**	
Wgt. of Dry Material (gm)	54.58	Hygroscopic Moisture Factor	0.994
Weight of Deflocculant (gm)	5.0		
		a - Factor	0.99
		Percent Finer than # 10	100.00
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By [illegible] Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID #	2011-373-01-01		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve		
3/8" Sieve		
#4 Sieve		
#10 Sieve	G884	9/15/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker		
#200 Wash Sieve		
Oven		

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID #	2011-373-01-01		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1158	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G357	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID	2011-373-01-01	Soil Description	**GRAY SILTY CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	38	43	53
Wt. of Tare & WS (gm)	44.87	43.47	45.74
Wt. of Tare & DS (gm)	39.74	38.64	40.21
Wt. of Tare (gm)	18.34	19.03	18.82
Wt. of Water (gm)	5.1	4.8	5.5
Wt. of DS (gm)	21.4	19.6	21.4
Moisture Content (%)	**24.0**	**24.6**	**25.9**
Number of Blows	**32**	**23**	**18**

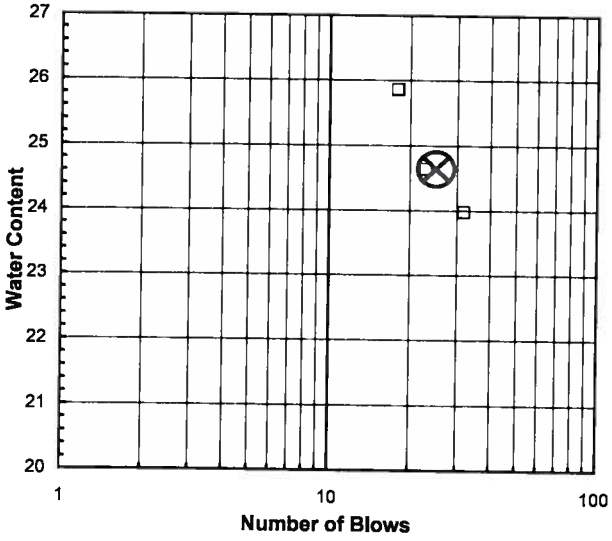
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	113	147	
Wt. of Tare & WS (gm)	24.88	26.77	
Wt. of Tare & DS (gm)	23.95	25.82	
Wt. of Tare (gm)	18.82	20.42	
Wt. of Water (gm)	0.9	0.9	
Wt. of DS (gm)	5.1	5.4	
Moisture Content (%)	**18.1**	**17.6**	**0.5**

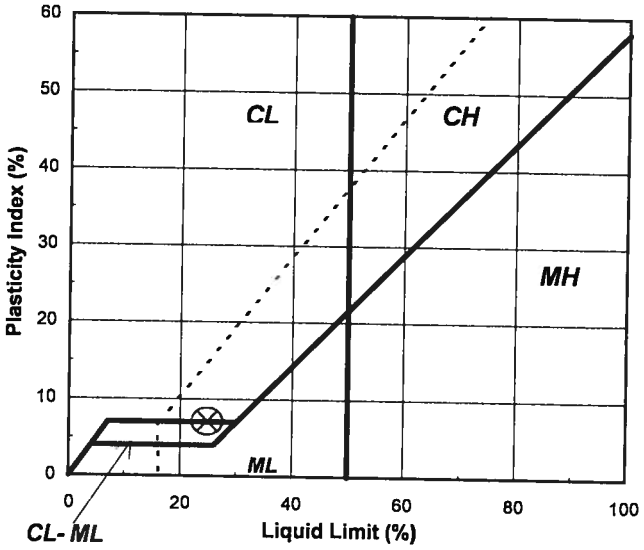
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**25**
Plastic Limit (%)	**18**
Plasticity Index (%)	**7**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



Tested By JP *Date* 8/3/2011 *Checked By* RJO *Date* 8-10-11

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.80-14.00
Project No.	2011-373-01	Sample No.	R-11
Lab ID	2011-373-01-01		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G284	12/13/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

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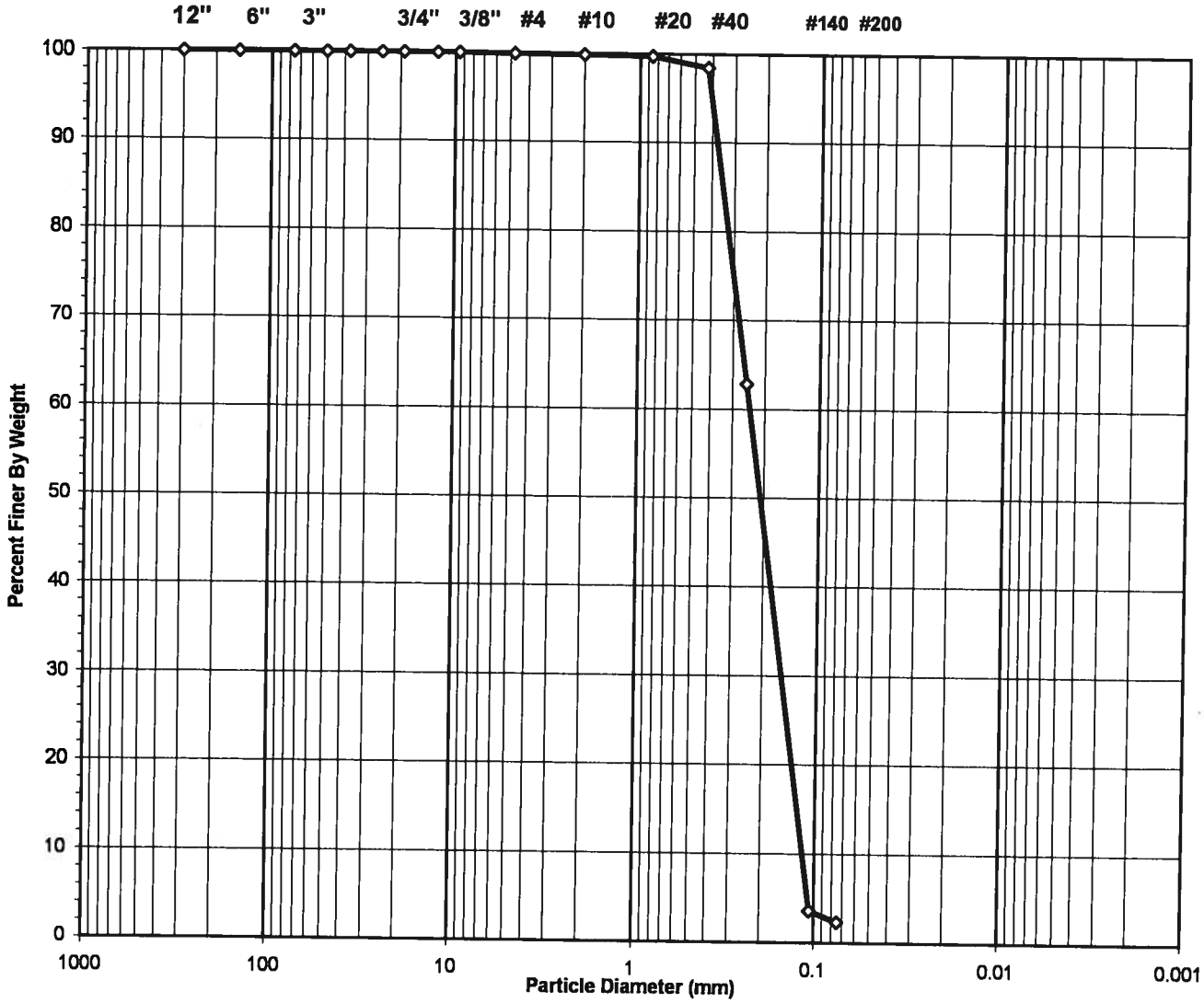
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	20.96-21.94
Project No.	2011-373-01	Sample No.	R-19
Lab ID	2011-373-01-02	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	*SP, TESTED*	D60 =	0.24	CC =	0.87
USCS Classification	*POORLY GRADED SAND*	D30 =	0.16	CU =	2.06
		D10 =	0.12		

Tested By PC Date 8/4/11 Checked By RTO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	20.96-21.94
Project No.	2011-373-01	Sample No.	R-19
Lab ID	2011-373-01-02	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	957	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	475.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	460.82	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	102.48	Weight of Tare (gm)	NA
Weight of Water (gm)	14.18	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	358.34	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**4.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	358.34
Dry Weight - 3/4" Sample (gm)	350.1	Weight of minus #200 material (gm)	8.24
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	350.10
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.13	0.04	0.04	99.96	**99.96**
#10	2.00	0.43	0.12	0.16	99.84	**99.84**
#20	0.850	0.46	0.13	0.28	99.72	**99.72**
#40	0.425	4.46	1.24	1.53	98.47	**98.47**
#60	0.250	127.70	35.64	37.17	62.83	**62.83**
#140	0.106	212.30	59.25	96.41	3.59	**3.59**
#200	0.075	4.62	1.29	97.70	2.30	**2.30**
Pan	-	8.24	2.30	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-4-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	20.96-21.94
Project No.	2011-373-01	Sample No.	R-19
Lab ID #	2011-373-01-02		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

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ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	20.96-21.94
Project No.	2011-373-01	Sample No.	R-19
Lab ID	2011-373-01-02	Visual	**GRAY SAND**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-4-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	20.96-21.94
Project No.	2011-373-01	Sample No.	R-19
Lab ID	2011-373-01-02		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	66.47-67.44
Project No.	2011-373-01	Sample No.	R-66
Lab ID	2011-373-01-03	Soil Color	**BLACK**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	66.47-67.44
Project No.	2011-373-01	Sample No.	R-66
Lab ID	2011-373-01-03	Soil Color	**BLACK**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	680	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	451.17	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	430.51	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	92.25	Weight of Tare (gm)	NA
Weight of Water (gm)	20.66	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	338.26	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**6.1**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	338.26
Dry Weight - 3/4" Sample (gm)	295.1	Weight of minus #200 material (gm)	43.18
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	295.08
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.05	0.01	0.01	99.99	**99.99**
#20	0.850	2.38	0.70	0.72	99.28	**99.28**
#40	0.425	6.77	2.00	2.72	97.28	**97.28**
#60	0.250	59.34	17.54	20.26	79.74	**79.74**
#140	0.106	203.62	60.20	80.46	19.54	**19.54**
#200	0.075	22.92	6.78	87.23	12.77	**12.77**
Pan	-	43.18	12.77	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	66.47-67.44
Project No.	2011-373-01	Sample No.	R-66
Lab ID #	2011-373-01-03		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	66.47-67.44
Project No.	2011-373-01	Sample No.	R-66
Lab ID	2011-373-01-03	Visual	**BLACK SILT**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	66.47-67.44
Project No.	2011-373-01	Sample No.	R-66
Lab ID	2011-373-01-03		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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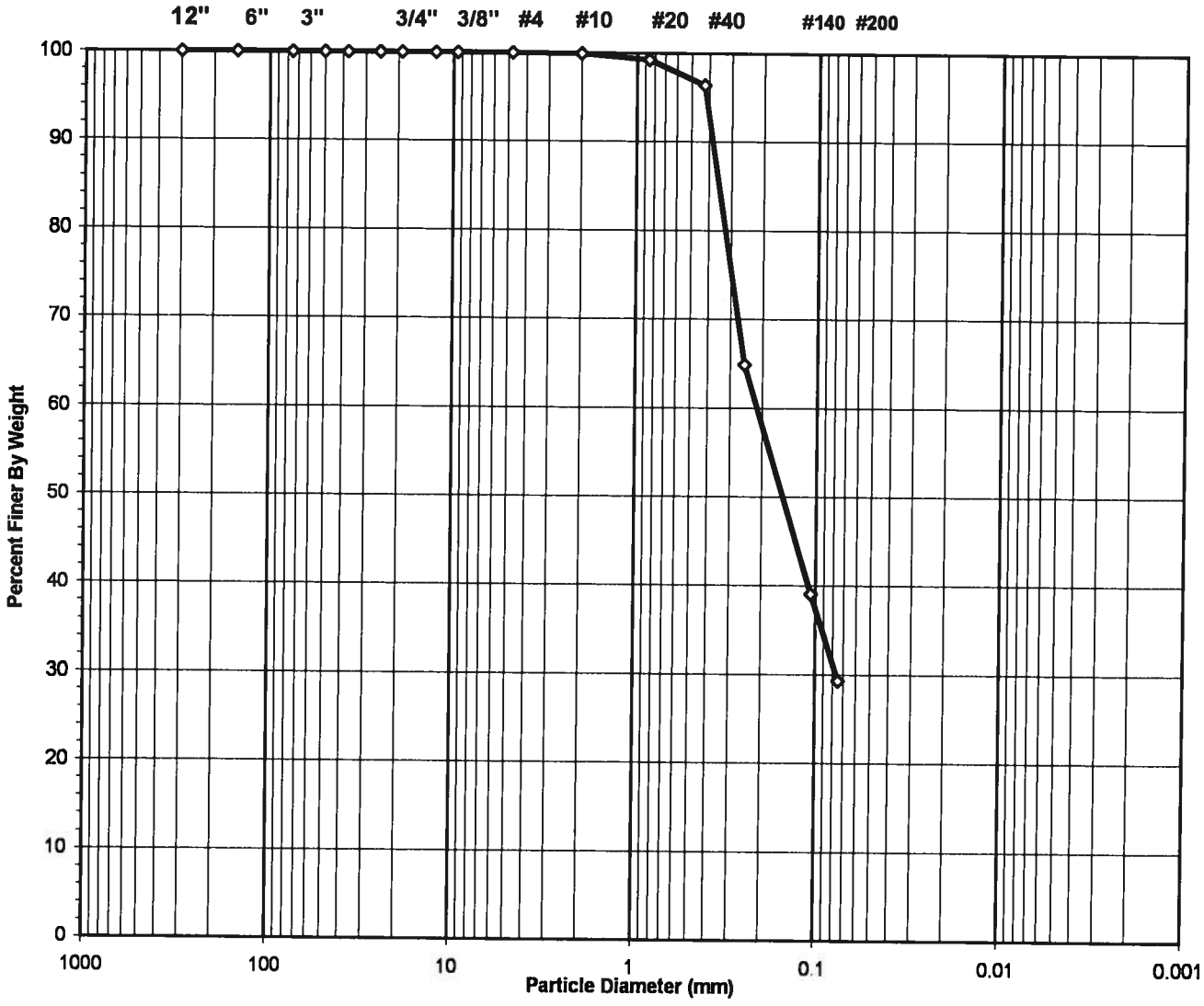
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	80.99-81.86
Project No.	2011-373-01	Sample No.	R-79
Lab ID	2011-373-01-04	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	80.99-81.86
Project No.	2011-373-01	Sample No.	R-79
Lab ID	2011-373-01-04	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	975	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	541.71	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	521.64	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	98.91	Weight of Tare (gm)	NA
Weight of Water (gm)	20.07	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	422.73	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**4.7**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	422.73
Dry Weight - 3/4" Sample (gm)	298.7	Weight of minus #200 material (gm)	124.06
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	298.67
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.28	0.07	0.07	99.93	**99.93**
#20	0.850	2.84	0.67	0.74	99.26	**99.26**
#40	0.425	12.17	2.88	3.62	96.38	**96.38**
#60	0.250	133.18	31.50	35.12	64.88	**64.88**
#140	0.106	109.03	25.79	60.91	39.09	**39.09**
#200	0.075	41.17	9.74	70.65	29.35	**29.35**
Pan	-	124.06	29.35	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	80.99-81.86
Project No.	2011-373-01	Sample No.	R-79
Lab ID #	2011-373-01-04		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	80.99-81.86
Project No.	2011-373-01	Sample No.	R-79
Lab ID	2011-373-01-04	Visual	**GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN CT-S4C DATE 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	80.99-81.86
Project No.	2011-373-01	Sample No.	R-79
Lab ID	2011-373-01-04		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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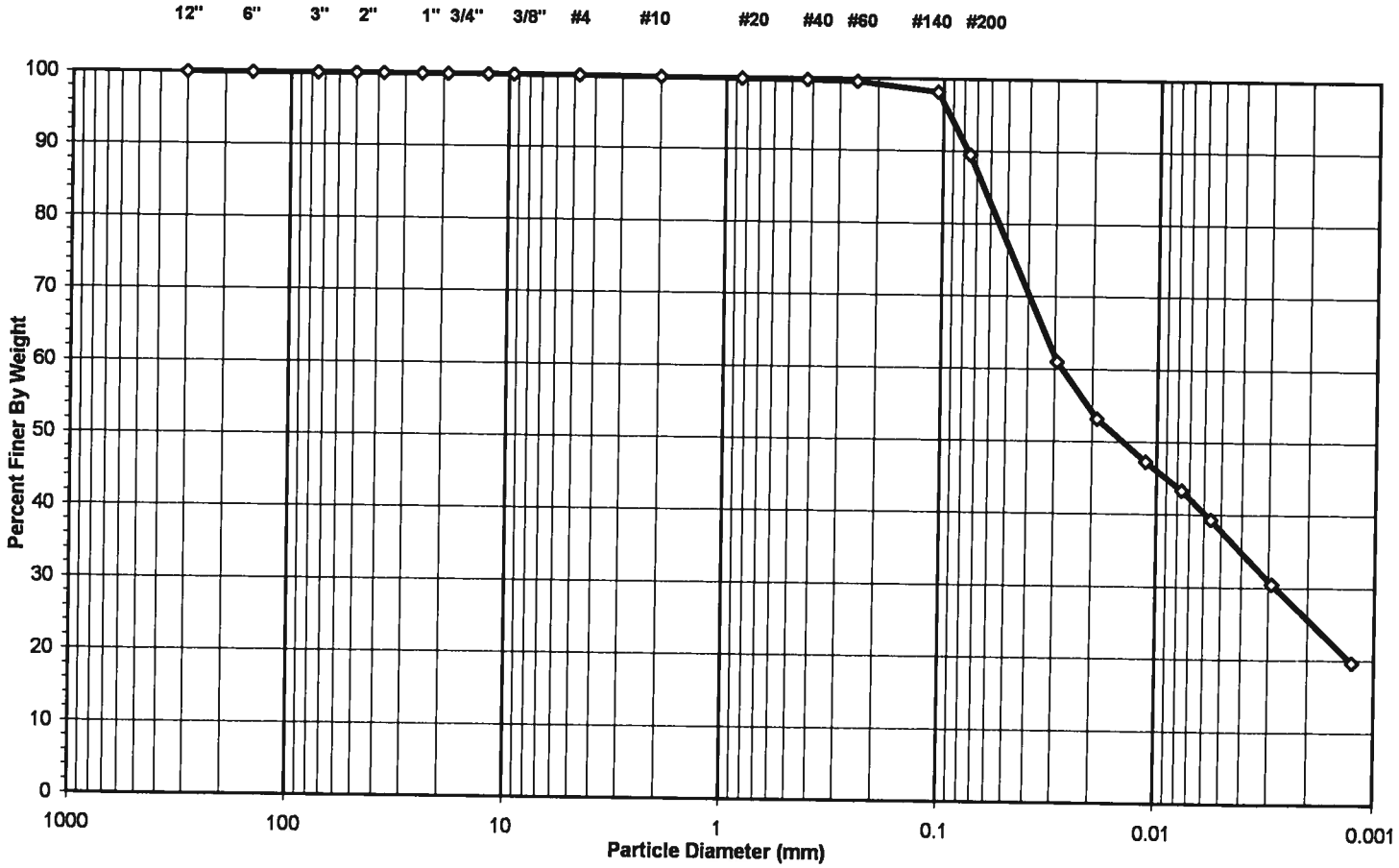
Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID	2011-373-01-05	Soil Color	**GRAY**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	10.47
Finer Than #200	*Silt & Clay*	89.53

USCS Symbol *CH, TESTED*

USCS Classification *FAT CLAY*

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID	2011-373-01-05	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		**Hydrometer Specimen Data**	
Tare No.	10	Air Dried - #10 Hydrometer Material (gm)	51.59
Wgt.Tare + Wet Soil (gm)	21.68	Corrected Dry Wt. of - #10 Material (gm)	50.48
Wgt.Tare + Dry Soil (gm)	21.39		
Weight of Tare (gm)	8.28	Weight of - #200 Material (gm)	45.23
Weight of Water (gm)	0.29	Weight of - #10 ; + #200 Material (gm)	5.25
Weight of Dry Soil (gm)	13.11		
Moisture Content (%)	**2.2**	**J-FACTOR (%FINER THAN #10)**	**0.9992**
Soil Specimen Data			
Tare No.	968		
Wgt.Tare + Air Dry Soil (gm)	357.80		
Weight of Tare (gm)	102.26		
Air Dried Wgt. Total Sample (gm)	255.54	Dry Weight of Material Retained on #10 (gm)	0.19
Total Dry Sample Weight (gm)	250.05	Corrected Dry Sample Wt - #10 (gm)	249.86

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.19	0.1	0.1	99.9	**99.9**
#20	0.85	0.06	0.1	0.1	99.9	**99.8**
#40	0.425	0.05	0.1	0.2	99.8	**99.7**
#60	0.250	0.05	0.1	0.3	99.7	**99.6**
#140	0.106	0.69	1.4	1.7	98.3	**98.2**
#200	0.075	4.40	8.7	10.4	89.6	**89.5**
Pan	-	45.23	89.6	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By DJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID	2011-373-01-05	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	36.0	24.4	4.88	31.1	61.0	0.01276	0.0291	**61.0**
5	32.0	24.4	4.88	27.1	53.2	0.01276	0.0190	**53.1**
15	29.0	24.4	4.88	24.1	47.3	0.01276	0.0112	**47.3**
33	27.0	24.4	4.88	22.1	43.4	0.01276	0.0077	**43.3**
64	25.0	24.3	4.92	20.1	39.4	0.01278	0.0056	**39.3**
250	20.5	24.3	4.92	15.6	30.5	0.01278	0.0029	**30.5**
1440	15.0	24.2	4.97	10.0	19.7	0.01279	0.0013	**19.7**

Soil Specimen Data		**Other Corrections**	
Wgt. of Dry Material (gm)	50.48	Hygroscopic Moisture Factor	0.979
Weight of Deflocculant (gm)	5.0		
		a - Factor	0.99
		Percent Finer than # 10	99.92
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJS Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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INTEGRITY IN TESTING

SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID #	2011-373-01-05		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker	G1067	9/21/11
#10 Wash Sieve	G415	11/2/11

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INTEGRITY IN TESTING

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID #	2011-373-01-05		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1159	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G368	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11

Geotechnics
INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID	2011-373-01-05	Soil Description	**GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

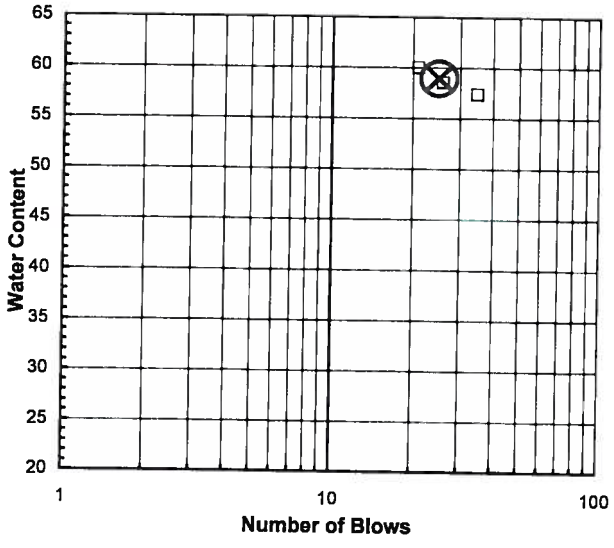
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	267	335	110	MULTIPOINT
Wt. of Tare & WS (gm)	33.95	41.99	37.77	
Wt. of Tare & DS (gm)	26.44	33.77	29.21	
Wt. of Tare (gm)	13.34	19.72	14.94	
Wt. of Water (gm)	7.5	8.2	8.6	
Wt. of DS (gm)	13.1	14.1	14.3	
Moisture Content (%)	**57.3**	**58.5**	**60.0**	
Number of Blows	**35**	**26**	**21**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	182	700	
Wt. of Tare & WS (gm)	24.88	25.32	
Wt. of Tare & DS (gm)	23.94	24.44	
Wt. of Tare (gm)	18.56	19.17	
Wt. of Water (gm)	0.9	0.9	
Wt. of DS (gm)	5.4	5.3	
Moisture Content (%)	**17.5**	**16.7**	**0.8**

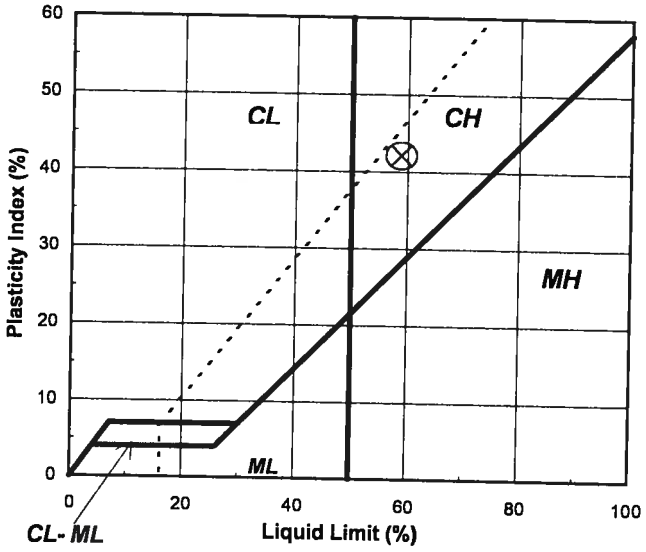
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**59**
Plastic Limit (%)	**17**
Plasticity Index (%)	**42**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	97.18-97.73
Project No.	2011-373-01	Sample No.	ST-5
Lab ID	2011-373-01-05		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G264	10/25/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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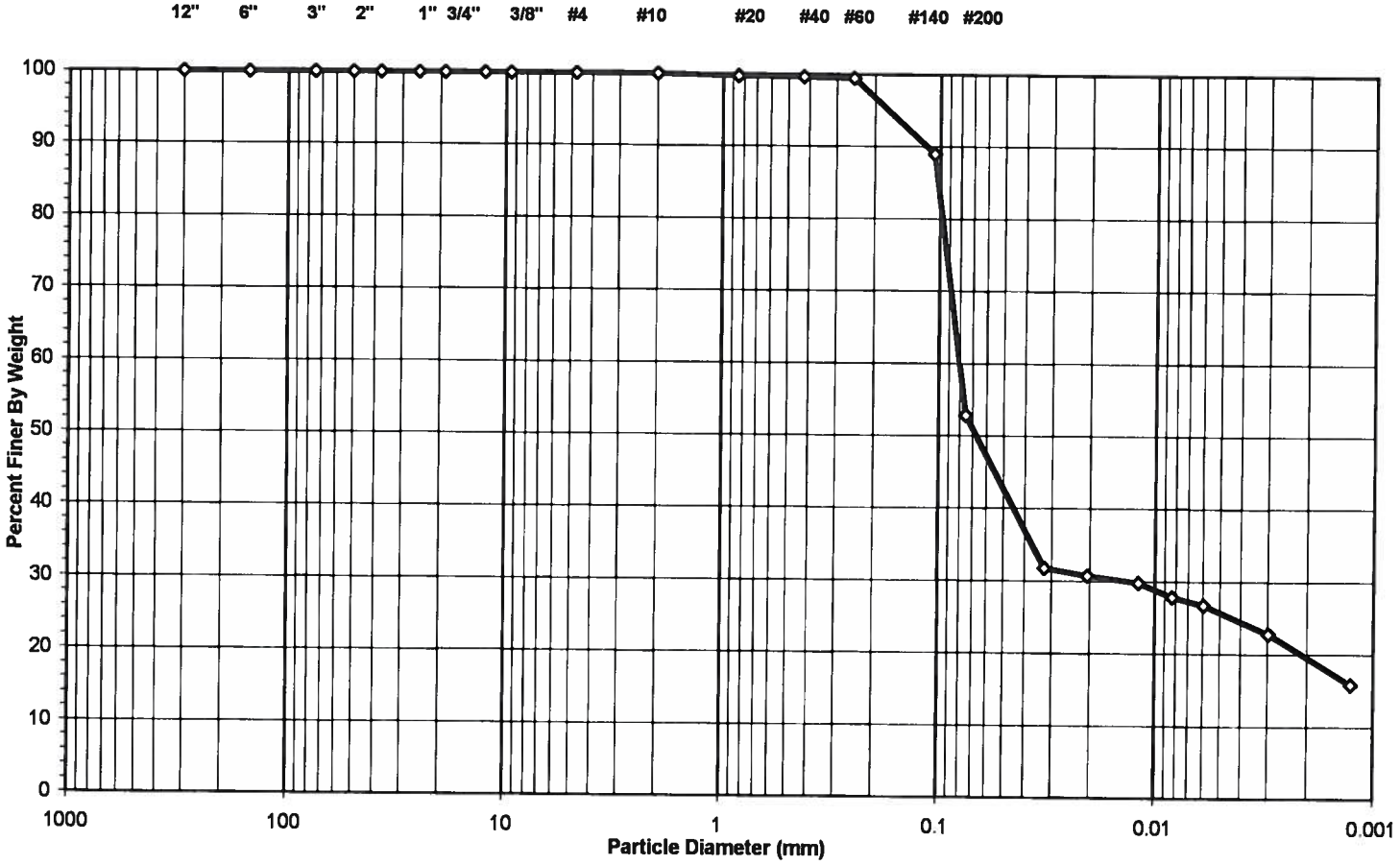
Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID	2011-373-01-06	Soil Color	**GRAY**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	47.20
Finer Than #200	*Silt & Clay*	52.80

USCS Symbol *CL, TESTED*

USCS Classification ***SANDY LEAN CLAY***

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID	2011-373-01-06	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		**Hydrometer Specimen Data**	
Tare No.	31	Air Dried - #10 Hydrometer Material (gm)	51.18
Wgt.Tare + Wet Soil (gm)	20.18	Corrected Dry Wt. of - #10 Material (gm)	50.24
Wgt.Tare + Dry Soil (gm)	19.96		
Weight of Tare (gm)	8.26	Weight of - #200 Material (gm)	26.53
Weight of Water (gm)	0.22	Weight of - #10 ; + #200 Material (gm)	23.71
Weight of Dry Soil (gm)	11.70		
Moisture Content (%)	**1.9**	**J-FACTOR (%FINER THAN #10)**	**1.0000**
Soil Specimen Data			
Tare No.	929		
Wgt.Tare + Air Dry Soil (gm)	313.83		
Weight of Tare (gm)	102.62		
Air Dried Wgt. Total Sample (gm)	211.21	Dry Weight of Material Retained on #10 (gm)	0.00
Total Dry Sample Weight (gm)	207.31	Corrected Dry Sample Wt - #10 (gm)	207.31

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.00	0.0	0.0	100.0	**100.0**
#20	0.85	0.14	0.3	0.3	99.7	**99.7**
#40	0.425	0.04	0.1	0.4	99.6	**99.6**
#60	0.250	0.08	0.2	0.5	99.5	**99.5**
#140	0.106	5.27	10.5	11.0	89.0	**89.0**
#200	0.075	18.18	36.2	47.2	52.8	**52.8**
Pan	-	26.53	52.8	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By [illegible] Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID	2011-373-01-06	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	21.0	24.4	4.88	16.1	31.8	0.01276	0.0324	**31.8**
5	20.5	24.4	4.88	15.6	30.8	0.01276	0.0205	**30.8**
15	20.0	24.4	4.88	15.1	29.8	0.01276	0.0119	**29.8**
31	19.0	24.4	4.88	14.1	27.8	0.01276	0.0083	**27.8**
61	18.5	24.3	4.92	13.6	26.8	0.01278	0.0060	**26.8**
250	16.5	24.3	4.92	11.6	22.8	0.01278	0.0030	**22.8**
1440	13.0	24.2	4.97	8.0	15.8	0.01279	0.0013	**15.8**

Soil Specimen Data		**Other Corrections**	
Wgt. of Dry Material (gm)	50.24	Hygroscopic Moisture Factor	0.982
Weight of Deflocculant (gm)	5.0		
		a - Factor	0.99
		Percent Finer than # 10	100.00
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID #	2011-373-01-06		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve		
3/8" Sieve		
#4 Sieve		
#10 Sieve	G884	9/15/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker		
#10 Wash Sieve		

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID #	2011-373-01-06		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1159	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G370	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11

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ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID	2011-373-01-06	Soil Description	**GRAY LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	309	316	319
Wt. of Tare & WS (gm)	40.13	39.08	40.44
Wt. of Tare & DS (gm)	34.50	33.37	34.20
Wt. of Tare (gm)	19.31	18.36	18.31
Wt. of Water (gm)	5.6	5.7	6.2
Wt. of DS (gm)	15.2	15.0	15.9
Moisture Content (%)	**37.1**	**38.0**	**39.3**
Number of Blows	**31**	**26**	**21**

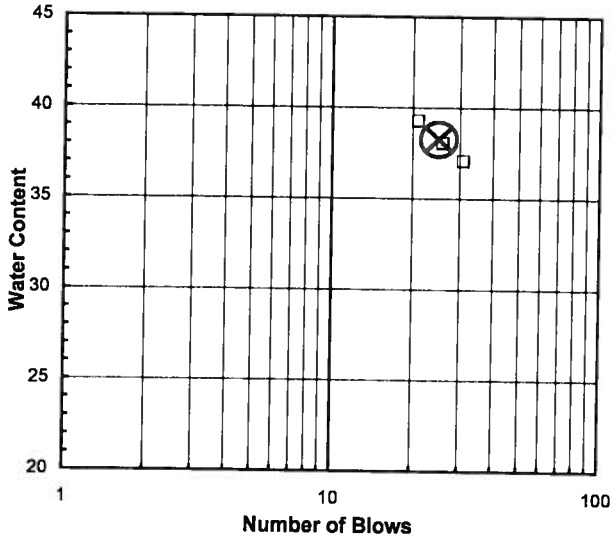
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	0	151	
Wt. of Tare & WS (gm)	26.42	25.44	
Wt. of Tare & DS (gm)	25.34	24.45	
Wt. of Tare (gm)	20.12	19.17	
Wt. of Water (gm)	1.1	1.0	
Wt. of DS (gm)	5.2	5.3	
Moisture Content (%)	**20.7**	**18.8**	**1.9**

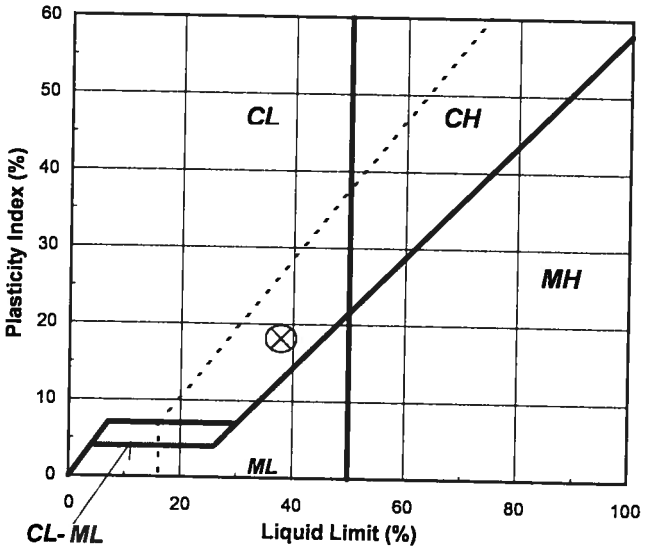
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**38**
Plastic Limit (%)	**20**
Plasticity Index (%)	**18**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

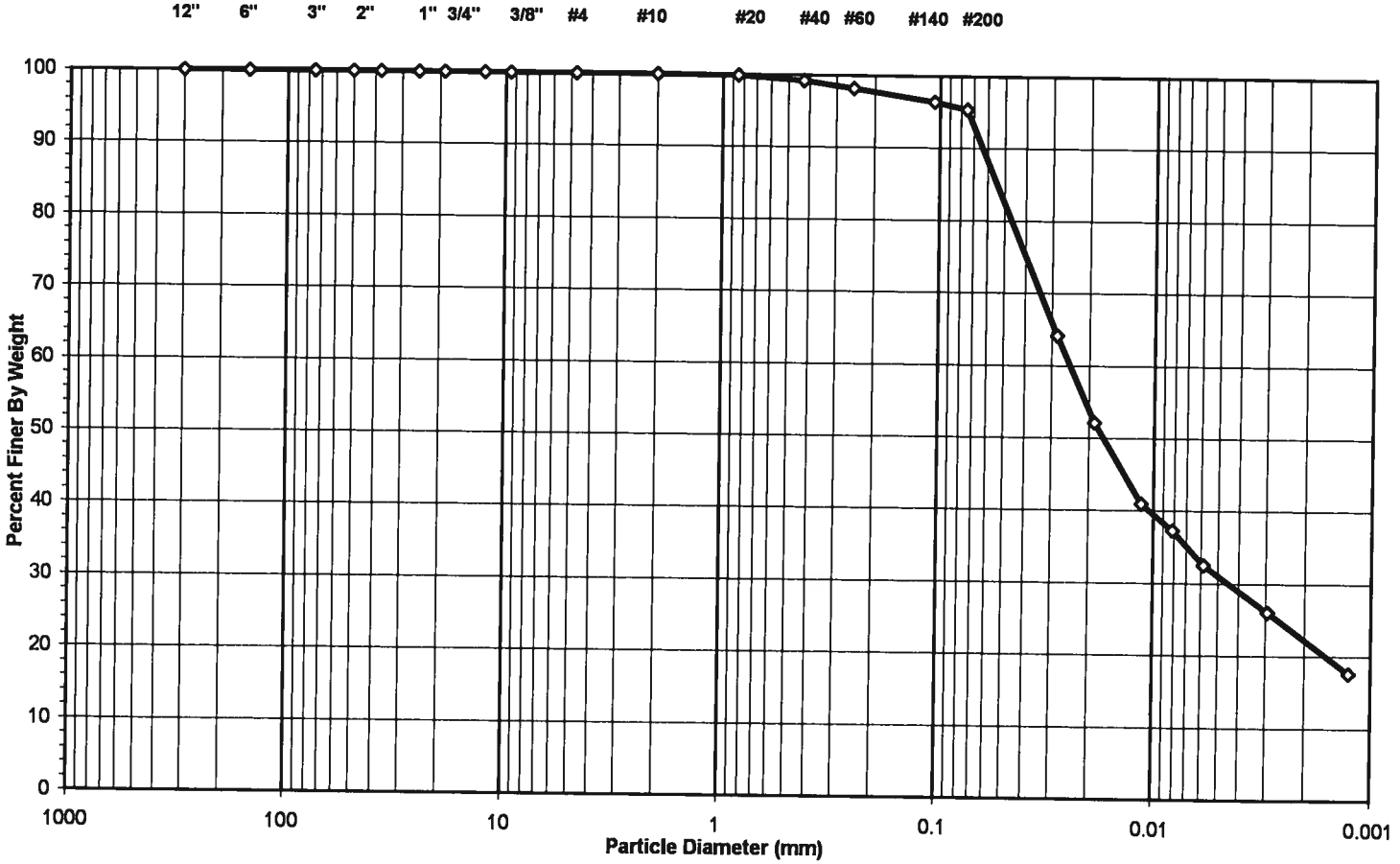
Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	108.26-108.81
Project No.	2011-373-01	Sample No.	ST-7
Lab ID	2011-373-01-06		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G284	12/13/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID	2011-373-01-07	Soil Color	**GRAY**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	4.62
Finer Than #200	*Silt & Clay*	95.38

USCS Symbol *CH, TESTED*

USCS Classification *FAT CLAY*

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID	2011-373-01-07	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		Hydrometer Specimen Data	
Tare No.	23	Air Dried - #10 Hydrometer Material (gm)	54.44
Wgt.Tare + Wet Soil (gm)	21.09	Corrected Dry Wt. of - #10 Material (gm)	53.41
Wgt.Tare + Dry Soil (gm)	20.85		
Weight of Tare (gm)	8.38	Weight of - #200 Material (gm)	50.94
Weight of Water (gm)	0.24	Weight of - #10 ; + #200 Material (gm)	2.47
Weight of Dry Soil (gm)	12.47		
Moisture Content (%)	**1.9**	**J-FACTOR (%FINER THAN #10)**	**1.0000**
Soil Specimen Data			
Tare No.	919		
Wgt.Tare + Air Dry Soil (gm)	240.16		
Weight of Tare (gm)	101.86		
Air Dried Wgt. Total Sample (gm)	138.30	Dry Weight of Material Retained on #10 (gm)	0.00
Total Dry Sample Weight (gm)	135.69	Corrected Dry Sample Wt - #10 (gm)	135.69

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.00	0.0	0.0	100.0	**100.0**
#20	0.85	0.06	0.1	0.1	99.9	**99.9**
#40	0.425	0.33	0.6	0.7	99.3	**99.3**
#60	0.250	0.57	1.1	1.8	98.2	**98.2**
#140	0.106	0.93	1.7	3.5	96.5	**96.5**
#200	0.075	0.58	1.1	4.6	95.4	**95.4**
Pan	-	50.94	95.4	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID	2011-373-01-07	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	39.5	24.4	4.88	34.6	64.2	0.01276	0.0283	**64.2**
5	33.0	24.4	4.88	28.1	52.1	0.01276	0.0188	**52.1**
15	27.0	24.4	4.88	22.1	41.0	0.01276	0.0114	**41.0**
30	25.0	24.4	4.88	20.1	37.3	0.01276	0.0081	**37.3**
60	22.5	24.3	4.92	17.6	32.6	0.01278	0.0059	**32.6**
250	19.0	24.3	4.92	14.1	26.1	0.01278	0.0029	**26.1**
1440	14.5	24.2	4.97	9.5	17.7	0.01279	0.0013	**17.7**

Soil Specimen Data		**Other Corrections**	
Wgt. of Dry Material (gm)	53.41	Hygroscopic Moisture Factor	0.981
Weight of Deflocculant (gm)	5.0	a - Factor	0.99
		Percent Finer than # 10	100.00
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By TJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID #	2011-373-01-07		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve		
3/8" Sieve		
#4 Sieve		
#10 Sieve		
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker	G1067	9/21/11
#10 Wash Sieve	G415	11/2/11

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID #	2011-373-01-07		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1159	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G198	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID	2011-373-01-07	Soil Description	**GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

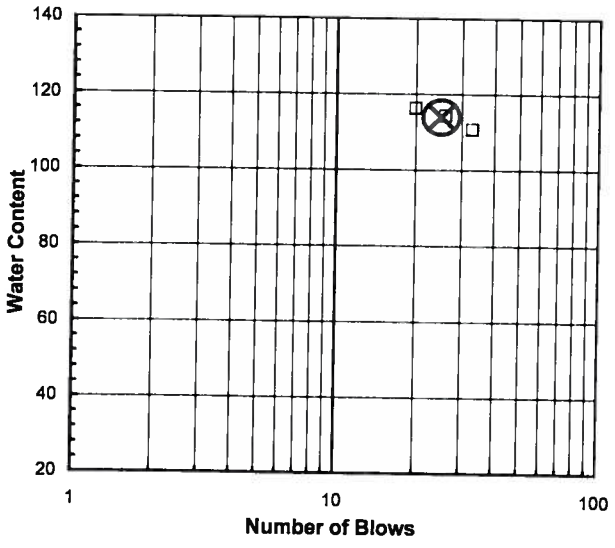
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	287	296	317	MULTIPOINT
Wt. of Tare & WS (gm)	39.19	39.14	39.41	
Wt. of Tare & DS (gm)	28.47	28.28	28.29	
Wt. of Tare (gm)	18.78	18.77	18.72	
Wt. of Water (gm)	10.7	10.9	11.1	
Wt. of DS (gm)	9.7	9.5	9.6	
Moisture Content (%)	**110.6**	**114.2**	**116.2**	
Number of Blows	**33**	**26**	**20**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	240	354	
Wt. of Tare & WS (gm)	26.06	26.63	
Wt. of Tare & DS (gm)	24.68	25.31	
Wt. of Tare (gm)	19.87	20.46	
Wt. of Water (gm)	1.4	1.3	
Wt. of DS (gm)	4.8	4.9	
Moisture Content (%)	**28.7**	**27.2**	**1.5**

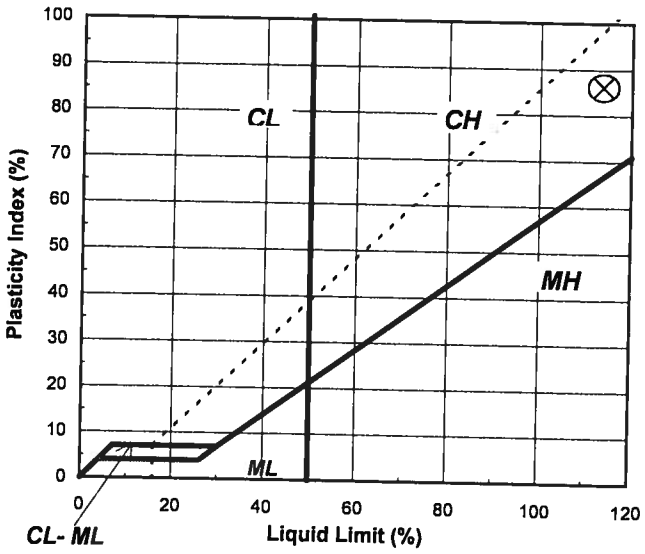
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**114**
Plastic Limit (%)	**28**
Plasticity Index (%)	**86**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By JP *Date* 8/3/2011 *Checked By* RJO *Date* 8-10-11

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	162.30-163.30
Project No.	2011-373-01	Sample No.	R-159
Lab ID	2011-373-01-07		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G284	12/13/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

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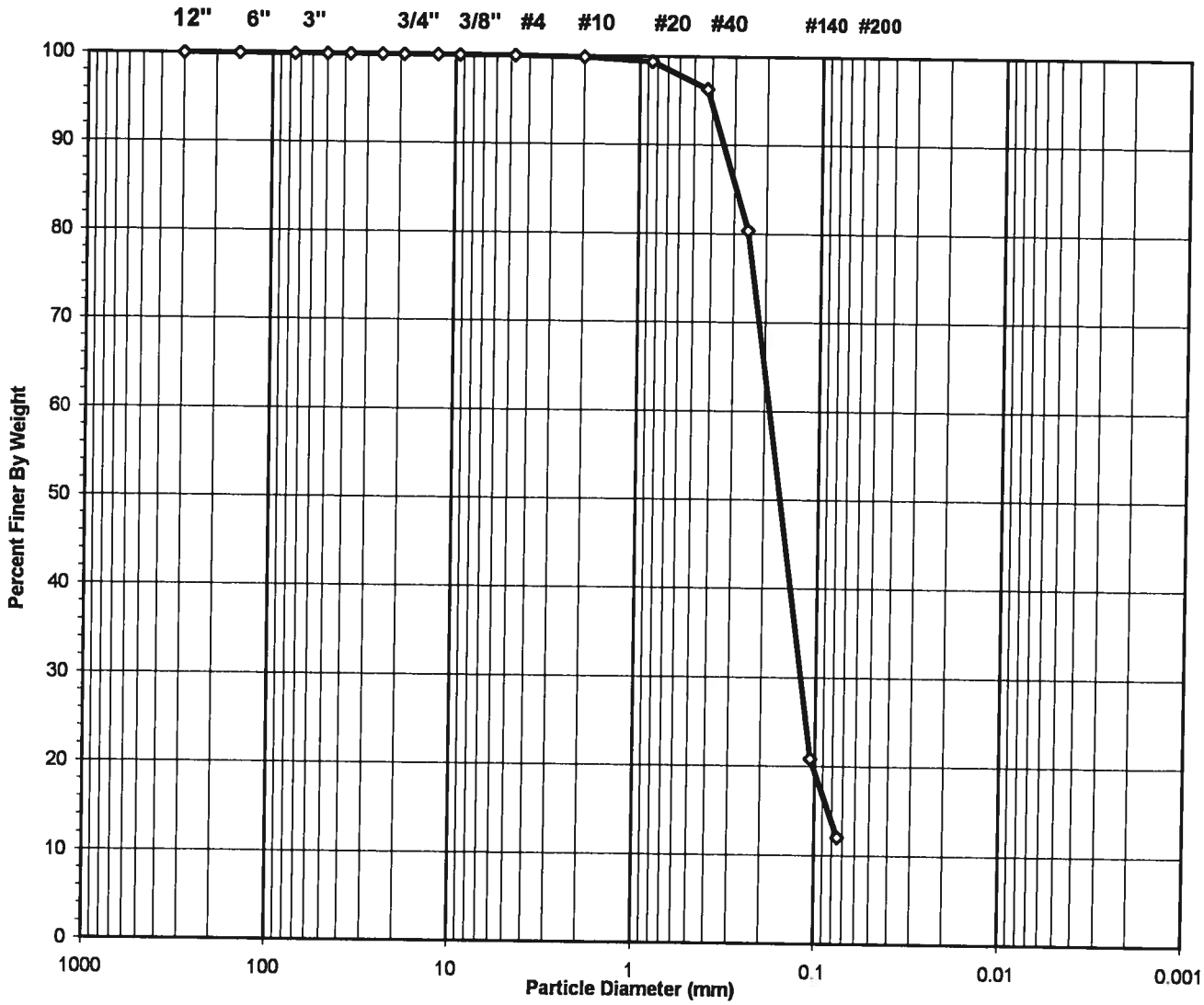
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	65.80-66.80
Project No.	2011-373-01	Sample No.	R-38
Lab ID	2011-373-01-08	Soil Color	BLACK

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

Tested By PC Date 8/4/11 Checked By RJO Date 8-4-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	65.80-66.80
Project No.	2011-373-01	Sample No.	R-38
Lab ID	2011-373-01-08	Soil Color	**BLACK**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	961	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	519.76	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	489.24	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.56	Weight of Tare (gm)	NA
Weight of Water (gm)	30.52	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	387.68	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**7.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	387.68
Dry Weight - 3/4" Sample (gm)	341.0	Weight of minus #200 material (gm)	46.72
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	340.96
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.41	0.11	0.11	99.89	**99.89**
#20	0.850	1.99	0.51	0.62	99.38	**99.38**
#40	0.425	11.79	3.04	3.66	96.34	**96.34**
#60	0.250	61.84	15.95	19.61	80.39	**80.39**
#140	0.106	230.80	59.53	79.15	20.85	**20.85**
#200	0.075	34.13	8.80	87.95	12.05	**12.05**
Pan	-	46.72	12.05	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	65.80-66.80
Project No.	2011-373-01	Sample No.	R-38
Lab ID #	2011-373-01-08		

Equipment	Equipment ID#	Callbration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	65.80-66.80
Project No.	2011-373-01	Sample No.	R-38
Lab ID	2011-373-01-08	Visual	**BLACK SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-4-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	65.80-66.80
Project No.	2011-373-01	Sample No.	R-38
Lab ID	2011-373-01-08		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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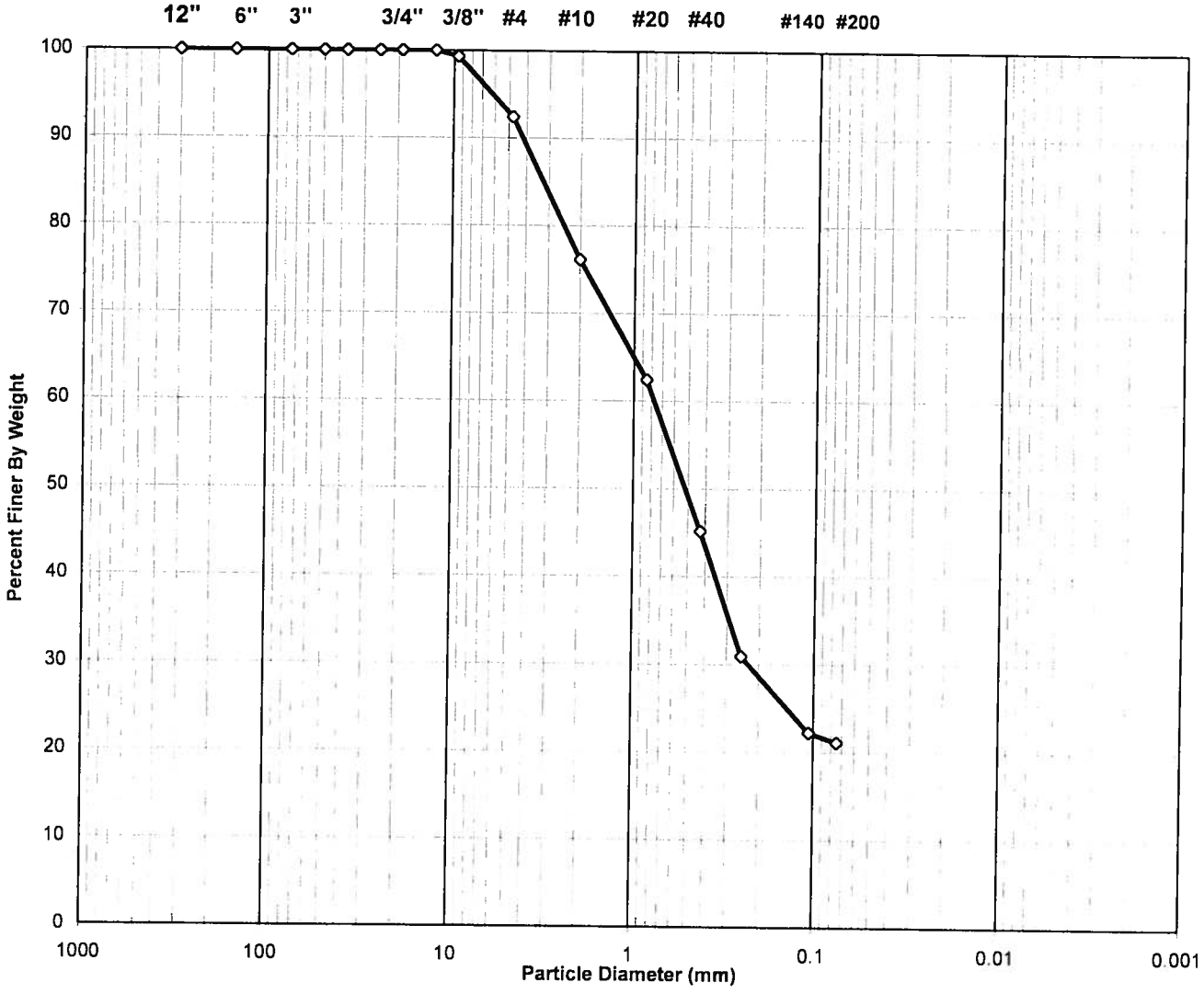
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-105
Client Reference	KCB-2 DELTA 104472	Depth (m)	25.74-26.34
Project No.	2011-373-01	Sample No.	S-43
Lab ID	2011-373-01-09	Soil Color	**GRAY**

USCS	*SIEVE ANALYSIS*		*HYDROMETER*
	gravel	**sand**	**silt and clay**



USCS Symbol ***SC, TESTED***

USCS Classification ***CLAYEY SAND***

Tested By PC Date 8/9/11 Checked By RTO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-105
Client Reference	KCB-2 DELTA 104472	Depth (m)	25.74-26.34
Project No.	2011-373-01	Sample No.	S-43
Lab ID	2011-373-01-09	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	922	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	431.35	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	431.35	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.44	Weight of Tare (gm)	NA
Weight of Water (gm)	0.00	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	329.91	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**0.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	329.91
Dry Weight - 3/4" Sample (gm)	260.3	Weight of minus #200 material (gm)	69.64
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	260.27
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	2.25	0.68	0.68	99.32	**99.32**
#4	4.75	22.81	6.91	7.60	92.40	**92.40**
#10	2.00	53.76	16.30	23.89	76.11	**76.11**
#20	0.850	45.25	13.72	37.61	62.39	**62.39**
#40	0.425	57.01	17.28	54.89	45.11	**45.11**
#60	0.250	46.99	14.24	69.13	30.87	**30.87**
#140	0.106	28.50	8.64	77.77	22.23	**22.23**
#200	0.075	3.70	1.12	78.89	21.11	**21.11**
Pan	-	69.64	21.11	100.00	-	-

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-105
Client Reference	KCB-2 DELTA 104472	Depth (m)	25.74-26.34
Project No.	2011-373-01	Sample No.	S-43
Lab ID #	2011-373-01-09		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

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ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-105
Client Reference	KCB-2 DELTA 104472	Depth (m)	25.74-26.34
Project No.	2011-373-01	Sample No.	S-43
Lab ID	2011-373-01-09	Soil Description	**GRAY FAT CLAY**

Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

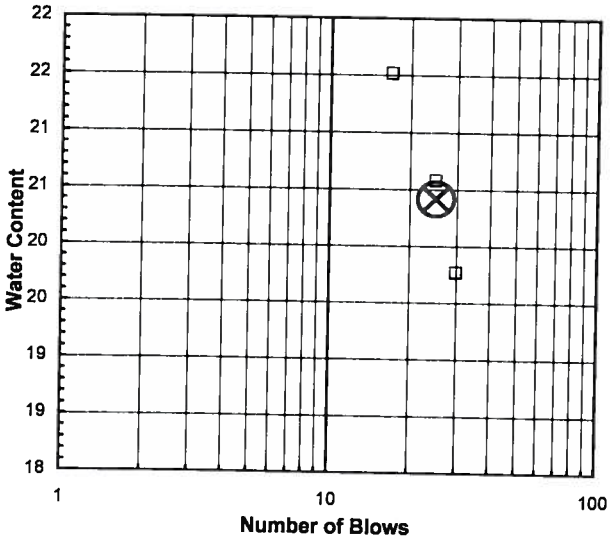
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	115	282	312	M
Wt. of Tare & WS (gm)	41.78	42.34	43.53	U
Wt. of Tare & DS (gm)	38.05	38.21	39.24	L
Wt. of Tare (gm)	19.18	18.14	19.30	T
Wt. of Water (gm)	3.7	4.1	4.3	I
Wt. of DS (gm)	18.9	20.1	19.9	P
				O
Moisture Content (%)	**19.8**	**20.6**	**21.5**	I
Number of Blows	**30**	**25**	**17**	N T

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	182	213	
Wt. of Tare & WS (gm)	24.68	25.16	
Wt. of Tare & DS (gm)	24.01	24.46	
Wt. of Tare (gm)	18.56	18.89	
Wt. of Water (gm)	0.7	0.7	
Wt. of DS (gm)	5.5	5.6	
Moisture Content (%)	**12.3**	**12.6**	**-0.3**

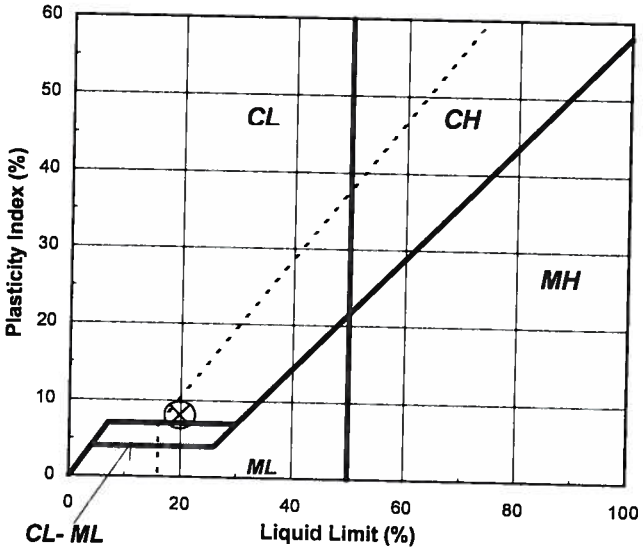
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**20**
Plastic Limit (%)	**12**
Plasticity Index (%)	**8**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-105
Client Reference	KCB-2 DELTA 104472	Depth (m)	25.74-26.34
Project No.	2011-373-01	Sample No.	S-43
Lab ID	2011-373-01-09		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G284	12/13/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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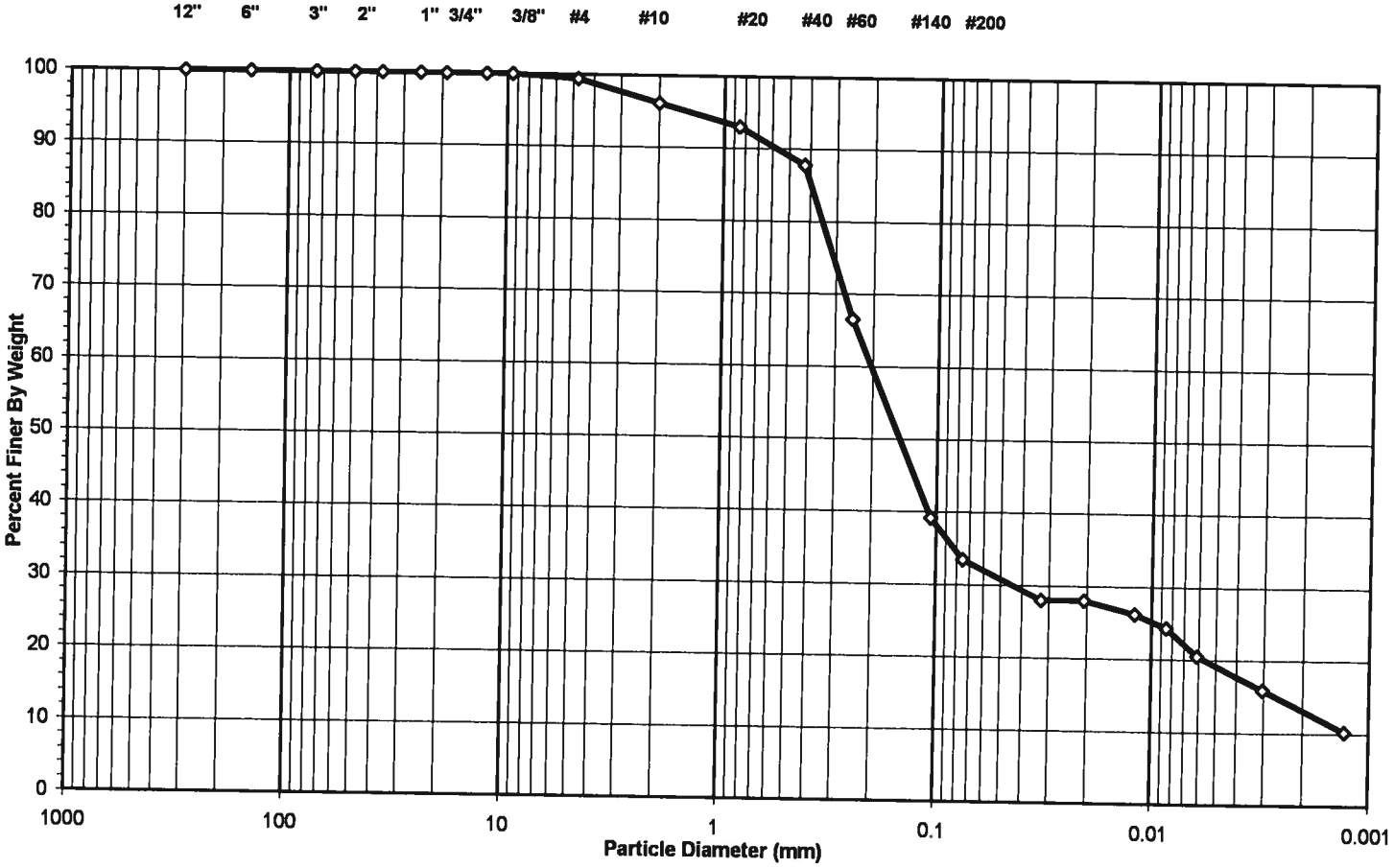
INTEGRITY IN TESTING

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID	2011-373-01-10	Soil Color	GRAY

	SIEVE ANALYSIS				HYDROMETER	
USCS	cobbles	gravel		sand	silt and clay fraction	
USDA	cobbles	gravel		sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.64
#4 To #200	*Sand*	65.85
Finer Than #200	*Silt & Clay*	33.51

USCS Symbol *SC-SM, TESTED*

USCS Classification *SILTY, CLAYEY SAND*

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID	2011-373-01-10	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		**Hydrometer Specimen Data**	
Tare No.	5	Air Dried - #10 Hydrometer Material (gm)	51.46
Wgt.Tare + Wet Soil (gm)	21.72	Corrected Dry Wt. of - #10 Material (gm)	51.34
Wgt.Tare + Dry Soil (gm)	21.69		
Weight of Tare (gm)	8.38	Weight of - #200 Material (gm)	17.88
Weight of Water (gm)	0.03	Weight of - #10 ; + #200 Material (gm)	33.46
Weight of Dry Soil (gm)	13.31		
Moisture Content (%)	**0.2**	**J-FACTOR (%FINER THAN #10)**	**0.9621**
Soil Specimen Data			
Tare No.	2349		
Wgt.Tare + Air Dry Soil (gm)	403.86		
Weight of Tare (gm)	98.00		
Air Dried Wgt. Total Sample (gm)	305.86	Dry Weight of Material Retained on #10 (gm)	11.57
Total Dry Sample Weight (gm)	305.20	Corrected Dry Sample Wt - #10 (gm)	293.63

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	1.94	0.6	0.6	99.4	**99.4**
#10	2.00	9.63	3.2	3.8	96.2	**96.2**
#20	0.85	1.71	3.3	3.3	96.7	**93.0**
#40	0.425	2.78	5.4	8.7	91.3	**87.8**
#60	0.250	11.34	22.1	30.8	69.2	**66.5**
#140	0.106	14.59	28.4	59.2	40.8	**39.2**
#200	0.075	3.04	5.9	65.2	34.8	**33.5**
Pan	-	17.88	34.8	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID	2011-373-01-10	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	20.0	24.4	4.88	15.1	29.2	0.01276	0.0326	**28.1**
5	20.0	24.4	4.88	15.1	29.2	0.01276	0.0206	**28.1**
15	19.0	24.4	4.88	14.1	27.2	0.01276	0.0120	**26.2**
30	18.0	24.4	4.88	13.1	25.3	0.01276	0.0085	**24.3**
60	16.0	24.3	4.92	11.1	21.4	0.01278	0.0061	**20.5**
250	13.5	24.3	4.92	8.6	16.5	0.01278	0.0030	**15.9**
1440	10.5	24.2	4.97	5.5	10.7	0.01279	0.0013	**10.3**

Soil Specimen Data		Other Corrections	
Wgt. of Dry Material (gm)	51.34	Hygroscopic Moisture Factor	0.998
Weight of Deflocculant (gm)	5.0	a - Factor	0.99
		Percent Finer than # 10	96.21
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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INTEGRITY IN TESTING

SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID #	2011-373-01-10		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker	G1067	9/21/11
#10 Wash Sieve	G415	11/2/11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID #	2011-373-01-10		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1160	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G358	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11

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ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID	2011-373-01-10	Soil Description	**GRAY SILTY CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	349	114	113
Wt. of Tare & WS (gm)	47.90	45.58	45.17
Wt. of Tare & DS (gm)	42.73	40.74	40.25
Wt. of Tare (gm)	18.37	18.61	18.81
Wt. of Water (gm)	5.2	4.8	4.9
Wt. of DS (gm)	24.4	22.1	21.4
Moisture Content (%)	**21.2**	**21.9**	**22.9**
Number of Blows	**27**	**23**	**17**

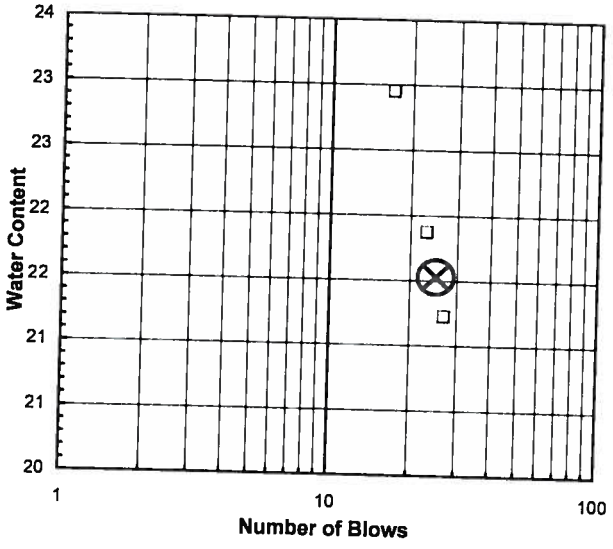
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	350	2301	
Wt. of Tare & WS (gm)	24.58	26.05	
Wt. of Tare & DS (gm)	23.73	25.24	
Wt. of Tare (gm)	18.31	19.80	
Wt. of Water (gm)	0.8	0.8	
Wt. of DS (gm)	5.4	5.4	
Moisture Content (%)	**15.7**	**14.9**	**0.8**

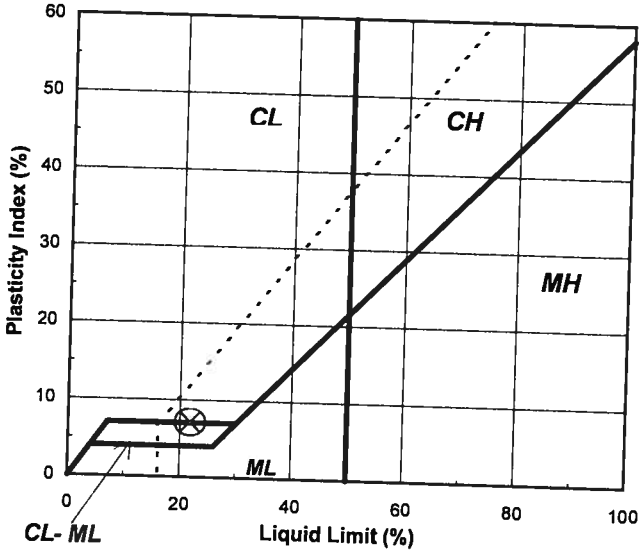
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**22**
Plastic Limit (%)	**15**
Plasticity Index (%)	**7**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	26.98-27.38
Project No.	2011-373-01	Sample No.	R-25A
Lab ID	2011-373-01-10		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G264	10/25/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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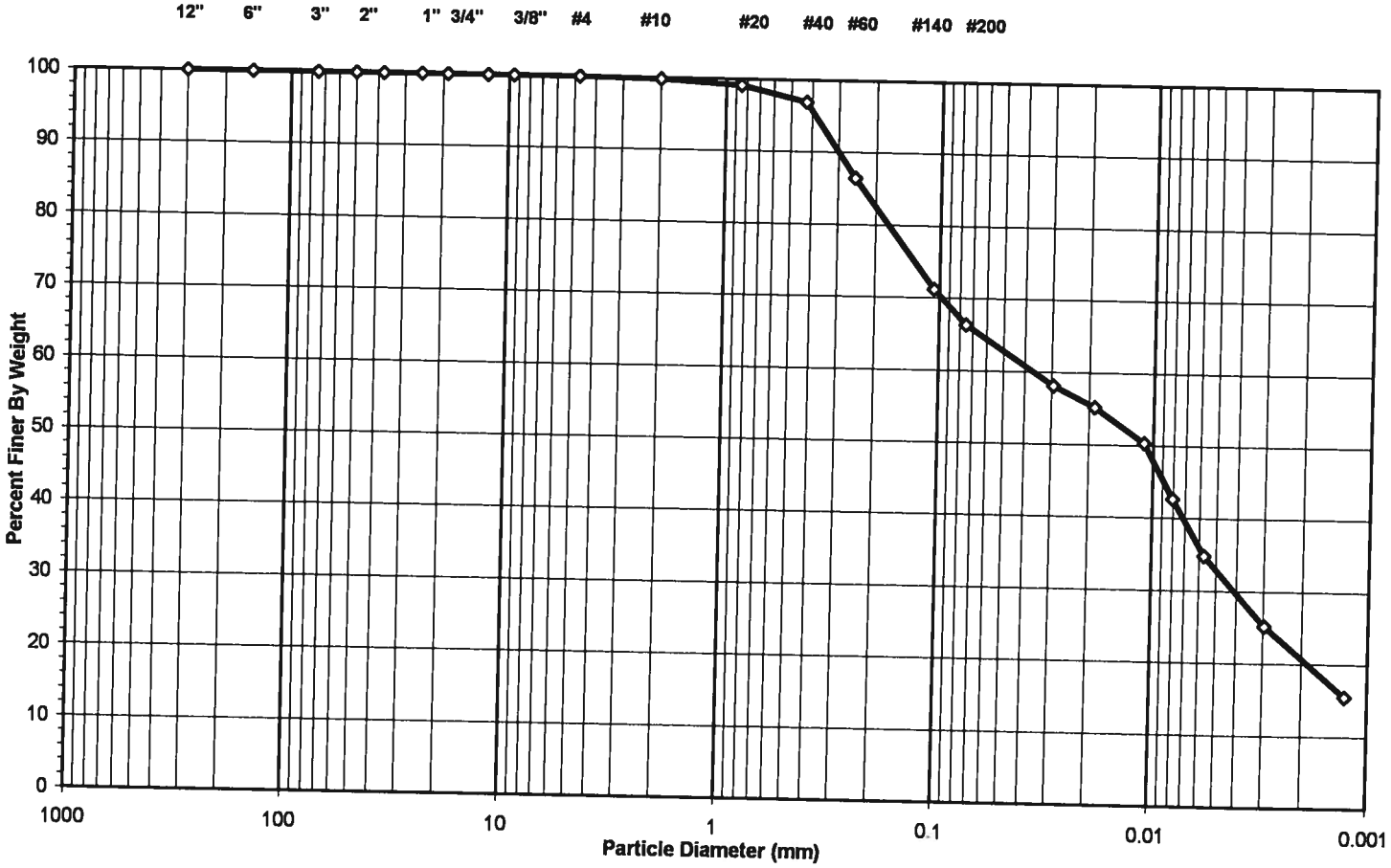
Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID	2011-373-01-11	Soil Color	GRAY

	SIEVE ANALYSIS				HYDROMETER	
USCS	cobbles	gravel	sand		silt and clay fraction	
USDA	cobbles	gravel	sand		silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	33.61
Finer Than #200	*Silt & Clay*	66.39

USCS Symbol *CL, TESTED*

USCS Classification ***SANDY LEAN CLAY***

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID	2011-373-01-11	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		Hydrometer Specimen Data	
Tare No.	17	Air Dried - #10 Hydrometer Material (gm)	51.38
Wgt.Tare + Wet Soil (gm)	23.36	Corrected Dry Wt. of - #10 Material (gm)	51.24
Wgt.Tare + Dry Soil (gm)	23.32		
Weight of Tare (gm)	8.24	Weight of - #200 Material (gm)	34.09
Weight of Water (gm)	0.04	Weight of - #10 ; + #200 Material (gm)	17.15
Weight of Dry Soil (gm)	15.08		
Moisture Content (%)	**0.3**	**J-FACTOR (%FINER THAN #10)**	**0.9979**
Soil Specimen Data			
Tare No.	1668		
Wgt.Tare + Air Dry Soil (gm)	281.21		
Weight of Tare (gm)	93.52		
Air Dried Wgt. Total Sample (gm)	187.69	Dry Weight of Material Retained on #10 (gm)	0.39
Total Dry Sample Weight (gm)	187.19	Corrected Dry Sample Wt - #10 (gm)	186.80

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.39	0.2	0.2	99.8	**99.8**
#20	0.85	0.32	0.6	0.6	99.4	**99.2**
#40	0.425	1.16	2.3	2.9	97.1	**96.9**
#60	0.250	5.37	10.5	13.4	86.6	**86.5**
#140	0.106	7.84	15.3	28.7	71.3	**71.2**
#200	0.075	2.46	4.8	33.5	66.5	**66.4**
Pan	-	34.09	66.5	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By RTO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID	2011-373-01-11	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	35.0	24.4	4.88	30.1	58.2	0.01276	0.0293	**58.1**
5	33.5	24.4	4.88	28.6	55.3	0.01276	0.0188	**55.2**
15	31.0	24.4	4.88	26.1	50.5	0.01276	0.0110	**50.4**
30	27.0	24.4	4.88	22.1	42.7	0.01276	0.0080	**42.6**
63	23.0	24.3	4.92	18.1	34.9	0.01278	0.0057	**34.8**
250	18.0	24.3	4.92	13.1	25.3	0.01278	0.0030	**25.2**
1440	13.0	24.2	4.97	8.0	15.5	0.01279	0.0013	**15.5**

Soil Specimen Data		Other Corrections	
Wgt. of Dry Material (gm)	51.24	Hygroscopic Moisture Factor	0.997
Weight of Deflocculant (gm)	5.0	a - Factor	0.99
		Percent Finer than # 10	99.79
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID #	2011-373-01-11		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker	G1067	9/21/11
#10 Wash Sieve	G415	11/2/11

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID #	2011-373-01-11		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1158	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G357	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11

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ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID	2011-373-01-11	Soil Description	**GRAY LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	343	340	322
Wt. of Tare & WS (gm)	43.25	42.35	45.21
Wt. of Tare & DS (gm)	37.63	37.09	38.88
Wt. of Tare (gm)	19.31	20.40	19.81
Wt. of Water (gm)	5.6	5.3	6.3
Wt. of DS (gm)	18.3	16.7	19.1
Moisture Content (%)	**30.7**	**31.5**	**33.2**
Number of Blows	**34**	**28**	**19**

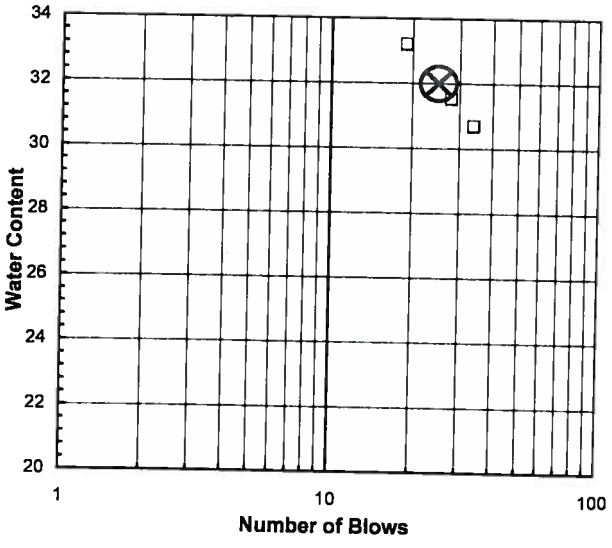
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	151	305	
Wt. of Tare & WS (gm)	25.18	25.44	
Wt. of Tare & DS (gm)	24.44	24.64	
Wt. of Tare (gm)	19.18	19.14	
Wt. of Water (gm)	0.7	0.8	
Wt. of DS (gm)	5.3	5.5	
Moisture Content (%)	**14.1**	**14.5**	**-0.5**

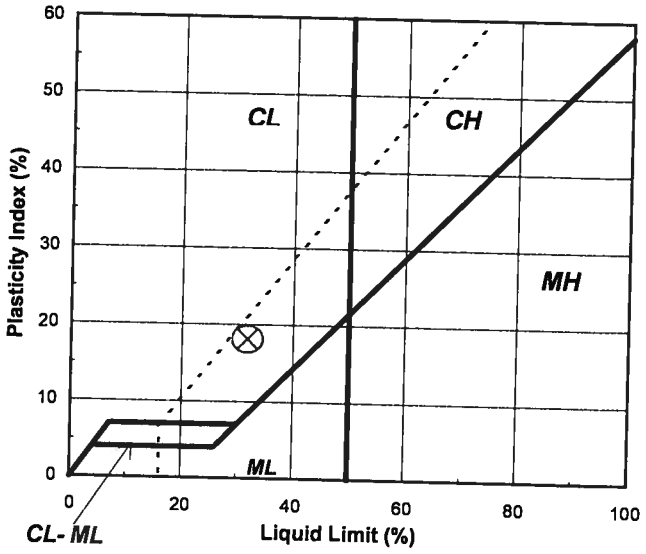
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**32**
Plastic Limit (%)	**14**
Plasticity Index (%)	**18**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.38-27.58
Project No.	2011-373-01	Sample No.	R-25B
Lab ID	2011-373-01-11		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G264	10/25/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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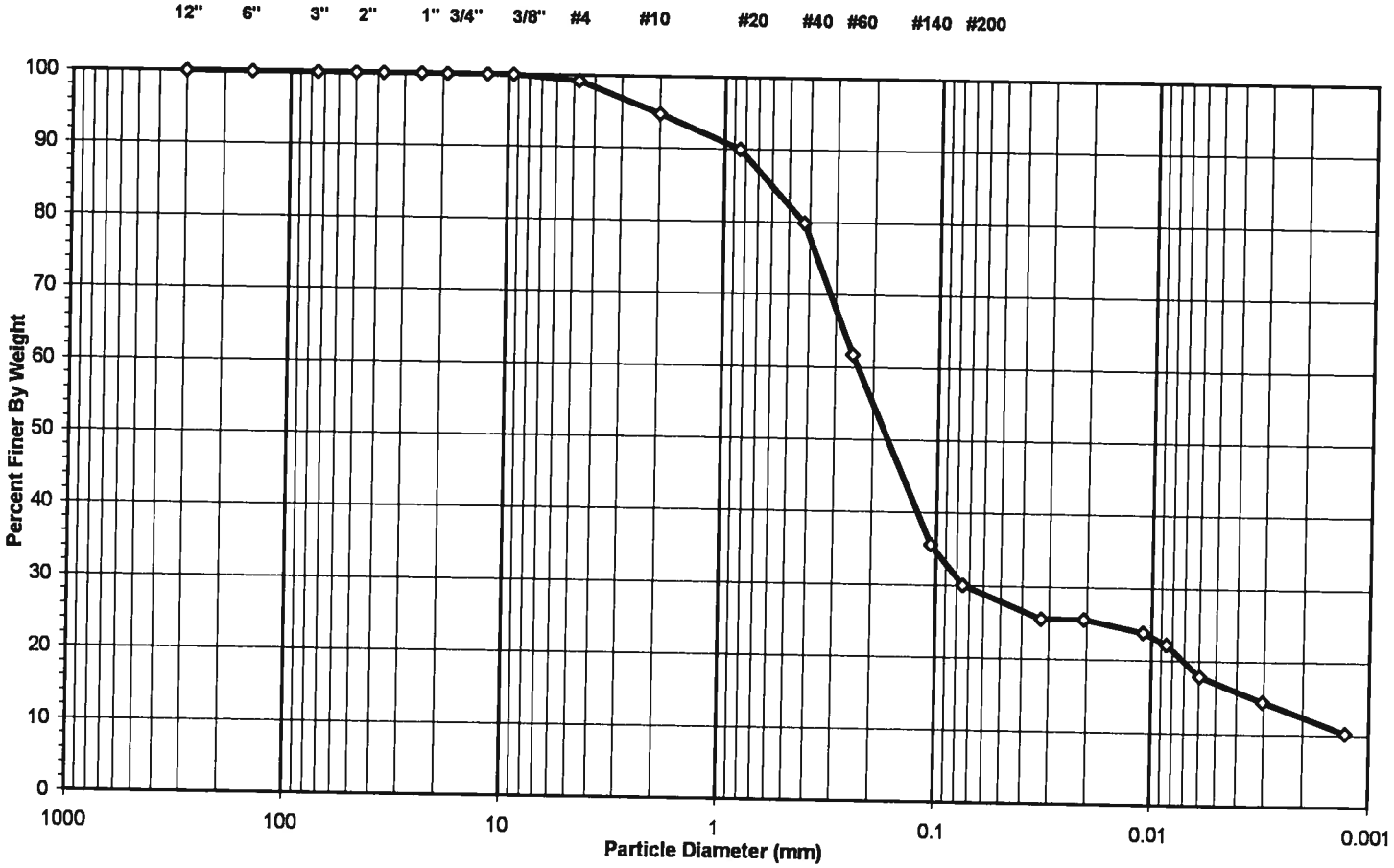
Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID	2011-373-01-12	Soil Color	GRAY

	SIEVE ANALYSIS				HYDROMETER	
USCS	cobbles	gravel	sand		silt and clay fraction	
USDA	cobbles	gravel	sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	0.74
#4 To #200	*Sand*	69.22
Finer Than #200	*Silt & Clay*	30.04

USCS Symbol ***SC-SM, TESTED***

USCS Classification ***SILTY, CLAYEY SAND***

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID	2011-373-01-12	Soil Color	GRAY

Minus #10 for Hygroscopic Moisture Content		Hydrometer Specimen Data	
Tare No.	30	Air Dried - #10 Hydrometer Material (gm)	55.68
Wgt.Tare + Wet Soil (gm)	21.58	Corrected Dry Wt. of - #10 Material (gm)	55.47
Wgt.Tare + Dry Soil (gm)	21.53		
Weight of Tare (gm)	8.26	Weight of - #200 Material (gm)	17.58
Weight of Water (gm)	0.05	Weight of - #10 ; + #200 Material (gm)	37.89
Weight of Dry Soil (gm)	13.27		
Moisture Content (%)	**0.4**	**J-FACTOR (%FINER THAN #10)**	**0.9479**
Soil Specimen Data			
Tare No.	1139		
Wgt.Tare + Air Dry Soil (gm)	378.81		
Weight of Tare (gm)	99.92		
Air Dried Wgt. Total Sample (gm)	278.89	Dry Weight of Material Retained on #10 (gm)	14.49
Total Dry Sample Weight (gm)	277.90	Corrected Dry Sample Wt - #10 (gm)	263.41

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	2.06	0.7	0.7	99.3	**99.3**
#10	2.00	12.43	4.5	5.2	94.8	**94.8**
#20	0.85	2.78	5.0	5.0	95.0	**90.0**
#40	0.425	5.92	10.7	15.7	84.3	**79.9**
#60	0.250	10.62	19.1	34.8	65.2	**61.8**
#140	0.106	15.29	27.6	62.4	37.6	**35.6**
#200	0.075	3.28	5.9	68.3	31.7	**30.0**
Pan	-	17.58	31.7	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID	2011-373-01-12	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	20.0	24.4	4.88	15.1	27.0	0.01276	0.0326	**25.6**
5	20.0	24.4	4.88	15.1	27.0	0.01276	0.0206	**25.6**
18	19.0	24.4	4.88	14.1	25.2	0.01276	0.0109	**23.9**
30	18.0	24.4	4.88	13.1	23.4	0.01276	0.0085	**22.2**
63	15.5	24.3	4.92	10.6	18.9	0.01278	0.0060	**17.9**
250	13.5	24.3	4.92	8.6	15.3	0.01278	0.0030	**14.5**
1440	11.0	24.2	4.97	6.0	10.8	0.01279	0.0013	**10.2**

Soil Specimen Data		Other Corrections	
Wgt. of Dry Material (gm)	55.47	Hygroscopic Moisture Factor	0.996
Weight of Deflocculant (gm)	5.0		
		a - Factor	0.99
		Percent Finer than # 10	94.79
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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INTEGRITY IN TESTING

SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID #	2011-373-01-12		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker	G1067	9/21/11
#10 Wash Sieve	G415	11/2/11

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID #	2011-373-01-12		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1160	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G362	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID	2011-373-01-12	Soil Description	**GRAY SILTY CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	135	143	329
Wt. of Tare & WS (gm)	46.21	45.04	43.16
Wt. of Tare & DS (gm)	41.78	40.64	38.73
Wt. of Tare (gm)	20.72	19.97	18.32
Wt. of Water (gm)	4.4	4.4	4.4
Wt. of DS (gm)	21.1	20.7	20.4
Moisture Content (%)	**21.0**	**21.3**	**21.7**
Number of Blows	**29**	**23**	**18**

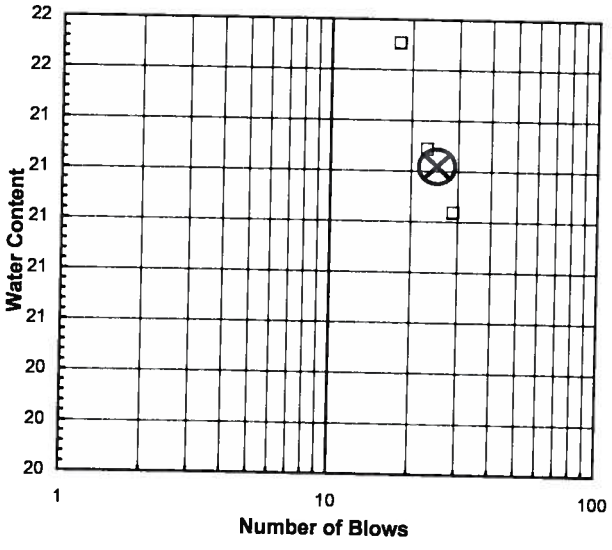
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	0	242	
Wt. of Tare & WS (gm)	26.56	26.44	
Wt. of Tare & DS (gm)	25.75	25.66	
Wt. of Tare (gm)	20.13	20.10	
Wt. of Water (gm)	0.8	0.8	
Wt. of DS (gm)	5.6	5.6	
Moisture Content (%)	**14.4**	**14.0**	**0.4**

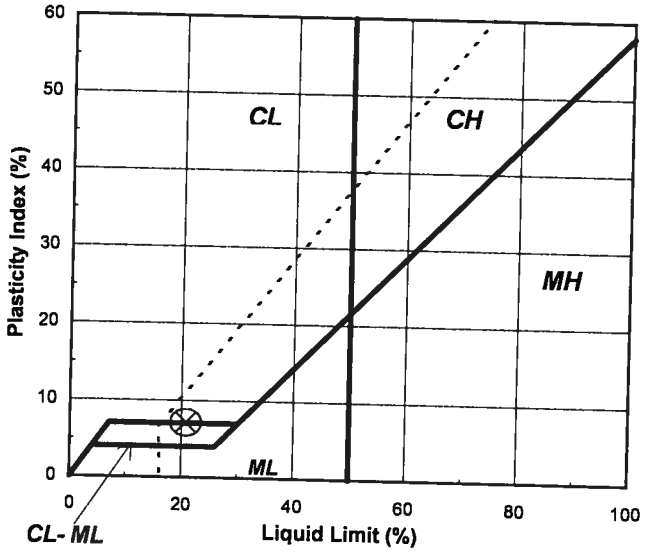
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**21**
Plastic Limit (%)	**14**
Plasticity Index (%)	**7**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



Tested By JP *Date* 8/4/2011 *Checked By* RJO *Date* 8-9-11

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.58-27.98
Project No.	2011-373-01	Sample No.	R-25C
Lab ID	2011-373-01-12		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G284	12/13/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

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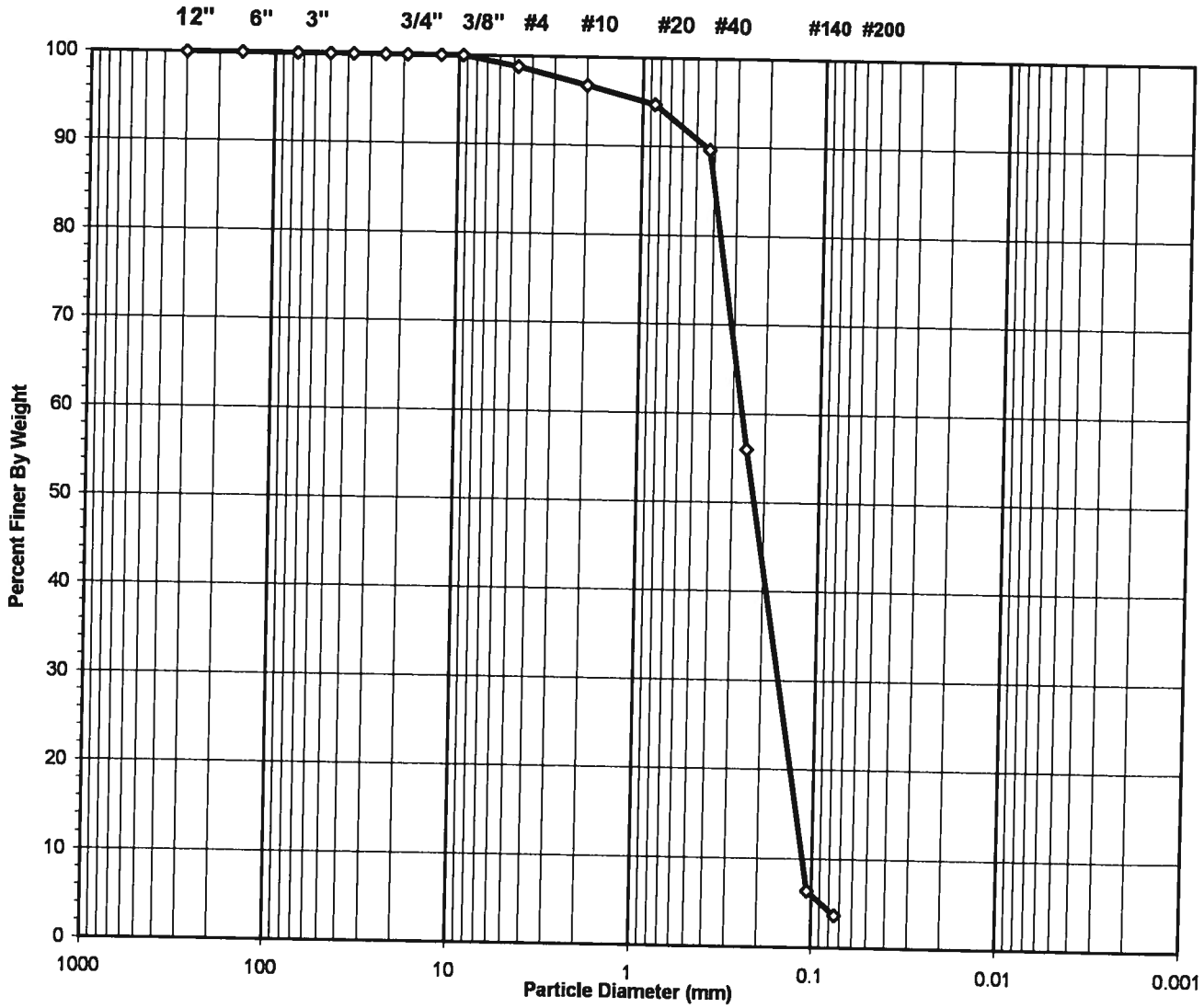
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	29.69-30.51
Project No.	2011-373-01	Sample No.	R-28
Lab ID	2011-373-01-13	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SP, TESTED***

USCS Classification ***POORLY GRADED SAND***

D60 =	0.27	CC =	0.85
D30 =	0.16	CU =	2.36
D10 =	0.11		

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	29.69-30.51
Project No.	2011-373-01	Sample No.	R-28
Lab ID	2011-373-01-13	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	672	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	507.18	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	473.88	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	96.81	Weight of Tare (gm)	NA
Weight of Water (gm)	33.30	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	377.07	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**8.8**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	377.07
Dry Weight - 3/4" Sample (gm)	363.3	Weight of minus #200 material (gm)	13.81
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	363.26
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	4.46	1.18	1.18	98.82	**98.82**
#10	2.00	7.58	2.01	3.19	96.81	**96.81**
#20	0.850	7.72	2.05	5.24	94.76	**94.76**
#40	0.425	19.13	5.07	10.31	89.69	**89.69**
#60	0.250	127.01	33.68	44.00	56.00	**56.00**
#140	0.106	187.20	49.65	93.64	6.36	**6.36**
#200	0.075	10.16	2.69	96.34	3.66	**3.66**
Pan	-	13.81	3.66	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-4-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	29.69-30.51
Project No.	2011-373-01	Sample No.	R-28
Lab ID #	2011-373-01-13		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	29.69-30.51
Project No.	2011-373-01	Sample No.	R-28
Lab ID	2011-373-01-13	Visual	**GRAY SAND**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	29.69-30.51
Project No.	2011-373-01	Sample No.	R-28
Lab ID	2011-373-01-13		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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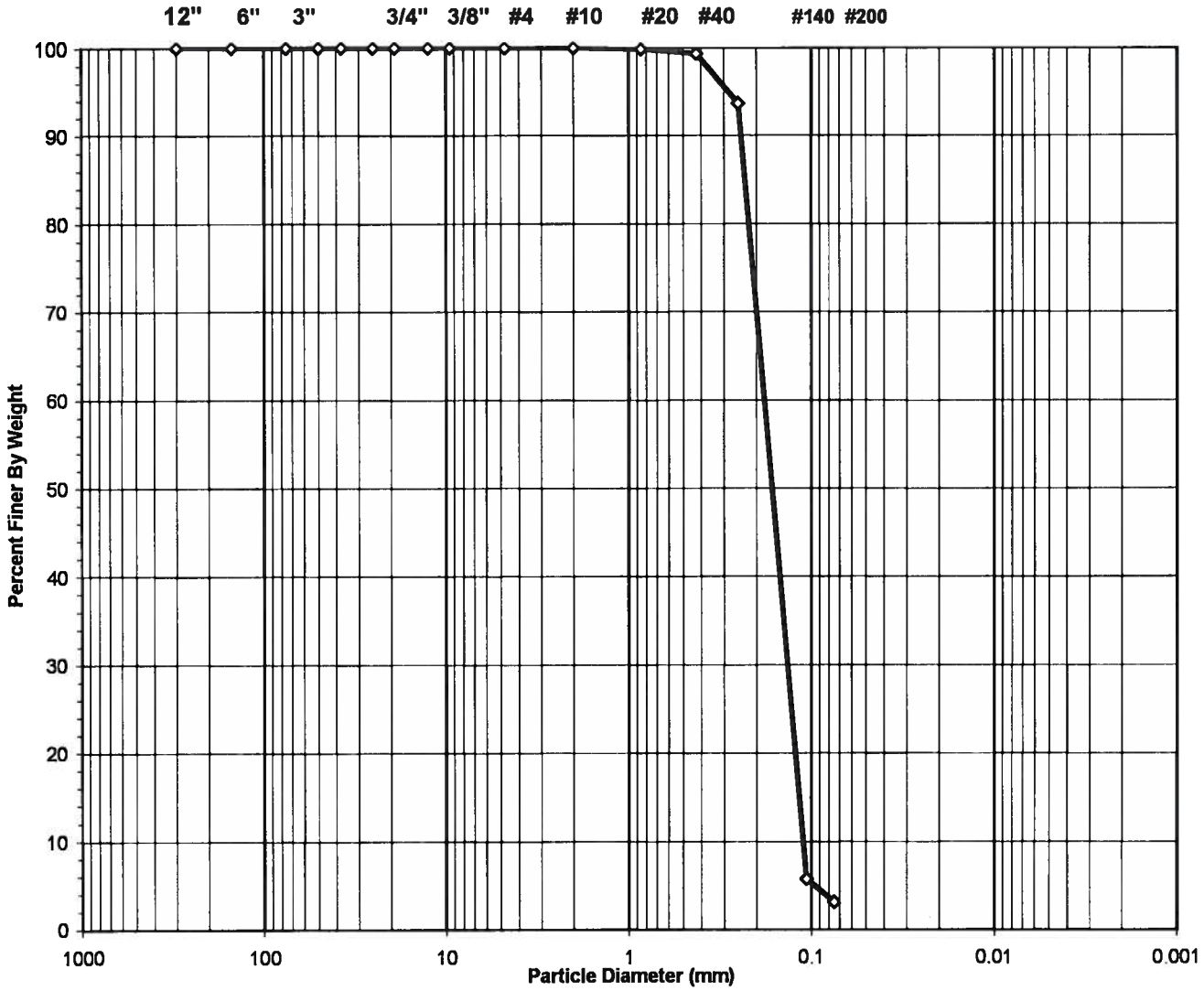
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	40.81-41.74
Project No.	2011-373-01	Sample No.	R-40
Lab ID	2011-373-01-14	Soil Color	**DARK GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	***SP, TESTED***	**D60 =**	**0.18**	**CC =**	**0.91**
USCS Classification	***POORLY GRADED SAND***	**D30 =**	**0.13**	**CU =**	**1.63**
		D10 =	**0.11**		

Tested By PC Date 8/4/11 Checked By DJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	40.81-41.74
Project No.	2011-373-01	Sample No.	R-40
Lab ID	2011-373-01-14	Soil Color	**DARK GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	664	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	455.50	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	437.44	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	97.06	Weight of Tare (gm)	NA
Weight of Water (gm)	18.06	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	340.38	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**5.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	340.38
Dry Weight - 3/4" Sample (gm)	329.5	Weight of minus #200 material (gm)	10.92
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	329.46
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer** (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.05	0.01	0.01	99.99	**99.99**
#20	0.850	0.30	0.09	0.10	99.90	**99.90**
#40	0.425	1.84	0.54	0.64	99.36	**99.36**
#60	0.250	19.38	5.69	6.34	93.66	**93.66**
#140	0.106	299.10	87.87	94.21	5.79	**5.79**
#200	0.075	8.79	2.58	96.79	3.21	**3.21**
Pan	-	10.92	3.21	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJD Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	40.81-41.74
Project No.	2011-373-01	Sample No.	R-40
Lab ID #	2011-373-01-14		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	40.81-41.74
Project No.	2011-373-01	Sample No.	R-40
Lab ID	2011-373-01-14	Visual	**DARK GRAY SAND**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	40.81-41.74
Project No.	2011-373-01	Sample No.	R-40
Lab ID	2011-373-01-14		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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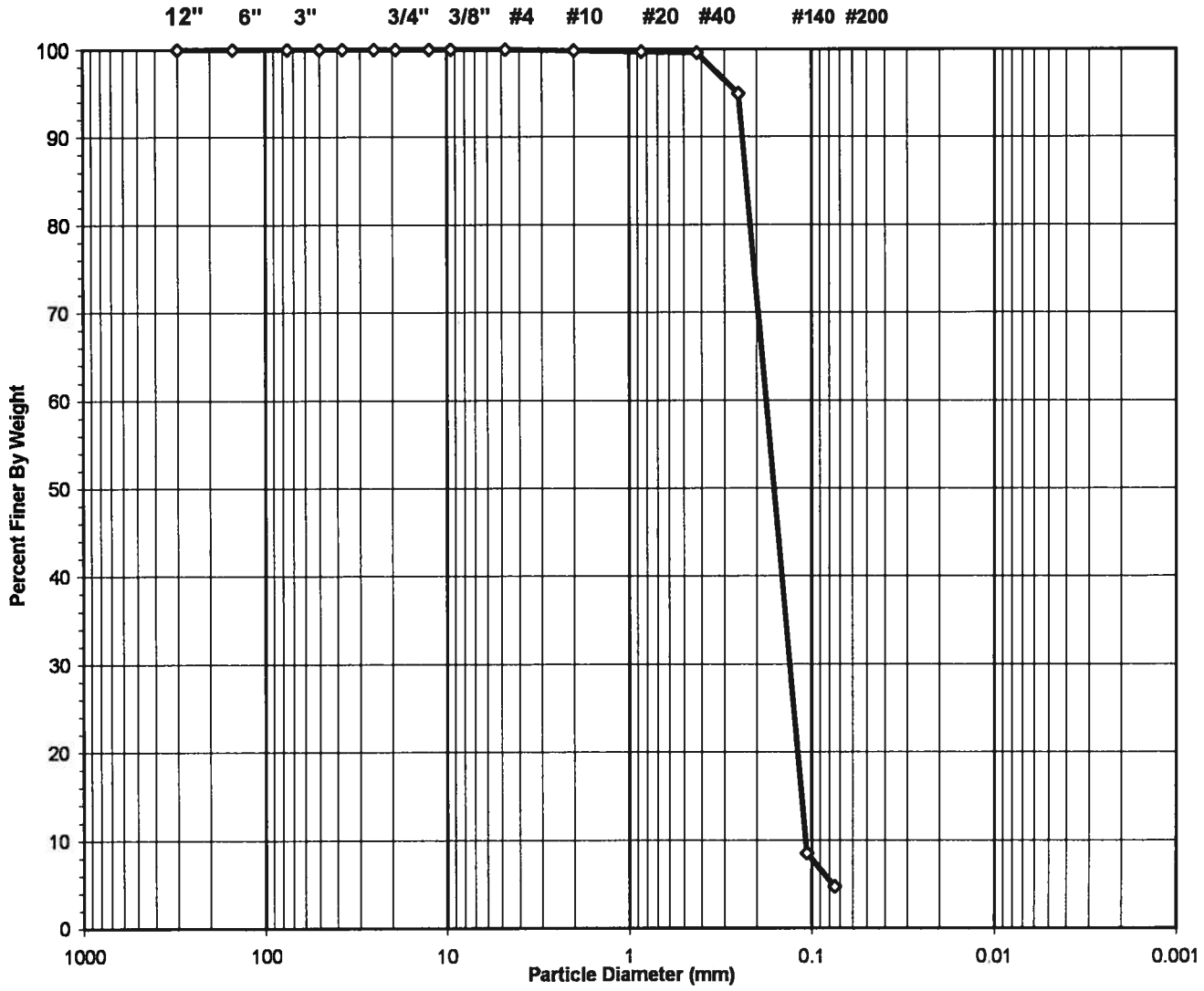
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	6.19-7.19
Project No.	2011-373-01	Sample No.	R-5
Lab ID	2011-373-01-15	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	*SP, TESTED*	D60 =	0.18	CC =	0.91
USCS Classification	*POORLY GRADED SAND*	D30 =	0.13	CU =	1.64
		D10 =	0.11		

Tested By PC Date 8/4/11 Checked By RJO Date 8-4-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	6.19-7.19
Project No.	2011-373-01	Sample No.	R-5
Lab ID	2011-373-01-15	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2471	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	353.60	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	333.37	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.31	Weight of Tare (gm)	NA
Weight of Water (gm)	20.23	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	234.06	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**8.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	234.06
Dry Weight - 3/4" Sample (gm)	223.0	Weight of minus #200 material (gm)	11.08
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	222.98
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.35	0.15	0.15	99.85	**99.85**
#20	0.850	0.27	0.12	0.26	99.74	**99.74**
#40	0.425	0.34	0.15	0.41	99.59	**99.59**
#60	0.250	10.83	4.63	5.04	94.96	**94.96**
#140	0.106	202.42	86.48	91.52	8.48	**8.48**
#200	0.075	8.77	3.75	95.27	4.73	**4.73**
Pan	-	11.08	4.73	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	6.19-7.19
Project No.	2011-373-01	Sample No.	R-5
Lab ID #	2011-373-01-15		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	6.19-7.19
Project No.	2011-373-01	Sample No.	R-5
Lab ID	2011-373-01-15	Visual	**GRAY SAND**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-4-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-101
Client Reference	KCB-2 DELTA 104472	Depth (m)	6.19-7.19
Project No.	2011-373-01	Sample No.	R-5
Lab ID	2011-373-01-15		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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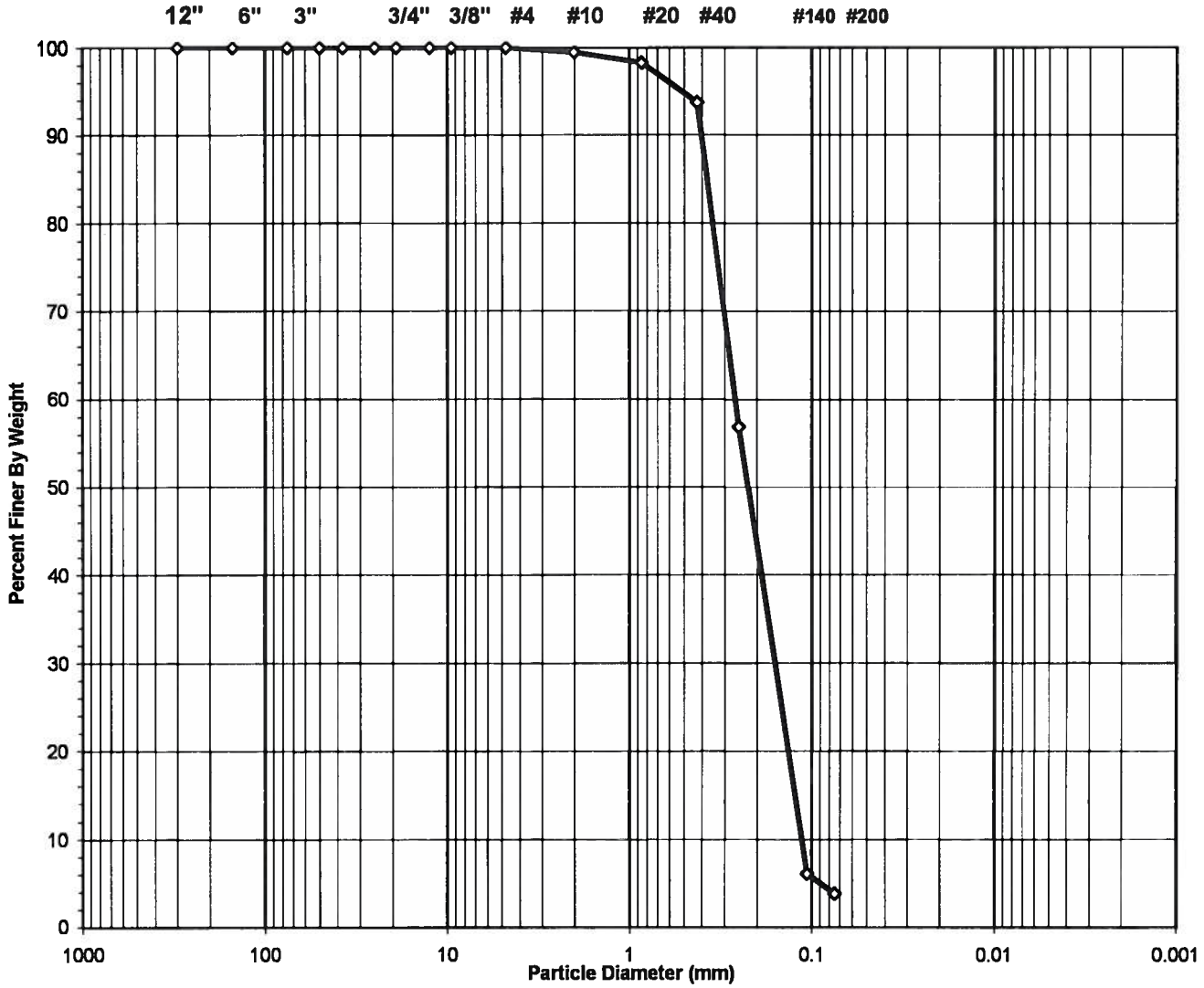
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	31.75-32.68
Project No.	2011-373-01	Sample No.	R-4
Lab ID	2011-373-01-16	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	*SP, TESTED*	D60 =	0.26	CC =	0.85
USCS Classification	*POORLY GRADED SAND*	D30 =	0.16	CU =	2.31
		D10 =	0.11		

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	31.75-32.68
Project No.	2011-373-01	Sample No.	R-4
Lab ID	2011-373-01-16	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	924	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	416.69	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	402.11	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.62	Weight of Tare (gm)	NA
Weight of Water (gm)	14.58	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	301.49	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**4.8**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	301.49
Dry Weight - 3/4" Sample (gm)	289.8	Weight of minus #200 material (gm)	11.71
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	289.78
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer** (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.07	0.02	0.02	99.98	**99.98**
#10	2.00	1.53	0.51	0.53	99.47	**99.47**
#20	0.850	3.70	1.23	1.76	98.24	**98.24**
#40	0.425	13.49	4.47	6.23	93.77	**93.77**
#60	0.250	111.17	36.87	43.11	56.89	**56.89**
#140	0.106	153.02	50.75	93.86	6.14	**6.14**
#200	0.075	6.80	2.26	96.12	3.88	**3.88**
Pan	-	11.71	3.88	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	31.75-32.68
Project No.	2011-373-01	Sample No.	R-4
Lab ID #	2011-373-01-16		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	31.75-32.68
Project No.	2011-373-01	Sample No.	R-4
Lab ID	2011-373-01-16	Visual	**GRAY SAND**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	31.75-32.68
Project No.	2011-373-01	Sample No.	R-4
Lab ID	2011-373-01-16		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	59.39-60.36
Project No.	2011-373-01	Sample No.	R-32
Lab ID	2011-373-01-17	Soil Color	**DARK GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SP-SM, TESTED***

USCS Classification ***POORLY GRADED SAND WITH SILT***

Tested By PC Date 8/4/11 Checked By RTO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	59.39-60.36
Project No.	2011-373-01	Sample No.	R-32
Lab ID	2011-373-01-17	Soil Color	**DARK GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2470	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	385.07	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	360.13	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	91.31	Weight of Tare (gm)	NA
Weight of Water (gm)	24.94	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	268.82	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**9.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	268.82
Dry Weight - 3/4" Sample (gm)	239.6	Weight of minus #200 material (gm)	29.23
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	239.59
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.47	0.17	0.17	99.83	**99.83**
#10	2.00	0.05	0.02	0.19	99.81	**99.81**
#20	0.850	0.25	0.09	0.29	99.71	**99.71**
#40	0.425	0.60	0.22	0.51	99.49	**99.49**
#60	0.250	5.41	2.01	2.52	97.48	**97.48**
#140	0.106	196.10	72.95	75.47	24.53	**24.53**
#200	0.075	36.71	13.66	89.13	10.87	**10.87**
Pan	-	29.23	10.87	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-4-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	59.39-60.36
Project No.	2011-373-01	Sample No.	R-32
Lab ID #	2011-373-01-17		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	59.39-60.36
Project No.	2011-373-01	Sample No.	R-32
Lab ID	2011-373-01-17	Visual	**DARK GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102
Client Reference	KCB-2 DELTA 104472	Depth (m)	59.39-60.36
Project No.	2011-373-01	Sample No.	R-32
Lab ID	2011-373-01-17		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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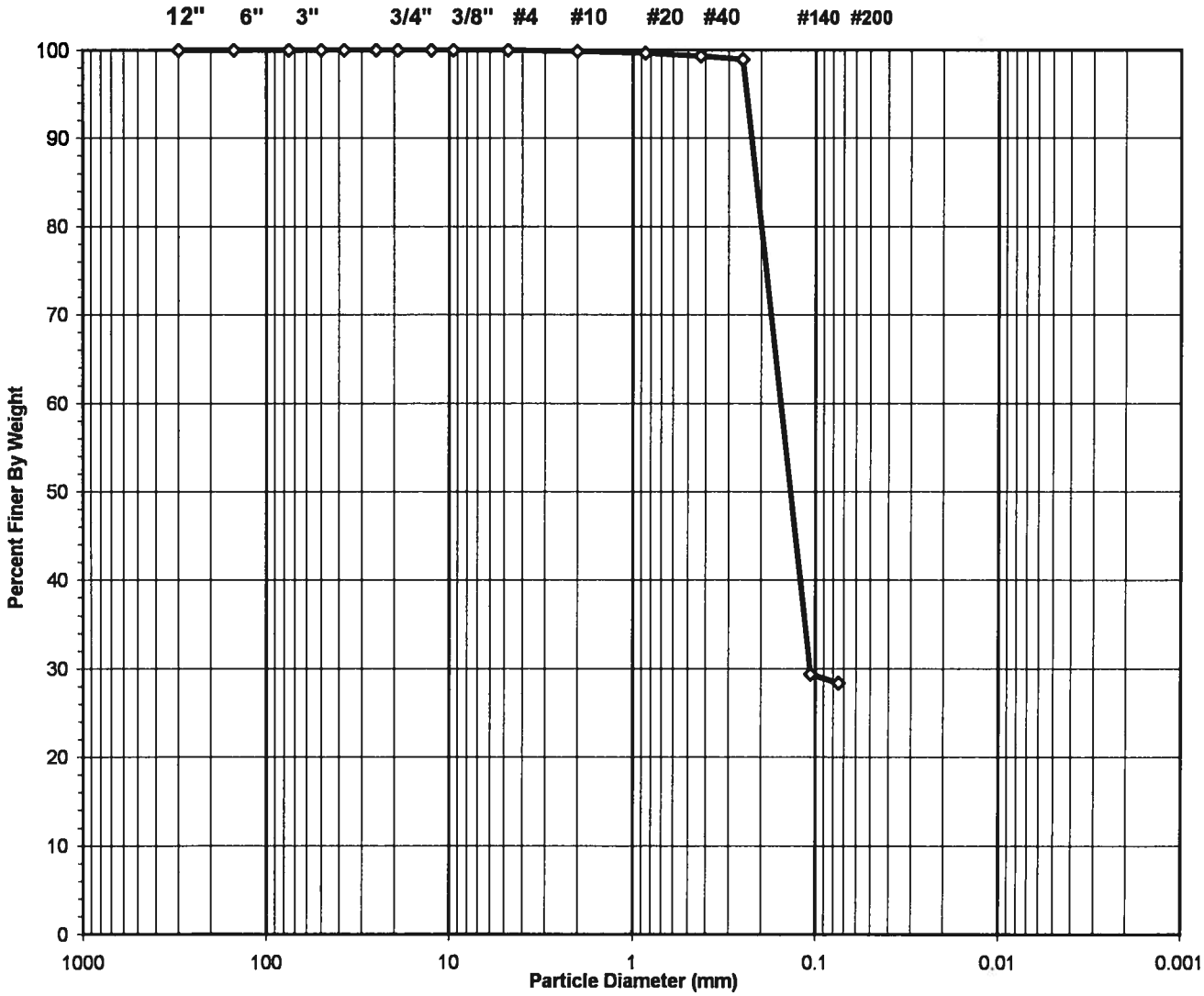
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	4.80-5.40
Project No.	2011-373-01	Sample No.	S-5
Lab ID	2011-373-01-18	Soil Color	GRAY

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

Tested By PC Date 8/4/11 Checked By RO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	4.80-5.40
Project No.	2011-373-01	Sample No.	S-5
Lab ID	2011-373-01-18	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	960	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	702.03	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	667.42	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.28	Weight of Tare (gm)	NA
Weight of Water (gm)	34.61	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	566.14	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**6.1**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	566.14
Dry Weight - 3/4" Sample (gm)	405.5	Weight of minus #200 material (gm)	160.61
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	405.53
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.13	0.02	0.02	99.98	**99.98**
#10	2.00	0.63	0.11	0.13	99.87	**99.87**
#20	0.850	1.03	0.18	0.32	99.68	**99.68**
#40	0.425	2.13	0.38	0.69	99.31	**99.31**
#60	0.250	2.17	0.38	1.08	98.92	**98.92**
#140	0.106	393.70	69.54	70.62	29.38	**29.38**
#200	0.075	5.74	1.01	71.63	28.37	**28.37**
Pan	-	160.61	28.37	100.00	-	-

Tested By PC Date 8/4/11 Checked By [illegible] Date 8-4-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	4.80-5.40
Project No.	2011-373-01	Sample No.	S-5
Lab ID #	2011-373-01-18		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	4.80-5.40
Project No.	2011-373-01	Sample No.	S-5
Lab ID	2011-373-01-18	Visual	**GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-4-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	4.80-5.40
Project No.	2011-373-01	Sample No.	S-5
Lab ID	2011-373-01-18		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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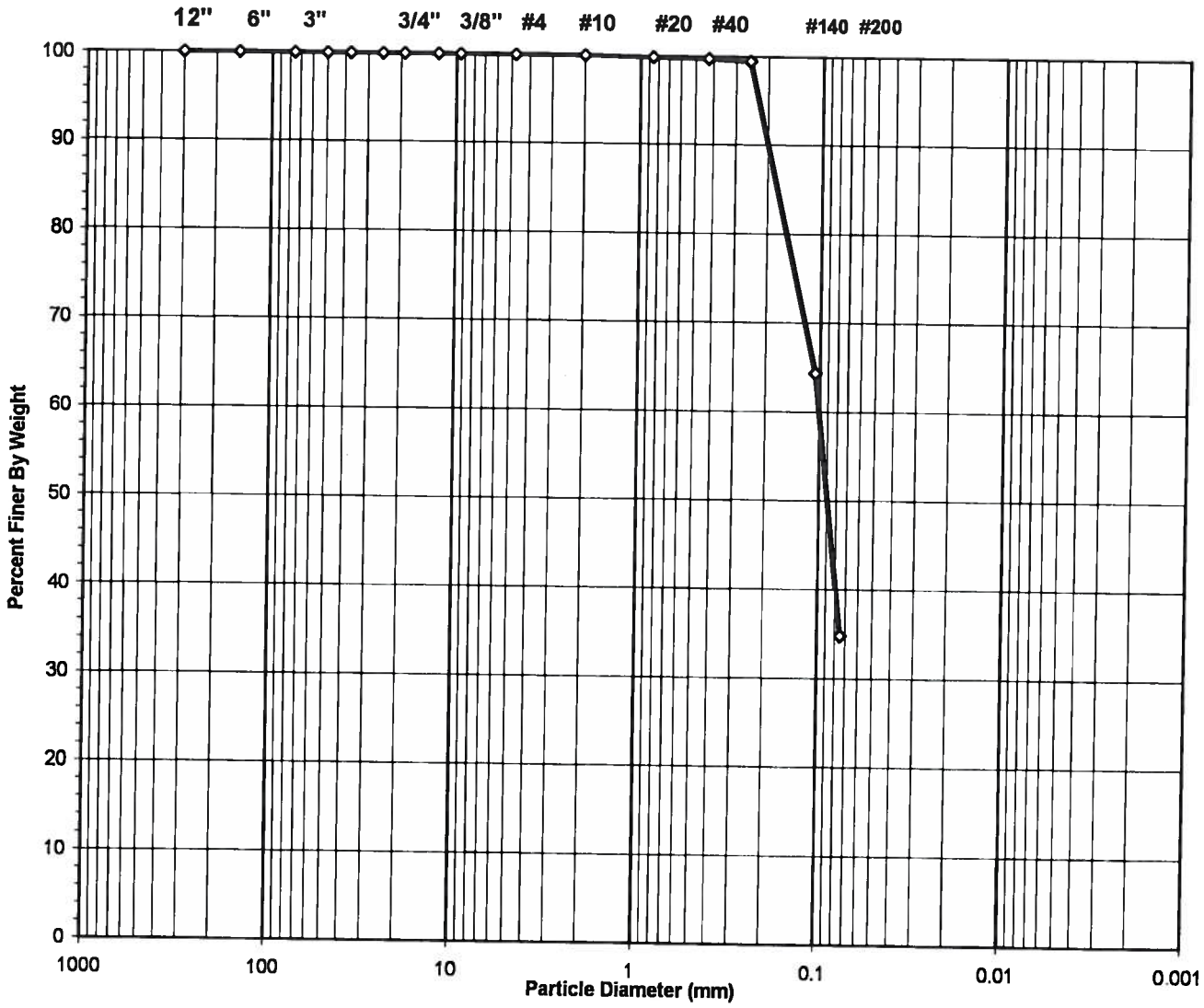
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	21.00-21.60
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-19	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

Tested By PC Date 8/9/11 Checked By MO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	21.00-21.60
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-19	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	947	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	537.33	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	487.26	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.39	Weight of Tare (gm)	NA
Weight of Water (gm)	50.07	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	385.87	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**13.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	385.87
Dry Weight - 3/4" Sample (gm)	251.4	Weight of minus #200 material (gm)	134.48
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	251.39
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.39	0.10	0.10	99.90	**99.90**
#40	0.425	0.60	0.16	0.26	99.74	**99.74**
#60	0.250	1.06	0.27	0.53	99.47	**99.47**
#140	0.106	135.56	35.13	35.66	64.34	**64.34**
#200	0.075	113.78	29.49	65.15	34.85	**34.85**
Pan	-	134.48	34.85	100.00	-	-

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	21.00-21.60
Project No.	2011-373-01	Sample No.	S-28
Lab ID #	2011-373-01-19		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	21.00-21.60
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-19	Visual	**GRAY SILT**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/4/11 *Checked By* DJO *Date* 8-10-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-104A
Client Reference	KCB-2 DELTA 104472	Depth (m)	21.00-21.60
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-19		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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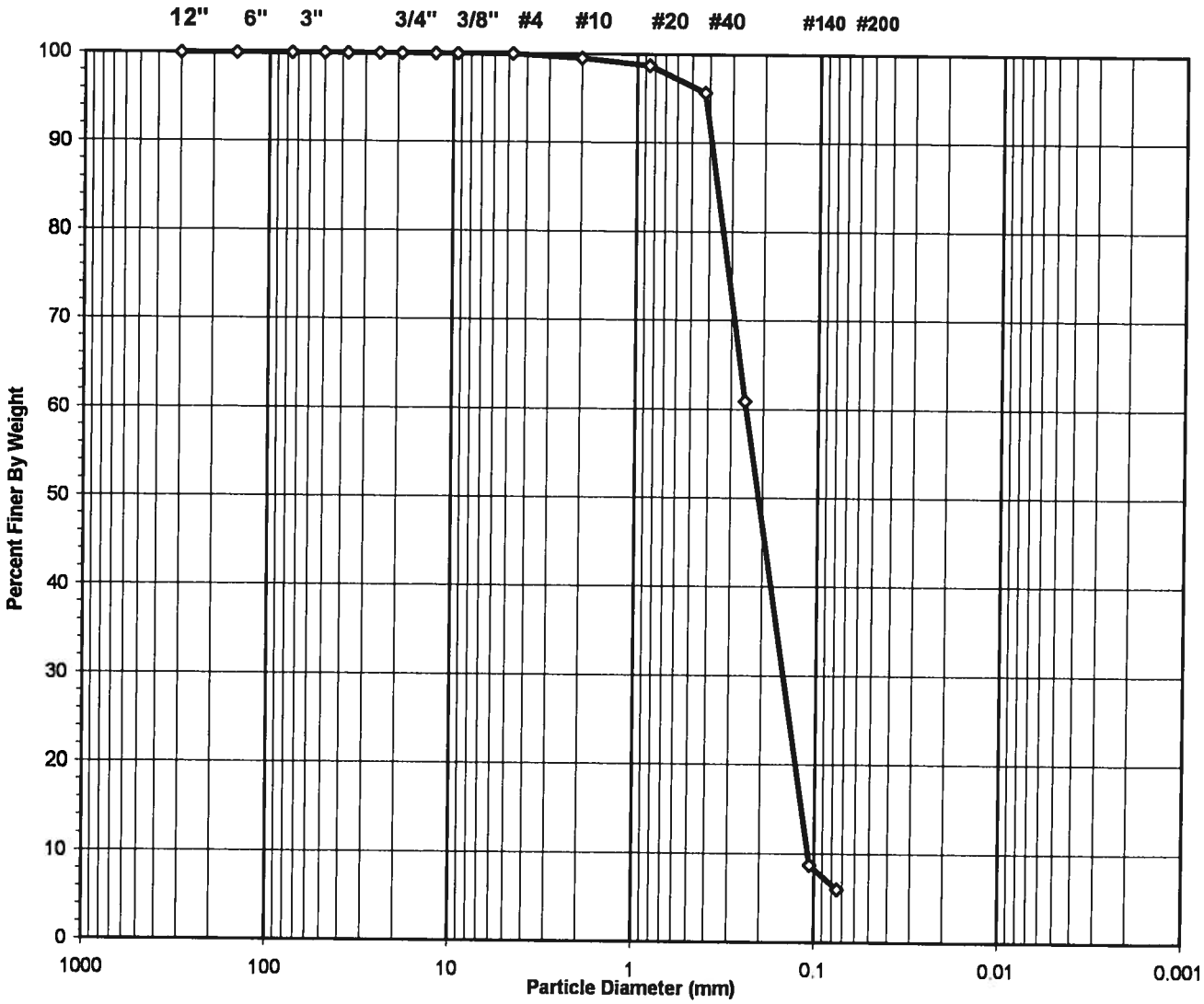
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-104
Client Reference	KCB-2 DELTA 104472	Depth (m)	30.80-31.55
Project No.	2011-373-01	Sample No.	R-2
Lab ID	2011-373-01-20	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	*SP-SM, TESTED*	D60 =	0.25	CC =	0.85
USCS Classification	*POORLY GRADED SAND WITH SILT*	D30 =	0.15	CU =	2.27
		D10 =	0.11		

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-104
Client Reference	KCB-2 DELTA 104472	Depth (m)	30.80-31.55
Project No.	2011-373-01	Sample No.	R-2
Lab ID	2011-373-01-20	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	967	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	358.80	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	344.42	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.89	Weight of Tare (gm)	NA
Weight of Water (gm)	14.38	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	242.53	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**5.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	242.53
Dry Weight - 3/4" Sample (gm)	228.0	Weight of minus #200 material (gm)	14.51
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	228.02
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer** (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.16	0.48	0.48	99.52	**99.52**
#20	0.850	1.89	0.78	1.26	98.74	**98.74**
#40	0.425	7.49	3.09	4.35	95.65	**95.65**
#60	0.250	84.25	34.74	39.08	60.92	**60.92**
#140	0.106	126.65	52.22	91.30	8.70	**8.70**
#200	0.075	6.58	2.71	94.02	5.98	**5.98**
Pan	-	14.51	5.98	100.00	-	-

Tested By PC Date 8/4/11 Checked By RTO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-104
Client Reference	KCB-2 DELTA 104472	Depth (m)	30.80-31.55
Project No.	2011-373-01	Sample No.	R-2
Lab ID #	2011-373-01-20		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-104
Client Reference	KCB-2 DELTA 104472	Depth (m)	30.80-31.55
Project No.	2011-373-01	Sample No.	R-2
Lab ID	2011-373-01-20	Visual	**GRAY SILT**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-104
Client Reference	KCB-2 DELTA 104472	Depth (m)	30.80-31.55
Project No.	2011-373-01	Sample No.	R-2
Lab ID	2011-373-01-20		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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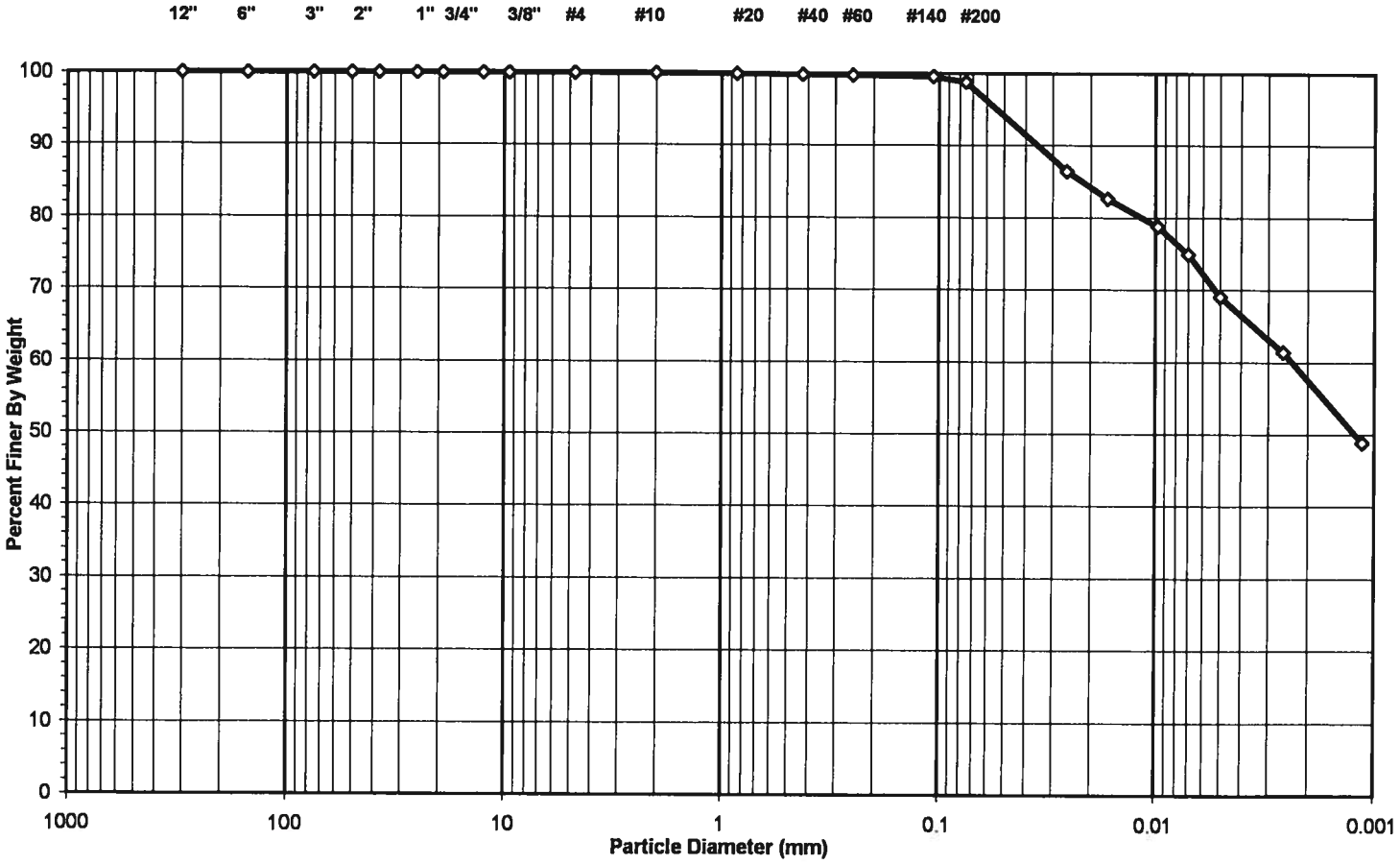
Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID	2011-373-01-21	Soil Color	**GRAY**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	1.20
Finer Than #200	*Silt & Clay*	98.80

USCS Symbol ***CH, TESTED***

USCS Classification ***FAT CLAY***

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID	2011-373-01-21	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		Hydrometer Specimen Data	
Tare No.	49	Air Dried - #10 Hydrometer Material (gm)	52.49
Wgt.Tare + Wet Soil (gm)	21.88	Corrected Dry Wt. of - #10 Material (gm)	51.68
Wgt.Tare + Dry Soil (gm)	21.67		
Weight of Tare (gm)	8.23	Weight of - #200 Material (gm)	51.06
Weight of Water (gm)	0.21	Weight of - #10 ; + #200 Material (gm)	0.62
Weight of Dry Soil (gm)	13.44		
Moisture Content (%)	**1.6**	**J-FACTOR (%FINER THAN #10)**	**1.0000**
Soil Specimen Data			
Tare No.	637		
Wgt.Tare + Air Dry Soil (gm)	224.53		
Weight of Tare (gm)	99.34		
Air Dried Wgt. Total Sample (gm)	125.19	Dry Weight of Material Retained on #10 (gm)	0.00
Total Dry Sample Weight (gm)	123.26	Corrected Dry Sample Wt - #10 (gm)	123.26

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.00	0.0	0.0	100.0	**100.0**
#20	0.85	0.05	0.1	0.1	99.9	**99.9**
#40	0.425	0.04	0.1	0.2	99.8	**99.8**
#60	0.250	0.04	0.1	0.3	99.7	**99.7**
#140	0.106	0.07	0.1	0.4	99.6	**99.6**
#200	0.075	0.42	0.8	1.2	98.8	**98.8**
Pan	-	51.06	98.8	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By PJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID	2011-373-01-21	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	50.0	24.4	4.88	45.1	86.4	0.01276	0.0257	**86.4**
5	48.0	24.4	4.88	43.1	82.6	0.01276	0.0166	**82.6**
15	46.0	24.4	4.88	41.1	78.8	0.01276	0.0098	**78.8**
30	44.0	24.4	4.88	39.1	74.9	0.01276	0.0070	**74.9**
63	41.0	24.3	4.92	36.1	69.1	0.01278	0.0050	**69.1**
250	37.0	24.3	4.92	32.1	61.4	0.01278	0.0026	**61.4**
1440	30.5	24.2	4.97	25.5	48.9	0.01279	0.0011	**48.9**

Soil Specimen Data		**Other Corrections**	
Wgt. of Dry Material (gm)	51.68	Hygroscopic Moisture Factor	0.985
Weight of Deflocculant (gm)	5.0		
		a - Factor	0.99
		Percent Finer than # 10	100.00
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID #	2011-373-01-21		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve		
3/8" Sieve		
#4 Sieve		
#10 Sieve	G884	9/15/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker		
#10 Wash Sieve		

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INTEGRITY IN TESTING

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID #	2011-373-01-21		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1158	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G367	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID	2011-373-01-21	Soil Description	**GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	290	310	279
Wt. of Tare & WS (gm)	41.31	39.93	38.42
Wt. of Tare & DS (gm)	34.07	32.37	30.83
Wt. of Tare (gm)	20.27	18.76	17.46
Wt. of Water (gm)	7.2	7.6	7.6
Wt. of DS (gm)	13.8	13.6	13.4
Moisture Content (%)	**52.5**	**55.5**	**56.8**
Number of Blows	**34**	**26**	**20**

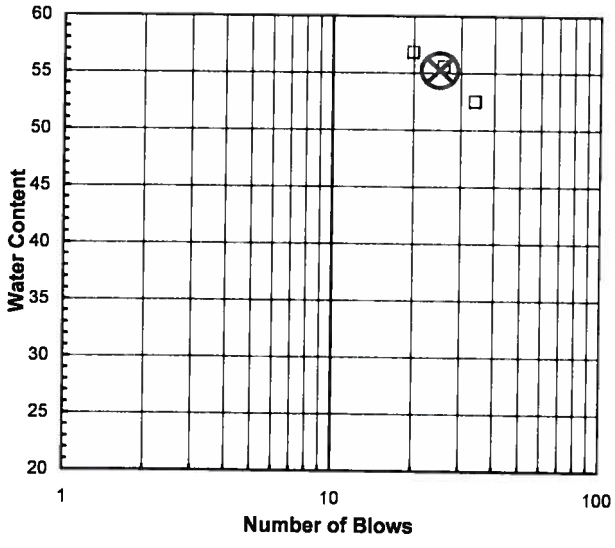
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	274	234	
Wt. of Tare & WS (gm)	26.23	25.44	
Wt. of Tare & DS (gm)	25.06	24.21	
Wt. of Tare (gm)	19.97	19.00	
Wt. of Water (gm)	1.2	1.2	
Wt. of DS (gm)	5.1	5.2	
Moisture Content (%)	**23.0**	**23.6**	**-0.6**

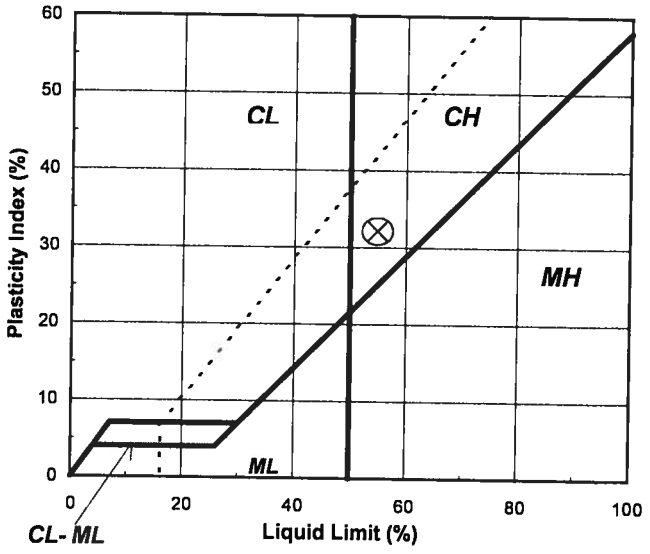
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**55**
Plastic Limit (%)	**23**
Plasticity Index (%)	**32**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

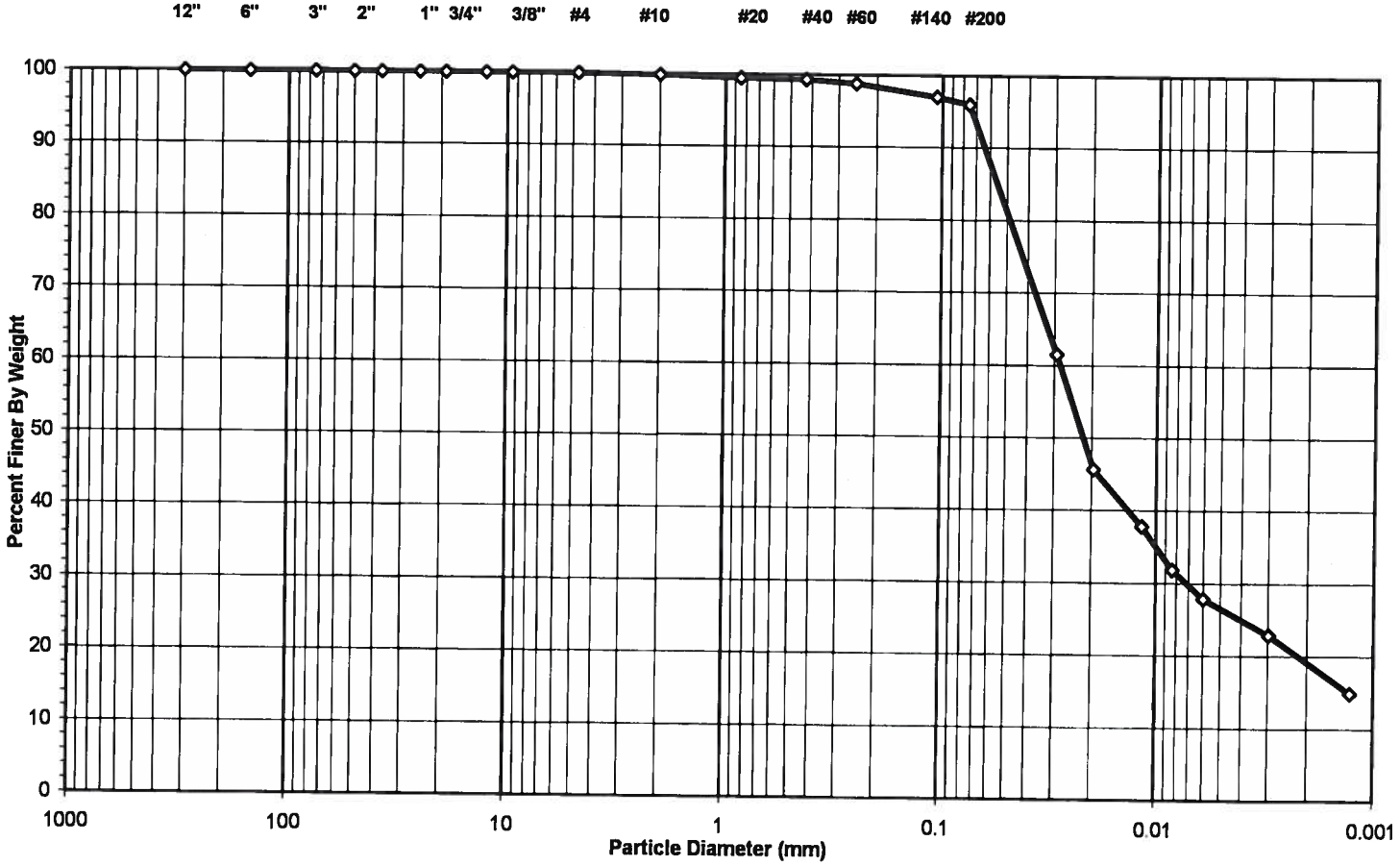
Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	8.32-8.92
Project No.	2011-373-01	Sample No.	ST-1
Lab ID	2011-373-01-21		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G264	10/25/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID	2011-373-01-22	Soil Color	GRAY

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	3.98
Finer Than #200	*Silt & Clay*	96.02

USCS Symbol *CL, TESTED*

USCS Classification *LEAN CLAY*

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID	2011-373-01-22	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		**Hydrometer Specimen Data**	
Tare No.	45	Air Dried - #10 Hydrometer Material (gm)	50.05
Wgt.Tare + Wet Soil (gm)	21.02	Corrected Dry Wt. of - #10 Material (gm)	50.01
Wgt.Tare + Dry Soil (gm)	21.01		
Weight of Tare (gm)	8.38	Weight of - #200 Material (gm)	48.10
Weight of Water (gm)	0.01	Weight of - #10 ; + #200 Material (gm)	1.91
Weight of Dry Soil (gm)	12.63		
Moisture Content (%)	**0.1**	**J-FACTOR (%FINER THAN #10)**	**0.9984**
Soil Specimen Data			
Tare No.	654		
Wgt.Tare + Air Dry Soil (gm)	464.77		
Weight of Tare (gm)	94.21		
Air Dried Wgt. Total Sample (gm)	370.56	Dry Weight of Material Retained on #10 (gm)	0.60
Total Dry Sample Weight (gm)	370.27	Corrected Dry Sample Wt - #10 (gm)	369.67

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.60	0.2	0.2	99.8	**99.8**
#20	0.85	0.16	0.3	0.3	99.7	**99.5**
#40	0.425	0.08	0.2	0.5	99.5	**99.4**
#60	0.250	0.27	0.5	1.0	99.0	**98.8**
#140	0.106	0.91	1.8	2.8	97.2	**97.0**
#200	0.075	0.49	1.0	3.8	96.2	**96.0**
Pan	-	48.10	96.2	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By [illegible] Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID	2011-373-01-22	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	36.0	24.4	4.88	31.1	61.6	0.01276	0.0291	**61.5**
5	28.0	24.4	4.88	23.1	45.8	0.01276	0.0195	**45.7**
15	24.0	24.4	4.88	19.1	37.9	0.01276	0.0116	**37.8**
30	21.0	24.4	4.88	16.1	31.9	0.01276	0.0084	**31.9**
60	19.0	24.3	4.92	14.1	27.9	0.01278	0.0060	**27.8**
250	16.5	24.3	4.92	11.6	22.9	0.01278	0.0030	**22.9**
1440	12.5	24.2	4.97	7.5	14.9	0.01279	0.0013	**14.9**

Soil Specimen Data		Other Corrections	
Wgt. of Dry Material (gm)	50.01	Hygroscopic Moisture Factor	0.999
Weight of Deflocculant (gm)	5.0		
		a - Factor	0.99
		Percent Finer than # 10	99.84
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID #	2011-373-01-22		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker	G1067	9/21/11
#10 Wash Sieve	G415	11/2/11

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID #	2011-373-01-22		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1158	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G202	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID	2011-373-01-22	Soil Description	**GRAY LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

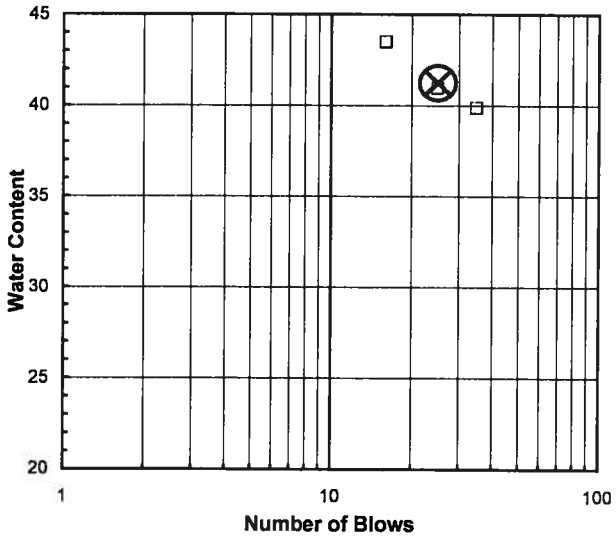
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	346	318	2234	**U**
Wt. of Tare & WS (gm)	44.92	43.74	39.87	**L**
Wt. of Tare & DS (gm)	37.30	36.42	32.67	**T**
Wt. of Tare (gm)	18.18	18.54	16.12	**I**
Wt. of Water (gm)	7.6	7.3	7.2	**P**
Wt. of DS (gm)	19.1	17.9	16.6	**O**
				I
Moisture Content (%)	**39.9**	**40.9**	**43.5**	**N**
Number of Blows	**35**	**25**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	117	120	
Wt. of Tare & WS (gm)	26.21	23.96	
Wt. of Tare & DS (gm)	25.22	22.95	
Wt. of Tare (gm)	20.20	17.87	
Wt. of Water (gm)	1.0	1.0	
Wt. of DS (gm)	5.0	5.1	
Moisture Content (%)	**19.7**	**19.9**	**-0.2**

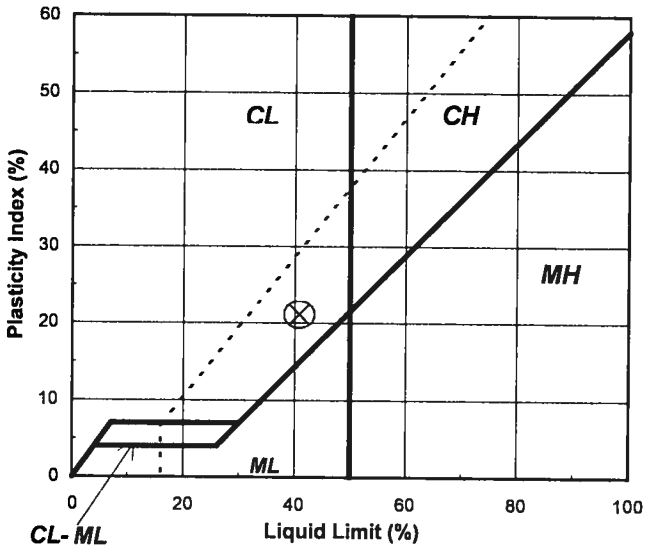
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**41**
Plastic Limit (%)	**20**
Plasticity Index (%)	**21**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	9.37-9.97
Project No.	2011-373-01	Sample No.	S-16
Lab ID	2011-373-01-22		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G264	10/25/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

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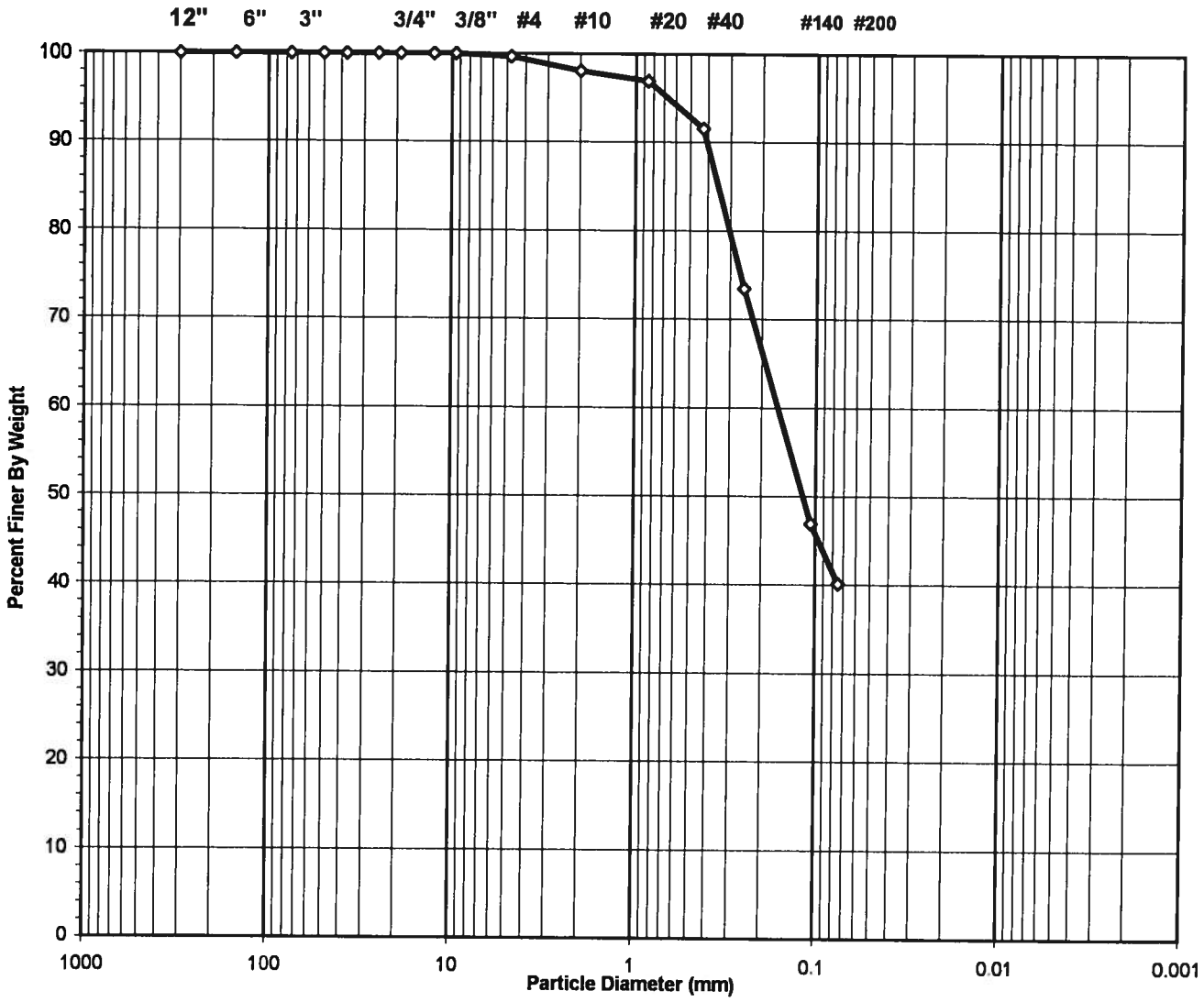
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.27-27.87
Project No.	2011-373-01	Sample No.	S-41
Lab ID	2011-373-01-23	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SC-SM, TESTED***

USCS Classification ***SILTY, CLAYEY SAND***

Tested By PC Date 8/9/11 Checked By DJO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.27-27.87
Project No.	2011-373-01	Sample No.	S-41
Lab ID	2011-373-01-23	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	693	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	446.76	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	446.76	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	93.29	Weight of Tare (gm)	NA
Weight of Water (gm)	0.00	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	353.47	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**0.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	353.47
Dry Weight - 3/4" Sample (gm)	211.5	Weight of minus #200 material (gm)	141.94
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	211.53
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	1.24	0.35	0.35	99.65	**99.65**
#10	2.00	5.66	1.60	1.95	98.05	**98.05**
#20	0.850	3.97	1.12	3.08	96.92	**96.92**
#40	0.425	18.90	5.35	8.42	91.58	**91.58**
#60	0.250	63.95	18.09	26.51	73.49	**73.49**
#140	0.106	93.83	26.55	53.06	46.94	**46.94**
#200	0.075	23.98	6.78	59.84	40.16	**40.16**
Pan	-	141.94	40.16	100.00	-	-

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.27-27.87
Project No.	2011-373-01	Sample No.	S-41
Lab ID #	2011-373-01-23		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.27-27.87
Project No.	2011-373-01	Sample No.	S-41
Lab ID	2011-373-01-23	Soil Description	**GRAY SILTY CLAY**

Note: The* USCS symbol used with this test refers only to the minus No. 40 sieve material. *See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	A119	126	315
Wt. of Tare & WS (gm)	51.84	47.53	55.37
Wt. of Tare & DS (gm)	46.30	42.59	48.82
Wt. of Tare (gm)	18.99	18.61	18.59
Wt. of Water (gm)	5.5	4.9	6.6
Wt. of DS (gm)	27.3	24.0	30.2
Moisture Content (%)	**20.3**	**20.6**	**21.7**
Number of Blows	**35**	**27**	**19**

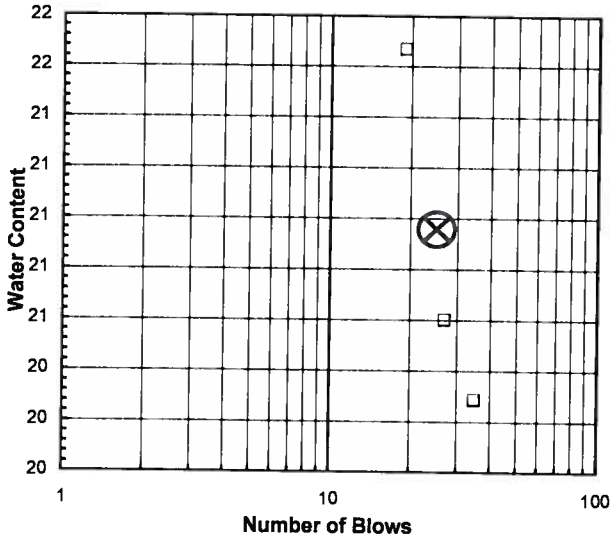
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	355	1882	
Wt. of Tare & WS (gm)	24.80	26.31	
Wt. of Tare & DS (gm)	23.88	25.35	
Wt. of Tare (gm)	18.18	19.23	
Wt. of Water (gm)	0.9	1.0	
Wt. of DS (gm)	5.7	6.1	
Moisture Content (%)	**16.1**	**15.7**	**0.5**

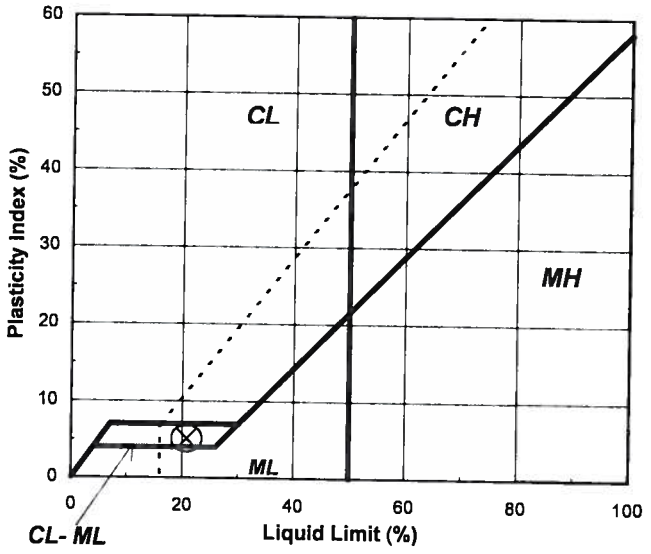
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**21**
Plastic Limit (%)	**16**
Plasticity Index (%)	**5**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



Tested By BS *Date* 8/4/2011 *Checked By* RJO *Date* 8-4-11

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	27.27-27.87
Project No.	2011-373-01	Sample No.	S-41
Lab ID	2011-373-01-23		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device	G264	10/25/11
Balance	G1057	11/5/11
Oven	G714	10/11/11
#40 Sieve	G1360	12/16/11

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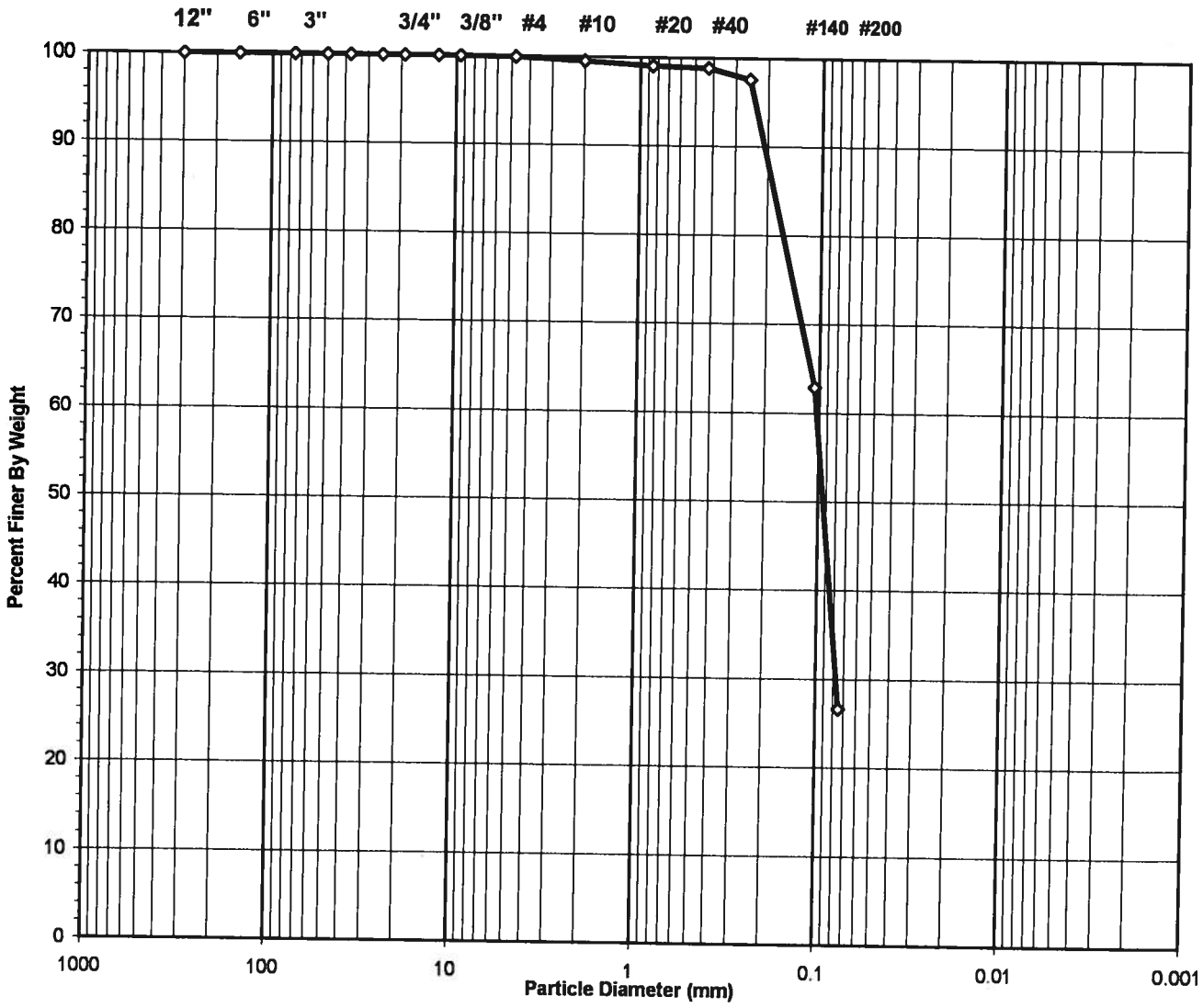
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	93.73-94.14
Project No.	2011-373-01	Sample No.	ST-10
Lab ID	2011-373-01-24	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	93.73-94.14
Project No.	2011-373-01	Sample No.	ST-10
Lab ID	2011-373-01-24	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2324	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	367.62	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	331.99	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.32	Weight of Tare (gm)	NA
Weight of Water (gm)	35.63	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	232.67	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**15.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	232.67
Dry Weight - 3/4" Sample (gm)	170.6	Weight of minus #200 material (gm)	62.09
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	170.58
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.12	0.05	0.05	99.95	**99.95**
#10	2.00	1.04	0.45	0.50	99.50	**99.50**
#20	0.850	0.94	0.40	0.90	99.10	**99.10**
#40	0.425	0.55	0.24	1.14	98.86	**98.86**
#60	0.250	2.89	1.24	2.38	97.62	**97.62**
#140	0.106	80.84	34.74	37.13	62.87	**62.87**
#200	0.075	84.20	36.19	73.31	26.69	**26.69**
Pan	-	62.09	26.69	100.00	-	-

Tested By PC Date 8/9/11 Checked By [illegible] Date 8-10-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	93.73-94.14
Project No.	2011-373-01	Sample No.	ST-10
Lab ID #	2011-373-01-24		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G009	9/17/11
3/8" Sieve	G1251	9/21/11
#4 Sieve	G802	9/18/11
#10 Sieve	G893	12/20/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	93.73-94.14
Project No.	2011-373-01	Sample No.	ST-10
Lab ID	2011-373-01-24	Visual	**GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By BS *Date* 8/4/11 *Checked By* RJO *Date* 8-10-11

DCN: CT-S4C DATE: 7-11-97 REVISION : 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103A
Client Reference	KCB-2 DELTA 104472	Depth (m)	93.73-94.14
Project No.	2011-373-01	Sample No.	ST-10
Lab ID	2011-373-01-24		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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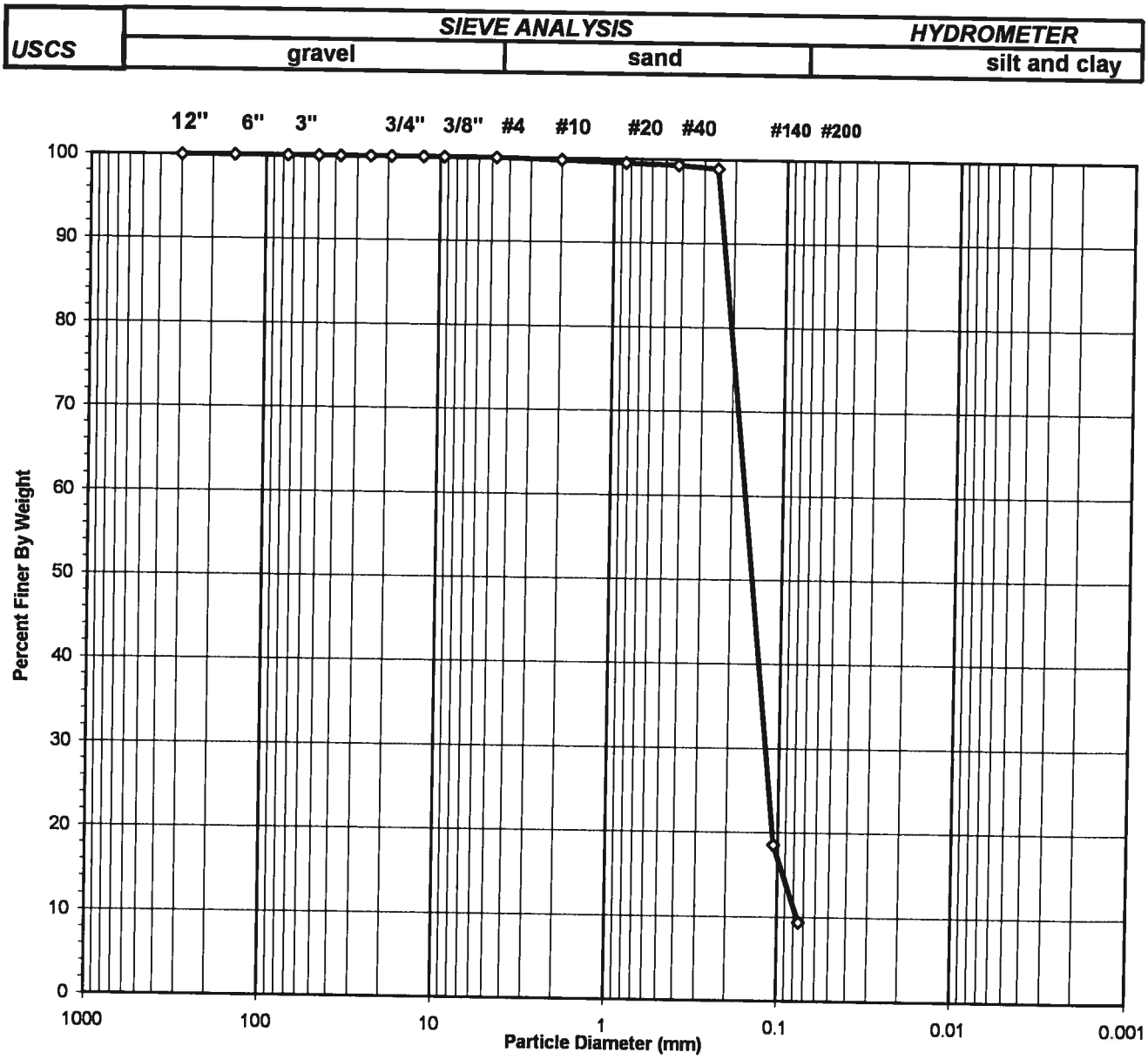
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.6-14.20
Project No.	2011-373-01	Sample No.	S-21
Lab ID	2011-373-01-25	Soil Color	GRAY



USCS Symbol	*SP-SM, TESTED*	D60 =	0.16	CC =	1.13
USCS Classification	*POORLY GRADED SAND WITH SILT*	D30 =	0.12	CU =	2.15
		D10 =	0.08		

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.6-14.20
Project No.	2011-373-01	Sample No.	S-21
Lab ID	2011-373-01-25	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	706	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	433.08	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	414.91	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.71	Weight of Tare (gm)	NA
Weight of Water (gm)	18.17	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	314.20	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**5.8**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	314.20
Dry Weight - 3/4" Sample (gm)	284.8	Weight of minus #200 material (gm)	29.40
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	284.80
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.55	0.18	0.18	99.82	**99.82**
#20	0.850	0.92	0.29	0.47	99.53	**99.53**
#40	0.425	0.65	0.21	0.67	99.33	**99.33**
#60	0.250	1.12	0.36	1.03	98.97	**98.97**
#140	0.106	252.66	80.41	81.44	18.56	**18.56**
#200	0.075	28.90	9.20	90.64	9.36	**9.36**
Pan	-	29.40	9.36	100.00	-	-

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.6-14.20
Project No.	2011-373-01	Sample No.	S-21
Lab ID #	2011-373-01-25		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.6-14.20
Project No.	2011-373-01	Sample No.	S-21
Lab ID	2011-373-01-25	Visual	**GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RTO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	13.6-14.20
Project No.	2011-373-01	Sample No.	S-21
Lab ID	2011-373-01-25		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

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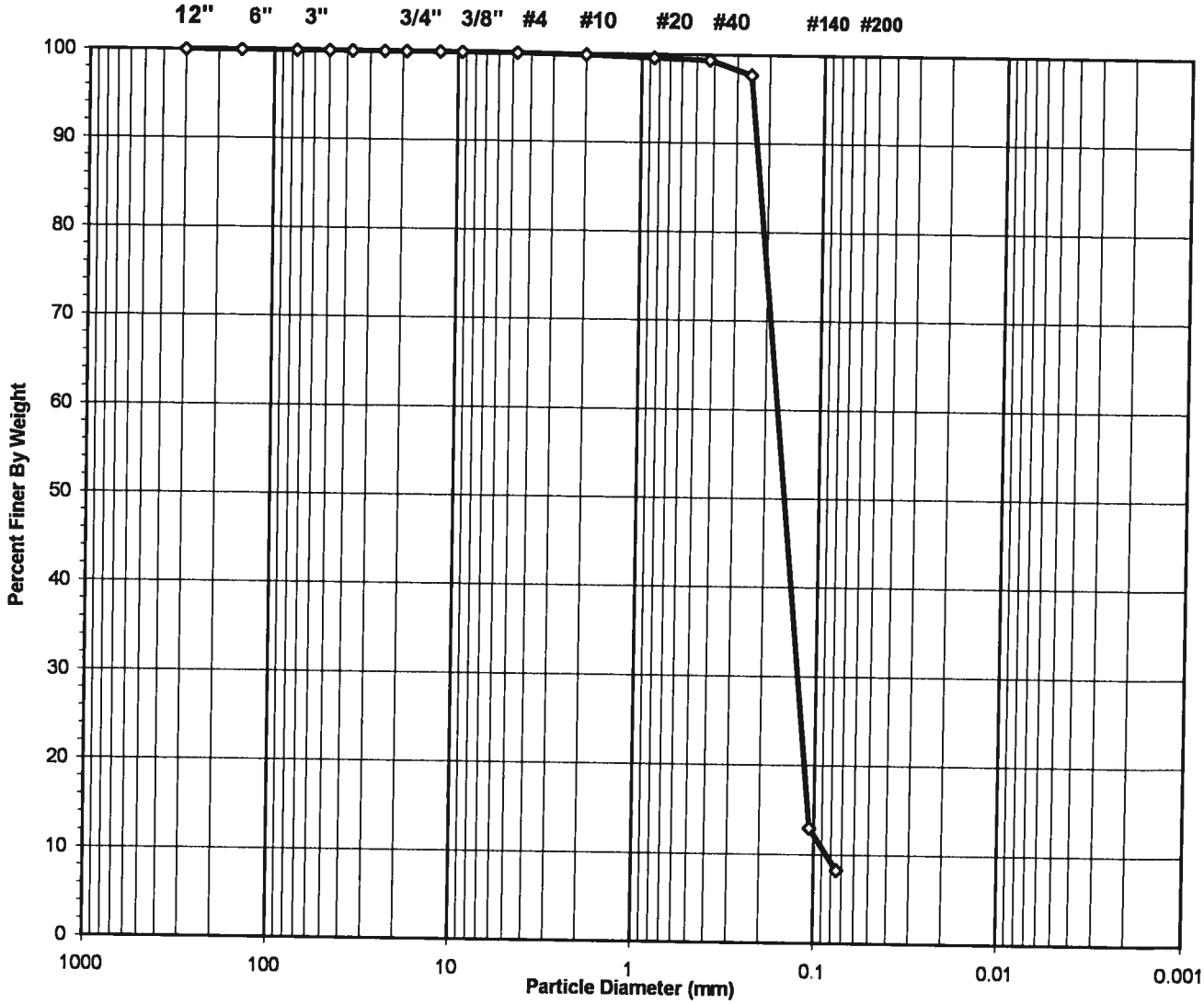
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	19.6-20.2
Project No.	2011-373-01	Sample No.	S-30
Lab ID	2011-373-01-26	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	*SP-SM, TESTED*	D60 =	0.17	CC =	1.09
USCS Classification	*POORLY GRADED SAND WITH SILT*	D30 =	0.13	CU =	2.00
		D10 =	0.09		

Tested By PC Date 8/4/11 Checked By RJO Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	19.6-20.2
Project No.	2011-373-01	Sample No.	S-30
Lab ID	2011-373-01-26	Soil Color	GRAY

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1619	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	476.26	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	452.20	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	93.08	Weight of Tare (gm)	NA
Weight of Water (gm)	24.06	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	359.12	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**6.7**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	359.12
Dry Weight - 3/4" Sample (gm)	329.5	Weight of minus #200 material (gm)	29.67
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	329.45
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.50	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	0.00	0.00	0.00	100.00	100.00
#4	4.75	0.00	0.00	0.00	100.00	100.00
#10	2.00	0.54	0.15	0.15	99.85	99.85
#20	0.850	0.88	0.25	0.40	99.60	99.60
#40	0.425	0.76	0.21	0.61	99.39	99.39
#60	0.250	6.01	1.67	2.28	97.72	97.72
#140	0.106	304.40	84.76	87.04	12.96	12.96
#200	0.075	16.86	4.69	91.74	8.26	8.26
Pan	-	29.67	8.26	100.00	-	-

Tested By PC Date 8/4/11 Checked By [illegible] Date 8-9-11

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	19.6-20.2
Project No.	2011-373-01	Sample No.	S-30
Lab ID #	2011-373-01-26		

Equipment	Equipment ID#	Calibration Due Date
Oven	G1363	11/26/11
Balance	G1057	11/5/11
Balance	G447	4/4/12
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve	G718	9/18/11
3/8" Sieve	G414	9/21/11
#4 Sieve	G620	11/13/11
#10 Sieve	G894	8/23/11
#20 Sieve	G1342	8/23/11
#40 Sieve	G1308	12/20/11
#60 Sieve	G1273	1/15/12
#140 Sieve	G1264	12/20/11
#200 Sieve	G1281	12/20/11
Sieve Shaker	G1067	9/21/11
#200 Wash Sieve	G1362	1/14/12
Oven	G714	10/11/11

ATTERBERG LIMIT
ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	19.6-20.2
Project No.	2011-373-01	Sample No.	S-30
Lab ID	2011-373-01-26	Visual	**GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/2/11 *Checked By* RJO *Date* 8-9-11

DCN: CT-S4C DATE: 7-11-97 REVISION: 2

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ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-102A
Client Reference	KCB-2 DELTA 104472	Depth (m)	19.6-20.2
Project No.	2011-373-01	Sample No.	S-30
Lab ID	2011-373-01-26		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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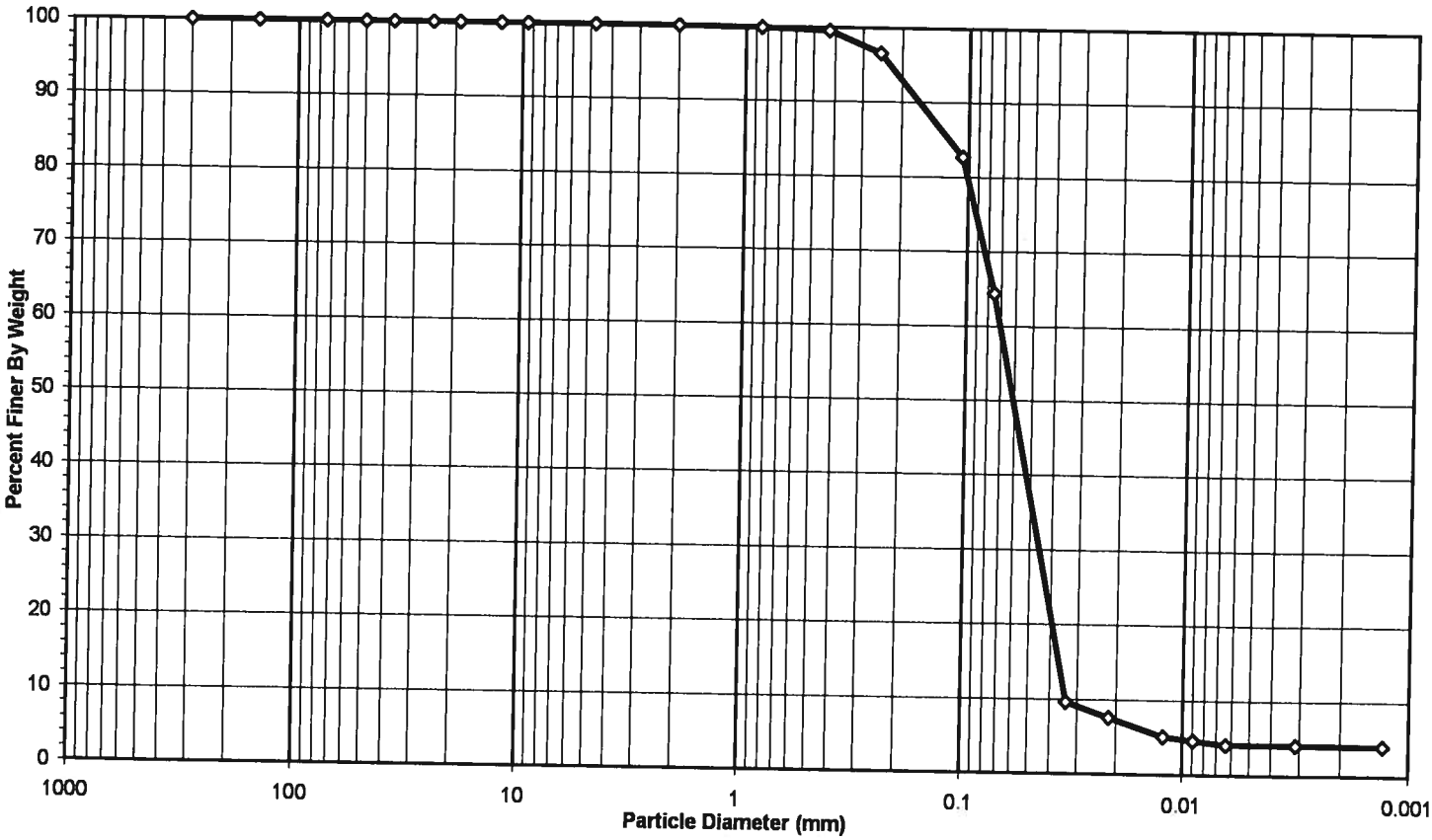
INTEGRITY IN TESTING

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.87
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-27	Soil Color	GRAY

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay

12" 6" 3" 2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #140 #200



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	35.60
Finer Than #200	*Silt & Clay*	64.40

USCS Symbol *ML, TESTED*

USCS Classification *SANDY SILT*

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.87
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-27	Soil Color	**GRAY**

Minus #10 for Hygroscopic Moisture Content		**Hydrometer Specimen Data**	
Tare No.	37	Air Dried - #10 Hydrometer Material (gm)	110.18
Wgt.Tare + Wet Soil (gm)	20.85	Corrected Dry Wt. of - #10 Material (gm)	99.03
Wgt.Tare + Dry Soil (gm)	19.58		
Weight of Tare (gm)	8.30	Weight of - #200 Material (gm)	63.78
Weight of Water (gm)	1.27	Weight of - #10 ; + #200 Material (gm)	35.25
Weight of Dry Soil (gm)	11.28		
Moisture Content (%)	**11.3**	**J-FACTOR (%FINER THAN #10)**	**1.0000**
Soil Specimen Data			
Tare No.	976		
Wgt.Tare + Air Dry Soil (gm)	501.09		
Weight of Tare (gm)	102.62		
Air Dried Wgt. Total Sample (gm)	398.47	Dry Weight of Material Retained on #10 (gm)	0.00
Total Dry Sample Weight (gm)	358.15	Corrected Dry Sample Wt - #10 (gm)	358.15

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.5	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.00	0.0	0.0	100.0	**100.0**
#20	0.85	0.11	0.1	0.1	99.9	**99.9**
#40	0.425	0.31	0.3	0.4	99.6	**99.6**
#60	0.250	2.99	3.0	3.4	96.6	**96.6**
#140	0.106	13.72	13.9	17.3	82.7	**82.7**
#200	0.075	18.12	18.3	35.6	64.4	**64.4**
Pan	-	63.78	64.4	100.0	-	-

Notes :

Tested By PC Date 8/9/11 Checked By RJO Date 8-10-11

DCN: CT-S3OR DATE: 2/20/08 REVISION: 5

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INTEGRITY IN TESTING

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.87
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-27	Soil Color	**GRAY**

Elapsed Time (min)	R Measured	Temp. (o C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	14.5	24.4	4.88	9.6	9.6	0.01276	0.0337	**9.6**
5	12.5	24.4	4.88	7.6	7.6	0.01276	0.0215	**7.6**
16	10.0	24.4	4.88	5.1	5.1	0.01276	0.0122	**5.1**
30	9.5	24.4	4.88	4.6	4.6	0.01276	0.0089	**4.6**
60	9.0	24.3	4.92	4.1	4.1	0.01278	0.0064	**4.1**
250	9.0	24.3	4.92	4.1	4.1	0.01278	0.0031	**4.1**
1440	9.0	24.2	4.97	4.0	4.0	0.01279	0.0013	**4.0**

Soil Specimen Data		Other Corrections	
Wgt. of Dry Material (gm)	99.03	Hygroscopic Moisture Factor	0.899
Weight of Deflocculant (gm)	5.0	a - Factor	0.99
		Percent Finer than # 10	100.00
		Specific Gravity	2.70 Assumed

Notes:

Tested By TO Date 8/8/11 Checked By RJO Date 8-10-11

DCN: CT-83OR DATE: 2/20/08 REVISION: 5

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INTEGRITY IN TESTING

SIEVE ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.87
Project No.	2011-373-01	Sample No.	S-28
Lab ID #	2011-373-01-27		

Equipment	Equipment ID#	Calibration Due Date
Oven	G714	10/11/11
Balance	G447	4/4/12
Balance	G1057	11/5/11
3" Sieve		
2" Sieve		
1 1/2 " Sieve		
1" Sieve		
3/4" Sieve		
1/2" Sieve		
3/8" Sieve		
#4 Sieve		
#10 Sieve	G884	9/15/11
#20 Sieve		
#40 Sieve		
#60 Sieve		
#140 Sieve		
#200 Sieve		
Sieve Shaker		
#10 Wash Sieve		

HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.8/7
Project No.	2011-373-01	Sample No.	S-28
Lab ID #	2011-373-01-27		

Equipment	Equipment ID#	Calibration Due Date
Oven	G288	10/20/11
Balance	G447	4/4/12
Hydrometer Bulb	G1160	1/29/12
Thermometer	G869	11/30/11
Sedimentation Cylinder	G771	NA
Sieve	G1362	1/14/12
Timing Device	G489	6/13/11
#20 Sieve	G1274	1/15/12
#40 Sieve	G1280	1/15/12
#60 Sieve	G806	12/20/11
#140 Sieve	G1303	12/20/11
#200 Sieve	G1304	12/20/11
Sieve Shaker	G1067	9/21/11

ATTERBERG LIMIT

ASTM D 4318-10

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.87
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-27	Visual	**GRAY SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By JP *Date* 8/4/11 *Checked By* RJO *Date* 8-10-11

DCN CT S4C DATE 7-11-97 REVISION 2

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

EQUIPMENT LIST

Client	Paul C. Rizzo & Associates	Boring No.	KB-103
Client Reference	KCB-2 DELTA 104472	Depth (m)	18.27-18.87
Project No.	2011-373-01	Sample No.	S-28
Lab ID	2011-373-01-27		

Equipment	Equipment ID#	Calibration Due Date
Liquid Limit Device		
Balance		
Oven		
#40 Sieve	G1360	12/16/11