

07 October 2025

Proposed Subdivision

Ohaupo Land and Chinamans Hill, Southern Links, Hamilton

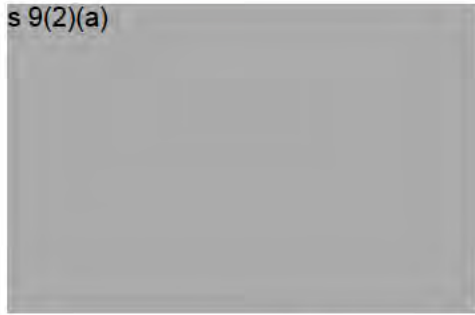
GEOTECHNICAL DESKTOP REPORT

Chinamans Hill and Ohaupo Land Partnership Ltd

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s 9(2)(a)



Version Control

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1.0 INTRODUCTION

1.1 Scope

CMW Geosciences (CMW) was engaged by Chinamans Hill and Ohaupo Land Partnership Ltd to carry out a geotechnical desktop assessment for a site within the Southern Links development located along the south-western boundary of Hamilton City. The total development encompasses an area of 447.25Ha.

CMW prepared a previous desktop study for the wider development in 2024 (Southern Links SL1 Geotechnical Desktop Report, CMW Doc. Ref.: s 9(2)(b)(ii), dated 15 March, 2024). The focus of this study is the 'Ohaupo Land Ltd' and 'Chinamans Hill Ltd' blocks near the southern end of the wider development, encompassing an area of approximately 126Ha.

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal letter referenced s 9(2)(b)(ii) dated 2 July 2025.

This report has been prepared to summarise expected ground conditions and provided preliminary recommendations for possible geohazards, foundation recommendations and site-specific geotechnical testing.

2.0 SITE DESCRIPTION

2.1 Site Location

The proposed development site is located off of Houchens Road, Hamilton, as shown in **Figure 1**. The site comprises an area of approximately 126ha and is currently used for agricultural and horticultural purposes.

The site is bordered by Houchens Road to the west and Ohaupo Road to the east, residential/lifestyle blocks to the north and farmland to the south.

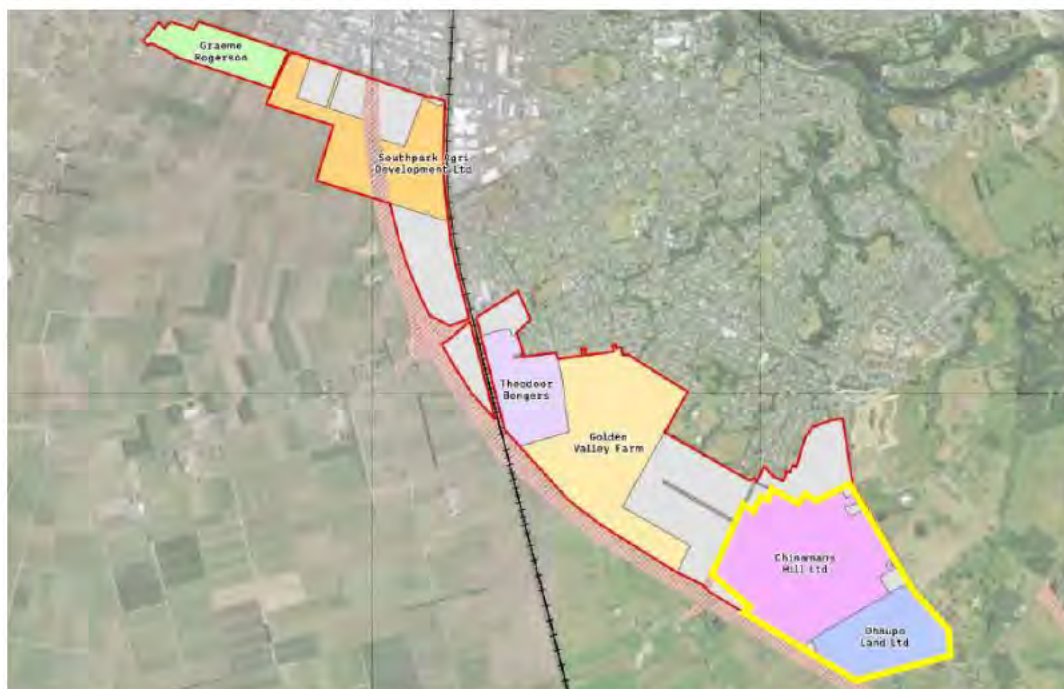


Figure 1: Southern Links Land Ownership Plan supplied by Colliers Project Leaders

2.2 Landform

The current general landform, together with associated features located within and adjacent to the site is presented on the attached Site Plan as *Drawing 04*.

The site is dominated by two major landforms – the ‘Low Hamilton Hills’ and the ‘Wetland/Alluvial Plain’:

- **Low Hamilton Hills** – found predominantly in the north-eastern half of the site. These areas are generally defined by gently undulating to moderately steep rolling hill country at between RL46m and RL81m (Moturiki Datum) elevated above the adjacent alluvial plain. Gully systems with tributary streams to the Waikato River can be found throughout the Low Hamilton Hill Areas. Approximately 50% of the subject site is within the Low Hamilton Hills landform.
- **Wetland/Alluvial Plain** – found predominantly in the south-western half of the site. This landform is defined by an essentially level to gently undulating plain at between RL40m and RL53m (Moturiki Datum) that lies to the west of the Low Hamilton Hills. The plains are often crossed with a network of open drains which collect surface water and discharge into a valley that cuts through the low hills to the north. Two large ponds are located within the base of this valley. The balance of the subject site is within the Wetland/Alluvial Plains landform.

The site is bound along its northern boundary by the Hamilton City limits, occupied typically by a combination of residential and commercial properties. The remaining boundaries lie adjacent to rural/agricultural land parcels.

2.3 Proposed Development

The SL1 Houchens Development is a combined residential and industrial development that comprises circa 145 hectares, which will be split into a mix of residential densities and industrial development. The residential component comprises circa 55ha of net residential, including 1,300 residential units of varying typologies (including single detached, duplex, terraced apartment), a 400-unit retirement village, along with two supporting mixed-use neighbourhood centres, open spaces, waterbodies and infrastructure devices including wetlands. The SL1 Houchens Development includes a net 25ha of industrial, generating between 24 – 47 industrial sized lots for industrial activities.

The residential development is underpinned by a series of design principles, which focus on creating a well-connected, legible, and diverse community on Hamilton City’s urban fringe. The proposed transport network, with a 30-metre-wide spine road running north-to-south, is supported by existing and proposed local roads, cycle connections and pedestrian pathways to create an accessible and legible development. As aforementioned, a range of housing typologies and densities are proposed to meet the growing and changing needs of the housing market to ensure there are options for future residents. Each typology has been thoughtfully located, based on opportunities and constraints, with density ranging from terraced, duplex and detached dwellings to ensure integration with the adjoining urban footprint.

Located on the eastern and central portions of the Houchens Development are neighbourhood centres that will provide a range of amenities and services to support the residential and industrial developments. This neighbourhood centre will likely include commercial properties, childcares, cafés, and a local superette.

Sitting at the lower, southern point of the site is a retirement village that comprises approximately 15 hectares and provides 400 units of varying typologies, including traditional villa and apartment typologies. This will be serviced by its own private transport network, infrastructure, and high amenity open spaces.

On the north-western edge is strategic industrial land that provides key connectivity to the potential Southern Links Houchens interchange, a Road of National Significance (RONS).

The wider SL1 Houchens Development integrates throughout a number of open spaces, waterbodies and wetlands that are well distributed to create a high amenity community that will be a pleasant and enjoyable place to live for future residents. These open spaces, waterbodies and wetlands support ecological restoration through the retention of a number of natural species and riparian revegetation and support broader cultural biodiversity outcomes within SL1 Houchens Development.

The SL1 Houchens Development includes a proposed Water Reservoir, to provide the ability for a long term strategic water asset for Hamilton City Council to be designated.

The development will be appropriately serviced via a robust infrastructure strategy, which includes the addition of a water reservoir to accompany the one already existing, utilisation of existing services and stormwater artificial wetlands

At the time of undertaking this investigation and of writing this report the project was in the early stages of planning and a desktop geotechnical assessment was proposed to provide details of preliminary feasibility options for development of the site.

A preliminary plans for the Houchens Development (see **Appendix A**) has been provided by Barkers, indicating residential, commercial and industrial areas with associated roading and stormwater reserves/open space within the subject site.

We have anticipated the ground will be built up over the Wetland/Alluvial Plain areas to increase the vertical distance between the future development from the existing groundwater and wetland soil deposits.

3.0 GROUND MODEL

3.1 Published Geology

Published geological maps¹ for the area depict the regional geology as comprising soils belonging to the Piako Subgroup, Hinuera Formation and Walton Subgroup, as illustrated on **Figure 2** below.

- Piako Subgroup – comprised soft, dark brown to black, organic mud, muddy peat and woody peat. This material has been deposited within the last 14,000 years.
- Hinuera Formation - comprised cross-bedded pumice sand, silt and gravel with interbedded peat. Age of deposits is between 11.9Ka and 58.8Ka.
- Walton Subgroup – comprised alluvium dominated by primary and reworked, non-welded ignimbrite with volcanic ashes mantling older deposits. Age of deposits is between 0.42Ma and 2.59Ma.

¹ Edbrooke S. W. (2005) Geology of the Waikato Area, Geological & Nuclear Sciences (GNS) Limited



Figure 2: Regional Geology (GNS Geology Map)¹

Note that while Hinuera Formation is not shown on Figure 2, nearby testing in the area indicates there will likely be a layer of Hinuera Sands and silts between the Walton subgroup and the Piako Subgroup (Peat) at the base of the hills.

The Te Tātua O Wairere fault is located approximately 500m east of the site. This fault has a return period of over 100,000 years.

Based on the known history of the site and surrounding land levels, some superficial depths of fill could be anticipated as a result of soft landscaping/agricultural activity.

3.2 Nearby Geotechnical Data

A review of nearby geotechnical logs from the New Zealand Geotechnical Database (NZGD) confirms the geology present in the published geological maps. Relevant plans and engineering logs are presented in **Appendix B**.

The ground conditions presented in geotechnical data logged by others, can be generalised according to the following units in **Table 1**.

Table 1: Summary of Strata Encountered in Publicly Available Logs

Strata/ Unit	Approximate Depth to Base of Unit (m)	Description of Material and Distribution
Topsoil	0.0 – 0.6	Organic topsoil expected over the surface of the site.
Peat (Piako Subgroup)	0.0 – 5.0	PEAT was encountered over much of the Wetland/Alluvial Plain. The peat is a variable mixture of amorphous, muddy and fibrous in texture with areas of organic silt. Soil strengths range from soft to stiff. Distribution is bound by the Low Hamilton Hills terrain and levee deposits of the underlying Hinuera Formation materials, with localised deepening's within infilled paleochannel features. Typical peat depths are less than 3-4m within the site.
Interbedded Sand/Silt	0.4 - >30.5	Interbedded SAND/SILT mixtures were encountered over the Wetland/Alluvial Plain, typically underlying Peat deposits in the west. The

Strata/ Unit	Approximate Depth to Base of Unit (m)	Description of Material and Distribution
Mixtures (Hinuera Formation)		Hinuera Formation is at ground level between the peat to the west and Low Hamilton Hills to the east, plus in isolated areas over the plain. Silt strengths typically stiff to very stiff. Sand strengths vary greatly from very loose to dense but are typically medium dense.
Silt/Clay Mixtures (Walton Subgroup)	0.2 - >30	SILT/CLAY mixtures were encountered near the ground surface over the Low Hamilton Hill areas. Walton Subgroup soils are of volcanic origin and include a mantle of weathered volcanic ashes over primary and reworked, non-welded ignimbrite. Includes Puketoka Formation silt/clay beneath the ashes that can be sensitive to disturbance. Soil strengths are typically stiff to very stiff. Deeper primary ignimbrite sands are typically dense to very dense. Walton Subgroup underlies the younger Piako Subgroup/Hinuera Formation at depth below the Wetland/Alluvial Plain and also 'outcrops' above the plain as isolated low hills to the west of the site.

3.3 Groundwater

Nearby NZGD data have logged groundwater ranging between 0 and 14.5 metres below ground level (mbgl) with an average depth of 2.6m.

- Groundwater in the Low Hamilton Hills groundwater ranged between 0.4 to 3.9mbgl with an average depth of 2.5m.
- Groundwater in the Wetland/Alluvial Plain groundwater ranged between 1.1 to 14.5mbgl with an average depth of 3.0m.

It should be anticipated that groundwater levels will fluctuate seasonally or during prolonged periods of dry or wet weather.

4.0 DESKTOP FINDINGS

4.1 Historical Photos

Historical photos dating back to 1941 have been reviewed and are attached in **Appendix C**. The historical photographs show that the site was predominantly covered by wetland scrub in 1943. The site shows evidence of clearing of wetland scrub and conversion to agricultural use beginning in 1947. Conversion of this site from wetland to agricultural use has resulted in the addition of farm drains. The agricultural use of this site has carried on to the current day. By 1954 most of the site had switched to agricultural use and has been fully converted since 1971. Two ponds were been constructed in the base of the valley during the 1970s, which is situated in the wetland/Alluvial plain area of the site.

4.2 Regional Hazards

A review of the Waikato Regional Council Natural Hazards Portal² was undertaken.

The Hazard Portal addresses potential flooding, coastal hazards, volcanic and seismic hazards.

No river flooding risk had been directly mapped, but the site is part of the Waikato Central Drainage Scheme and has a Waikato Regional Council drain to discharge water after a rainfall event. Some areas downstream from this site are shown as being at risk of flooding within the Hamilton City Council flood maps (which do not extend to this site). This demonstrates that the site is potentially prone to flooding after a heavy rainfall event.

No coastal flooding or coastal inundation risk is present at this site due to its inland location.

The nearest active volcanoes are Rotorua and Mayor Island, both of which are approximately 100km away and are currently at alert level 0. A summary of the findings on the Waikato Regional Council Hazard portal have been presented in *Appendix D*.

4.3 Fault Rupture

This site is not considered to be at risk of fault rupture on the basis that there are no mapped active faults in the area. The GNS Active Fault Database³ indicates the nearest active fault is the Kerepehi Fault which is approximately 50km to the east of the site and has a recurrence interval of 2,000 to 3,500 years.

The Te Tatua O Wairere fault is located 500m to the east of the site, but has a return period of over 100,000 years and is not mapped as active.

4.4 Liquefaction and Lateral Spread

Liquefaction occurs in loose saturated cohesionless soils that are subject to cyclic shear loading during an earthquake. This process leads to pore pressure build-up, soil grains moving into suspension and temporary loss of strength causing vertical and lateral ground deformation. The Earthquakes and Landslides map is presented in *Appendix D* depicting the liquefaction hazard categories identified by the Waikato Regional Council. The majority of the site is classed as possible, and the low hills are classed as unlikely or undetermined.

Based on our local knowledge, the Hinuera Formation and Piako Subgroup deposits are susceptible to liquefaction when below the groundwater table. Free-field liquefaction induced settlement may be significant during a ULS seismic event. The magnitude of liquefaction induced settlement is likely to vary across the site and differential settlement should be anticipated, should there be a large seismic event.

A high-level liquefaction assessment was undertaken in the CMW Southern Links SL1 Geotechnical Desktop Report using publicly available CPT data. That assessment identified index settlements of 70-215mm within the Hinuera Formation and Piako Subgroup deposits, and a non-liquefiable crust of 0.7-4.6m. No digitally available CPT data is present within the subject area, however a similar liquefaction potential is anticipated.

Following the onset of liquefaction, liquefied soils will behave as a very weak undrained material, which can give rise to lateral spreading where a free face is present within the vicinity of the site or where proposed cut or fill batters are proposed over or within the zone of influence of liquefied soils. The Waikato Regional Council drain/gully and the existing farm drains present as a free face where the risk of lateral spreading must be considered. Lateral spreading will also need to be considered when constructing stormwater basins, as this will create a free face.

² Waikato Regional Council. Waikato Regional Hazards Portal.

<https://waikatoregion.maps.arcgis.com/apps/MapSeries/index.html?appid=f2b48398f93146e8a5cf0aa3fddce92c>

³ GNS NZ Active Fault Database <https://data.gns.cri.nz/af/>

The extent and magnitude of lateral spread that may occur during liquefaction is dependent of the groundwater levels present beneath the site and the depth of liquefiable soils. These will need to be assessed once a site investigation has taken place.

4.5 Cyclic Softening

While not liquefiable due to their high plasticity, the fine-grained soils in the Walton Subgroup may be susceptible to some strength loss, during a ULS seismic event. On account of the typically high shear strengths of these soils this is often not a significant geotechnical issue for low-rise residential land development projects.

4.6 Slope Stability

The stability of cut batters and fill embankments under a range of design conditions is expressed in terms of a factor of safety, which is defined as the ratio of forces resisting failure to the forces causing failure.

Soils within the Wetland/Alluvial Plain landscape (Piako Subgroup peat and Hinuera Formation silts/sands) typically only form gently undulating to slightly steep slopes. Given the shallow groundwater level and low soil strength when saturated, where slopes are steeper than 15 degrees (1v:4h) are present within the Wetland/Alluvial Plain areas, they may be subject some movement under static/elevated GW/seismic conditions.

Soils within the Low Hamilton Hills landscape (Walton Subgroup silts/clays) typically occur on gently undulating to moderately steep slopes. Given the cohesive nature and strength of these materials, slopes consisting of Walton Subgroup soils are typically stable when slopes are less than 25 degrees. These findings are subject to further investigation and analyses at future investigation phases.

4.7 Load Induced Settlement

If is anticipated that land development will involve filling over the low-lying Wetland/Alluvial Plain to raise ground levels to provide separation from groundwater table and organic/peat soils. Proposed fill embankments and future building loads will induce settlements within the Wetland/Alluvial Plain subsoils. The soft and compressible peat soils that underlie the majority of those areas will experience significant primary consolidation and long-term secondary creep settlements in response to the placement of this filling.

Preliminary estimated static settlements were calculated using assumed a 2m to 4m thick fill embankment will be formed over the Wetland/Alluvial Plain development area with a fill unit weight of 16kN/m³ for the locally sourced earthfill over the peat. Back calculated parameters have been used from a nearby project located on the same Wetland/Alluvial Plain to the west of the site, which has involved filling and preloading on 6m of peat. An assessment of static settlements, as summarised below.

Table 2: Estimated Fill Induced Static Settlements (without remedial measures)

Peat Thickness (m)	Assessed total settlement range (m)
2	0.5 to 1
4	0.75 to 2
6	1 to 3m

Assessed post construction ground settlements are excessive for the proposed development and specific ground improvement measures will be required, as discussed in Section 5.3 below.

5.0 PRELIMINARY RECOMMENDATIONS

5.1 Liquefaction / Lateral Spread Mitigation

Based on the assessment outlined in Sections 4.3 and 4.4, we consider the risk of liquefaction and the associated risk of potentially unacceptable liquefaction induced settlements or lateral spread to be moderate to high for the Wetland/Alluvial Plain area for the design cases considered. Mitigation options could include:

- Excavate and replace upper 1 m of soil and replacement with geogrid-reinforced compacted aggregate raft in conjunction with a Specific Engineered Design Waffle Slab Foundations for residential structures to mitigate liquefaction-induced vertical settlements. This may be incorporated into bulk earthfill process as a part of land development.
- Ground improvement such as Rammed Aggregate Piers (RAPs) or Rigid Inclusions' may present a viable option for critical infrastructure (such as Wastewater Pump Stations and bridge abutments) and multi-storey commercial buildings. RAPs are unlikely to be economically viable option for residential applications.
- The layout/design of remedial measures is subject to detailed design.

Whilst no specific analysis has yet been completed for the Low Hamilton Hills area, based on our extensive experience in the Hamilton region, we consider the risk of liquefaction and the associated liquefaction induced settlement or lateral spread risk to be low for the residential land development. This is subject to further investigation/analysis at a future investigation stage.

5.2 Slope Stability Management

Slope stability is discussed in Section 4.6 above demonstrates that the Low Hamilton Hills over the investigation area are expected to achieve an appropriate FoS under different site conditions.

Where Piako Subgroup unconsolidated peat is exposed in cuts such as stormwater basin excavations, the maximum cut batter for these materials that meets the required FoS is likely to be in the order of 1v:5h. Depending the cut heights, further slope support measures may be required.

Where Hinuera Formation sand/silt is exposed in future cut areas, the maximum cut batter for these materials that meets the required FoS is likely to be in the order of 1v:3h.

Where Walton Subgroup silt/clay is exposed in future cut areas, the maximum cut batter for these materials that meets the required FoS is likely to be in the order of 1v:2h.

Once earthworks levels/volumes are known, cut and fill slope stability will need to be assessed.

Detailed analysis and design of slope stability measures is subject to specific design and Council approval. These findings are subject to further analyses at future investigation phases.

5.3 Ground Improvement for Static Settlement

Where peat is less than 1.5m deep, it is typically more economical to excavate the peat material and backfill excavations with structural earthfill. Construction dewatering /subsoil drainage would be expected in this case.

Where peat is greater than 1.5m thick, temporary surcharge filling (preloading) of peat to induced/accelerate primary consolidation and reduce long-term creep settlements to within acceptable limits is a viable option.

It is recommended that a varying thickness of surcharge is adopted depending on peat thickness to help keep long term post construction creep settlements more uniform thereby reducing long term differential settlement.

Using the static settlement assessments in Section 4.7 and allowing for a long-term widespread surcharge load to model single storey buildings on raft foundations, the structural fill and surcharge thicknesses will need to account for the assessed induced settlement assessments to mitigation measure for post-construction creep settlements. Thus, additional fill will be needed to account for the assessed settlement and to maintain a surcharge load above the future target earthworks fill contours.

It is expected that Council infrastructure will require a 100yr design life. In particular, buried stormwater and sanitary sewer pipe are commonly installed within road reserves and due to relatively flat grades can be sensitive to settlement. Our experience is that post construction creep settlement magnitudes are negligible following appropriate preloading when no future loading occurs.

Based on our experience working with similar materials to those encountered on-site, the pre-load requirements presented in Table 4 are based on achieving 90% settlement (t90), is assessed to take the following periods of time:

Table 3: Summary of Estimated Pre-load Durations

Peat Thickness (m)	Time to reach t90 (months)
2.0	6 to 9
4.0	9 to 16
6.0	12 to 24

It must be noted that pre-load durations are difficult to predict and a contingency to the above time assessments should be applied. Settlement monitoring is a critical part of successful pre-loading to confirm suitable preload thickness and duration.

6.0 FURTHER WORK

The following additional scope of work is considered necessary to consider the risk profile for the scheme.

- Geotechnical investigation to inform ground model development, detailed geohazard assessment, selection of geotechnical design parameters, design, and construction recommendations.
- Geotechnical analysis and reporting, suitable to support future project stages including resource consent application, detailed design, and building consent applications (if any).
- Design of ground improvement if necessary to mitigate load or liquefaction induced settlement, or lateral spread.
- Geotechnical completion reporting of subdivision earthworks.

7.0 CLOSURE

This report has been prepared for use by Chinamans Hill and Ohaupo Land Partnership Ltd in relation to the proposed development at Ohaupo Land and Chinamans Hill, Southern Links, Hamilton project in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

Where a party other than Chinamans Hill and Ohaupo Land Partnership Ltd seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.

USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Environmental matters are not covered

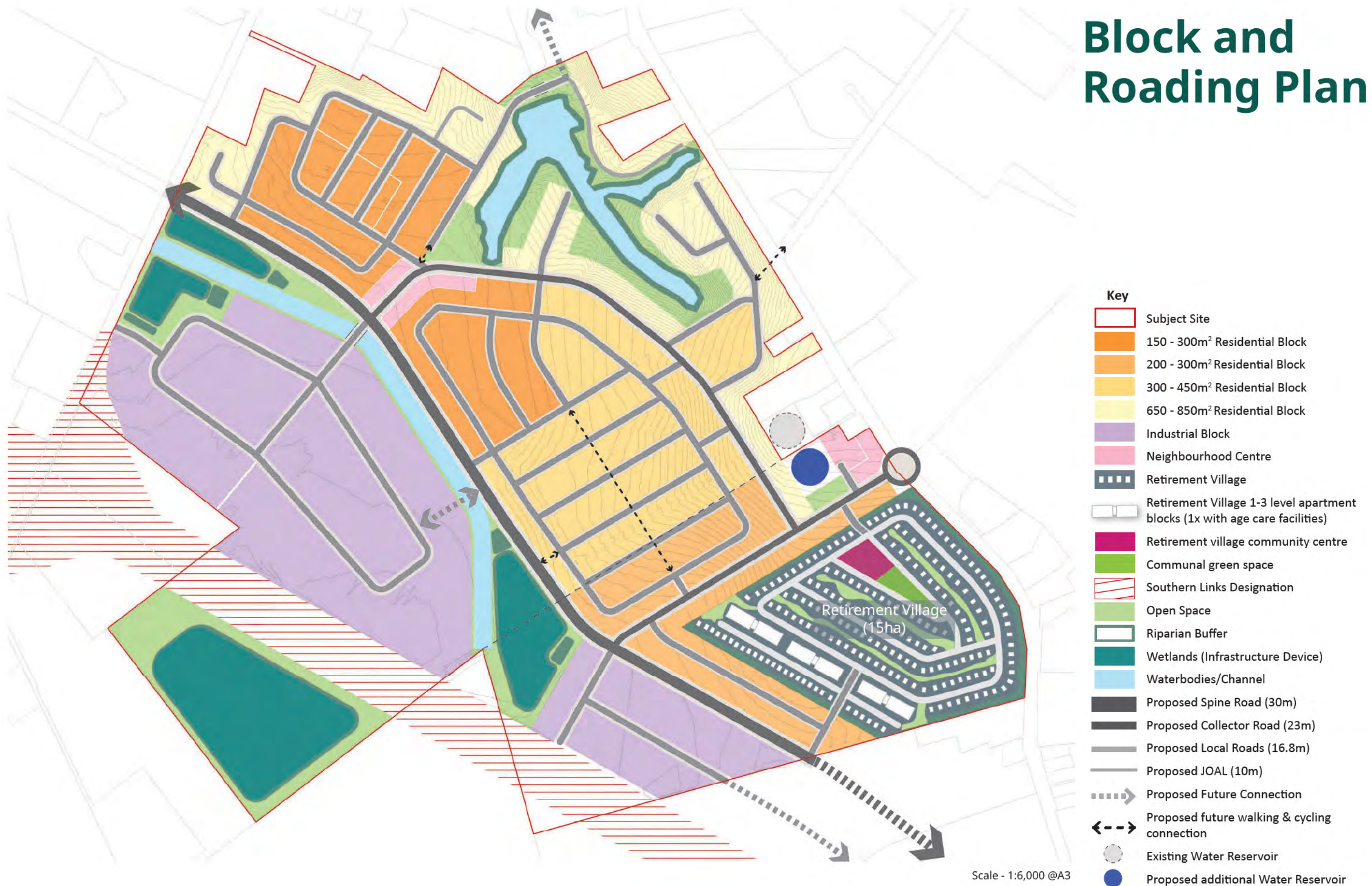
Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

APPENDIX A

Southern Links Development Structure Plan

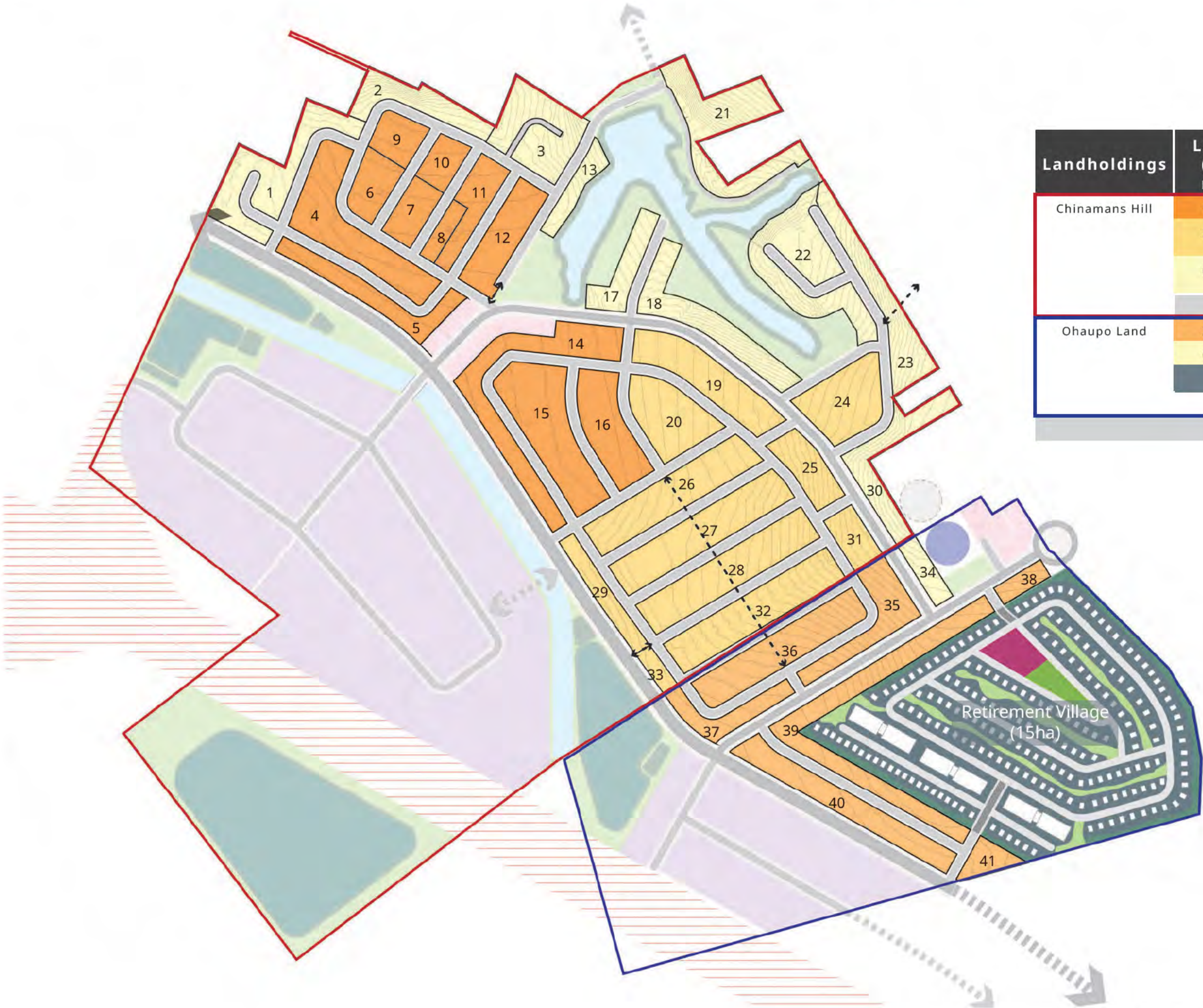
DRAFT For Discussion

Block and
Roading Plan

DRAFT For Discussion

Yield Study - Residential

Landholdings	Lot size (m2) - range	Blocks	Net Area (m²)	Yield (approx.)
Chinamans Hill	150-300	4-12, 14-16	103,869	510
	300-450	19-20, 24-29, 31-33	110,475	350
	650-850	1-3, 13, 17-18, 21-23, 33	111,836	140
	Total			1,000
Ohaupo Land	200-300	35 - 41	63,966	292
	650-850	34	5,362	8
	RV	-	150,000	400
Total				700
Total (all landholdings - residential)				1,700



- Subject Site
- 150 - 300m² Residential Block
- 200 - 300m² Residential Block
- 300 - 450m² Residential Block
- 650 - 850m² Residential Block
- Industrial Block
- Neighbourhood Centre
- Retirement Village
- Southern Links Designation
- Open Space
- Riparian Buffer
- Wetlands (Infrastructure Device)
- Waterbodies/Channel
- Proposed Spine Road (30m)
- Proposed Collector Road (23m)
- Proposed Local Roads (16.8m)
- Proposed JOAL (10m)
- Proposed Future Connection
- Proposed future walking & cycling connection
- Existing Water Reservoir
- Proposed additional Water Reservoir

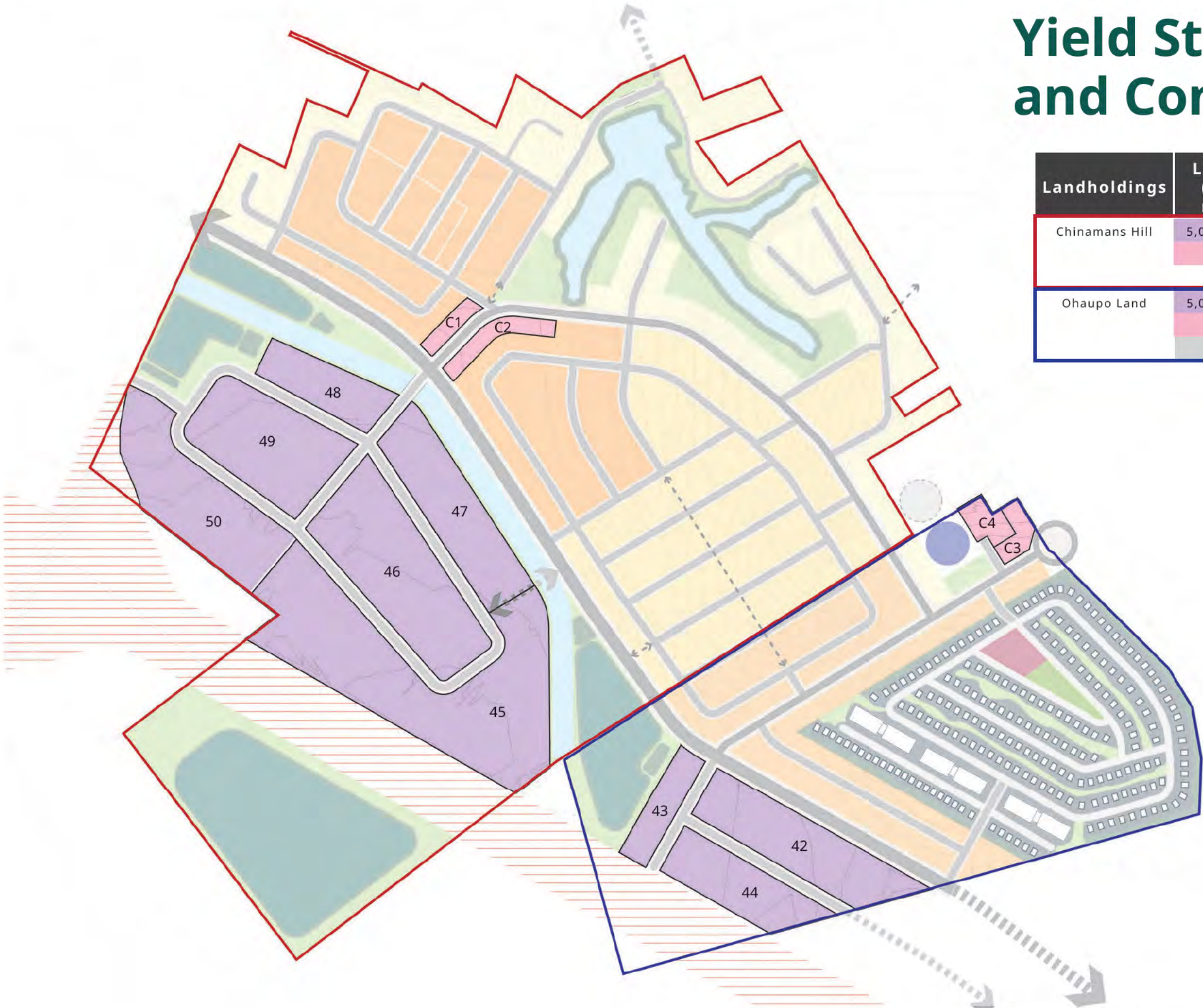
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DRAFT For Discussion

Yield Study - Industrial and Commercial

Landholdings	Lot size (m2) - range	Blocks	Net Area (m²)	Yield (approx.)
Chinamans Hill	5,000 - 9,000	45 - 49	203,695	20 - 38
	-	C1, C2	7,244	-
	Total			20 - 38
Ohaupo Land	5,000 - 9,000	42-44	51,138	4 - 9
	-	C3, C4	6,860	-
	Total			4 - 9

Total (all landholdings - industrial) 24 - 47



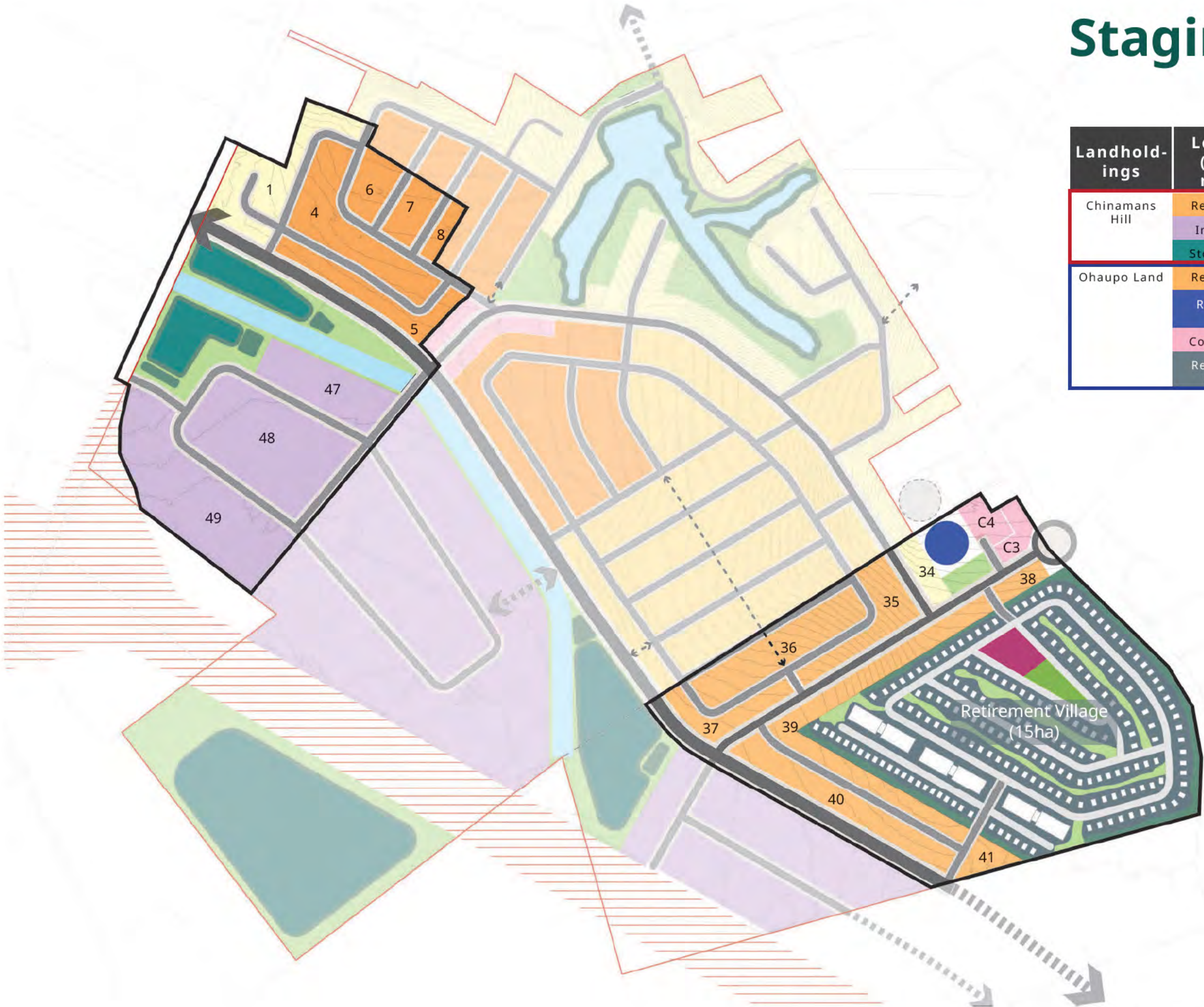
- Key
- Subject Site
 - 150 - 300m² Residential Block
 - 200 - 300m² Residential Block
 - 300 - 450m² Residential Block
 - 650 - 850m² Residential Block
 - Industrial Block
 - Neighbourhood Centre
 - Retirement Village
 - Southern Links Designation
 - Open Space
 - Riparian Buffer
 - Wetlands (Infrastructure Device)
 - Waterbodies/Channel
 - Proposed Spine Road (30m)
 - Proposed Collector Road (23m)
 - Proposed Local Roads (16.8m)
 - Proposed JOAL (10m)
 - Proposed Future Connection
 - Proposed future walking & cycling connection
 - Existing Water Reservoir
 - Proposed additional Water Reservoir

Scale - 1:6,000 @A3

DRAFT For Discussion

Staging - Option 1a

Landhold-ings	Lot size (m2) - range	Blocks	Net Area (m²)	Yield (approx.)
Chinamans Hill	Residential	1, 4 - 8	51,040	200
	Industrial	47 - 49	73,023	7 - 13
	Stormwater	2x wetlands	28,902	-
Ohaupo Land	Residential	34 - 41	69,328	300
	Reservoir	Water Reservoir	5,656	-
	Commercial	C3, C4	6,860	-
	Retirement Village		150,000	400

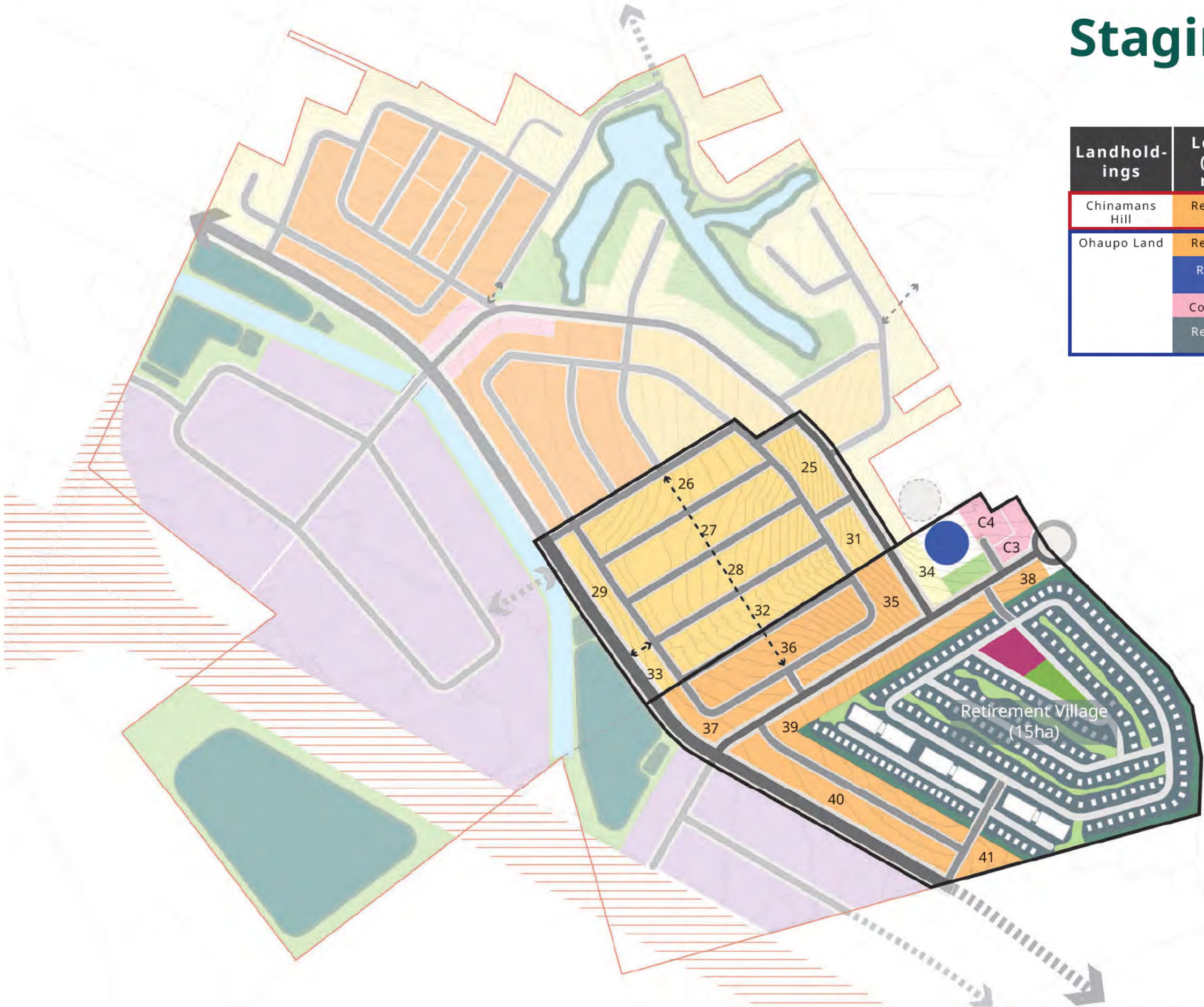


- Key**
- Subject Site
 - 150 - 300m² Residential Block
 - 200 - 300m² Residential Block
 - 300 - 450m² Residential Block
 - 650 - 850m² Residential Block
 - Industrial Block
 - Neighbourhood Centre
 - Retirement Village
 - Southern Links Designation
 - Open Space
 - Riparian Buffer
 - Wetlands (Infrastructure Device)
 - Waterbodies/Channel
 - Proposed Spine Road (30m)
 - Proposed Collector Road (23m)
 - Proposed Local Roads (16.8m)
 - Proposed JOAL (10m)
 - Proposed Future Connection
 - Proposed future walking & cycling connection
 - Existing Water Reservoir
 - Proposed additional Water Reservoir

DRAFT For Discussion

Staging - Option 1b

Landhold-ings	Lot size (m2) - range	Blocks	Net Area (m²)	Yield (approx.)
Chinamans Hill	Residential	25-29, 31-33	77,071	245
Ohaupo Land	Residential	34 - 41	69,328	300
	Reservoir	Water Reservoir	5,656	-
	Commercial	C3, C4	6,860	-
	Retirement Village	-	150,000	400



- Key**
- Subject Site
 - 150 - 300m² Residential Block
 - 200 - 300m² Residential Block
 - 300 - 450m² Residential Block
 - 650 - 850m² Residential Block
 - Industrial Block
 - Neighbourhood Centre
 - Retirement Village
 - Southern Links Designation
 - Open Space
 - Riparian Buffer
 - Wetlands (Infrastructure Device)
 - Waterbodies/Channel
 - Proposed Spine Road (30m)
 - Proposed Collector Road (23m)
 - Proposed Local Roads (16.8m)
 - Proposed JOAL (10m)
 - Proposed Future Connection
 - Proposed future walking & cycling connection
 - Existing Water Reservoir
 - Proposed additional Water Reservoir

Scale - 1:6,000 @A3



URBANISATION OF HOUCHENS ROAD
APPROX. L=400m

HOUCHENS ROAD

OHAUPO ROAD

PROPOSED SPINE ROAD
APPROX. L=940m

PROPOSED
INTERSECTION
UPGRADE

SOUTHERN LINKS DESIGNATION

- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH RITS.
 2. COORDINATES IN TERMS OF NZ GEODETIC DATUM MT EDEN 2000
 3. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016.
 4. ORIGIN OF LEVELS = SM XXXX SO XXXX(XXXX) PUBLISHED RL=XX.XX, SOURCED FROM THE LINZ DIGITAL GEODETIC DATABASE.
 5. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE ALL SERVICES THAT MAY BE AFFECTED BY THEIR OPERATIONS.
 6. THE CONTRACTOR SHALL COMPLY WITH ALL RELEVANT HEALTH AND SAFETY REQUIREMENTS.
 7. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY APPROVAL FROM UTILITY OPERATORS BEFORE COMMENCING WORK UNDER OR NEAR THEIR SERVICES.
 8. SEDIMENT CONTROL SHALL BE INSTALLED AND OPERATIONAL BEFORE EARTHWORKS START ONSITE IN ACCORDANCE WITH COUNCIL STANDARDS.
 9. CONTRACTOR SHALL PROVIDE AS-BUILT OF WORKING SEDIMENT CONTROL DEVICES AND CONFIRMATION OF POND/DECENT VOLUMES TO ENGINEER.
 10. SEDIMENT CONTROL TO COMPLY WITH GD05 STANDARDS.

LEGEND

- PR STAGE BDY
- PR SPINE ROAD
- PR URBANISATION ROAD
- PR INTERSECTION UPGRADE
- PR WETLAND
- PR CHANNEL
- PR ROAD
- PR FUTURE ROAD
- PR CUL-DE-SAC
- PR CULVERT OR BRIDGE
- SOUTHERN LINKS DESIGNATION
- EX WETLAND

A	PRELIMINARY	HN	08/25
Rev	Description	By	Date
Survey	LANDPRO		02/21
Design	KH		07/25
Drawn	KH		07/25
Checked	RW		07/25

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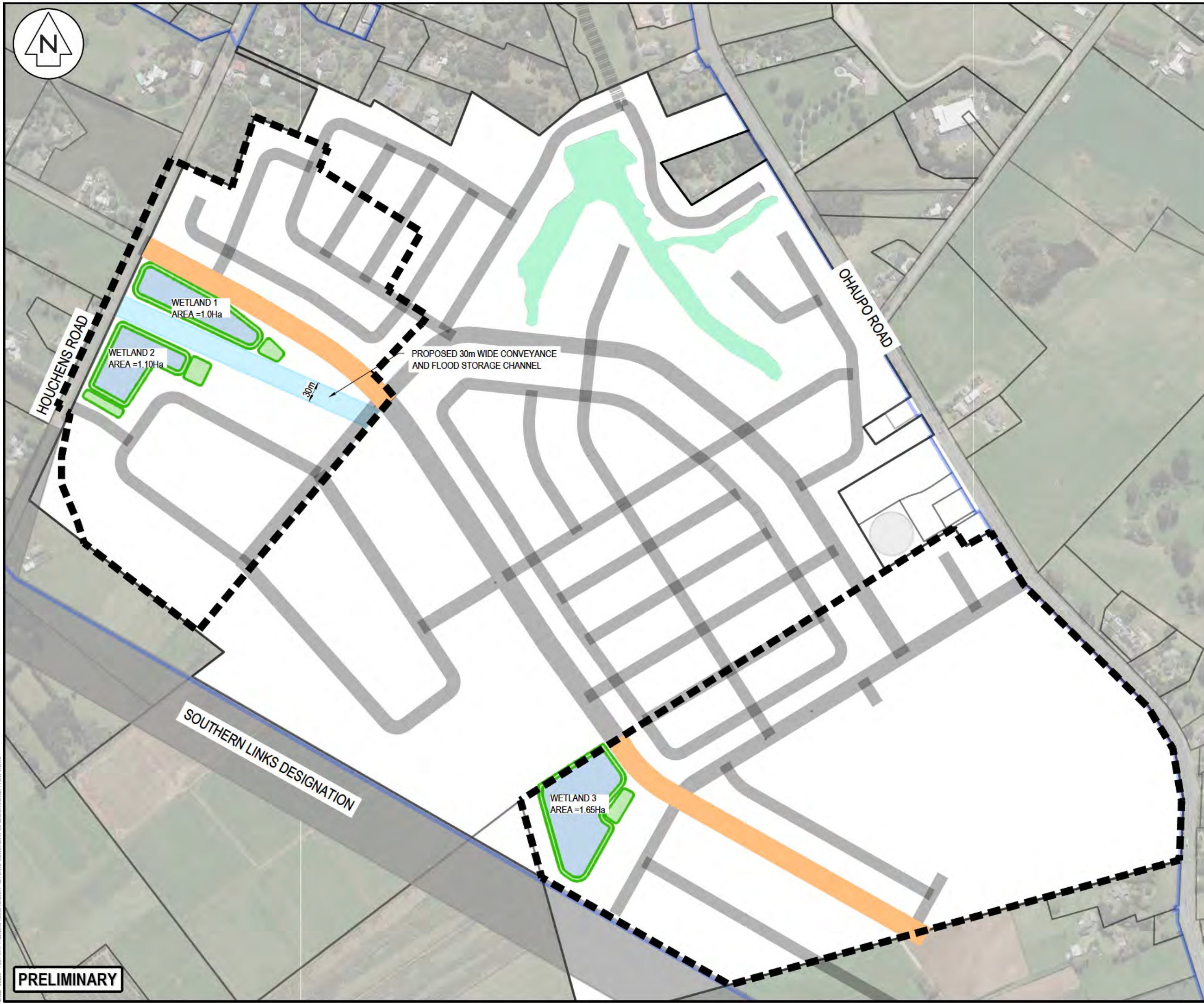
Project
SL 1
HOUCHENS DEVELOPMENT

Title
**PROPOSED 1A
ROADING
PLAN**

Project no.	180014
Scale	1:5000 @ A3
Cad file	180014 100- MASTER CONCEPT PLAN 1A.DWG
Drawing no.	C100
Rev	A

PRELIMINARY

DATE: 9/2/25 FILEPATH: F:\Maven\PROJECTS\180014-SL1\OHAUPO\DWG\180014-100-MASTERCONCEPTPLAN1A.DWG



- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH RITS.
 2. COORDINATES IN TERMS OF NZ GEODETIC DATUM MT EDEN 2000
 3. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016.
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LEGEND

	PR STAGE BDY
	PR SPINE ROAD
	PR WETLAND
	PR CHANNEL
	PR ROAD
	PR CUL-DE-SAC
	PR CULVERT OR BRIDGE
	SOUTHERN LINKS DESIGNATION
	EX WETLAND

A	PRELIMINARY	HN	08/25
Rev	Description	By	Date
Survey	LANDPRO		02/21
Design	KH		07/25
Drawn	KH		07/25
Checked	RW		07/25

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Project
SL 1
HOUCHENS
DEVELOPMENT

Title
PROPOSED 1A
STORMWATER
PLAN

Project no.	180014
Scale	1:5000 @ A3
Cad file	180014 100- MASTER CONCEPT PLAN 1A.DWG
Drawing no.	C101
Rev	A

DATE: 9/2/25 FILE PATH: F:\Maven\Projects\180014 SL 1\180014 100- MASTER CONCEPT PLAN 1A.DWG

PRELIMINARY



A) PUBLIC RETICULATED OPTION:
PUMP STATION AND WASTEWATER
RISING MAIN CONNECT TO EX. 225Ø
(REFER TO BLOWUP "A")
APPROX. L=1650m

B) DECENTRALISED OPTION:
MBR WASTEWATER TREATMENT
PLANT AND DISPOSAL WETLAND

WASTEWATER PUMP
STATION TO DISCHARGE TO
ADOPTED INTERIM
DISCHARGE SOLUTION

GRAVITY
WASTEWATER LINE
APPROX. L=830m

CONNECT TO
EX. 225Ø WASTEWATER (GIS)

BLOWUP "A "

NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH RITS.
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10. SEDIMENT CONTROL TO COMPLY WITH GD05 STANDARDS.

LEGEND

- PR STAGE BODY
- PR GRAVITY WASTEWATER
- PR RISING MAIN
- POTENTIAL WASTEWATER TREATMENT PLANT
- PR WASTEWATER PUMP STATION
- EXISTING WASTEWATER

A	PRELIMINARY	HN	08/25
Rev	Description	By	Date
Survey	LANDPRO		02/21
Design	KH		07/25
Drawn	KH		07/25
Checked	RW		07/25



Project
SL 1
HOUCHENS
DEVELOPMENT

Title
PROPOSED 1A
INTERIM WASTEWATER
PLAN

Project no.	180014
Scale	1:5000 @ A3
Cad file	180014 100- MASTER CONCEPT PLAN 1A.DWG
Drawing no.	C102
Rev	A

PRELIMINARY



INDICATIVE SOUTHERN
WASTEWATER TREATMENT
PLANT LOCATION

FAIPING RD

PEACOCKES RD

RAYNES RD

BLOWUP "B"

OHAUPO ROAD

HOUCHENS ROAD

ULTIMATE SOLUTION :
ABANDON FEED TO INTERIM SOLUTION
(PUBLIC OR DECENTRALISED) AND
CONNECT PUMP STATION TO SOUTHERN
WWTP RISING MAIN

WASTEWATER RISING MAIN
CONNECT TO SOUTHERN
WASTEWATER TREATMENT PLANT
(REFER TO BLOWUP "B")
APPROX. L=4090m

SOUTHERN LINKS DESIGNATION

NOTES

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3. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016.
4. ORIGIN OF LEVELS = SM XXXX SO XXXX(XXXX)
PUBLISHED RL=XX.XX, SOURCED FROM THE LINZ
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7. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY
APPROVAL FROM UTILITY OPERATORS BEFORE
COMMENCING WORK UNDER OR NEAR THEIR
SERVICES.
8. SEDIMENT CONTROL SHALL BE INSTALLED AND
OPERATIONAL BEFORE EARTHWORKS START
ONSITE IN ACCORDANCE WITH COUNCIL
STANDARDS.
9. CONTRACTOR SHALL PROVIDE AS-BUILT OF
WORKING SEDIMENT CONTROL DEVICES AND
CONFIRMATION OF POND/DECENT VOLUMES TO
ENGINEER.
10. SEDIMENT CONTROL TO COMPLY WITH GD05
STANDARDS.

LEGEND

- PR STAGE BODY
- PR GRAVITY WASTEWATER
- PR RISING MAIN
- POTENTIAL WASTEWATER
TREATMENT PLANT
- PR WASTEWATER
PUMP STATION
- EXISTING WASTEWATER

A	PRELIMINARY	HN	08/25
Rev	Description	By	Date
	By	Date	
Survey	LANDPRO	02/21	
Design	KH	07/25	
Drawn	KH	07/25	
Checked	RW	07/25	

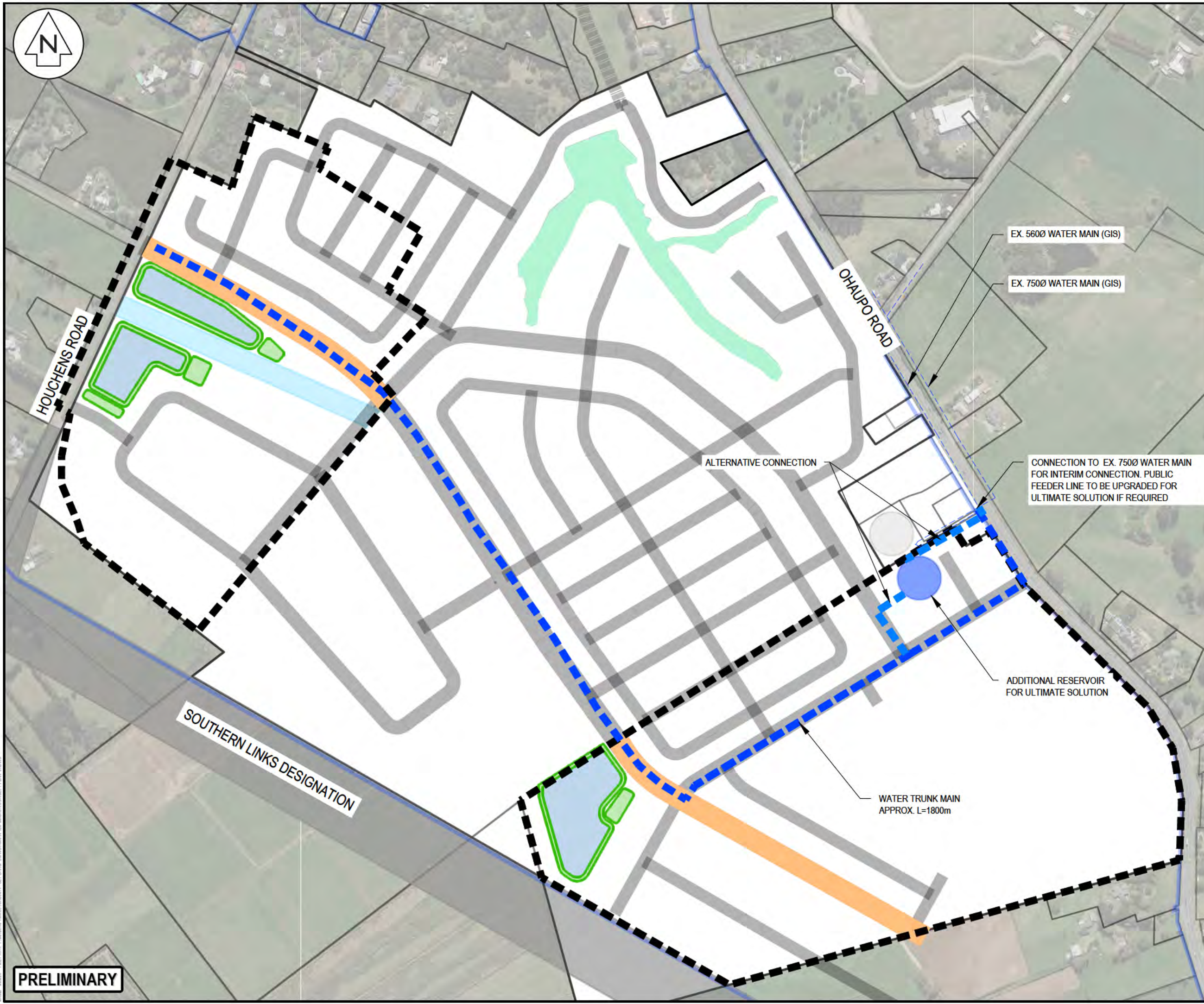


Project
SL 1
HOUCHENS
DEVELOPMENT

Title
PROPOSED 1A
ULTIMATE WASTEWATER
PLAN

Project no.	180014
Scale	1:5000 @ A3
Cad file	180014 100- MASTER CONCEPT PLAN 1A.DWG
Drawing no.	C103
Rev	A

PRELIMINARY



- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH RITS.
 2. COORDINATES IN TERMS OF NZ GEODETIC DATUM MT EDEN 2000
 3. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016.
 4. ORIGIN OF LEVELS = SM XXXX SO XXXX(XXXX) PUBLISHED RL=XX.XX, SOURCED FROM THE LINZ DIGITAL GEODETIC DATABASE.
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 10. SEDIMENT CONTROL TO COMPLY WITH GD05 STANDARDS.

- LEGEND
- PR STAGE BDY
 - PR WATER TRUNK MAIN
 - PR WATER TRUNK MAIN (ALTERNATIVE OPTION)
 - RESERVOIR
 - EXISTING WATER

A	PRELIMINARY	HN	08/25
Rev	Description	By	Date
Survey	LANDPRO		02/21
Design	KH		07/25
Drawn	KH		07/25
Checked	RW		07/25

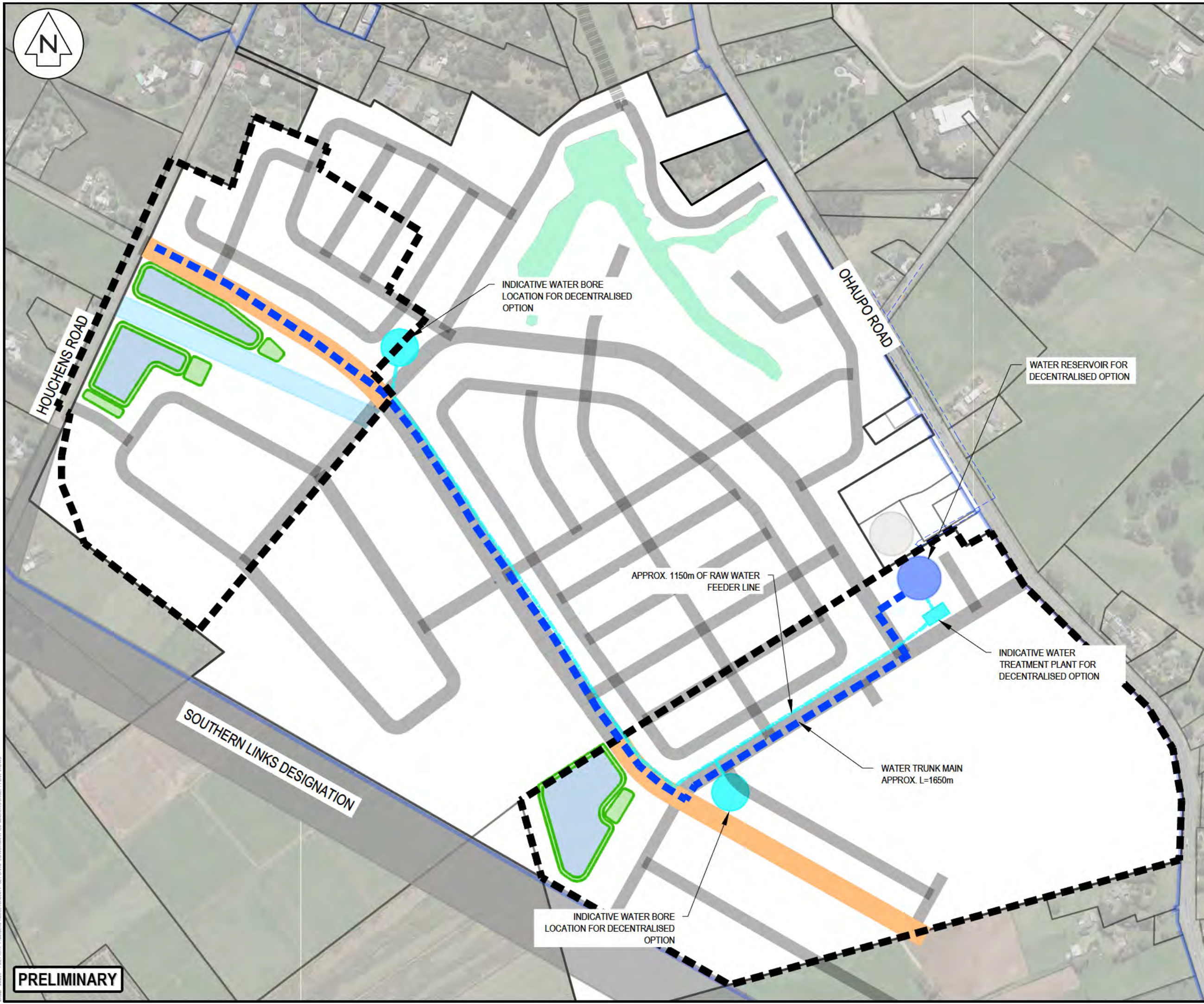


Project
SL 1
HOUCHENS
DEVELOPMENT

Title
PROPOSED 1A
PUBLIC WATER SUPPLY
PLAN

Project no.	180014
Scale	1:5000 @ A3
Cad file	180014 100- MASTER CONCEPT PLAN 1A.DWG
Drawing no.	C104
Rev	A

PRELIMINARY



- NOTES
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 2. COORDINATES IN TERMS OF NZ GEODETIC DATUM MT EDEN 2000
 3. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016.
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LEGEND

---	PR STAGE BDY
---	PR WATER TRUNK MAIN
---	PR WATER MAIN FEEDER LINE
●	RESERVOIR
---	EXISTING WATER

A	PRELIMINARY	HN	08/25
Rev	Description	By	Date
Survey	LANDPRO		02/21
Design	KH		07/25
Drawn	KH		07/25
Checked	RW		07/25

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Project
SL 1
HOUCHENS
DEVELOPMENT

Title
PROPOSED 1A
DECENTRALISED
WATER SUPPLY PLAN

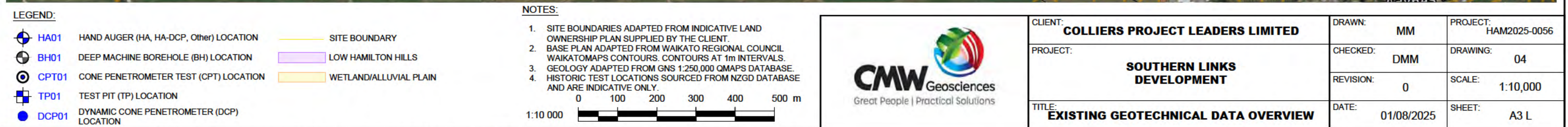
Project no.	180014
Scale	1:5000 @ A3
Cad file	180014 100- MASTER CONCEPT PLAN 1A.DWG
Drawing no.	C105
Rev	A

PRELIMINARY

DATE: 9/2/25 FILEPATH: F:\Maven\Projects\180014 SL 1\100-MASTER CONCEPT PLAN 1A.DWG

APPENDIX B

Site Plan and NZGD Test Logs



BORE HOLE LOG				BORE HOLE NO: 5		
PROJECT: SAFE 73		LOCATION: CHINAMANS HILL REALIGNMENT		PROJECT NO: 261443.00		
RL GROUND(m) :		CO - ORDINATES :		LAB REF NO: 98/343/001		
DATUM (m) :						
CORE DESCRIPTION Rock or Soil Type , Colour, Strength, Structure, Particle Size, Weathering Lithological Features, (bedding, foliation, texture, mineralogy, etc)	Depth (m)	Graphic Log	ROCK DEFECTS / COMMENTS Joints, bedding, seams, shear and crush Zones etc	Water Level (Date)	Shear Strength (kPa)	SPT Values
Dark brown TOPSOIL	0.32	0.0				
Dark yellowish brown firm CLAY, plastic, moist	0.58	-0.5				
Interbedded HW gravelly SILT / silty SAND banded light grey / yellowish brown / brown soft - firm, sensitive, very moist beds subhorizontal 50 - 300mm thick gravels HW soft subrounded upto 25mm ø occasional light grey sensitive SILT beds		-1.0 -1.5 -2.0 -2.5 -3.0 -3.5 -4.0 -4.5 -5.0 -5.5 -6.0	Sand particles break down wet when remouldede Copper Ring Sample form 5.00 - 7.5m			
Predominantly HW - CW silty SAND with lesser gravelly SILT and SILT beds banded orange brown / lt grey		-6.5 -7.0 -7.5 -8.0 -8.5 -9.0				
	9.07	-9.0	Copper Ring Sample form 9.0 - 10.5m			
Light grey homogenous SILT, some clay soft, sensitive, very moist	9.50	-9.5				
Light grey HW pumiceous silty SAND sand medium - coarse some fine gravel		-10.0 -10.5				
	10.70	-10.5				
Light grey homogenous SILT some clay, soft, very moist, st plastic		-11.0 -11.5				
	11.75	-11.5				
Light grey laminated SILT some fine sand, dilatant, non plastic		-12.0 -12.5				
	12.45	-12.5				
Light grey pumiceous silty fine SAND loose, uniform, dilatant trace of silt occasional large pumice gravel inclusions		-13.0 -13.5				
	14.05	-13.5				
Grey pumiceous sandy GRAVEL		-14.0				
	14.22	-14.0				
Grey pumiceous SAND fine - medium sand		-14.5				
	14.55	-14.5	Lost Core 14.55 - 14.90m			
		-15.0				
Driller : Drillwell Started : 9/06/98 Finished : 10/06/98			Hamilton Laboratory Fox Street Private Bag 3057, Hamilton, New Zealand Ph: +64 7 856 2870 Fax: +64 7 856 2873			
			Comments			
			Logged by: P Smith			
			Checked:			
			Date: 6/98			

BORE HOLE LOG				BORE HOLE NO: 5										
PROJECT: SAFE 73		LOCATION: CHINAMANS HILL REALIGNMENT		PROJECT NO: 261443.00										
RL GROUND(m) :		CO - ORDINATES :		LAB REF NO: 98/343/001										
DATUM (m) :														
CORE DESCRIPTION Rock or Soil Type, Colour, Strength, Structure, Particle Size, Weathering Lithological Features, (bedding, foliation, texture, mineralogy, etc)	Depth (m)	Graphic Log	ROCK DEFECTS / COMMENTS Joints, bedding, seams, shear and crush Zones etc	Water Level (Date)	Shear Strength (kPa)	SPT Values								
Olive gray fine - medium SAND	15.30	-15.0												
Light yellow soft highly sensitive SILT some fine sand	15.25	-15.5												
White soft highly sensitive SILT, pumiceous	16.20	-16.0												
		-16.5	E.O.Bore 16.2m											
		-17.0												
		-17.5												
		-18.0												
		-18.5												
		-19.0												
		-19.5												
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		-28.5												
		-29.0												
		-29.5												
		-30.0												
Driller : Drillwell Started : 9/06/98 Finished : 10/06/98			 Hamilton Laboratory Fox Street Private Bag 3057, Hamilton, New Zealand Ph: +64 7 856 2870 Fax: +64 7 856 2873											
			Comments											
			<table border="1"> <tr> <td>Logged by:</td> <td>P Smith</td> <td>Checked</td> <td>Date</td> </tr> <tr> <td></td> <td></td> <td></td> <td>6/98</td> </tr> </table>				Logged by:	P Smith	Checked	Date				6/98
Logged by:	P Smith	Checked	Date											
			6/98											



BORE HOLE LOG				BORE HOLE NO: 6		
PROJECT: SAFE 73		LOCATION: CHINAMANS HILL REALIGNMENT		PROJECT NO: 251443.00		
RL GROUND(m) :		CO - ORDINATES :		LAB REF NO: 98/343/001		
DATUM (m) :						
CORE DESCRIPTION Rock or Soil Type, Colour, Strength, Structure, Particle Size, Weathering Lithological Features, (bedding, foliation, texture, mineralogy, etc)	Depth (m)	Graphic Log	ROCK DEFECTS / COMMENTS Joints, bedding, seams, shear and crush Zones etc	Water Level (Date)	Shear Strength (kPa)	SPT Values
Dark brown organic SILT soft, traces of peat, wet	0.85					
Brownish grey SILT some clay, initially soft becoming firm slightly plastic, occasional organic inclusions	2.00					
Dark greyish brown silty CLAY plastic, very sticky	2.35					
Light grey HW soft sandy SILT	2.50					
Brownish grey SILT soft, sensitive, very moist, silty organic	2.90					
Greyish brown clay SILT firm, some fine sand, very moist some organic fibres	4.10		Highly disturbed core from 3.6 - 4.0m			
Light bluish grey HW - CW sandy SILT soft, sensitive, some clay initially from 4 - 6m	6.00		Copper Ring Sample 4.0 - 5.7m			
Light bluish grey HW - CW silty fine SAND pumiceous, sand fine - medium, sensitive wet when remoulded	8.00					
Light blue MW homogenous gravelly fine - medium SAND loose - medium dense, trace of silt some pumice gravel upto 40mm ø generally < 10mm ø very moist			Copper Ring sample 8.7 - 10.3m			
Light bluish grey SW - MW homogenous gravelly SAND medium dense, fine - medium SAND gravels upto 50mm ø generally <15mm ø pumiceous, subrounded						

Driller : Drillwell
Started : 8/6/98
Finished : 9/06/98

OPUS
INTERNATIONAL CONSULTANTS

Hamilton Laboratory
Fox Street
Private Bag 3057,
Hamilton, New Zealand
Ph: +64 7 856 2870
Fax: +64 7 856 2873

Comments

Logged by: P Smith	Checked:	Date: 6/98
--------------------	----------	------------

BORE HOLE LOG				BORE HOLE NO: 6		
PROJECT: SAFE 73		LOCATION: CHINAMANS HILL REALIGNMENT		PROJECT NO: 261443.00		
RL GROUND(m) :		CO - ORDINATES :		LAB REF NO: 98/343/001		
DATUM (m) :						
CORE DESCRIPTION Rock or Soil Type , Colour, Strength, Structure, Particle Size, Weathering Lithological Features, (bedding, foliation, texture, mineralogy, etc)	Depth (m)	Graphic Log	ROCK DEFECTS / COMMENTS Joints, bedding, seams, shear and crush Zones etc	Water Level (Date)	Shear Strength (kPa)	SPT Values
Light bluish grey SW - MW gravelly SAND medium dense	16.20					
		-15.0 -15.5 -16.0 -16.5 -17.0 -17.5 -18.0 -18.5 -19.0 -19.5 -20.0 -20.5 -21.0 -21.5 -22.0 -22.5 -23.0 -23.5 -24.0 -24.5 -25.0 -25.5 -26.0 -26.5 -27.0 -27.5 -28.0 -28.5 -29.0 -29.5 -30.0	E.O.Bore 16.2m			
Driller : Drillwell Started : 8/06/98 Finished : 9/06/98		 Hamilton Laboratory Fox Street Private Bag 3057, Hamilton, New Zealand Ph: +64 7 856 2870 Fax: +64 7 856 2873		Comments		
				Logged by: P Smith	Checked	Date 6/98



U8>G8 L->:Ä8+ ;>9 7+ 89,Ä 9: >,3 9Ä

NZGD ID: BH 108648



À !Ā "Ā\$%ĀĀ& Ā'

P)F X
S<#1S\$B(1S)#

DH0%

B438 #^1V Ā9: ĀBB
]C- 86, P>+ 3-9 Ā -G,58ĀĀ37Ā
] G86,ĀG+; 8C /& /%A%/'

B- Y-C>8Ā @& "A[. "K+ X A@&[?& +#
)C89,>,39 Y[&b X8R>39
F-6>,39 ' -G5Ā>+ 349
U8>,G8 L->:Ā8+>,9 7+ 89,Ā8: >,39Ā

QX)F)QS BVF c'X'BLS j1 \$ #		18ĀĀL86- C Ā		c82, 5		QC->SĀFE		OV1XLS/FĀ X'BLS j1 \$ #		SĀ,CG+8>3-9	
* 8>58ĀĀĀ 8>38Ā 89Ā 89,1Ā2>Ā 38>ĀĀĀ 38Ā #>+ 81Ā83>4Ā8>Ā8>Ā8Ā , 8,Ē825ĀĀ 93		' 58>CĀ'>98 8Ā8G>Ā88>7 8Ā88,8Ā7>		#Ā'>4G8Ā 8Ā8Ā8		c82, 5		H8 9ĀĀ 896<ĀC8,38Ā 89Ā3<Ā>, 8Ā8 9,89,1Ā2>Ā 38>ĀĀĀ 38Ā 8,61		SĀ,CG+8>3-9	
A. + ĀĀĀ[. [A+ 0Ā8=8>588: ! 6G89,Ā8:8Ā >4G8>Ā9: ! Ā8 >9: Ā8F84Ā88Ā8<Ā, - ; G=936Ā88<Ā 128>4Ā88Ā, - 6->88Ā>9:Ā>9:Ā88Ā. Ā 8:3G+ EGF84Ā846>9-E8937Ā 6>4 ; 8: : 8: 1Ā4>3>8: Ā, Ā, 8! ĀG5-C 3-9, >4-9:Ā8G84 Ā84 Ā2>68: 1Ā8: ĀĀĀ88Ā89: Ā8: Ā34,		(1] ĀĀ 1?7 Ā8Ā		PI * F		/		' 51TĀ88Ā8<Ā8G8- Ā8-8,1Ā4=Ā2Ā83<.		VĀ	
		ĀĀ 1?7 Ā8Ā		J1		K		U88Ā, Ā+8: 3> Ā'V# c 1Ā,888Ā8F84ĀG=936Ā88<Ā8: 3> : 89Ā8TĀ8,1Ā82Ā8:8T Ā8:~+ 3>9,4-8G+88-GĀĀ:35 >22Gf3>,84Ā8, Ā88Ā8-ĀĀTĀ8F8488ĀĀ8G-9EG+Ā, - ĀG-CG9:8: /+ 0]GĀ8,G,8Ā, -Ā8Ā4EE8:Ā=89Ā8, G,6,8:.			
		ĀĀ 1?7 Ā8Ā		J1				O8: 3> Ā, Ā6>88Ā8: 1Ā+3- 88F84ĀG=9Ā9: Ā>ĀĀ8< F- Ā8Ā, Ā+8: 3> Ā89Ā8TĀ8, TĀ82Ā8: 8: Ā, 8GE5Ā88Ā>9:T 28: ~+ 3>9,4-8G+88-GĀĀ:35 EGF84Ā88ĀG >9EGĀ8- Ā9EGĀC			
		ĀĀ 1?7 Ā8Ā		PI * F		@		K."A+ 84Ā84Ā2>68:Ā:8: ĀĀDĀ85,Ā88<8G+88-GĀ Ā>9: Ā8:Ā88GĀ, 8Ā, -Ā88ĀH"&+ Ā, -Ā8+ + 1Ā>9: ĀG:5-C3-9,>4. K.A+0F--Ā8.			
		ĀĀ 1?7 Ā8Ā		J1				@+08F84ĀC>88, -Ā88Ā, Ā+8:3G+ ĀC2ĀĀ A+ +! + - :8C>, 8-Ā8 84Ā82>68:Ā:8:ĀĀ-D88Ā89:1Ā" ĀĀ, - /8+ + Ā, 88Ā89:Ā8G:5-C3-9,>4.			
		ĀĀ 1?7 Ā8Ā		PI * F		I		B) L XĀF' ' Ā&&+ ĀĀ >,G8:8: Ā - Ā8Ā>9:.			
		ĀĀ 1?7 Ā8Ā		J1				B) L XĀF' ' Ā&&+ ĀĀ >,G8:8: Ā - Ā8Ā>9:.			
		ĀĀ 1?7 Ā8Ā		PI * F		&		B) L XĀF' ' Ā&&+ ĀĀ >,G8:8: Ā - Ā8Ā>9:.			
		ĀĀ 1?7 Ā8Ā		J1				QG84Ā88Ā, Ā+8: 3> Ā'V# c TĀ>ĀĀ8<Ā8: 3> Ā89Ā8T + - ĀTĀ82Ā8: 8: TĀ8F84Ā88Ā, Ā6>88TĀ889EG+Ā, - G8: 8: T8+ĀĀĀĀ89: 8Ā81/5< 48Ā9: Ā, 588Ā 469364Ā,36 +>, 8C4 &[A+ 0&&+ + Ā-98Ā:84= Ā' 1Ā88-888:Ā>Ā8C+8Ā -94<Ā88Ā82C-;,>4<Ā>Ā88:Ā-GĀ, ĀC84Ā8			
QL) (#c* V1XLĀ) a'XL'V1S) # c82,5] 8J+ 8,8C L8>:39E c>,8		c>,8ĀEE8: K8?Z & F-EE8: cO O B58678: Veā		L8+>CĀ VĀC84-888G>8: 888C>88: 88>8G+9: Ā88-86589ĀĀ->: VĀ 58>88-98Ā8ĀĀ, 8+2,8: Ā, Ā8Ā+Ā>8C>ĀGĀĀĀ-DĀĀC8888CĀ35Ā(+ + R-98Ā4: 8.		c 8488] 8CC< K8?Z & c 8448 U9388: e-59Ā888 K8?Z & B- 888-f 8Ā %]>E8 " -D %					
B>Ā88Ā 8,>34Ā c82,5 c 3+ 8,8C L8+>CĀ				P>9:Ā584 Ā 58>CĀ >98 '>988G+; 8C cL @K& a4: 8 [+ + U>6,-C. [%8K'K' vane shear strength per NZGS guideline							

c>,8Ā] 8,8:0
"AZ8/Z8 "



À !Ā "Ā\$%ĀĀ& Ā'

P)F X
S<X#1S1\$B/1S)#

DH0%

B438 #^1V Ā9: ĀBB
]C- 86, P>+ 3-9 Ā -G,58ĀĀ37Ā
] G86,ĀG+; 8C /& /%A%/

B- Y-C3>,8Ā @& "A[. "K+ X A@&[?& +
)C39,>,39 Y[8b X8R>39
F-6>,39 ' -G5Ā>+ 349
U8>,G8 L->:Ā8+,>9 7+ 89,Ā8: >,39Ā

QX)F)QS BVF cX'BLS j1 \$ # * 8>58Q8EĀ 8+ 38Ā 8959Ā-4GĀ #>: 81Ā35-4E35>Ā8>:G8Ā , 9, E8258Ā 93		18ĀĀ86- C Ā ' 58>CĀ'>98 8Ā3G>4Ā82>7 8Ā88,8Ā7'>		c82.5 CC388E8,5-: B>3EĀ8+>OĀ B- C8FĀĀĀD, c82.5		QC>88ĀFE OV1XLS/FĀ X'BLS j1 \$ # H89Ā8,896<ĀC8,38Ā 89Ā3<Ā>: 8Ā69,89,1Ā2>Ā38<ĀE>3E 8,61		VĀ	
A. +ĀĀĀ[. [A+ 0Ā8=8>588: ! 6G89,Ā8:8Ā >4C9>Ā9:!! Ā3 >9: ĀC8F4Ā88ĀĀ<Ā,- ; G=935ĀĀ<Ā 125>4Ā88Ā,- 6->88Ā>9:Ā>9:Ā88Ā- Ā 8:3G+ E8F84Ā46>9-E893674 6>4 ; 8: : 8: 1Ā4>3>8: Ā, Ā, 5! Ā5-C 3-9, >4-9:Ā8G84 Ā84 Ā2>68: 1Ā8: ĀĀĀ88ĀĀ9: Ā8: Ā34,		ĀĀ 1Ā1@ Ā8 ?		P1 * F		QGF84Ā88Ā,Ā+8: 3G- Ā'V#c TĀ>7ĀĀ<Ā8: 3G- Ā89Ā8T + 3ĀTĀĀĀ8: 8: TĀĀF84Ā88Ā,Ā6>88TĀĀ89EG+Ā,- G8: 8: 164ĀĀĀĀ9: 8Ā38!Ā5< 48Ā9: Ā,5888 468364Ā,36 +>,8C4 + 0c88Ā6- + + 89,088F84Ā86 - + 3EĀ88Ā;-G9! Ā>C8EĀ8ĀC89Ā .A+ 0'>9:Ā8:8ĀĀ,-Ā88Ā,Ā6>CĀ8 .@A+ 0&&+ + Ā8G5-C3-9,>4Ā8:Ā- DĀ:8Ā8<Ā88Ā,- + 8:3G+ĀĀ9:.		B) L XĀ' ' ' Ā8A&+ ĀĀ, G8,8:Ā4-Ā8Ā>9:Ā9:ĀEGF84	
A" + 0ĀĀ" + Ā,Ā[. [A+ Ā'3 6-9,89,Ā38>Ā8ĀĀ,<8>4* ;8:8Ā =35Ā88Ā- Ā 8:3G+ Ā9:!! Ā- 4G88G:8ĀĀ- Ā88936 E8<Ā9:ĀE8<		ĀĀ 1Ā1! Ā Ā8 %		P1 * F		U38Ā,Ā6>88Ā'V#c 1ĀĀ+ 8ĀĀF84Ā>7ĀĀ<Ā8: 3G- : 89Ā8TĀ8,TĀ84Ā8: 8: TĀ8: - + 3>9,4Ā858Ā8-ĀĀTĀĀF84 88Ā- Ā 8:3G+T8G9:8Ā,- Ā8G;>9EG4C		B) L XĀ' ' ' Ā8A&+ ĀĀF- Ā8Ā9: Ā8: ĀĀF84	
		ĀĀ 81818 Ā88 ') *		P1 * F		'>9: <Ā'SHTĀ>7ĀĀ<Ā8GĀĀĀ+ 3Ā,Ā8,1ĀĀ8Ā3F8!Ā99 24Ā8.			
				P1 * F		' 3<Ā88Ā,Ā+8: 3G- Ā'V#c TĀ>7ĀĀ<Ā8GĀ4 Ā8TĀ+3Ā,- =8,TĀĀĀ8: 8: TĀĀĀ88,4ĀĀ8Ā3F8.			
QL) (#c* V1XLĀ) a'XL'V1S) # c82,5] 3J-+ 8,8CL8>39E c>,8		c>,8ĀEE8: K8?Z & F-EE8: cO O B58678: Veā		L8+>CĀ V8C34-4883G>8: 888C38: 88>ĀG 4+9: ĀĀ8-G6589ĀĀ->: VĀ 58>88-96Ā8ĀĀ,8+2,8: Ā,Ā8Ā+Ā>8C>ĀGĀĀĀĀĀĀC83Ā8C835Ā(+ + R-98Ā4: 8.		P>9:Ā584 Ā58>Ā >98 '>98ĀG+; 8C cL @K& a4: 8 [+ + U>6,-C . [%8K'K' vane shear strength per NZGS guideline		c 3448 ' ,>C8:] 8CC< K8?Z & c 3448 U9358: e-59Ā888 K8?Z & B- 88Ā-f 8Ā %]>E8 ? -D %	
B>Ā9ĒĀ 8,>34Ā c82,5 c3+8,8C L8+>OĀ									



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P)F X
S<X#1S1\$B/1S)#

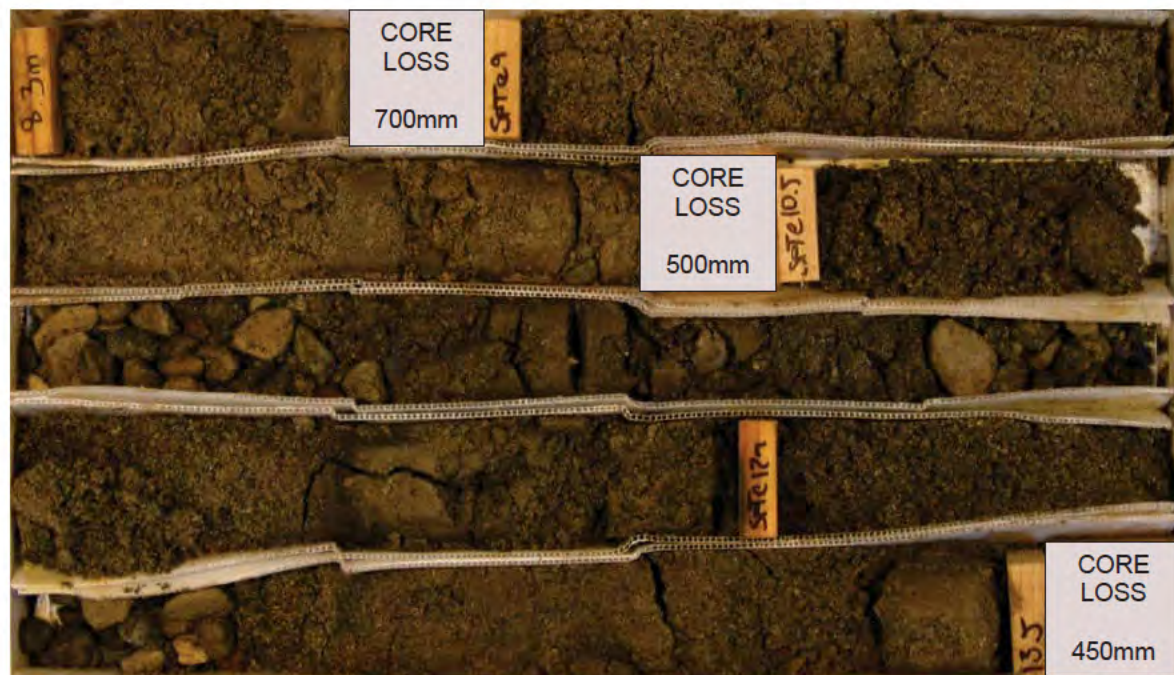
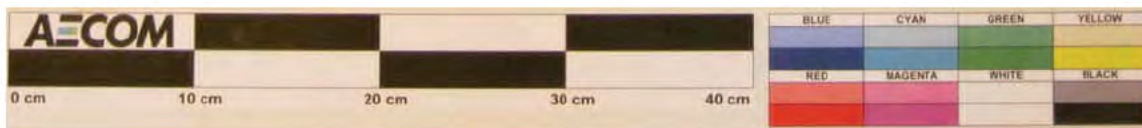
DH0%

B438 #^1V Ā9: ĀBB
]C- 86, P>+ 3-9 Ā -G,589Ā 37Ā
] G 86,ĀG+; 8C /& /%A%/

B- Y-C3>,8Ā @& "A[. "K+ X A@&[?& +
)C39,>,39 Y[&b X4R>39
F-6>,39 ' - G5ĀP>+ 349
U8>,G8 L->:Ā8+ ;>9 7+ 89,Ā8: >,39Ā

QX)F)QS BVF cX'BLS j1 \$ # * 8>5899EĀ 8+ 38Ā 89E 518-4 G0 #>+ 81835-4E35>Ā18>:C8Ā , 0, E82558Ā 93		18ĀĀL86- C Ā ' 58>CĀ'>98 8Ā3G>Ā828>7 8Ā88,8Ā7'>		c82, 5 QC>88ĀFE		OV1XLS/FĀ X'BLS j1 \$ # H89ĀĀ 896<ĀC8,38Ā 89Ā3<Ā>, 8089,89,1Ā2Ā38<ĀE>:3E 8,61	SĀ,CG+8>3-9 VĀ
A. + ĀĀĀ[. [A+ 0Ā8=8>588: ! 6G89,Ā8:8:Ā >ĀC8-Ā>9:Ā 3 >9: ĀC8847 Ā88Ā8<Ā, - ; G=935Ā88<Ā 128>4Ā88Ā, - 6->88Ā>9:Ā>9:Ā88Ā- Ā 8:3G+ E884Ā846>9-E89374 6>4 ; 8: : 8: 1Ā4>3>8: Ā, Ā, 5! ĀG5-C 3-9, >4-9:Ā8G84 Ā84 Ā2>68: 1Ā8: ĀĀ888Ā89: Ā8: Ā34,		ĀĀ 11 Ā8"		j1		' 3<Ā88Ā, Ā+8: 3G+ Ā'V# c TĀ>CĀ88<Ā 8GĀ4 Ā8TĀ+3Ā, - =8,TĀE2ĀC: 8: TĀĀ8Ā85,4ĀĀ8Ā388.	
		ĀĀ 11? Ā8Ā		K		' 51!ĀĀ+ 8Ā>9: 1ĀĀ+ 884<TĀ88936Ā88<Ā', 3ĀĀ+ 3Ā! 24Ā8TĀĀ>1Ā88TĀ8>48: Ā- 98ĀZ 8: ĀĀ-35Ā- ĀĀ9: 1Ā 8&Ā, - "88+ + Ā,887.	
		(1) ĀĀ 81818 Ā8& ') *		@		' >9: <Ā'S8TĀ88936Ā88<Ā- DĀ, Ā8 1Ā+ 3Ā1ĀĀ8Ā388! 88>88Ā+ 3Ā88Ā 589Ā= 08: TĀĀ> 1Ā88Ā, Ā+8: 3G+ .	
P3G88ĀU8 >3-9				[		' 51TĀ88Ā88<Ā 8GĀ- DĀ+ 3Ā1Ā85,4Ā24Ā8.	
				"&		c P&8,8 3>8: Ā>Ā[. [A+ Ā+88,Ā82,5	
QL) (#c* V1XLĀ) a'XL'V1S) # c 82,5] 3J+ 8,8C L8>:39E c>,8		c>,84EE8: K8?Z & F- EE8: cO O B58678: Vea		L 8+ >CĀ VĀC84-883G>8: 888C388: 88>8G 4+9: Ā88- G6589ĀĀ-> : VĀ 58>88-9688ĀĀ, 8+ 2,8: Ā, Ā(Ā+ Ā >8C>ĀGĀ-ĀĀ-DĀ-ĀC88388CĀ35Ā[+ + R-98Ā4: 8.		c 3448] 8CC< K8?Z & c 3448 U938: e-59Ā 888 K8?Z & B- 88-f 8Ā %] >E8 % -D %	
B>Ā88Ā 8,>34Ā c 82,5 c 3+ 8,8C L 8+ >CĀ				P>9:Ā584 Ā 58>CĀ >98 ' >988ĀG+ ; 8C cL @K& a4: 8 [+ + U>6,-C . [%8K.K'1 vane shear strength per NZGS guideline			

c>,8Ā] 8,8:0
"AZ&/Z& "



Project	Southern Links	Box	1 & 2 of 4
Job no.	60164546	Depth (below ground level)	From 0.00m to 13.50m of 19.95m
Location	Peat farmland off Houchens Road	Notes	Date photographed: 23/05/2011



Project	Southern Links	Box	3 & 4 of 4
Job no.	60164546	Depth (below ground level)	From 13.50m to 19.95m of 19.95m
Location	Peat farmland off Houchens Road	Notes	Date photographed: 23/05/2011

B-Y-C3>8Ä @& %./?/+ X A@&[/''' ?[K+ #
) 33>,3-9 Y[&b X4R>3-9
 F-6>3,9 ' -G5Ä+> 34-9
 U8>,33 QGG9: Ä-9:3,39 ÄÄÄÄÄÄÄÄ9>,3,9Ä
 >9:Ä>:Ä8+>9 7+ 89.

NZGD ID: BH 108665

B-Y-C3>8Ä @& %./?/+ X A@&[/''' ?[K+ #
)C39,>39 Y[&b X4R>39
 F-6>39 ' -G5Ä+> 349
 U8>G3 QGG9: Ä-9:39 3ÄÄÄÄÄÄÄÄG9>: 39Ä
 >9:ÄG>Ä8+>9 7+ 89.

NZGD ID: BH 108665



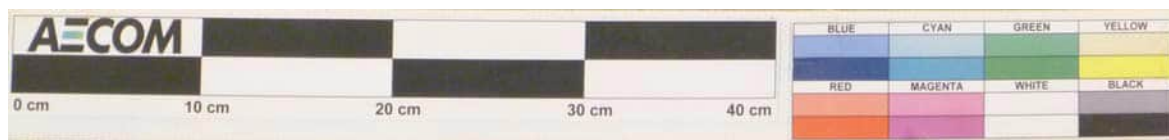
À !Ā "Ā\$%ĀĀ& Ā'

P)F X
SĀ#1SĀB(1S)#
DH1! "

B438 #^1V Ā9: ĀBB
]C- 86, P>+ 3-9 Ā -G,58ĀĀ37Ā
] G86,ĀG+; 8C /& /%A%/
P.3G88ĀUG > 3-9

B- Y-C:3>,8Ā @& %/. ?//+ X A@&/!/. ?[K+ #
)C39,>,39 Y[8b X48R>39
F-6>,39 ' -G5ĀP>+ 349
U8>,G8 QGG9: Ā-9 :3,39 ĀD ĀĀĀE8ĀDG9:>, 39Ā
>9:ĀG>:Ā8+ ;>9 7+ 89,

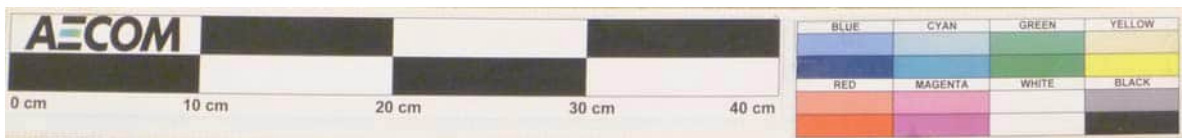
QX)F)QS BVF cX'BLS j1 \$ # * 8>58C8EĀ 8+ 38Ā 89E 5ĀĀ-4 GĀ #>+ 8ĀĀ38-4E38>ĀĀ8>C8Ā , 0, E8258Ā 93		18ĀĀĀ86- CĀ ' 58>CĀ'>98 8ĀĀG>ĀĀ8>7 &Ā88ĀĀ'>		c82, 5 QC-58ĀFE		OV1XLS/FĀ X'BLS j1 \$ # H89ĀĀ896<ĀC8,38Ā 89Ā3<Ā=>8Ā89,89,ĀĀ8Ā38<ĀĀE>38Ā 8,6!		V SĀ,CG+8>3-9	
?.% ĀĀĀ&KĀ+ 0ĀĀĀĀG+ T ;C= 936Ā- ĀĀ36ĀE8< B-58ĀĀ8Ā>,8C>ĀĀĀĀĀ! E89GĀĀ>,8C>ĀĀĀĀ 8:3G+ : 89Ā8Ā,Ā89Ā8TĀ8Ā,84Ā,- 4+ 3>,8Ā8:3 9E.		ĀĀ K! Ā!" Ā8?K		ĀĀ %ĀĀ! & Ā8Ā Ā		ĀĀ ĀĀĀ! & Ā8Ā /		QGR84Ā88Ā,Ā6>C8Ā'V# c.ĀC8: 3G+ Ā89Ā8TĀ+3ĀTĀĒR84 88Ā- Ā 8:3G+ĀG GG9:8Ā,- ĀG>9EGĀĀG+88! Ā>9Ā,- 98Ā9Ā+ 38ĀĒ98-GĀĀ85-4 E8Ā Ā 0#-ĀEC8Ā>9ĀĀ>9ĀĒ3:39EĀ,Ā88. B4<8<Ā'SHĀ-35Ā,88ĀĀ9: TĀ8Ā:Ā5ĀĀB<Ā8GĀĀĀ,- Ā DTĀ+3ĀTĀ5ĀĀĀĀ83<TĀĀ>Ā88.	
QL) (#c* V1XLĀ) a'XL'V1S) # c82,5 j 3J+ 8,8C L8>39E c>,8		c>,84EE8: "Z " Z & F- EE8: Veā B58678: cO O		L8+ >CĀ VĀP &7Ā46>,8: 89C>: 88C8Ā49 EĀP-G6589ĀĀ-> :		c 3448 ' , >C8: j 8CC< "Z " Z & c 3448 U938: O- C- 7> "Z " Z & O' 1@& B- 8Ā-f 8Ā /			
B>Ā8ĀĀ 8,>34Ā c82,5 c 3+ 8,8C L 8+ >ĀĀ				P>9:Ā58Ā Ā 58>ĀĀ>98 '>98ĀG+ ; 8C a4: 8 U6,-C vane shear strength per NZGS guideline				j>E8 ? -D A	



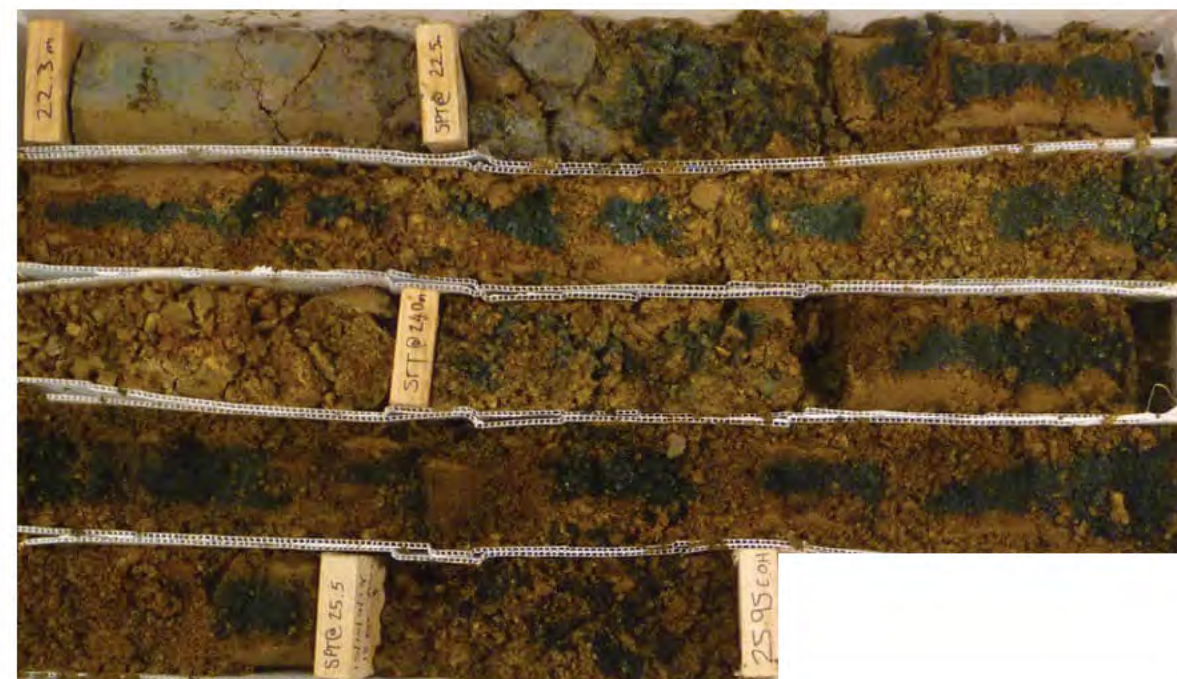
Project	Southern Links	Box	1 & 2 of 7
Job no.	60164546	Depth (below ground level)	From 0.0m to 8.2m of 25.95m
Location	Southern end of Houchens Road	Notes	Date photographed: 14/02/2012

Date printed 17/04/2012

1 of 4



Project	Southern Links	Box	3 & 4 of 7
Job no.	60164546	Depth (below ground level)	From 8.2m to 18.45m of 25.95m
Location	Southern end of Houchens Road	Notes	Date photographed: 14/02/2012



Project	Southern Links	Box	5 & 6 of 6
Job no.	60164546	Depth (below ground level)	From 18.45m to 25.95m of 25.95m.
Location	Southern end of Houchens Road	Notes	Date photographed: 14/02/2012



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P)F X
S<X#1S1\$B(1S)#

DH1! #

B438 #^1V Ā9: ĀBB
]C- 86, P>+ 3-9 Ā -G,58ĀĀ37Ā
] G 86,ĀG+; 8C /& /%A%/

B- Y-C3>,8Ā @&"KK"K/+ X A@&@/0%#%#
)C39,>,39 Ÿ &b X8R>39 A".A| +
F-6>,39 ' -G5Ā>+ 349
U8>,G8 QG8: Ā69: 33 9ĀĀCĀ8,9E

QX)F)QS BVF cX'BLS j1 \$ # * 8>58ĀĀĀ 8+ 38Ā 89E 51Ā-4 GC >+ 81Ā35-4E35>Ā18>(C8Ā , 0, E825ĀĀ93		18ĀĀL86- CĀ ' 58>CĀ'>98 8Ā3G>ĀĀ8>7 8Ā38,8Ā7) > #Ā'>4G8Ā 8ĀĀ8		c82, 5 QC>8ĀĀE		OV1XLS/FĀ X'BLS j1 \$ # H6 9ĀĀ 896<ĀC8,38Ā 89Ā3<Ā>,8Ā6 9,89,1Ā2Ā38<ĀĒ>3E 8,61	SĀ,CG+8>3-9 VĀ
LXB#1ĀVFF('SVFĀcX)]' S' % ĀĀĀ+ 0ĀĀC8-ĀĀ9:1 Ā3 >9: Ā4<TĀĀĀ893Ā5ĀĒ< '>9: ĀĀĀ2+ 88Ā9: Ā5<- 48Ā+3! 2G+88-GĀĀ>9:Ā3Ā8>,588: >9:Ā;C8>7ĀĀ= 9Ā589Ā- C78:..		ĀĀ ! 1" ĀĀ5?		/ '>9: <Ā8<8<Ā'SHTĀĀ893Ā5ĀĒ<Ā',3ĀĀ+ 3Ā!ĀĀ- 24Ā 83<Ā99Ā89Ā38TĀĀ>1Ā88Ā,Ā+8: 3Ā!ĀĀ+ 8Ā8>7Ā :-=9Ā,Ā8<8<ĀĀĀ589Ā= C78:..			
/ + ĀĀĀ0+ 0ĀĀĒ5,4Ā8>,588: >4C8>Ā>9:TĀ>GĀĒ889,Ā-Ā 8 >9:Ā=84Ē8:8:..		ĀĀ 171% ĀĀ5K		j1 U38Ā,Ā6>C8Ā'V# c TĀ>CĀ889,ĀF- Ā8Ā,Ā8GĀ4 Ā8T + - 3ĀTĀ84Ē8: 8: TĀ8G-Ā82- C3 9ĀĀĀ388Ā9: Ā2+ 88 64ĀĀTĀ2Gf3> >84Ā & _ ĀĀĀ>,8C>Ā,8>7ĀĀ: =9Ā,Ā8< ĀĀĀ589Ā- C78:..			
@/4 ĀĀĀ[Ā+ 0ĀĀC8-Ā9: 46Ā,3884<Ā8: ĀĀTĀC8<Ā9: E8893Ā5ĀG=9!ĀĀ. D		ĀĀ &1 1" ĀĀ5?		K B) LXĀ) ' ' &Ā+			
[Ā+ ĀĀĀ?+ 0ĀĀĒ5,4 =8>,588:ĀG9¥848: 2G+88-GĀĀ93: C38TĀĒ5, E8893Ā5ĀC<Ā188Ā- Ā 8:3G+! >9EG4<2G+ 8884ĀĀĀ3539 :89Ā8ĀG+88Ā>9:..		ĀĀ &1 1" ĀĀ5?		j1 ' 3<8FVWTĀ88Ā8<Ā9: ĀC889,Ā',3ĀĀ+ 3Ā!ĀĀ-Ā2Ā 83<T ĀQY5-C3- 9,>ĀĀ, Ā89,4Ā8688:ĀE889Ā,>39E.			
		ĀĀ &1 1" ĀĀ5?"		j1 QGf84Ā88Ā,Ā6>C8Ā'V# c TĀĀ893Ā5ĀĒ<Ā89Ā8T + - 3ĀTĀ84Ē8: 8: TĀĀ> ĀĀĀ- ĀĀ8,384ĀG+ 88- GĀTĀ8f84 88Ā,Ā+8: 3Ā!Ā8EG+Ā,ĀĀGG 8: TĀ2+ 88Ā-35Ā8ĀĀ,89 &_ Ā88Ā8ĀĀ			
QL) (#c* V1XLĀ) a'XL'V1S) # c82,5] 8J+ 8,8C L8>:39E c>,8 &+ & @Ā+ V a "KZ&Z&" "Z&Z&"		c>,8ĀEE8: KZ&Z" & " F- EE8: cO O B58678: Veā		L 8+ >CĀ ĀĀP &ĀĀ6>8: 898G+9: Ā>Ā8ĀDĀ42 8Ā8ĀĀ P7Ā9: ĀP &% ĀĀ >8Ā8ĀĀC8888>8: Ā589ĀC88Ā5GGE5ĀC 368Ā9 8ĀĀ @ Ā9Ā. D : C88ĀKZ& Z& "Ā>C8Ā3>8>,8C8Ā= 88+ ĀP ĀC: ĀĀ: Ā8C8:..		c 348] 8CC< KZ& Z & " c 344Ē U9358: O- C- 7> @Z Z & " O' 1@& B- 8Ā-f 8Ā /	' , >C8: U9358: @Z Z & " /
B>Ā8Ē8, >34Ā c82,5 c 3+ 8,8C L 8+ >CĀ		P>9:Ā584 Ā 58>CĀ >98 '>98ĀG+; 8C a4+: 8 U>6,-C		c 348] 8CC< KZ& Z & " c 344Ē U9358: O- C- 7> @Z Z & " O' 1@& B- 8Ā-f 8Ā /		-D A	
		vane shear strength per NZGS guideline					

c>,8Ā]C8:0
"AZ&Z& "



À !Ā "Ā#\$%ĀĀ& Ā'

P)F X
S<#1S\$B/1S)#

DH1! #

B438 #^1V Ā9: ĀBB
]C- 86, P>+ 3-9 Ā -G,58Ā 37Ā
] G 86,ĀG+; 8C /& /%A%/'

B- Y-C,8Ā @&"KK"K/+ X A@&@/0%# #
)C89,>,39 Ÿ &b X8R>39 A".A| +
F-6>,39 ' -G5Ā>+ 349
U8>,88 QG8: Ā69: 339ĀĀCĀ8,9E

QX)F)QS BVF cX'BLS j1 \$ # * 8>58C8EĀ 8+ 38Ā 89E 5Ā8-4GĀ #>+ 8Ā835-4E8>ĀĀ8>C8Ā , 0, E8258Ā 93		18ĀĀL86- C Ā ' 58>CĀ'>98 8Ā8G>ĀĀ8>7 8Ā8&Ā'>		c82, 5 QC-88ĀFE		OV1XLS/FĀ X'BLS j1 \$ # H89ĀĀ896<ĀC8,38Ā 89Ā3<Ā=>8Ā89,89,Ā2>Ā38<ĀE>38 8,61		SĀ,CG+8>3-9 VĀ	
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QL) (#c* V1XLĀ) a'XL'V1S) # c 82,5] 8J+ 8,8C L8>:39E c>,8		c>,8ĀEE8: KZ&Z"& " F- EE8: cO O B58678: Veā		L 8+ >CĀ YĀP &AĀ6>8: 888G+9: Ā>Ā8ĀDĀ42 8Ā8ĀĀ Ā P7Ā9: ĀP &% YĀ >888ĀĀĀC8888>Ā8: Ā=589ĀC88Ā5GGE5ĀG 368Ā9 8ĀĀ @ Ā9Ā. D : 888ĀKZ& Z& "Ā>C8Ā3>8>,888= Ā8+ ĀP ĀC: ĀĀ: Ā888:		c 8448 ', >C8:] 8CC< KZ& Z & " c 8448 U9368: O- C- 7> @Z Z & " O' 188 B- 888-f 8Ā /			
B>Ā8ĀEĀ 8,>34Ā c 82,5 c 3+ 8,8C L 8+ >8Ā				P>9:Ā584 Ā 58>8Ā >98 ' >988G+ ; 8C a4: 8 U6,-C vane shear strength per NZGS guideline		] >E8 ? -D A			

c>,8Ā] 88,8:0
"AZ&/Z& "



À !Ā "Ā\$%ĀĀ& Ā'

P)F X
S<X#1S)B(1S)#

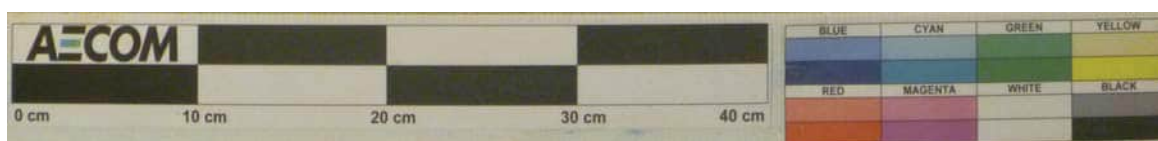
DH1! #

B438 #^1V Ā9: ĀBB
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] G 86,ĀG+; 8C /& /%A%/

B- Y-C3>,8Ā @&"KK"K/+ X A@&@/0%#<#
)C39,>,39 Y &b X4R>39 A".A| +
F-6>,39 ' -G5Ā>+ 349
U8>,G8 QG8: Ā69: 339ĀĀCĀ8,9E

QX)F)QS BVF cX'BLS j1 \$ # * 8>58ĀĀĀ8>38Ā 89E5Ā8-4GĀ #> 8Ā835-4E8>ĀĀ8>C8Ā , 0, E8258Ā93		18ĀĀĀ86- C Ā ' 58>CĀ'>98 8Ā8G>ĀĀ8>7 &Ā8&Ā'>		C38ĀĀ8,5- B>Ā8ĀĀ>CĀ B- CĀFĀĀĀD, ĀĀĀ c82, 5 QC>88ĀFE		OV1XLS/FĀ X'BLS j1 \$ # H89ĀĀ896<ĀC8,38Ā89Ā3<Ā=>8Ā89,89,Ā8>Ā8<ĀĀE>38Ā 8,6Ā	SĀ,CG+8>3-9 VĀ
[.A+ ĀĀĀ7+ 0ĀĀE5,4< =8> 588:ĀG9Y848: 2G+88-GĀĀE93 ;C38TĀE5, E88936ĀE8<ĀĀ8Ā- Ā 8:3G+ ! >9EG4-8G+ 88Ā4ĀĀĀ-3539 :89Ā8ĀG+88Ā>9:..		ĀĀ "?? ? ! [D-CĀ%&+ ĀĀĀ& j1		PĀ * F		QG-F84-Ā8Ā,Ā6>8Ā'V#cTĀ83Ā888936Ā8<Ā89Ā8T + 3ĀTĀ84ĀE8: 8: TĀĀ>ĀĀ+ - ĀĀ8,384-8G+ 88- GĀTĀ8F84 88Ā,Ā+8: 3+ Ā8EG+Ā,ĀĀCG8: 8: TĀ2- 88Ā-35ĀĀĀ,59 &_ Ā858Ā8-ĀĀ	
" ?+ ĀĀĀĀ[Ā+ 0Ā8=8> 588: 2G+88-GĀĀE93 ;C38TĀE5, E88936ĀE8<Ā -C4ĀĀ Q8: >9EG4-8G ĀCG9:8:Ā2G+88 E8F849ĀĀ>9:..		ĀĀ K1?%!/ D-CĀ%&+ ĀĀĀ& j1		PĀ * F		"?+ 0C8F849ĀĀ+8:3G+Ā,Ā8-CĀ8>9:89=8> 588:..	
		ĀĀ " !?Ā! Ā D-CĀ?Ā+ ĀĀĀ& j1		PĀ * F		"A	
						"K	
						"I	
						c P &ĀĀ,8>3>8: Ā>ĀĀ[Ā+ Ā+88,Ā82,5	
QL) (#c* V1XLĀ) a'XL'V1S) # c 82,5] 3J+ 8,8C L8>:39E c>,8		c>,8ĀEE8: KZ& Z"& " F- EE8: cO O B58678: Vea		L 8+ >CĀ ĀĀP &ĀĀ6>8: 898G+9: Ā>Ā8ĀDĀ428Ā8ĀĀĀ P7Ā9: ĀP &% ĀĀ >8Ā8ĀĀC8888>Ā8: Ā=589ĀC88Ā5GGE5ĀG 368Ā98ĀĀ @ Ā9Ā- D : 888ĀKZ& Z& "Ā>C8Ā3>8>,8C8Ā= Ā8+ ĀP ĀC: ĀĀ: Ā888: .		c 3448] 8CC< KZ& Z & " c 3448 U9368: O- C- 7> @Z Z & " O' 1@& B- 88Ā-f 8Ā /	']>E8 A -D A
B>Ā8Ā8,8>34Ā c 82,5 c 3+ 8,8C L 8+ >CĀ				P>9:Ā584 Ā 58>CĀ >98 ' >98ĀG+ ; 8C a4: 8 U6,-C			
				vane shear strength per NZGS guideline			

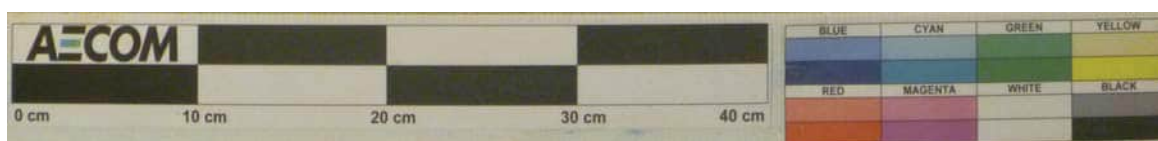
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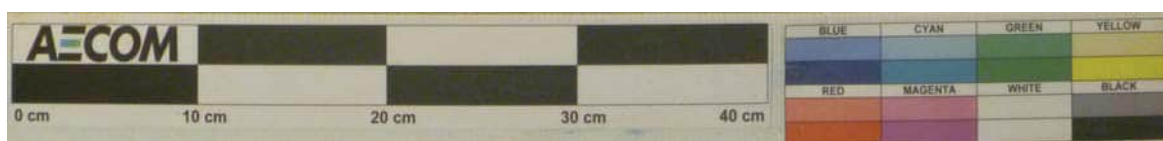
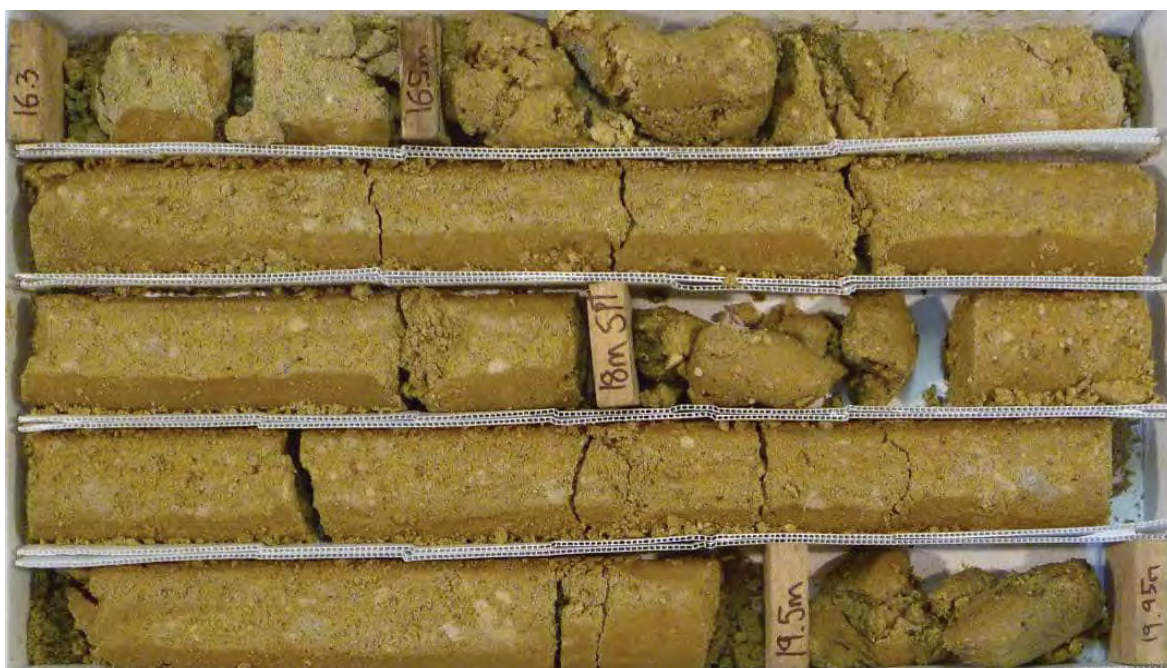
Project	Southern Links	Box	1 & 2 of 7
Job no.	60164546	Depth (below ground level)	From 0.0m to 8.7m of 25.95m
Location	Base of slope west of SH3	Notes	Date photographed: 14/02/2012

Date printed 17/04/2012

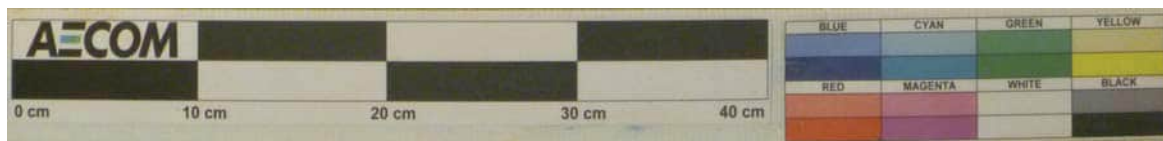
1 of 4



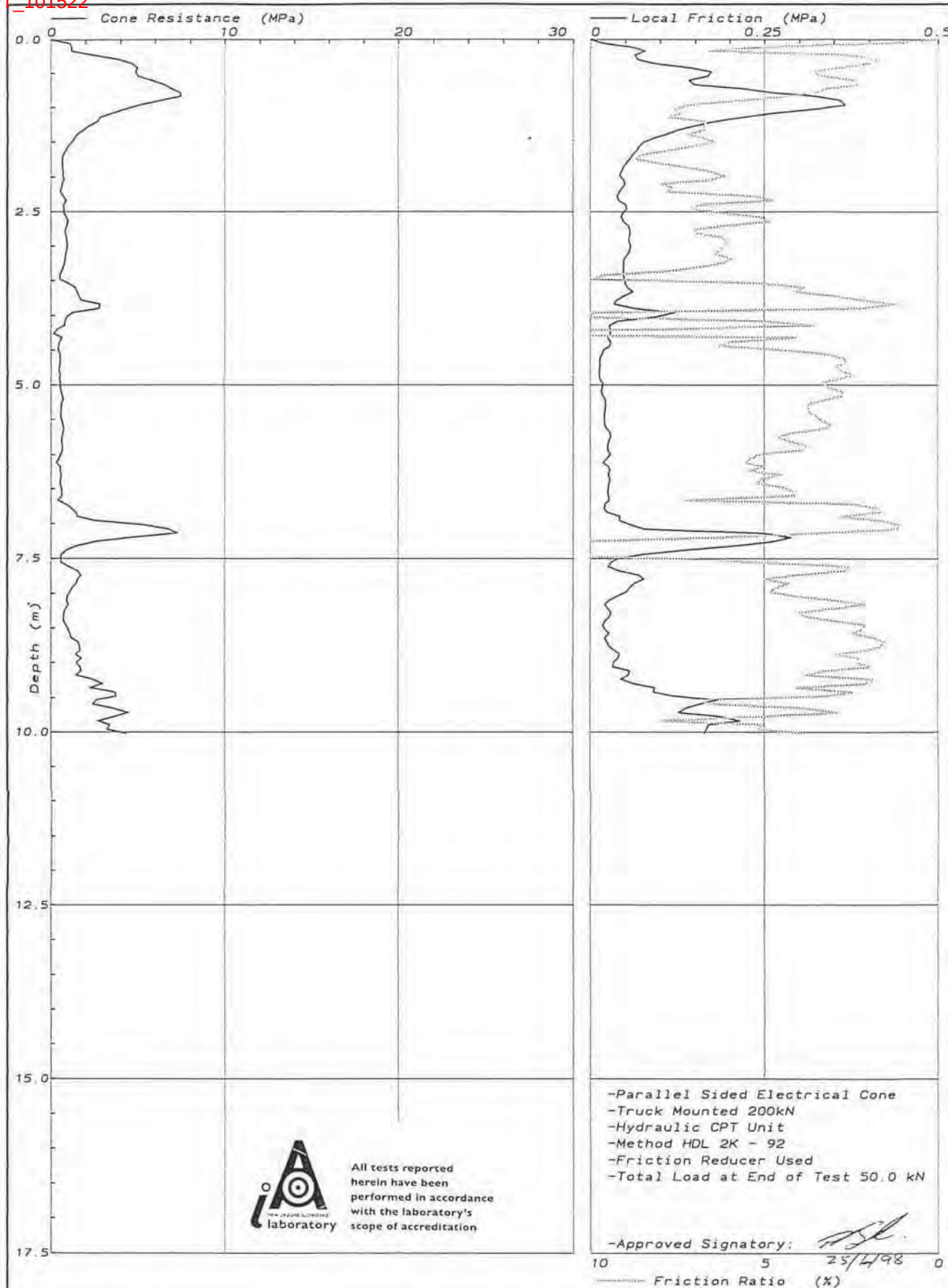
Project	Southern Links	Box	3 & 4 of 7
Job no.	60164546	Depth (below ground level)	From 8.7m to 16.3m of 25.95m
Location	Base of slope west of SH3	Notes	Date photographed: 14/02/2012



Project	Southern Links	Box	5 & 6 of 7
Job no.	60164546	Depth (below ground level)	From 16.3m to 23.1m of 25.95m.
Location	Base of slope west of SH3	Notes	Date photographed: 14/02/2012



Project	Southern Links	Box	7 of 7
Job no.	60164546	Depth (below ground level)	From 23.1m to 25.95m of 25.95m.
Location	Base of slope west of SH3	Notes	Date photographed: 14/02/2012



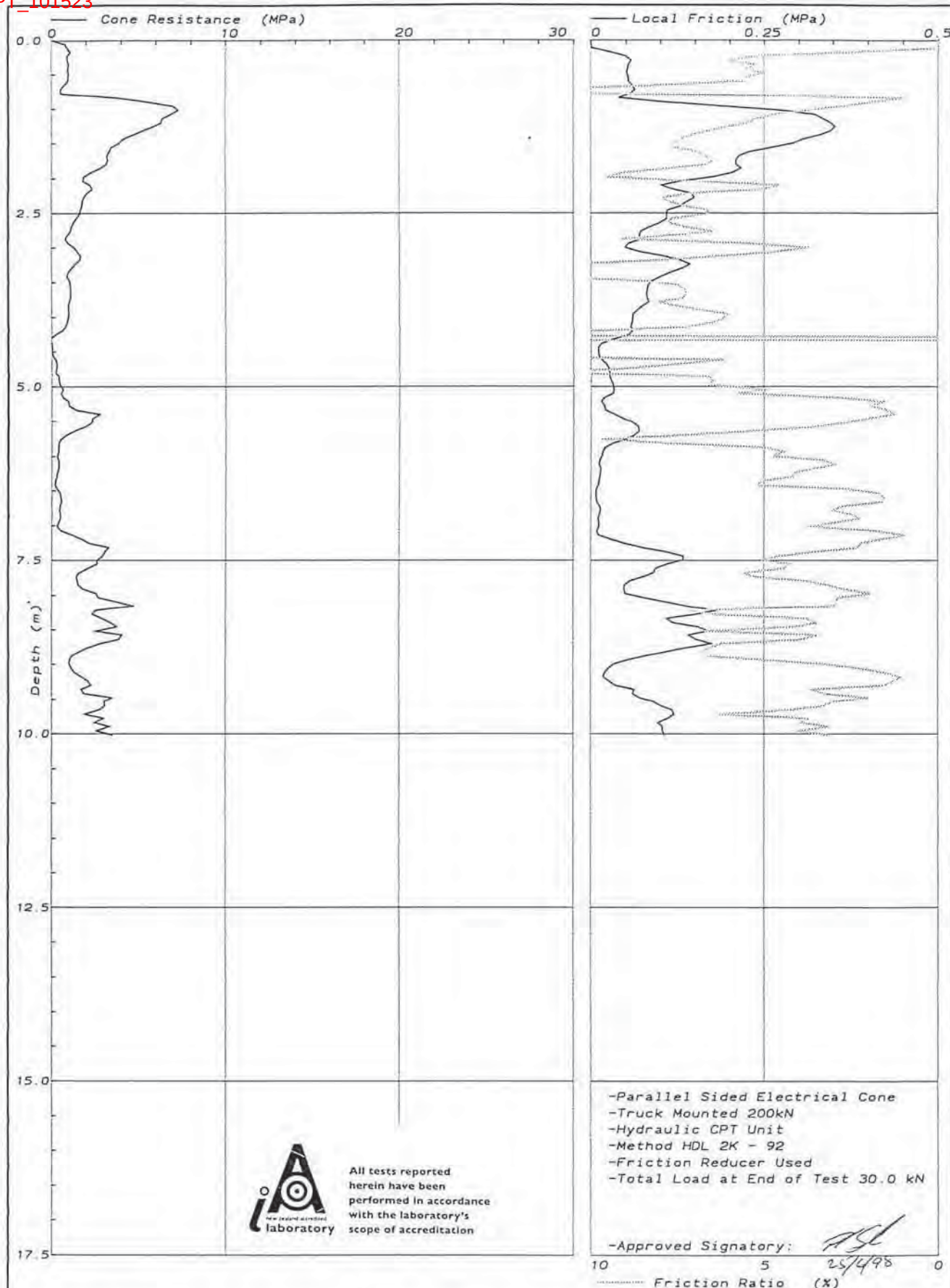
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	CHINAMANS HILL REALIGN.		Sheet of	CPT 10

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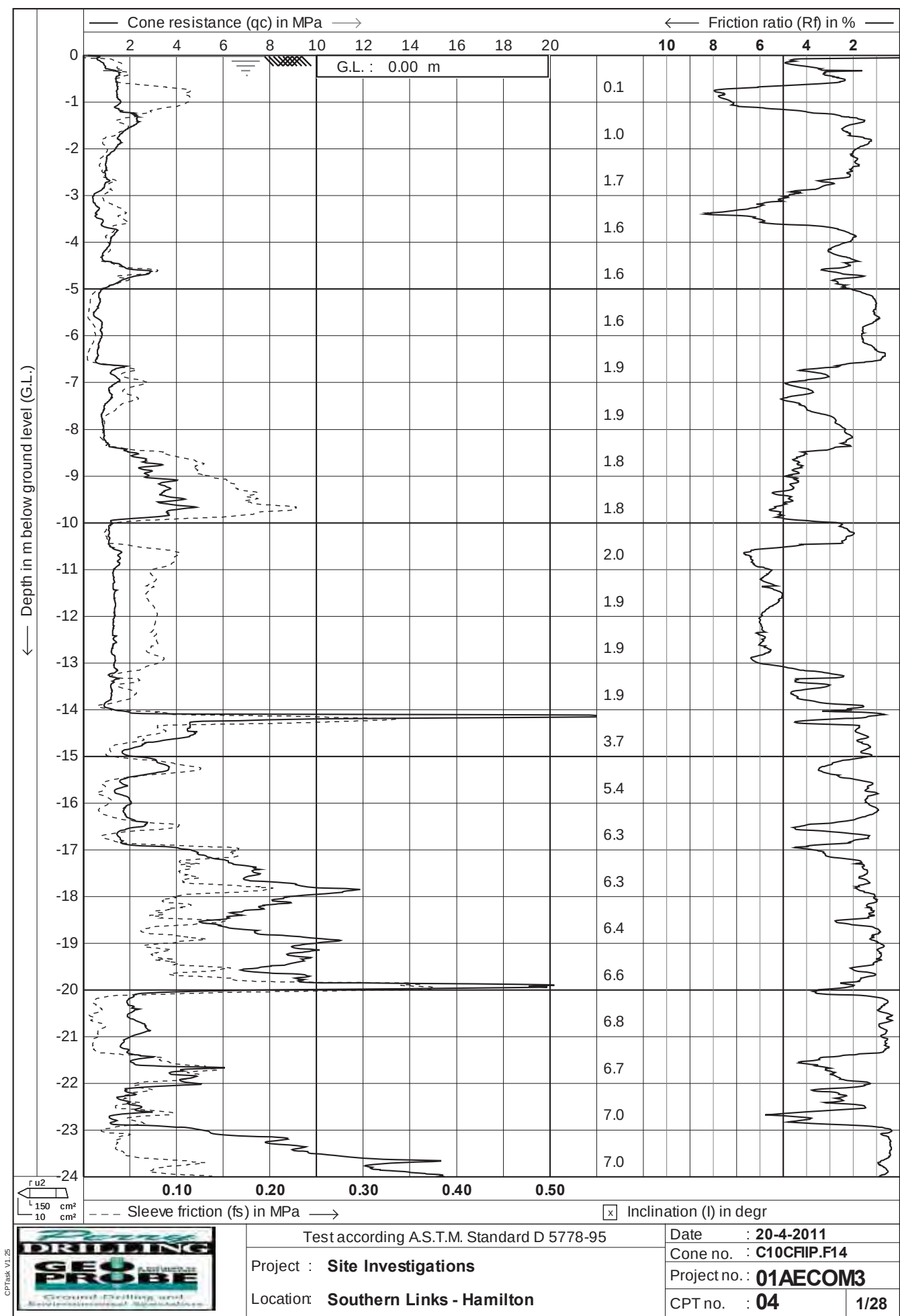
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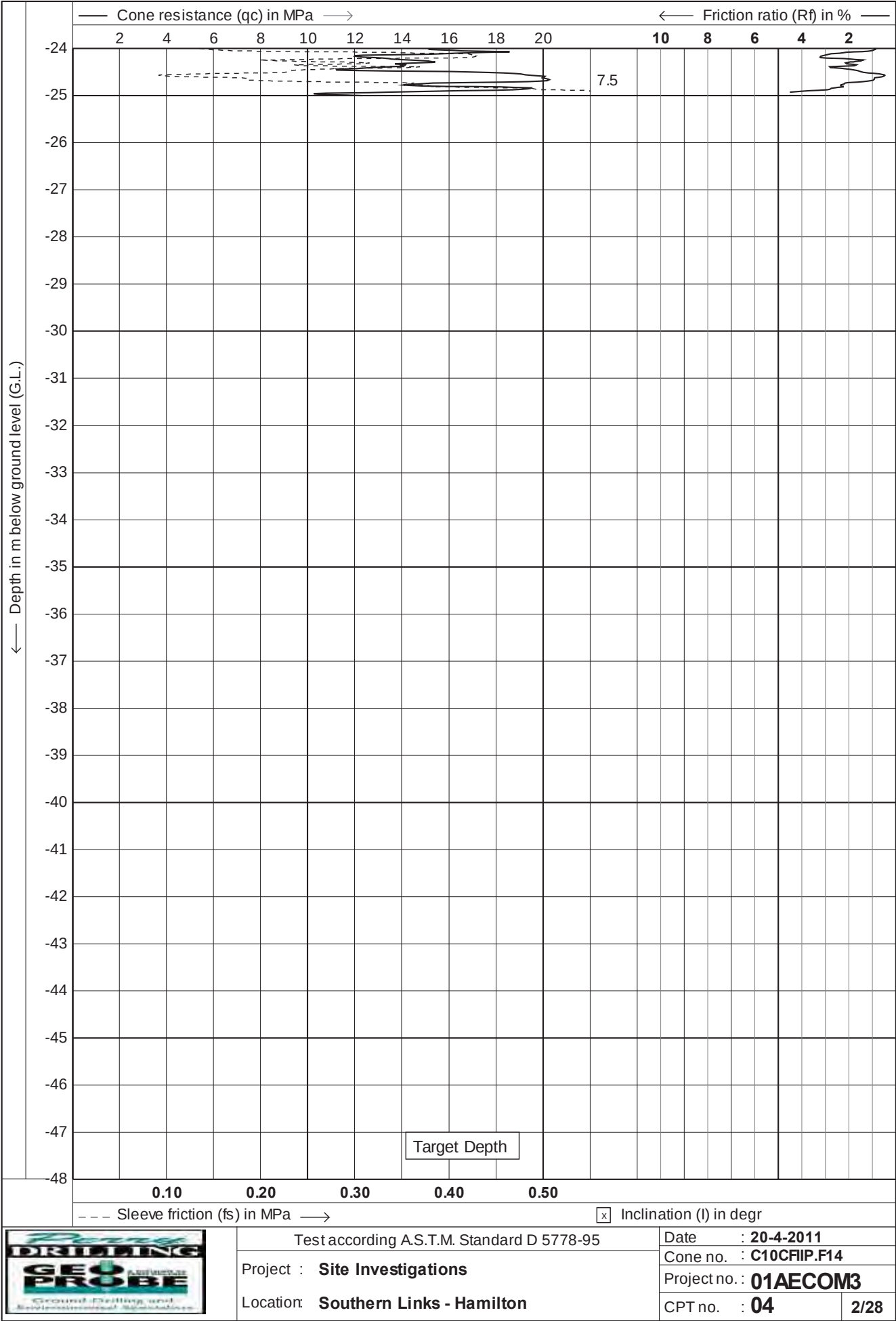
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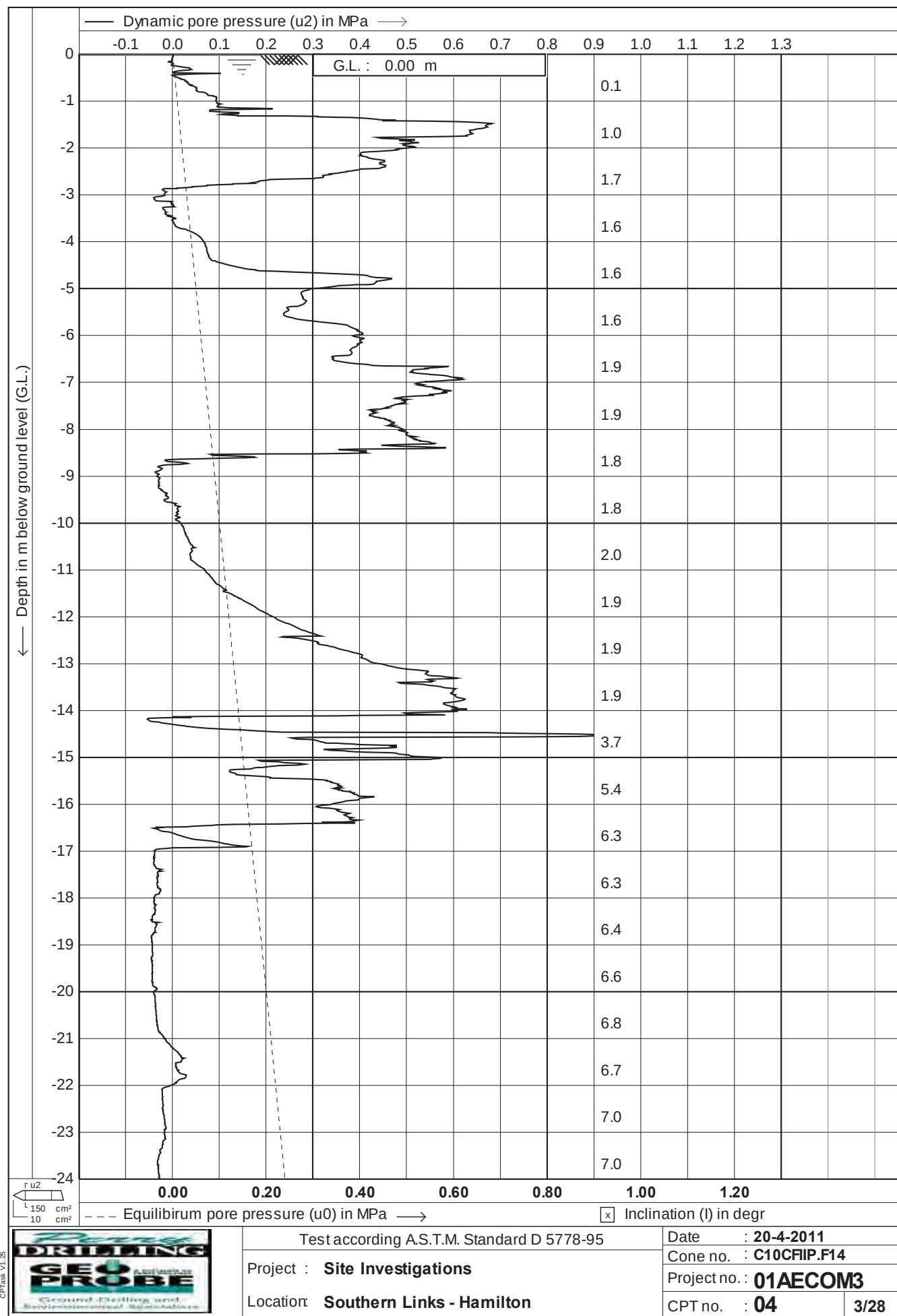
Fox Street
 Private Bag 3057
 Hamilton, New Zealand

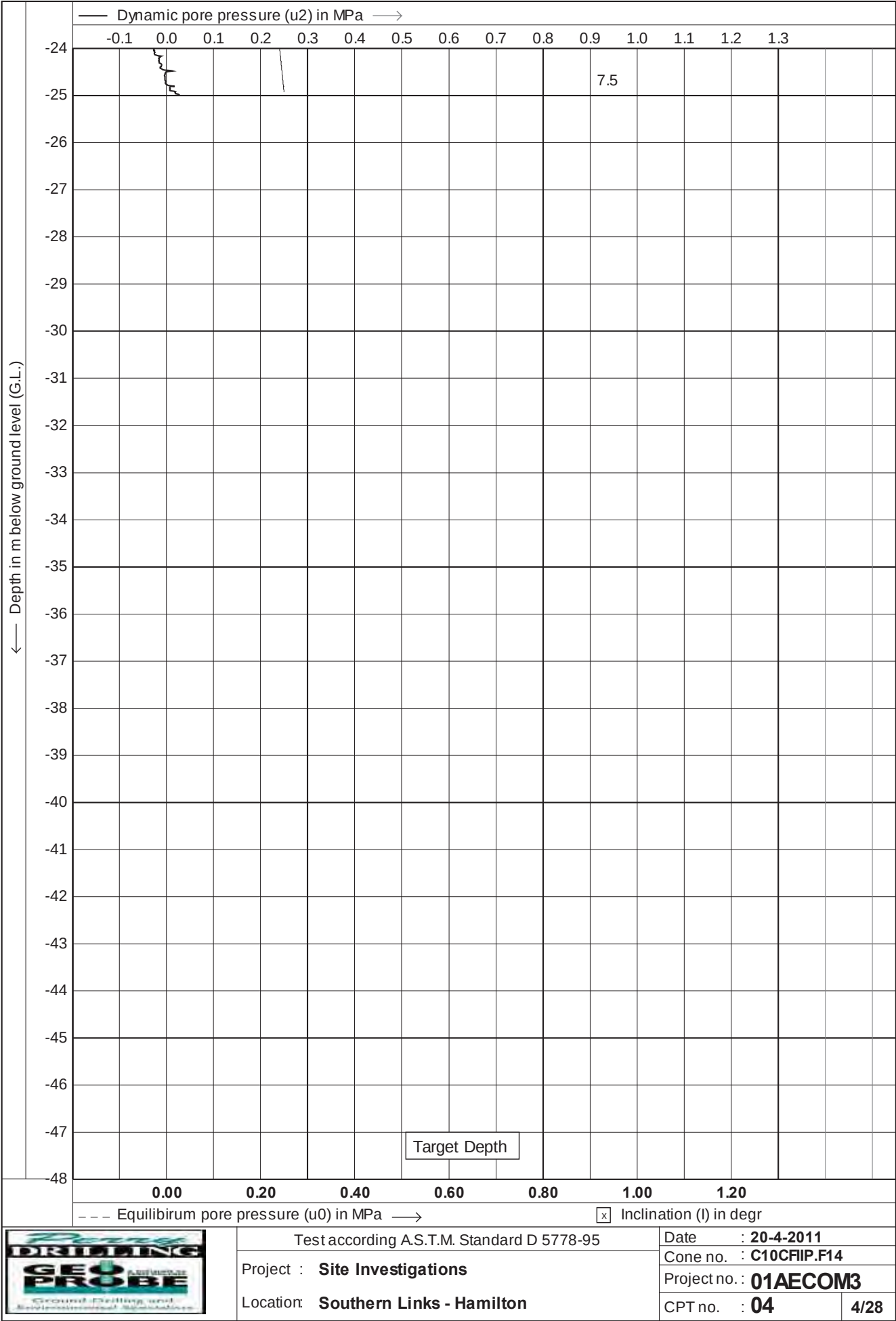
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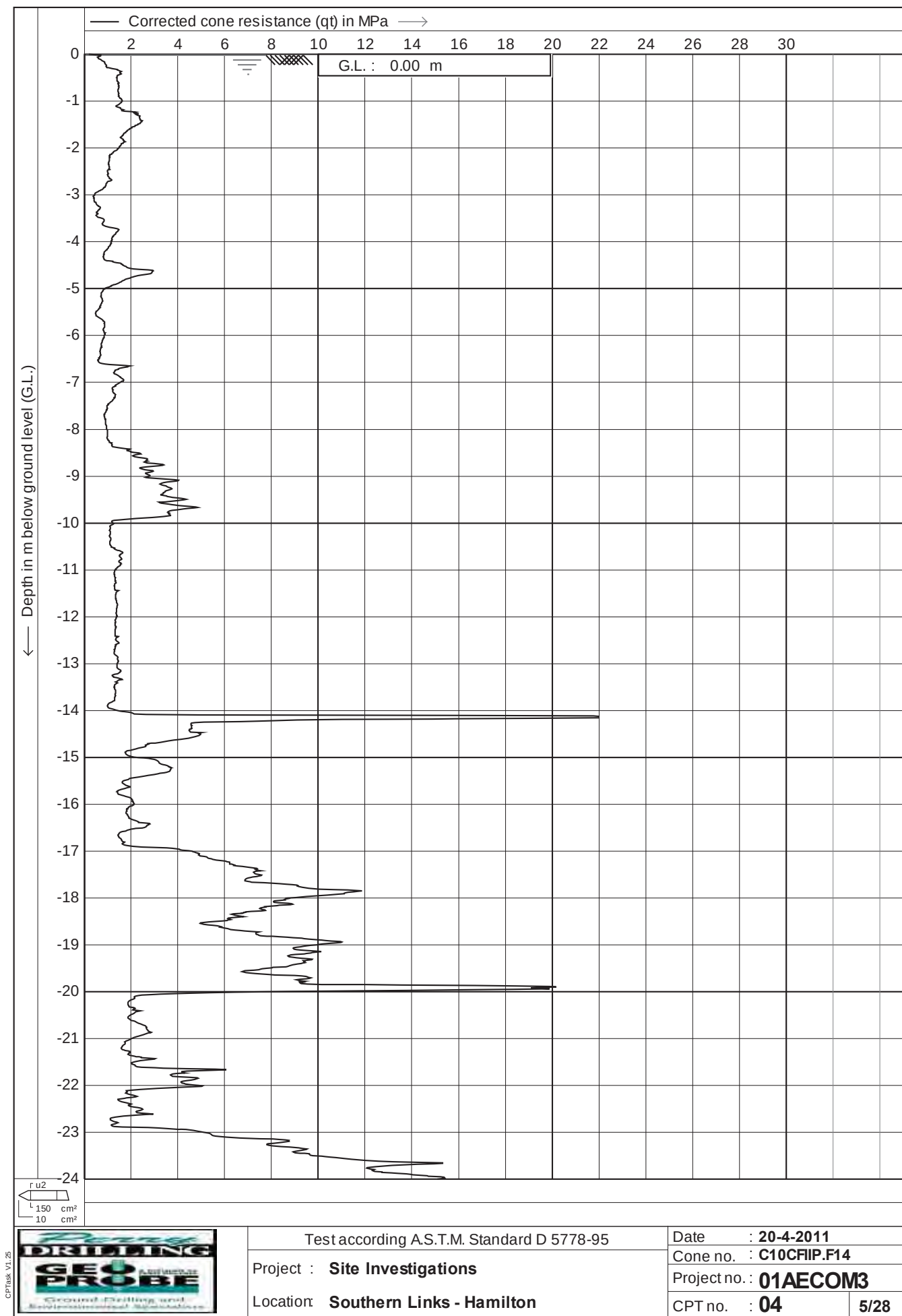
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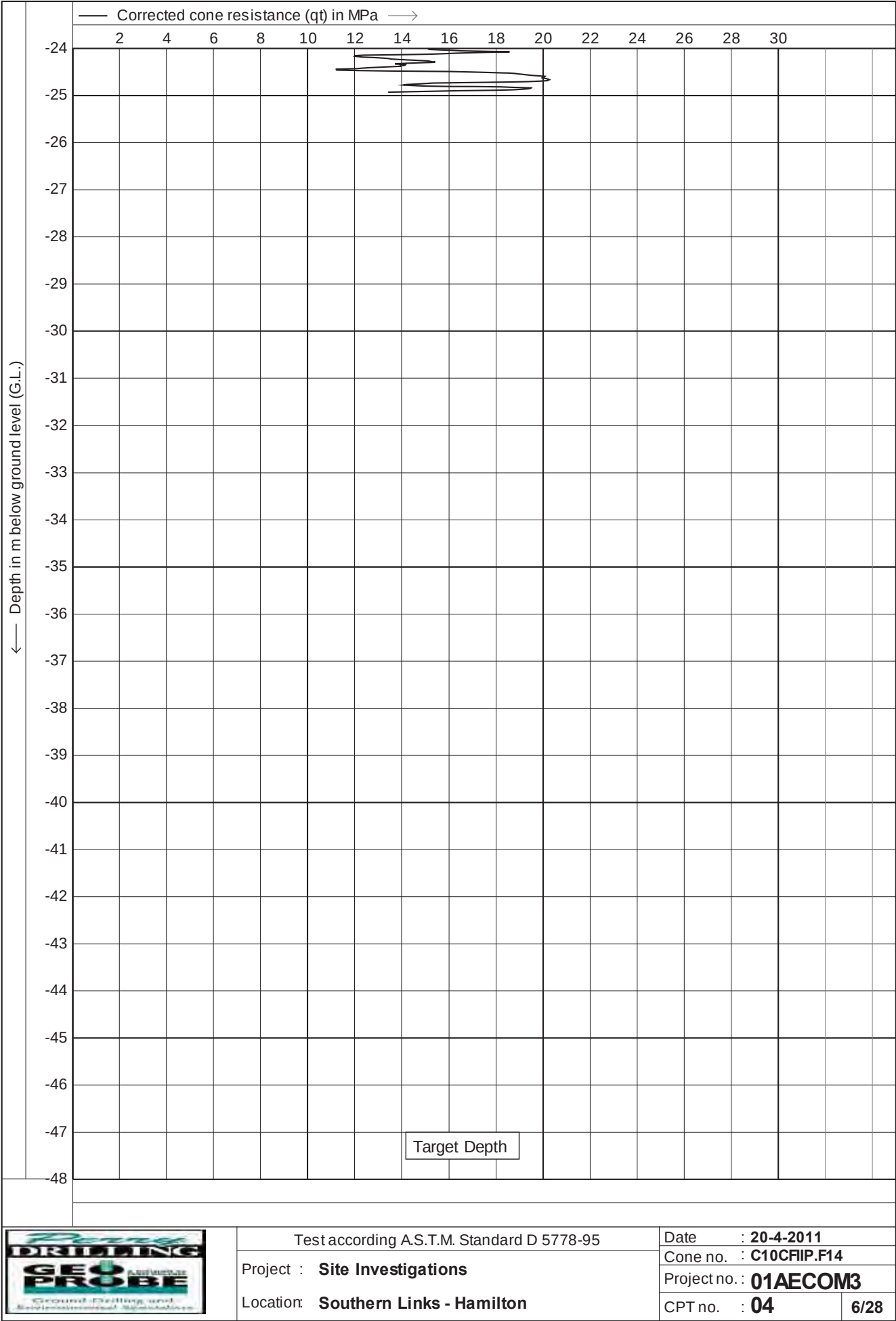


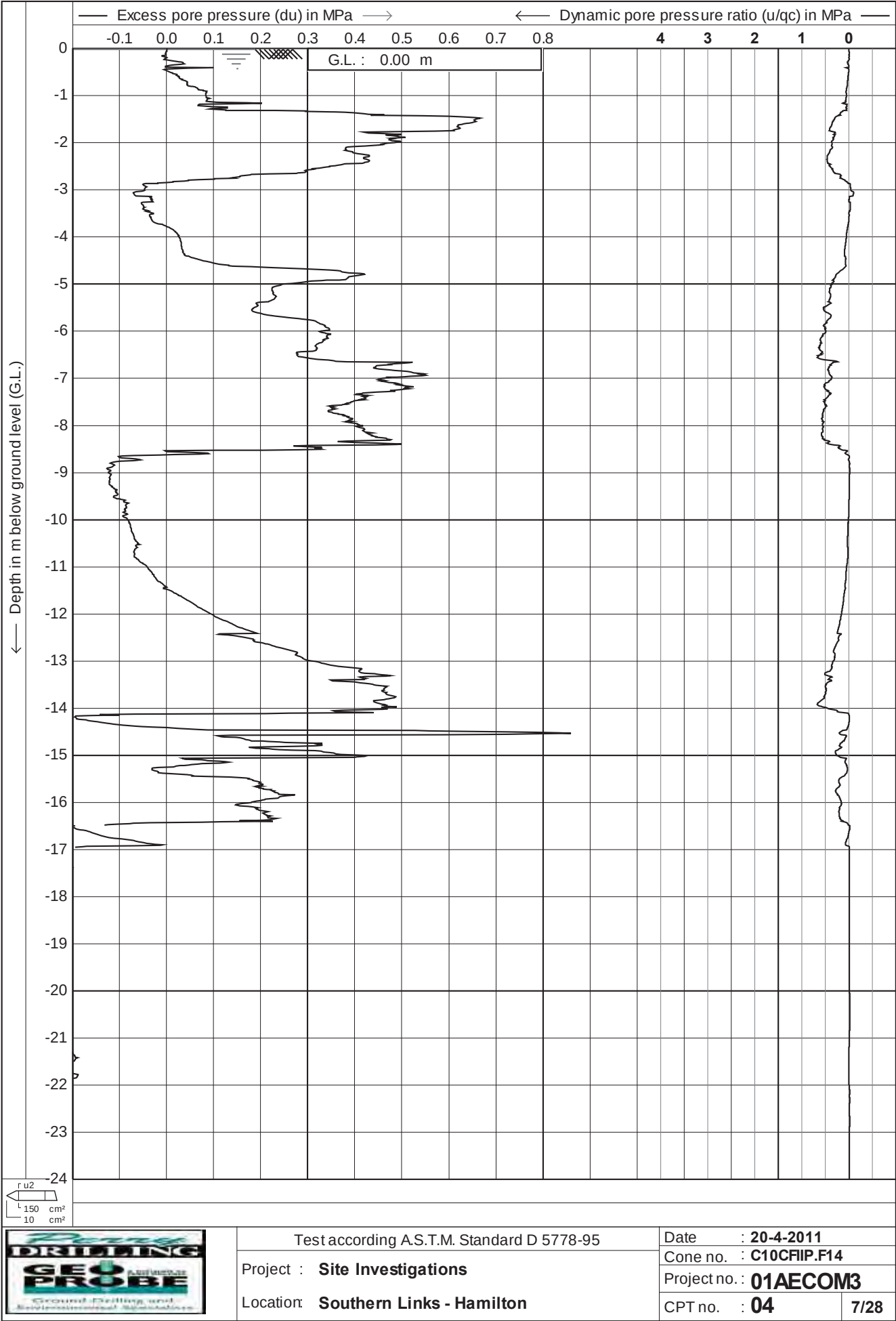




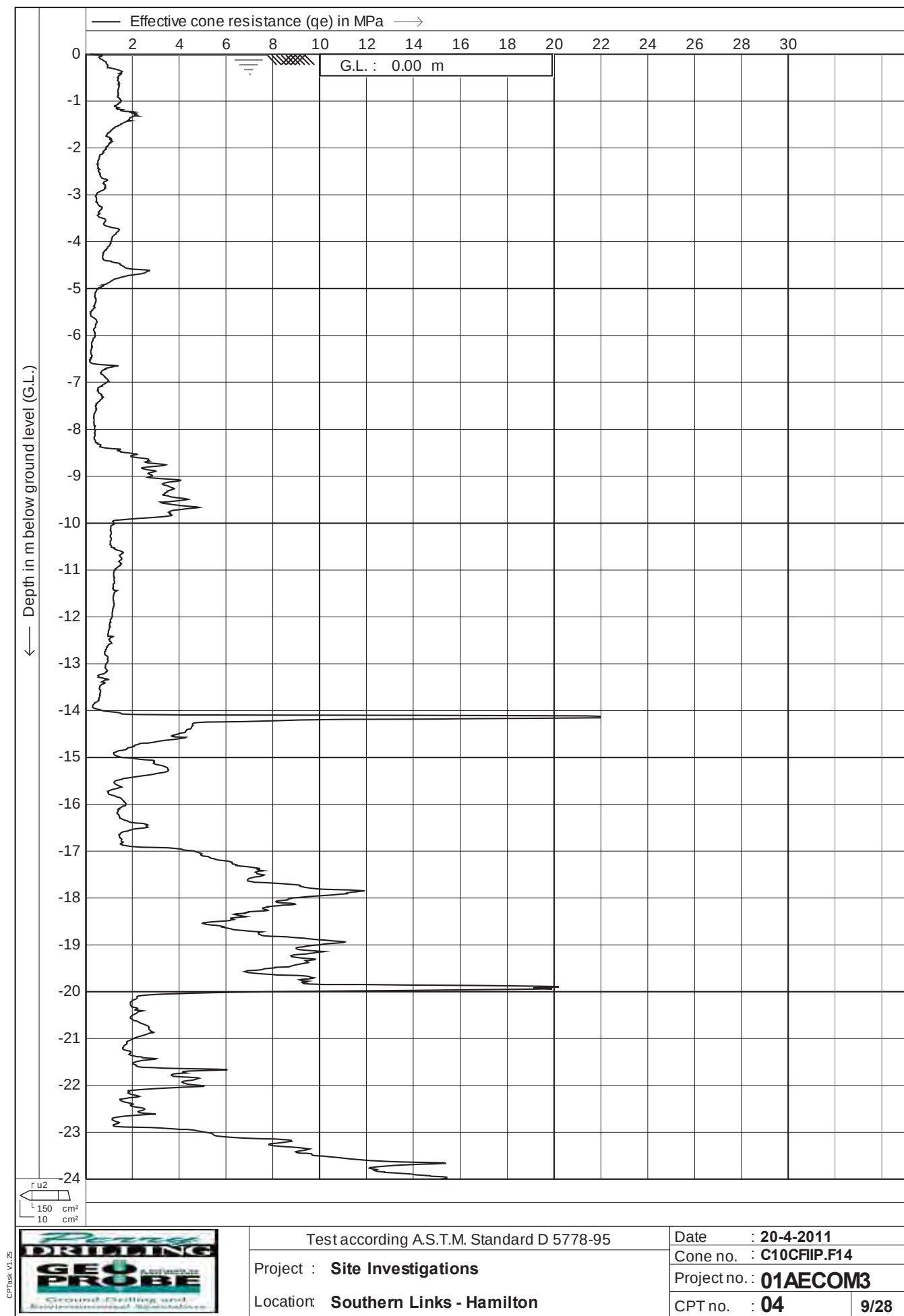




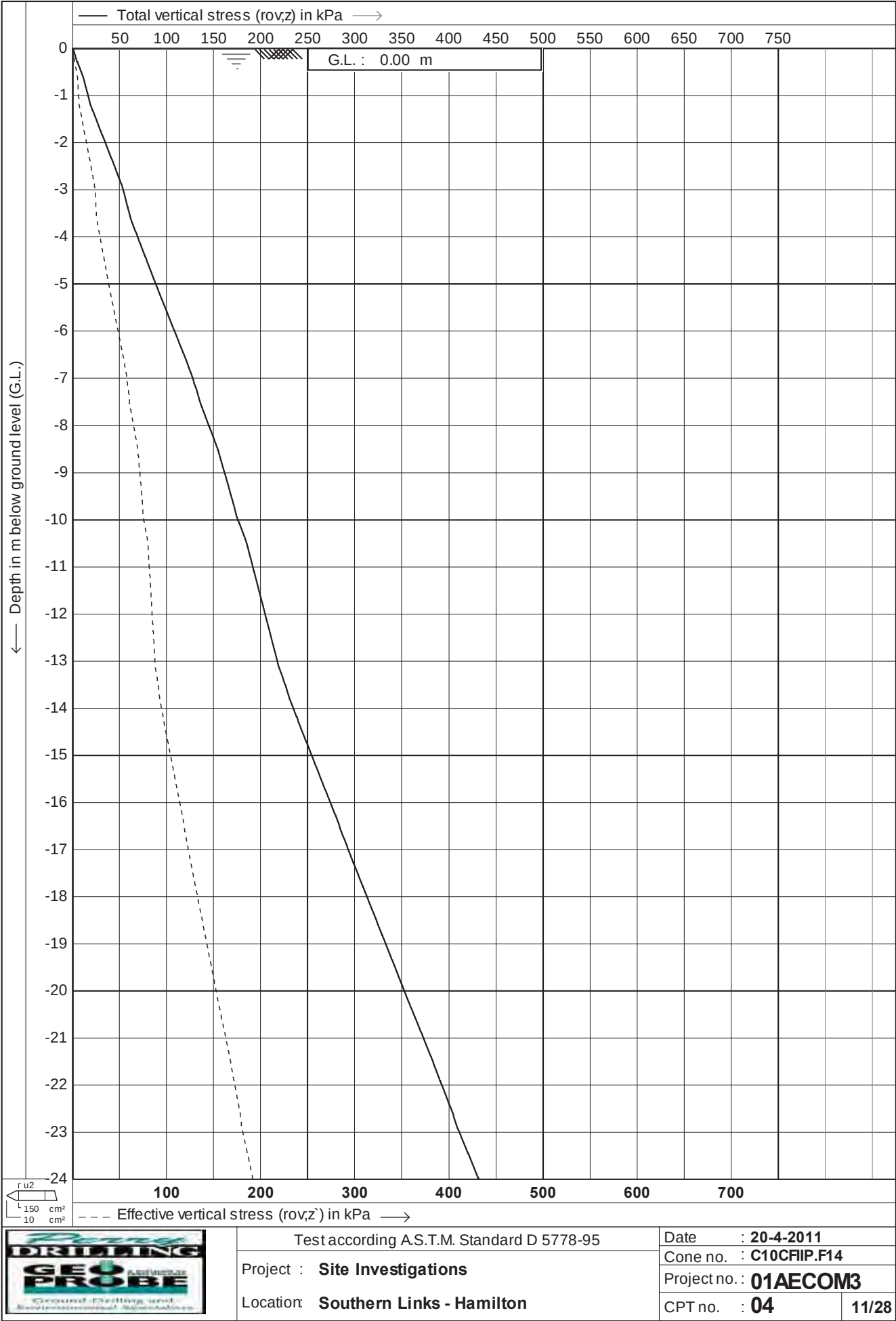


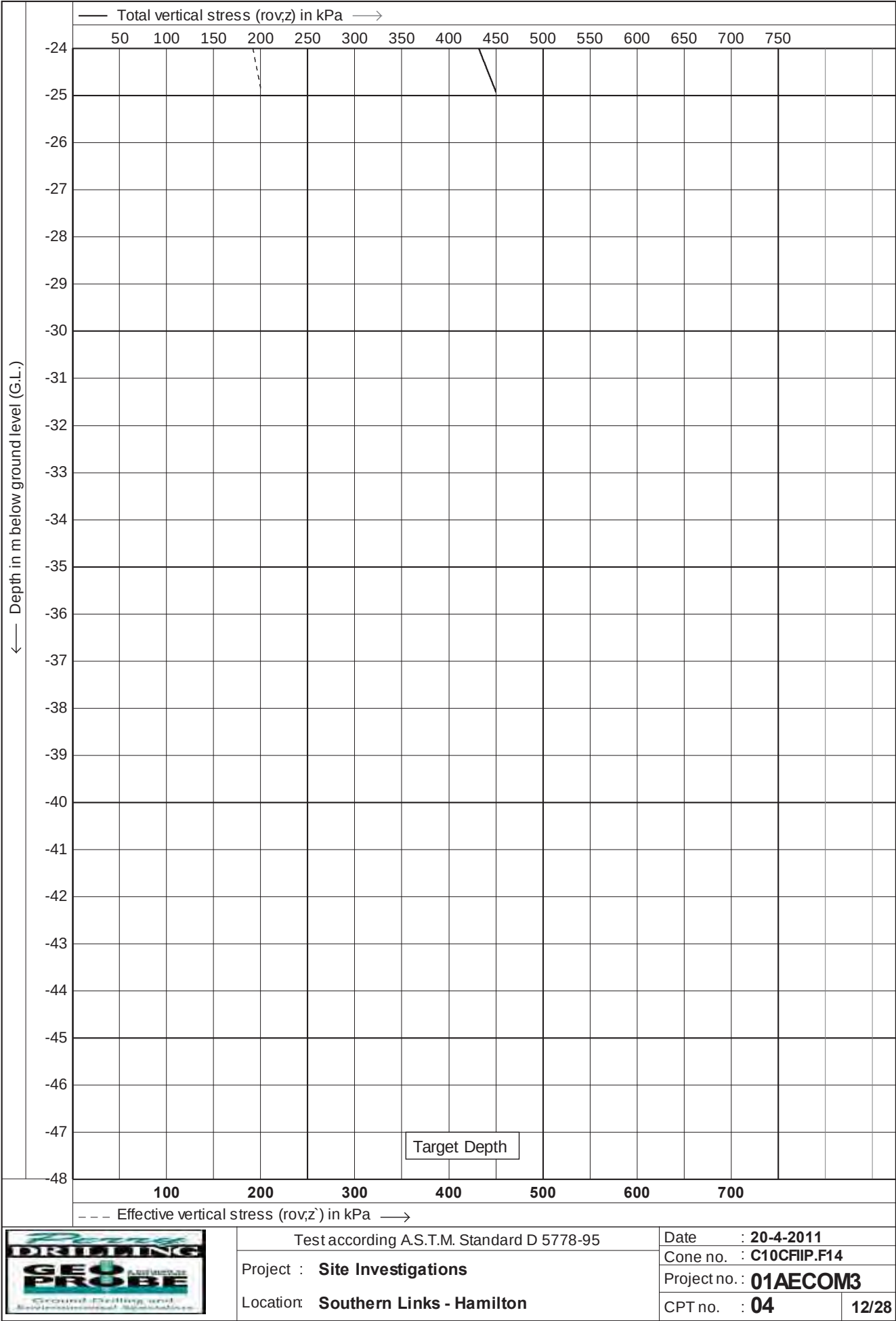


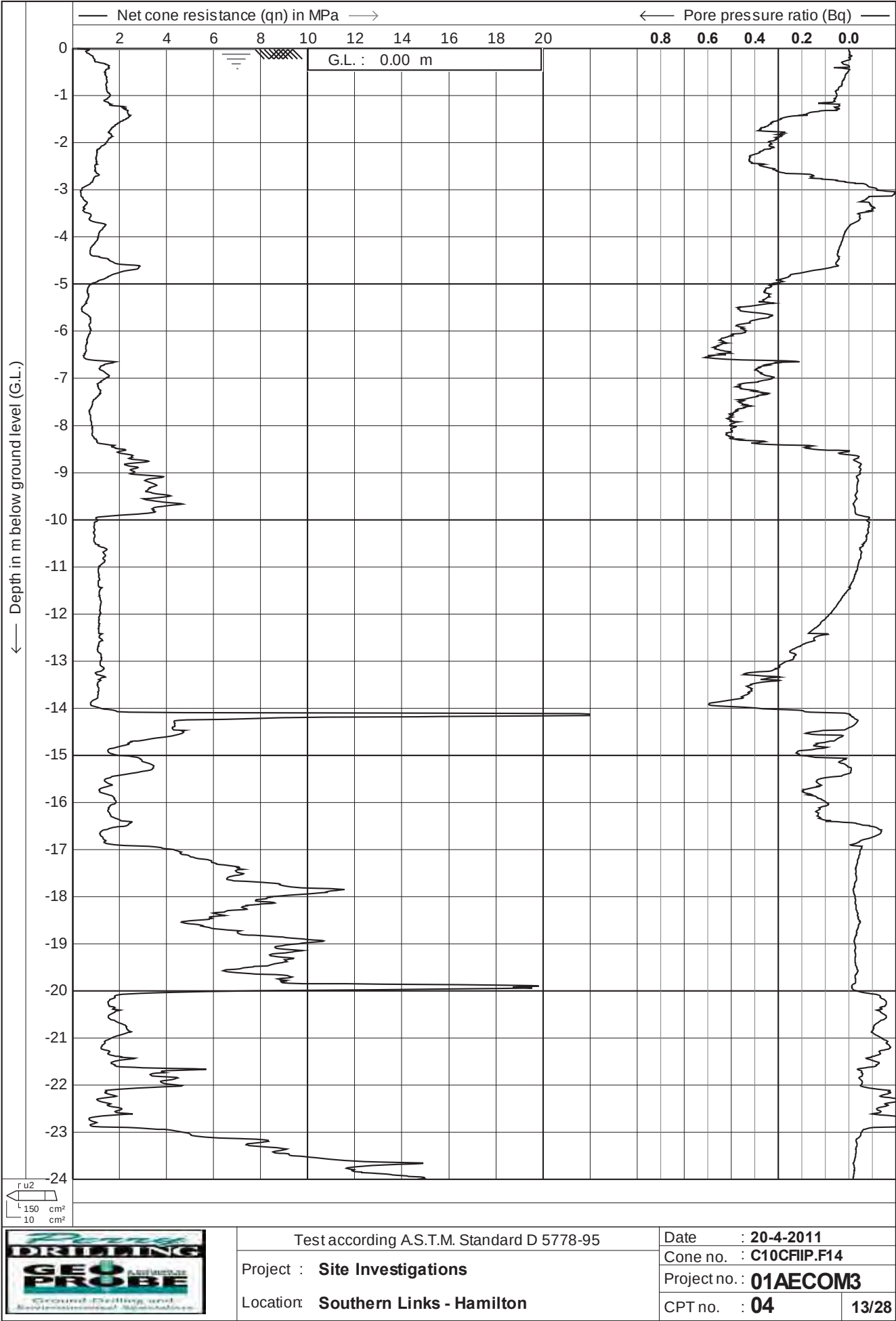
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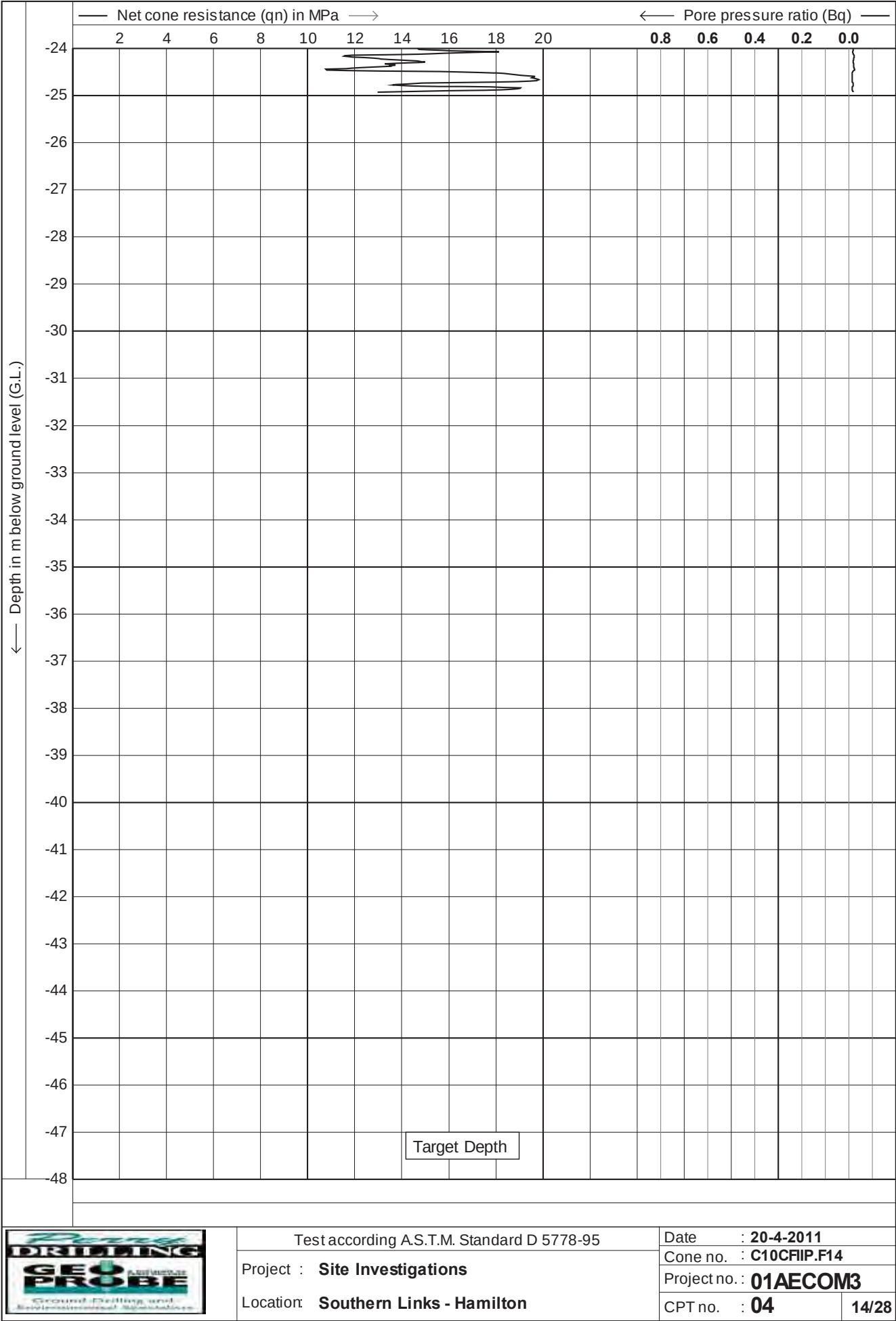


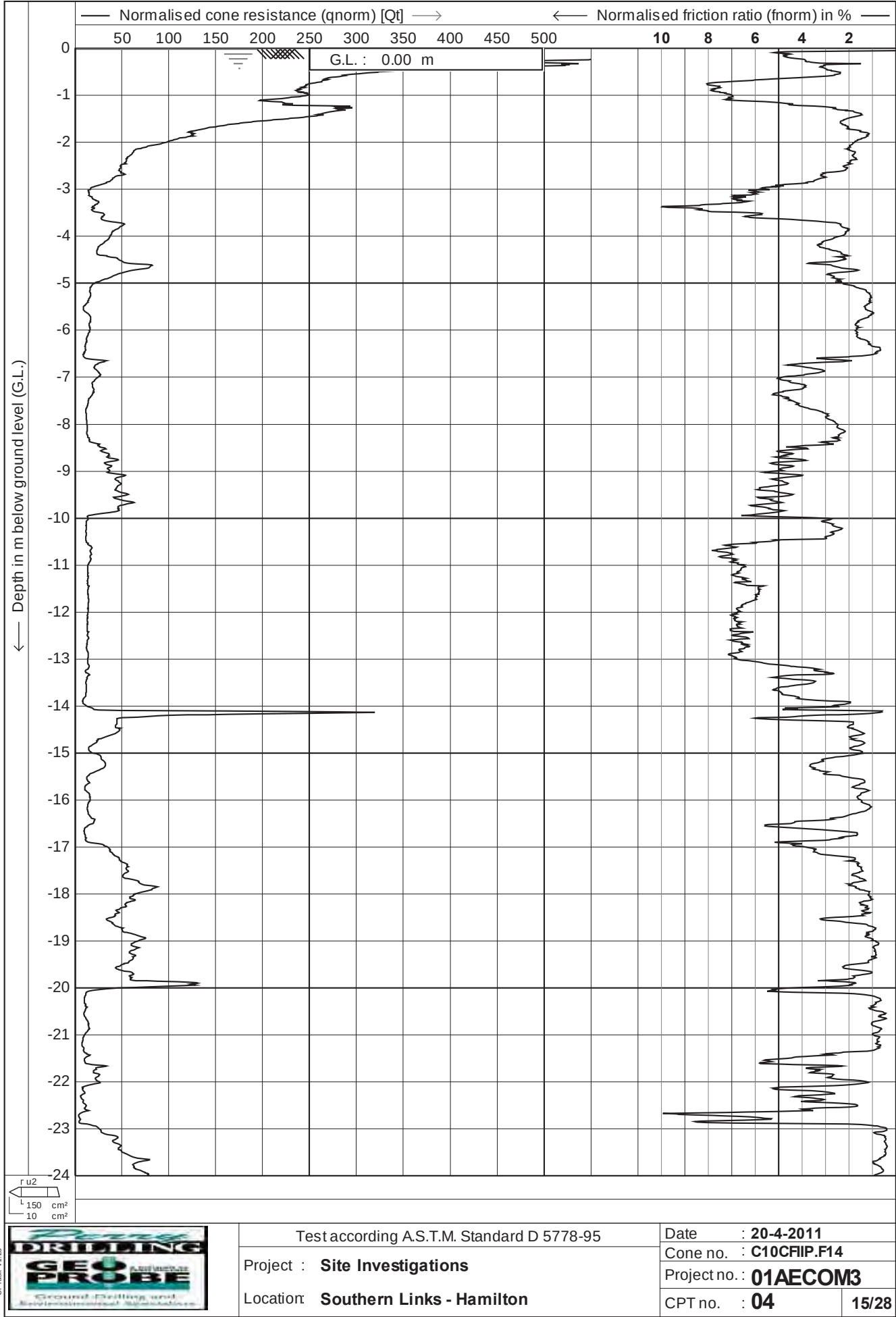


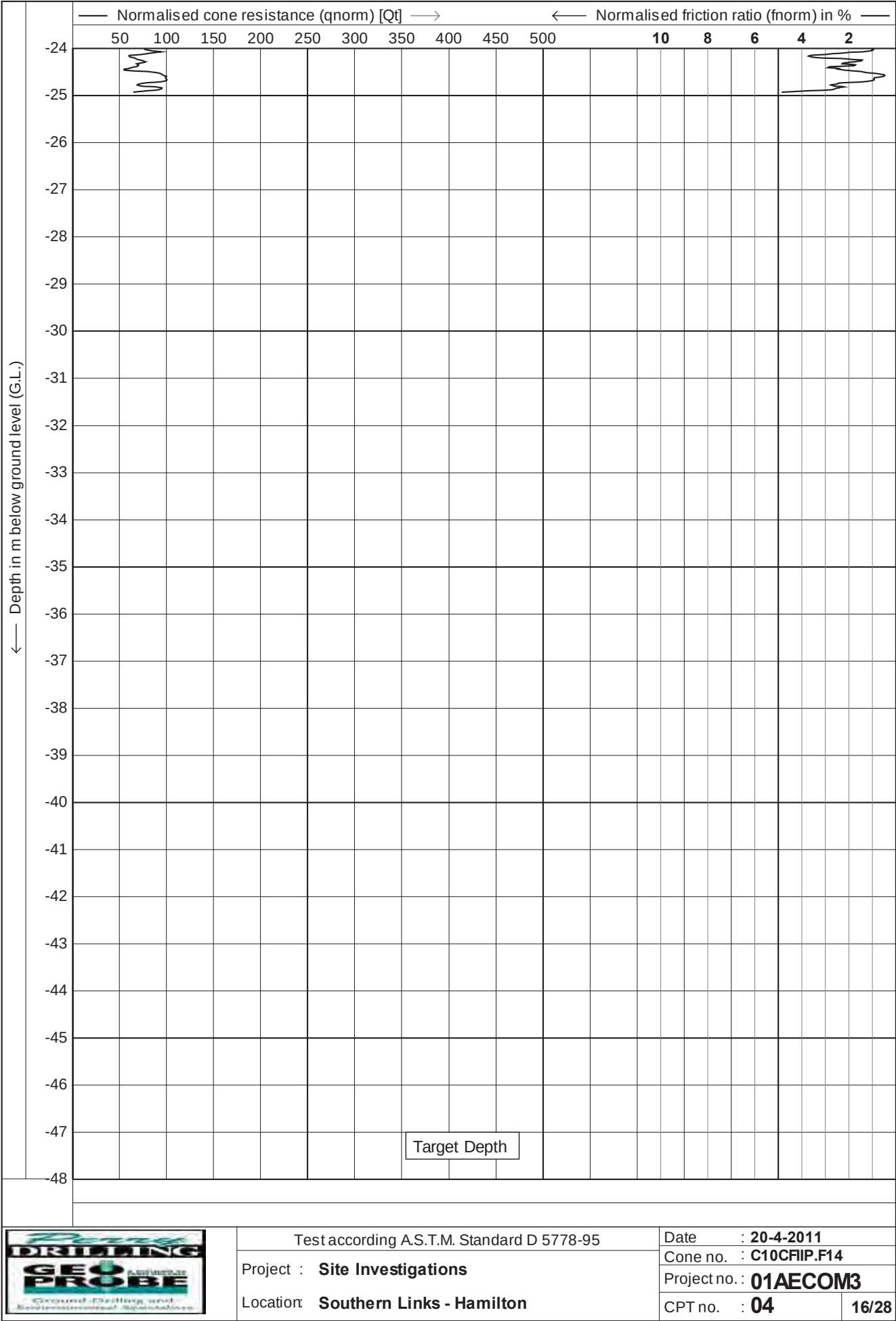


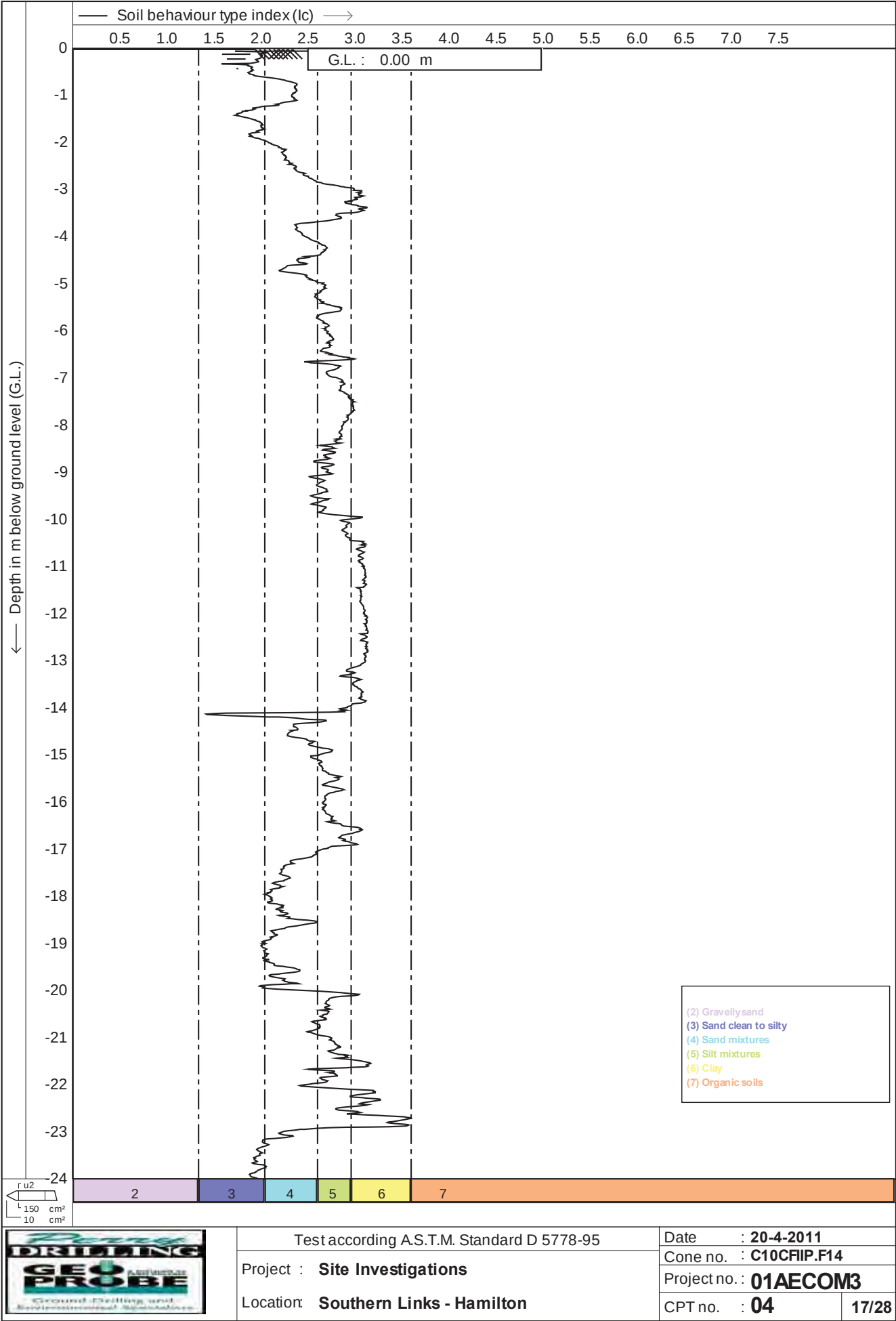


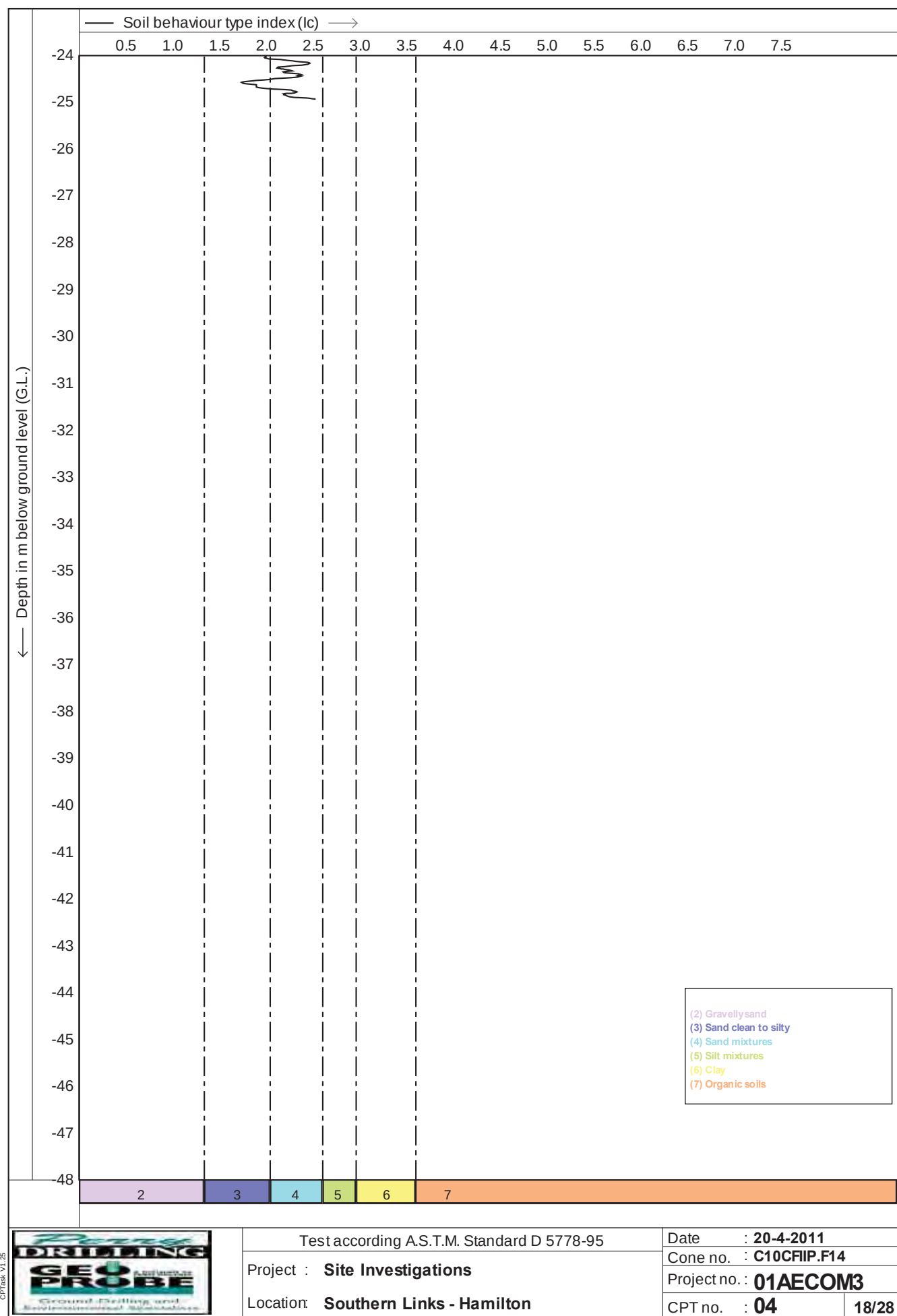


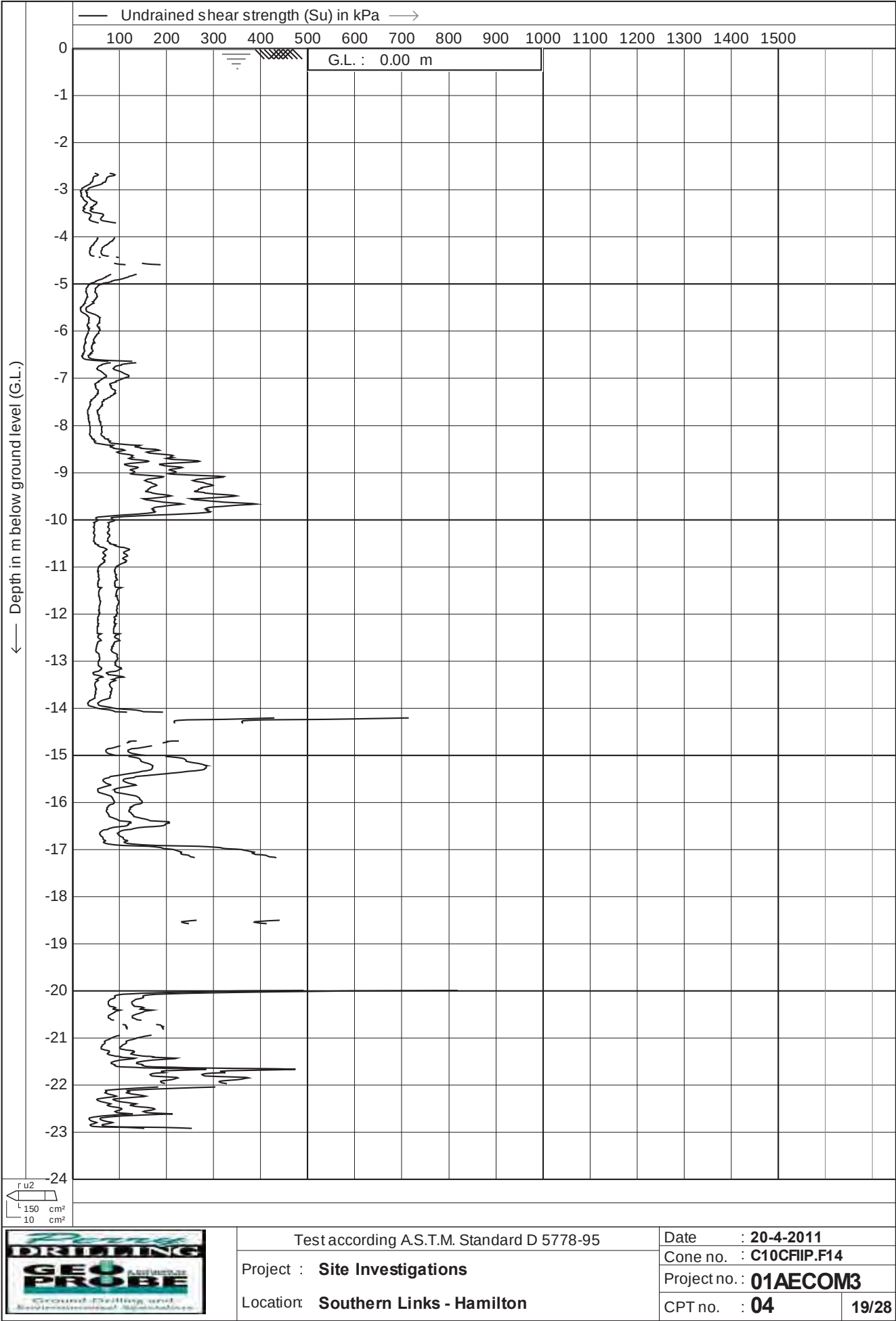




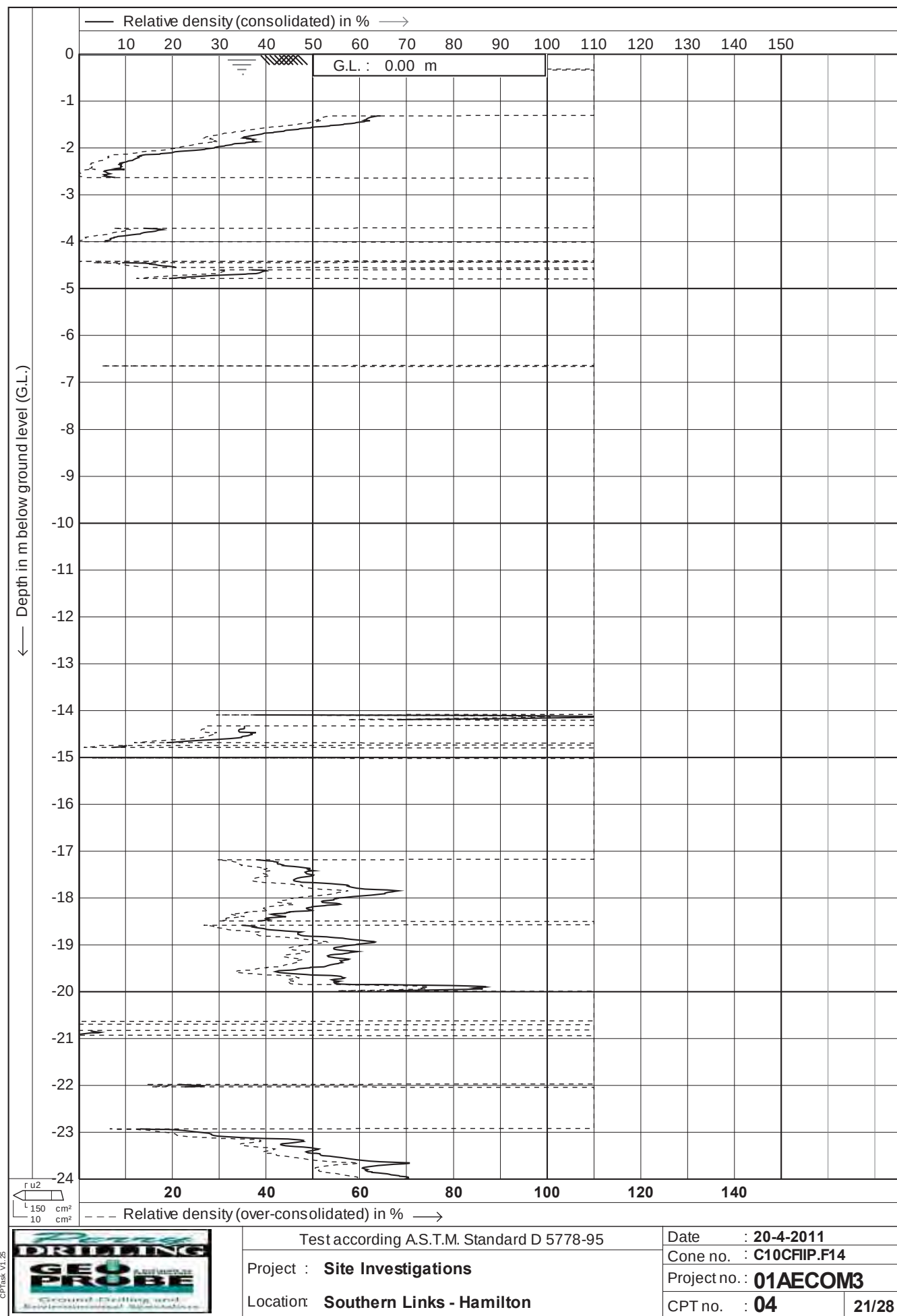


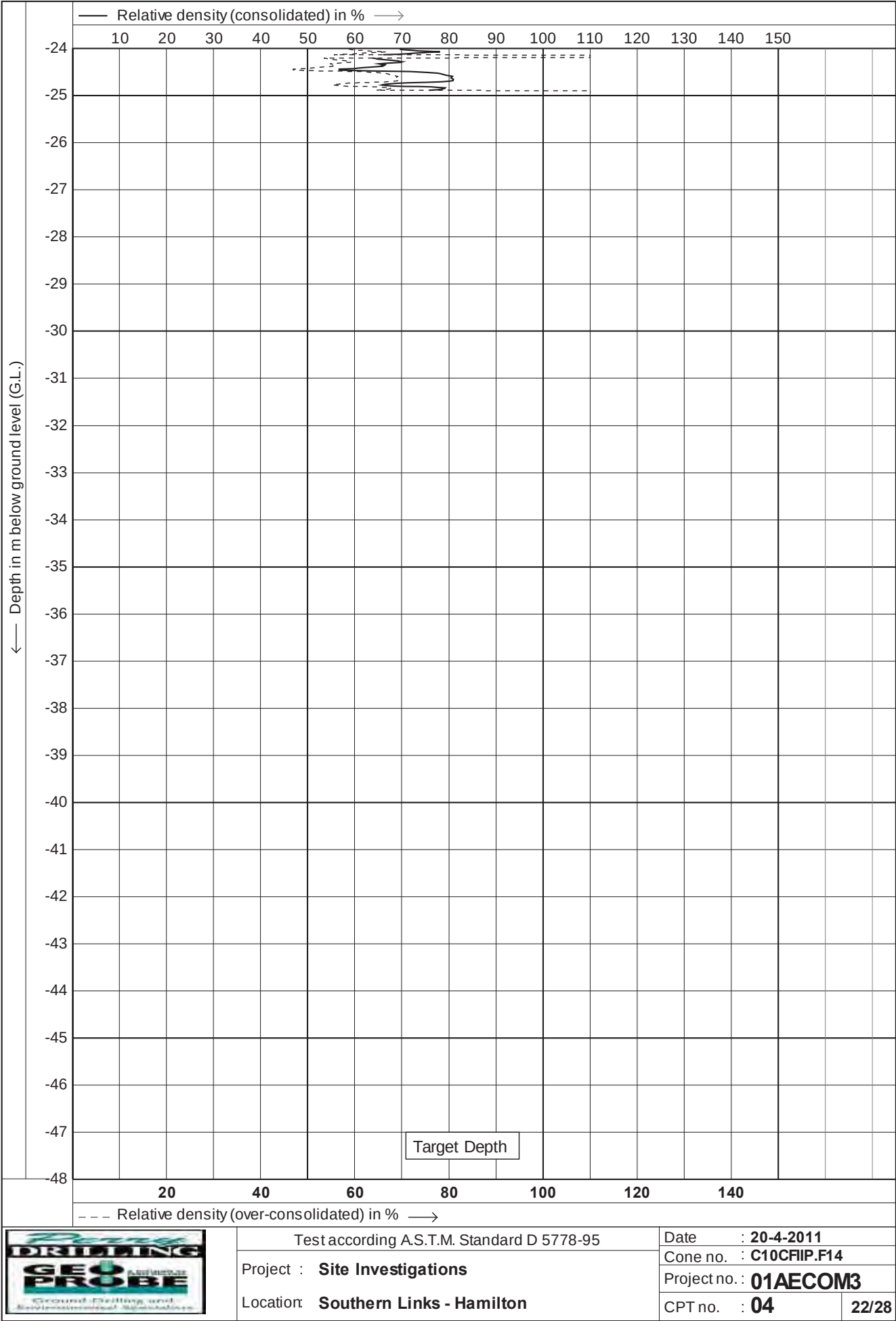


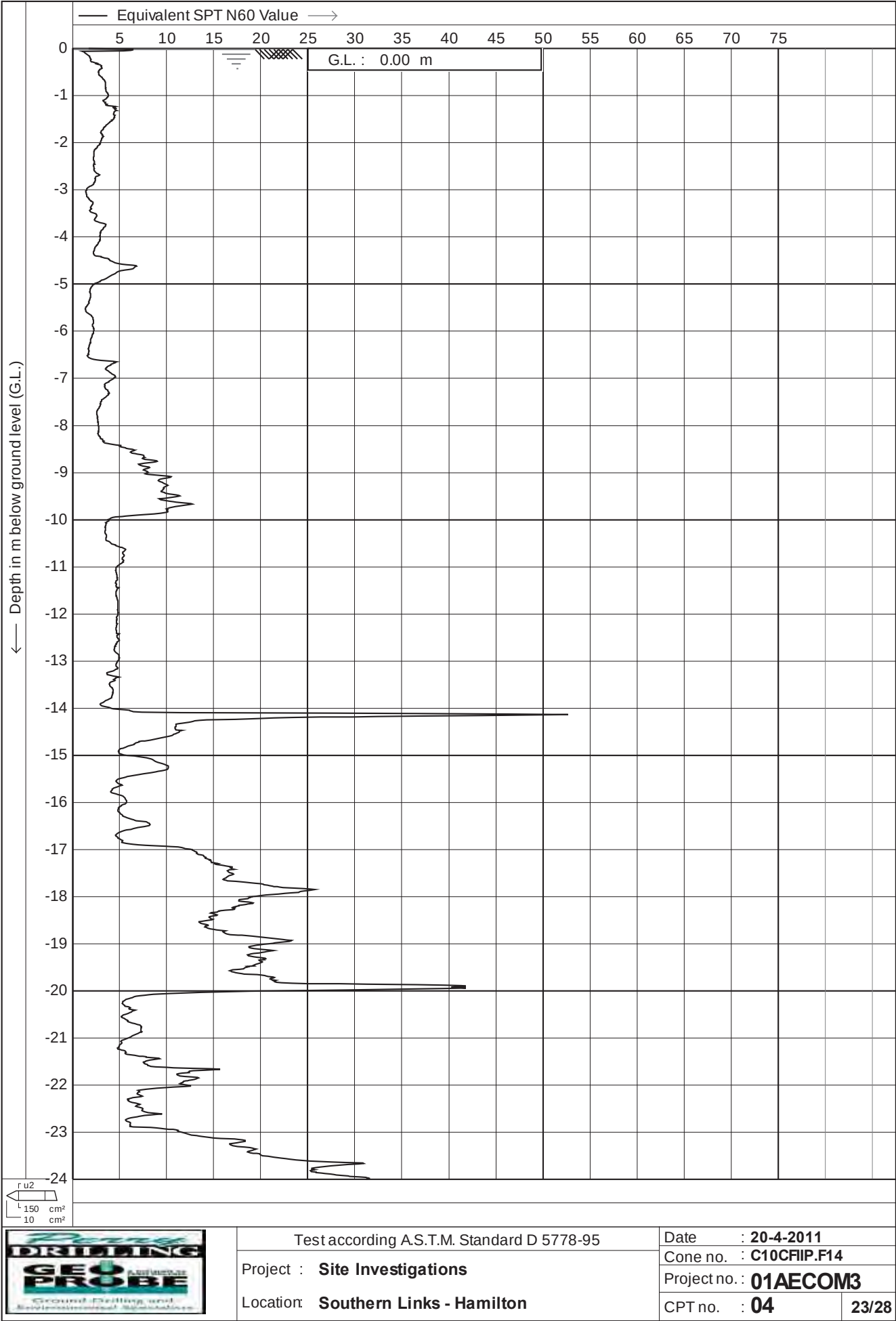




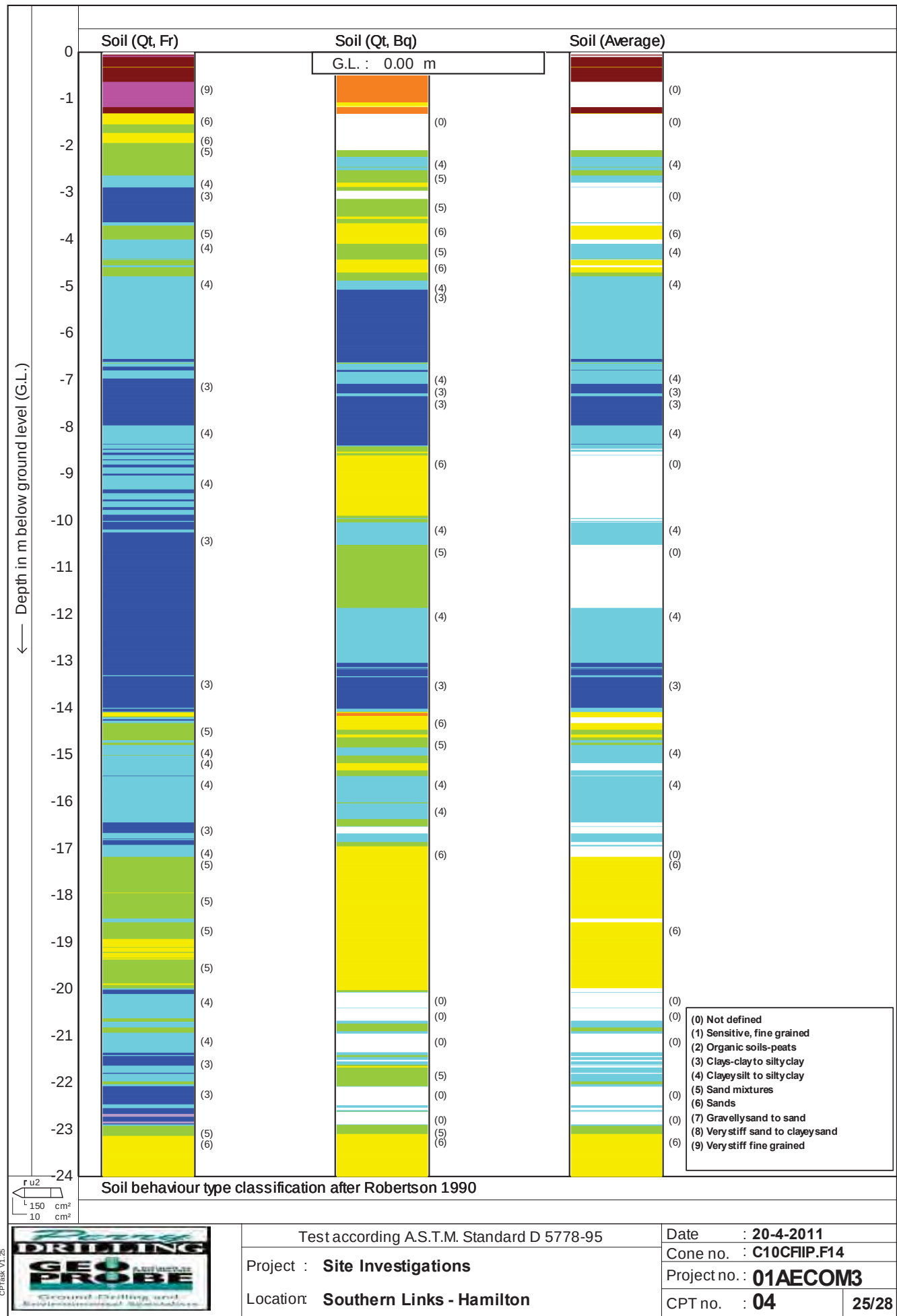




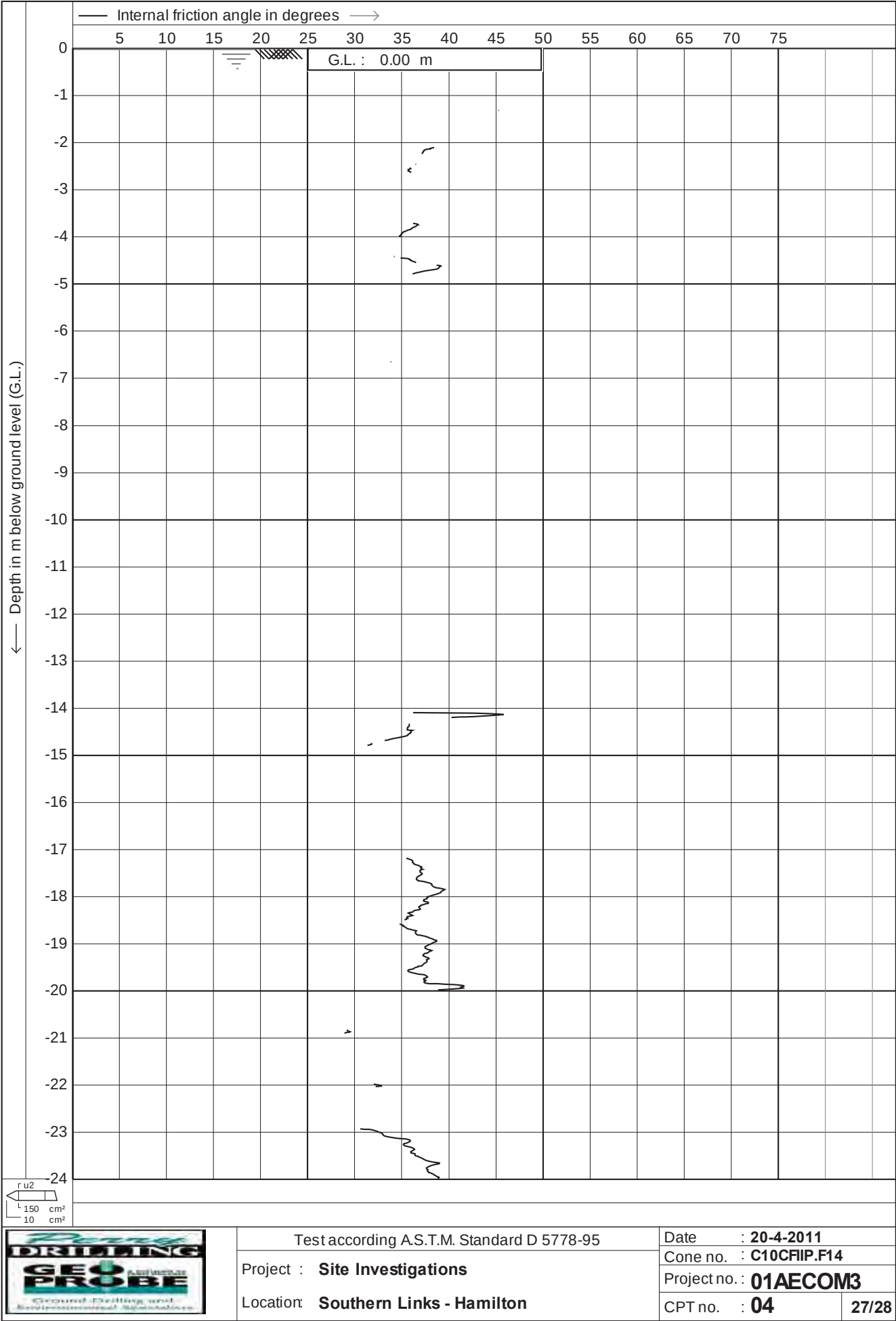




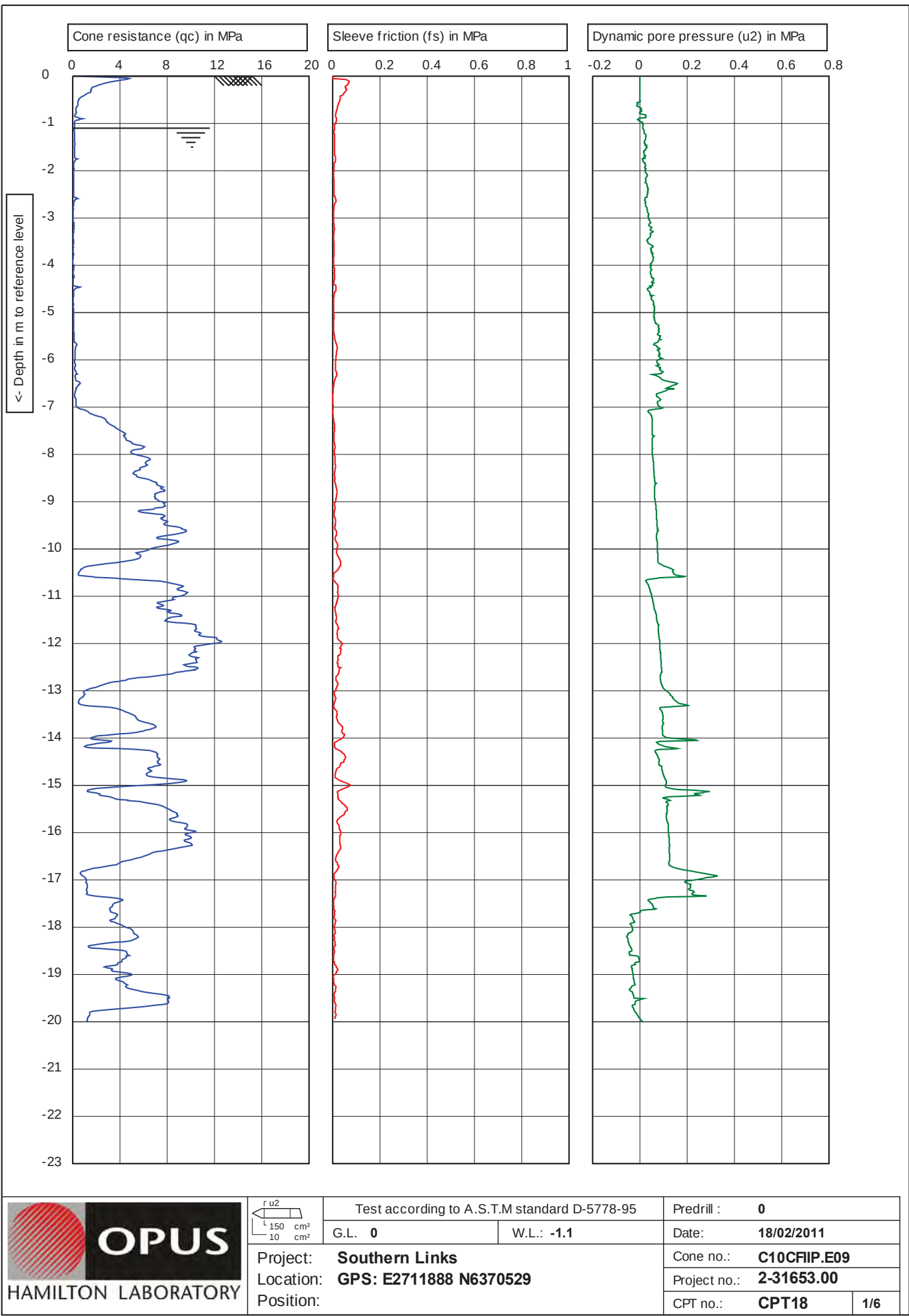


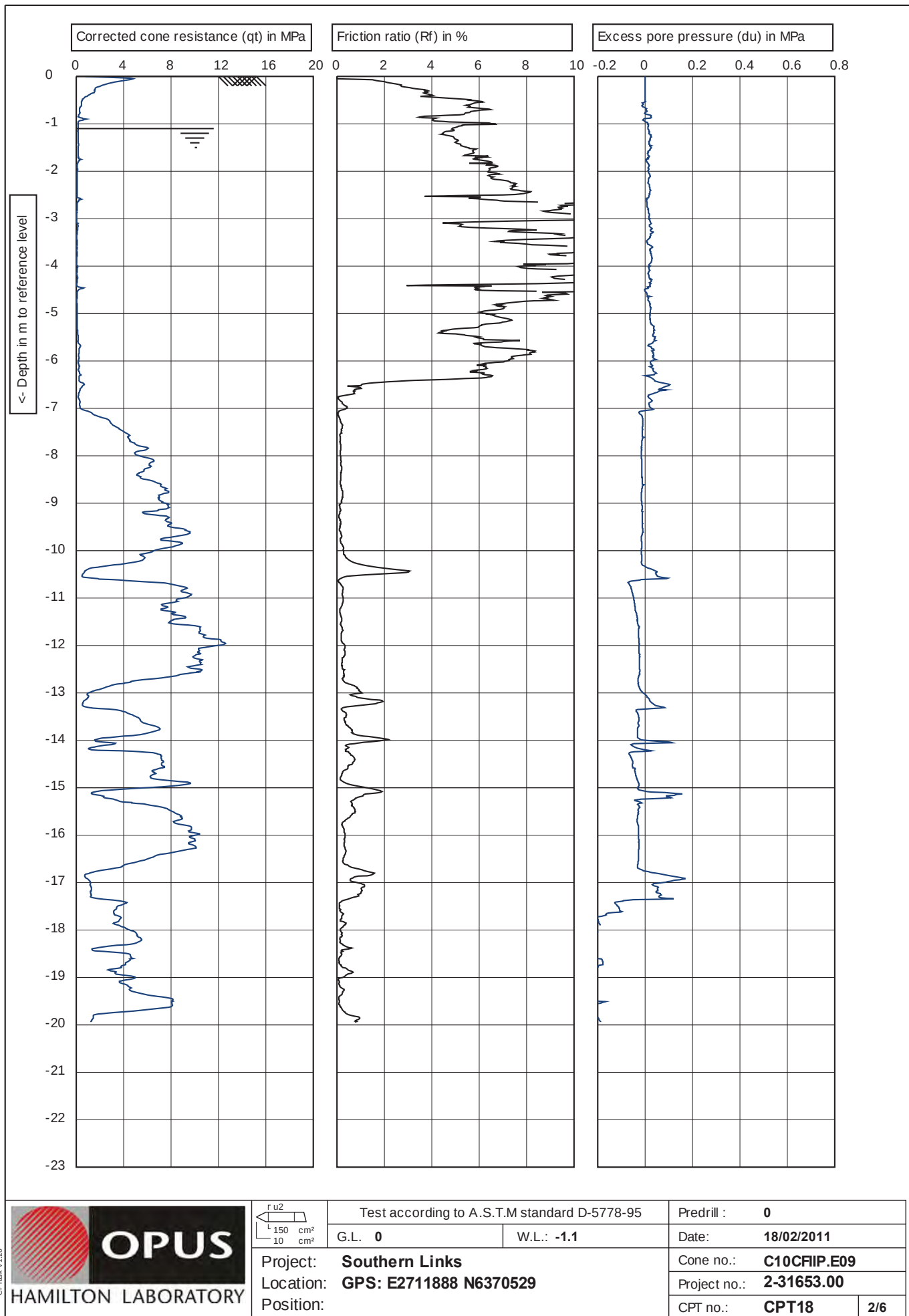


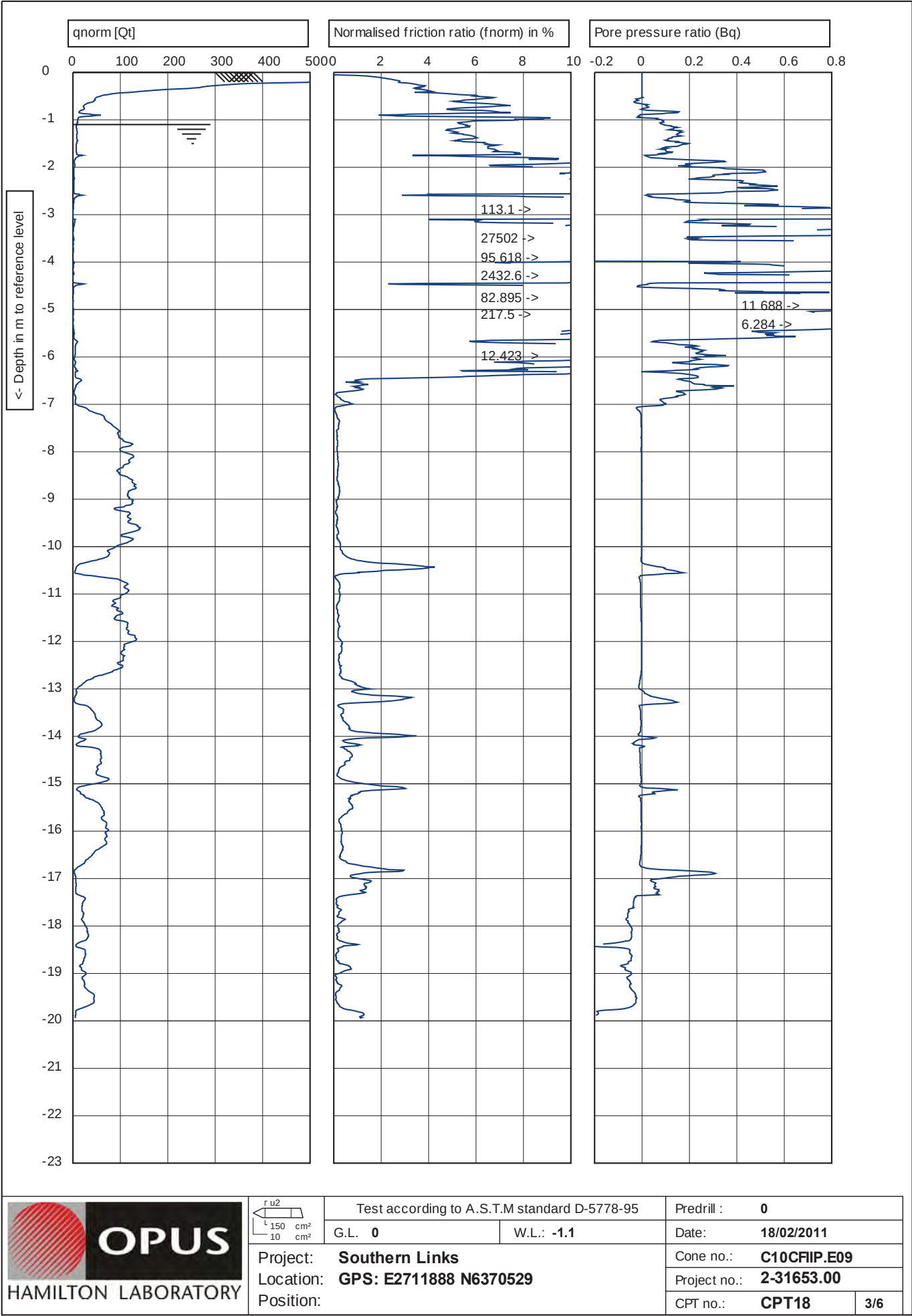
← Depth in m below ground level (G.L.)	Soil (Qt, Fr)		Soil (Qt, Bq)		Soil (Average)	
	(5) (6)				(6)	
</						

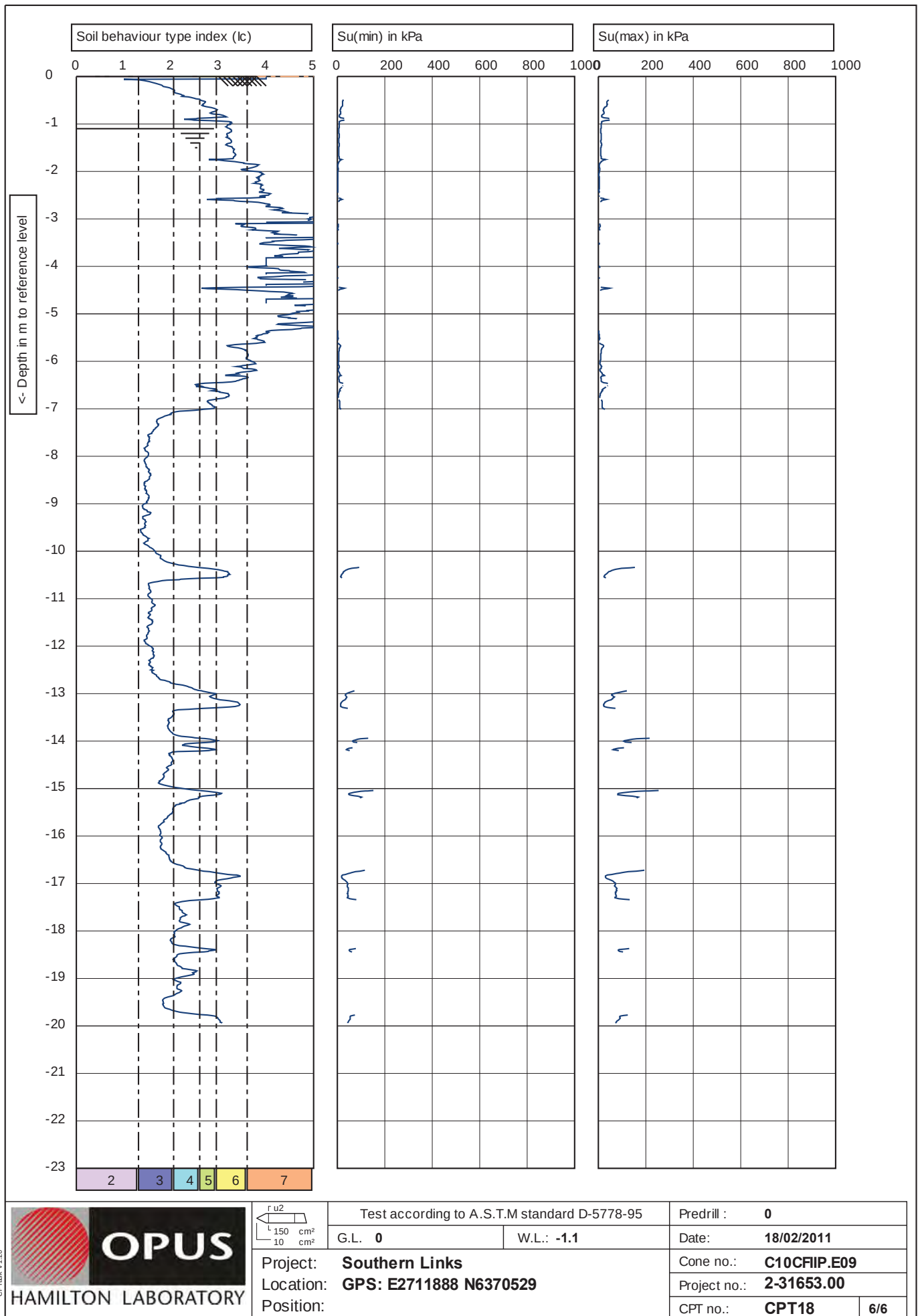


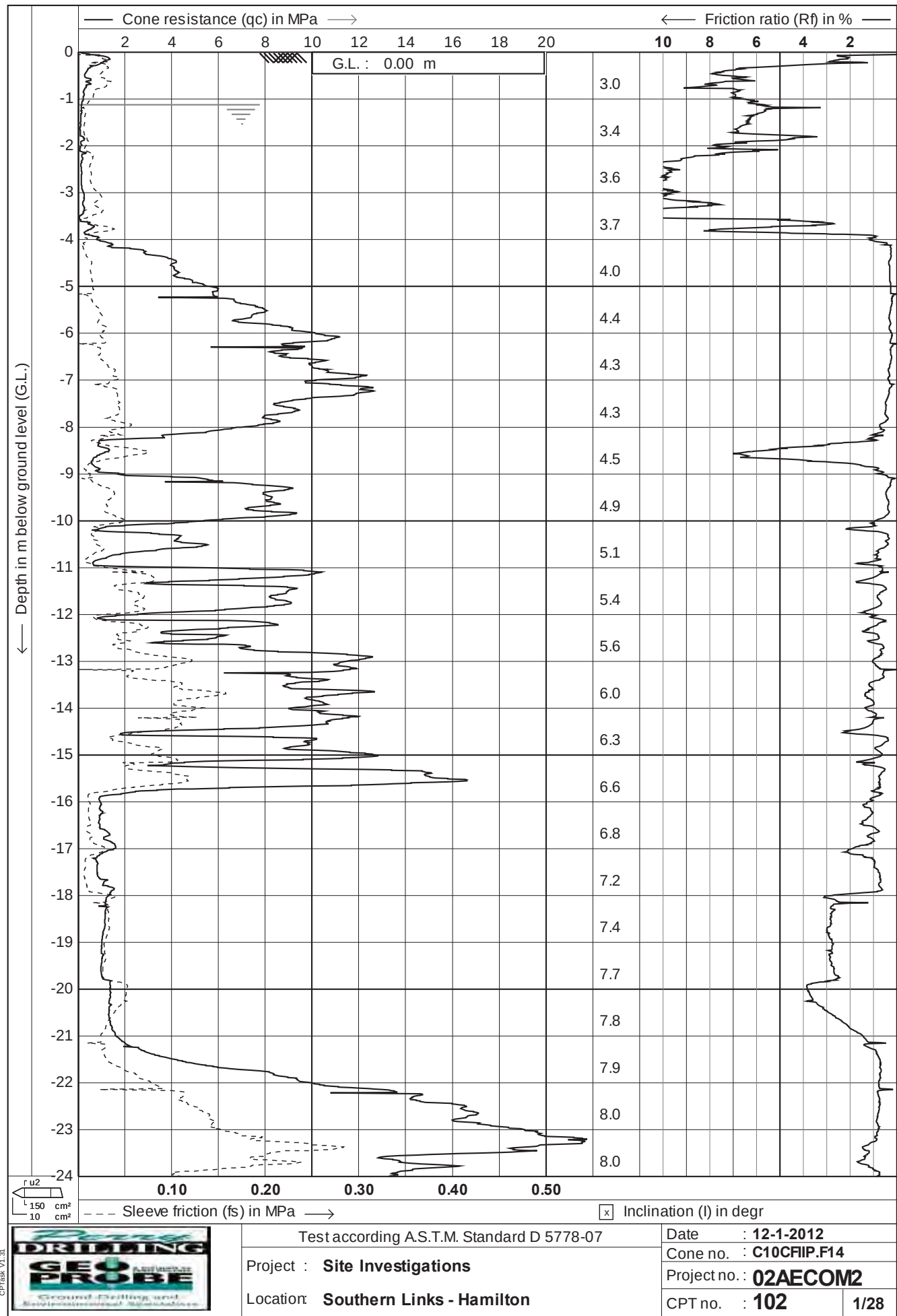


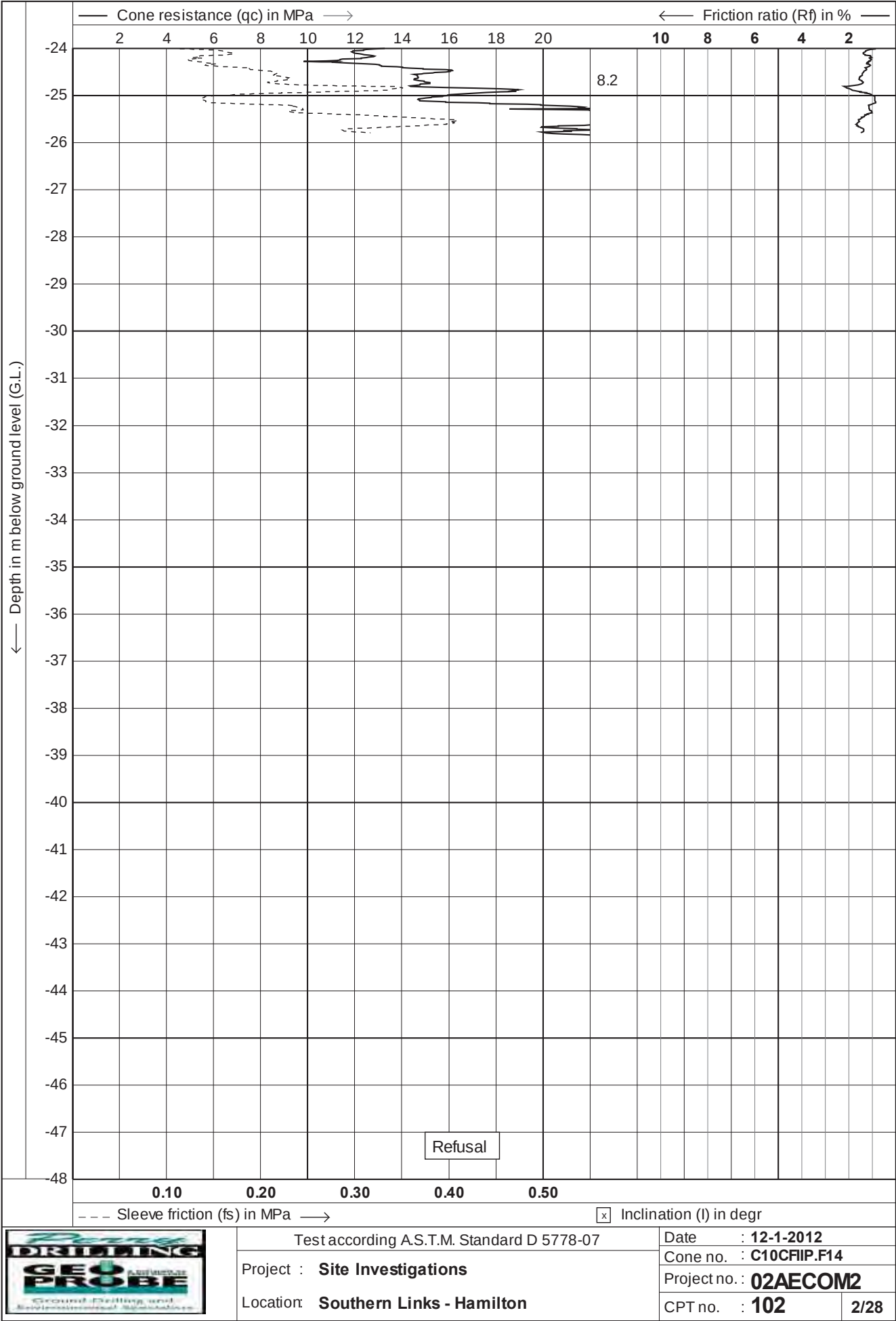


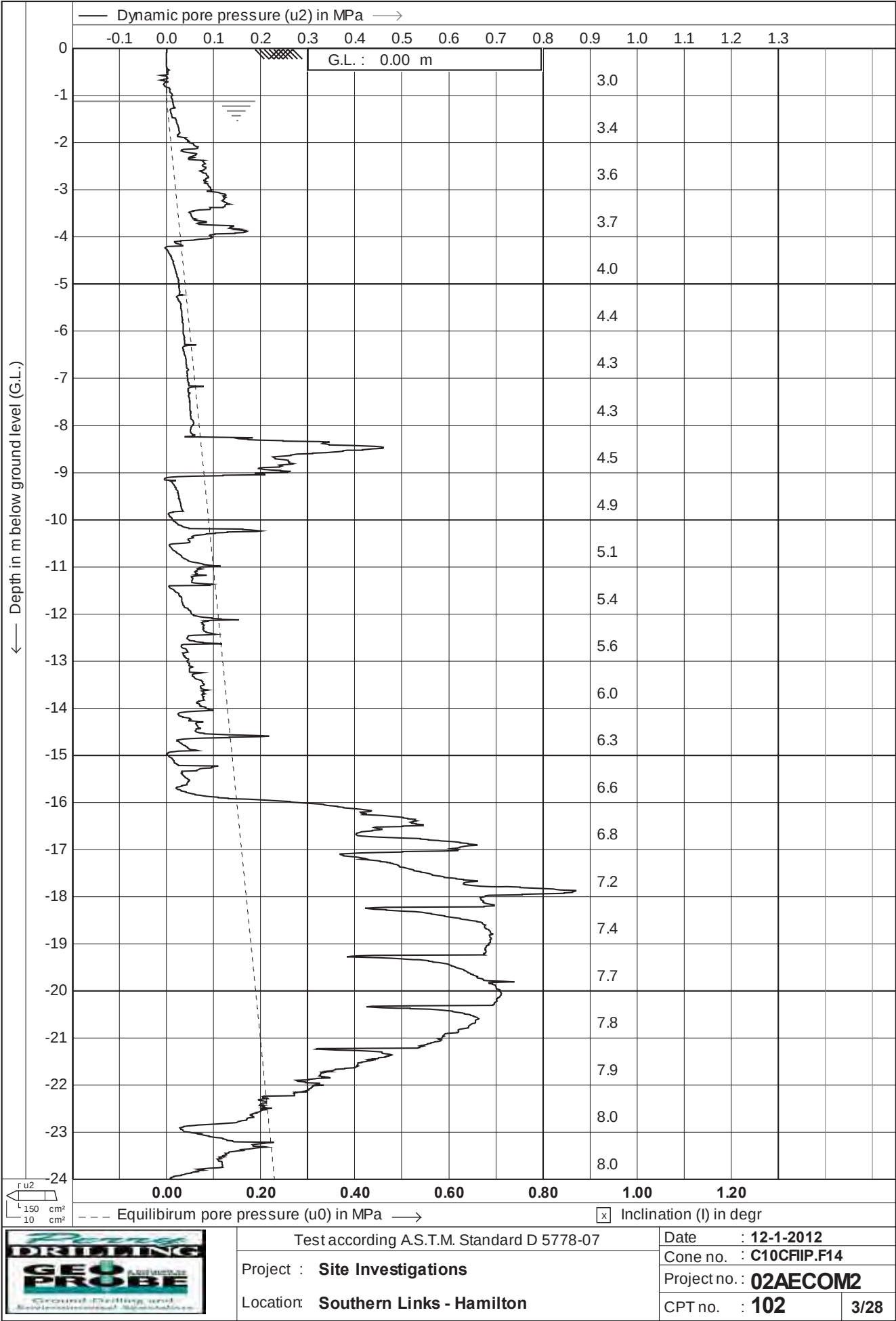




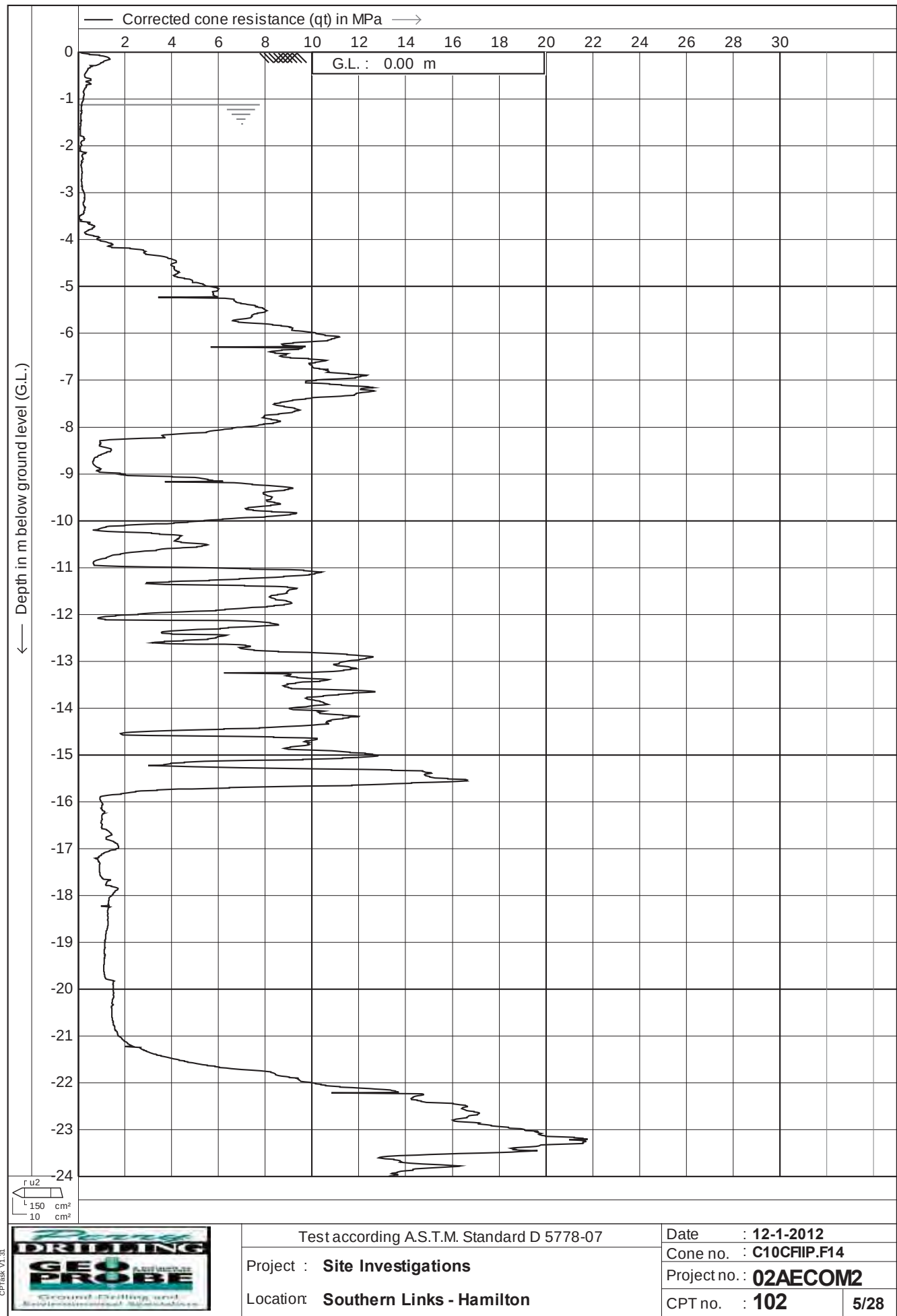


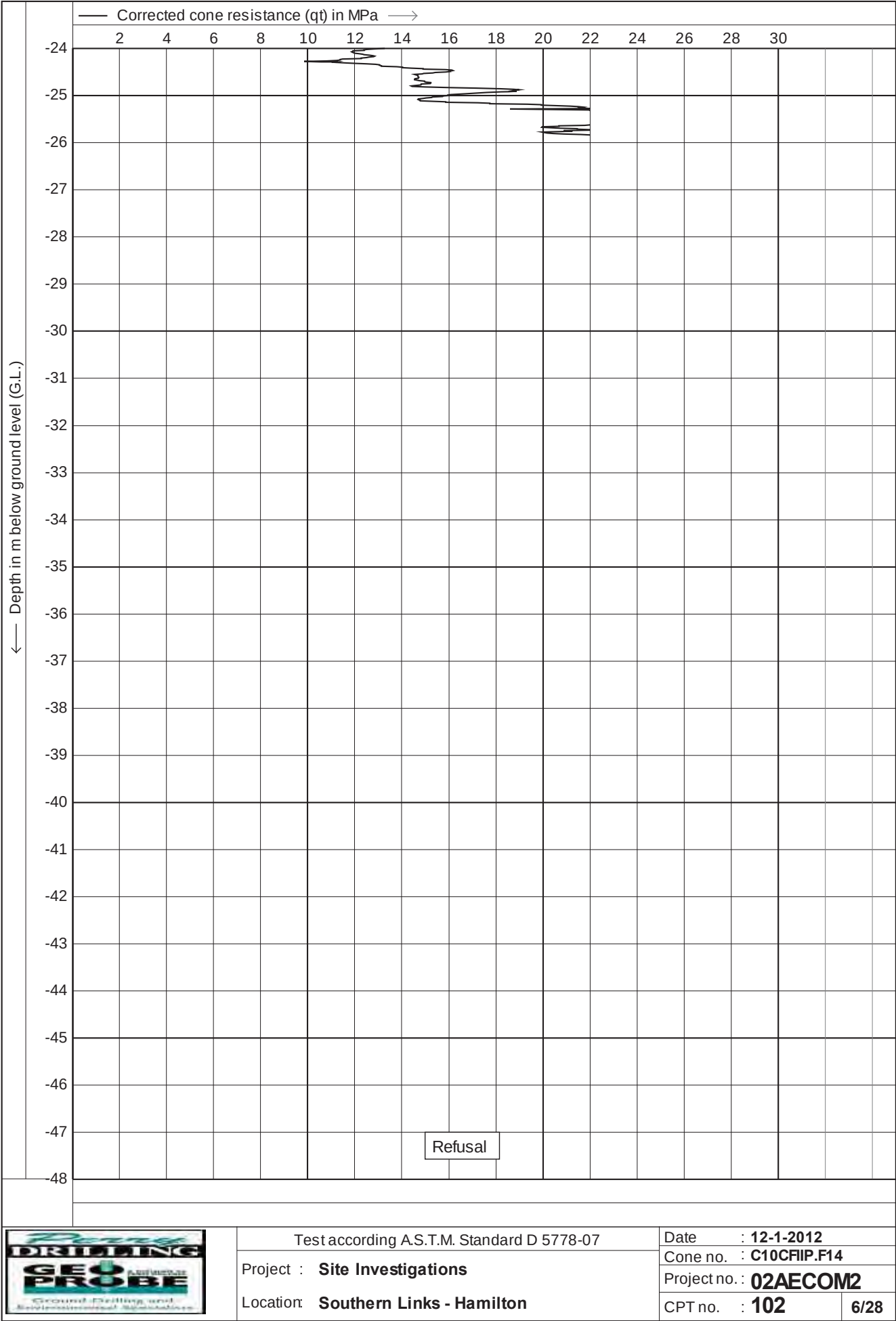


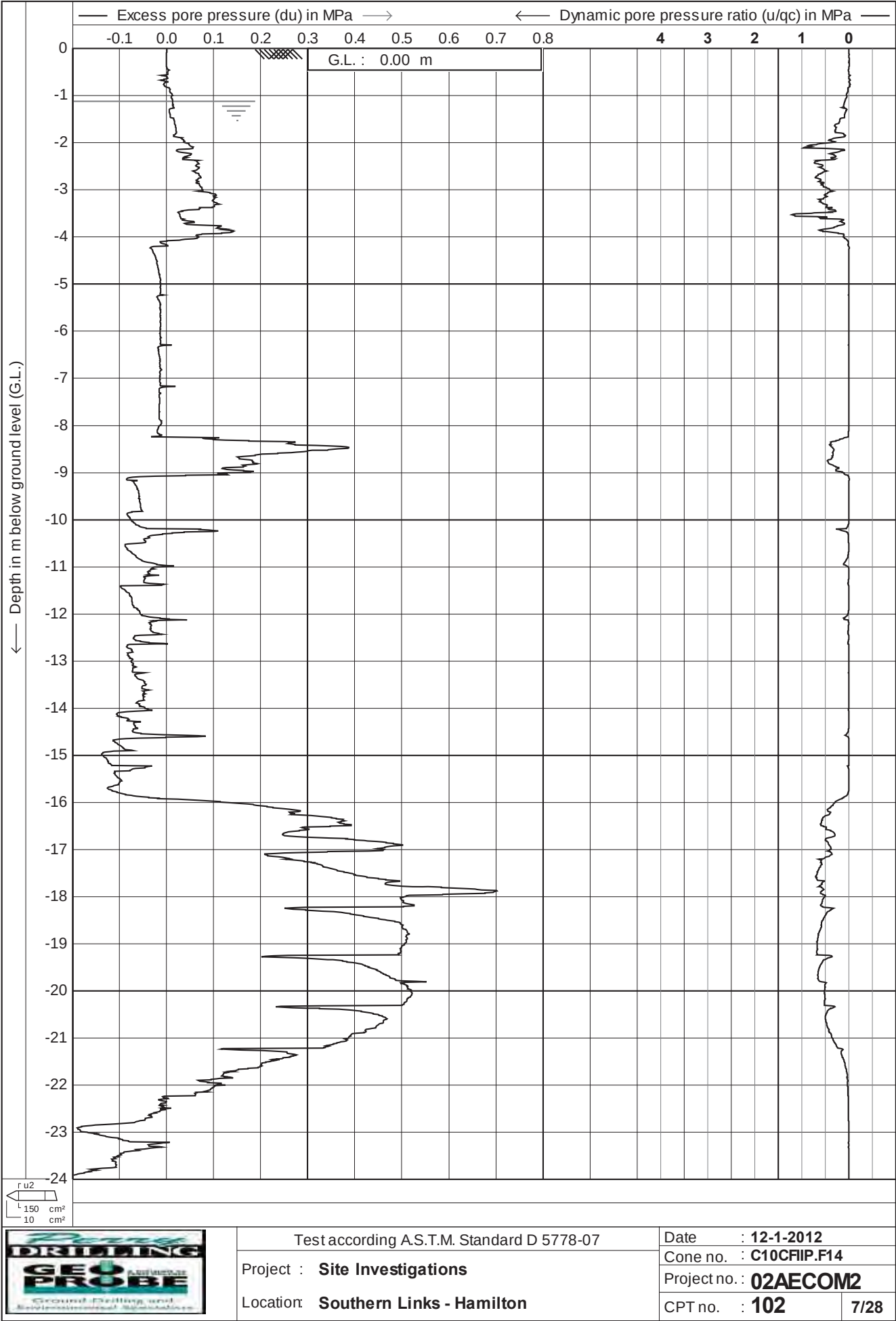


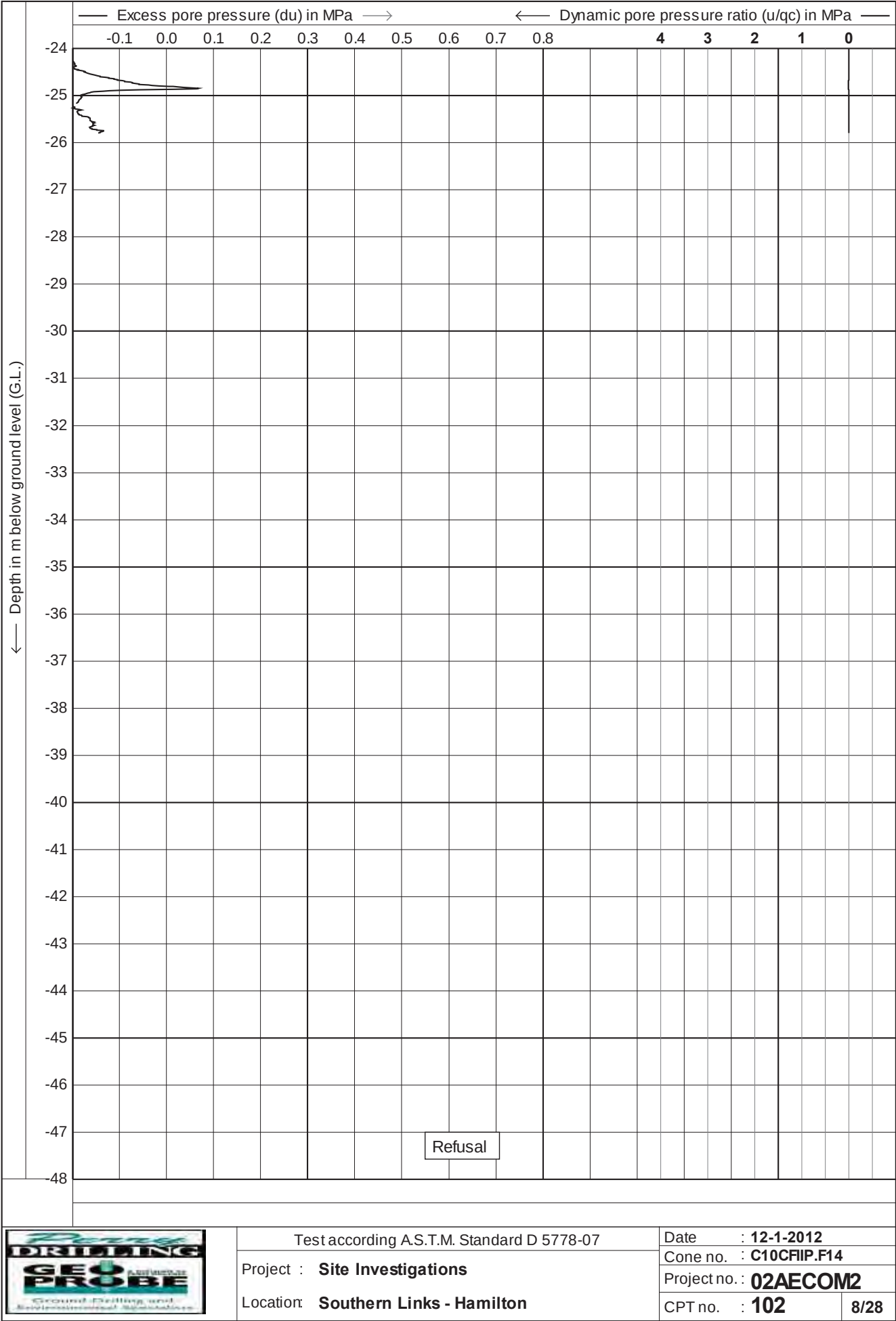


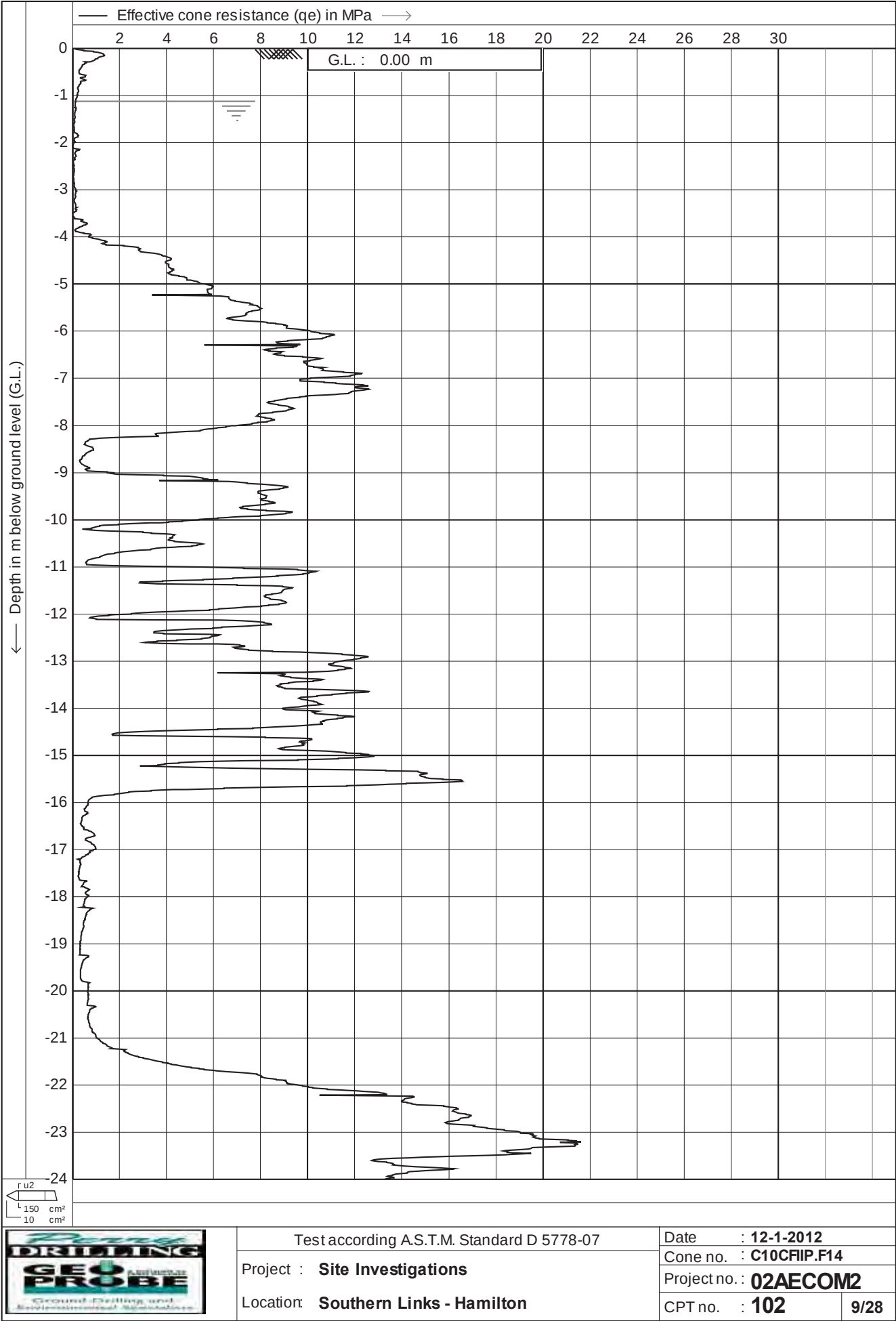




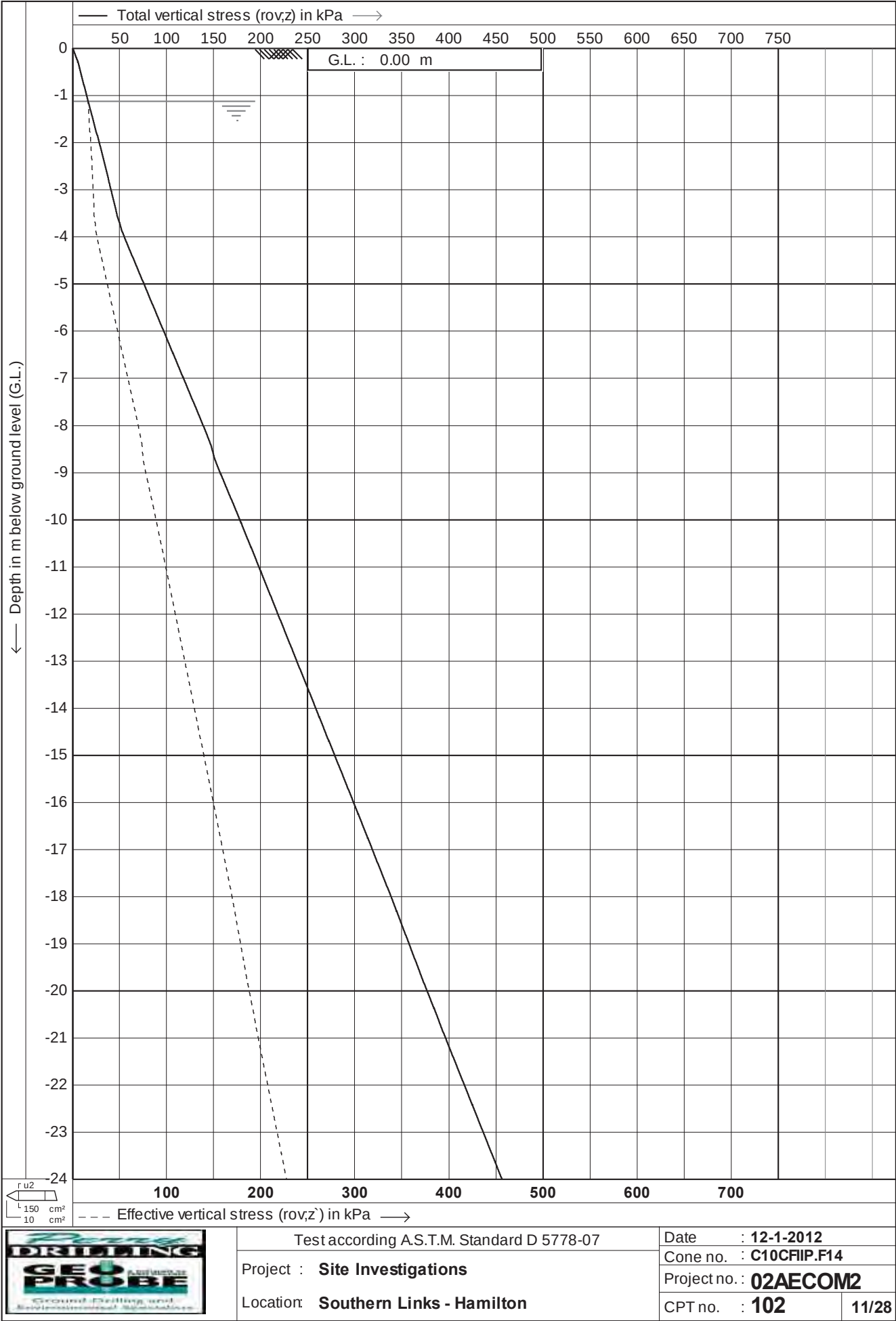


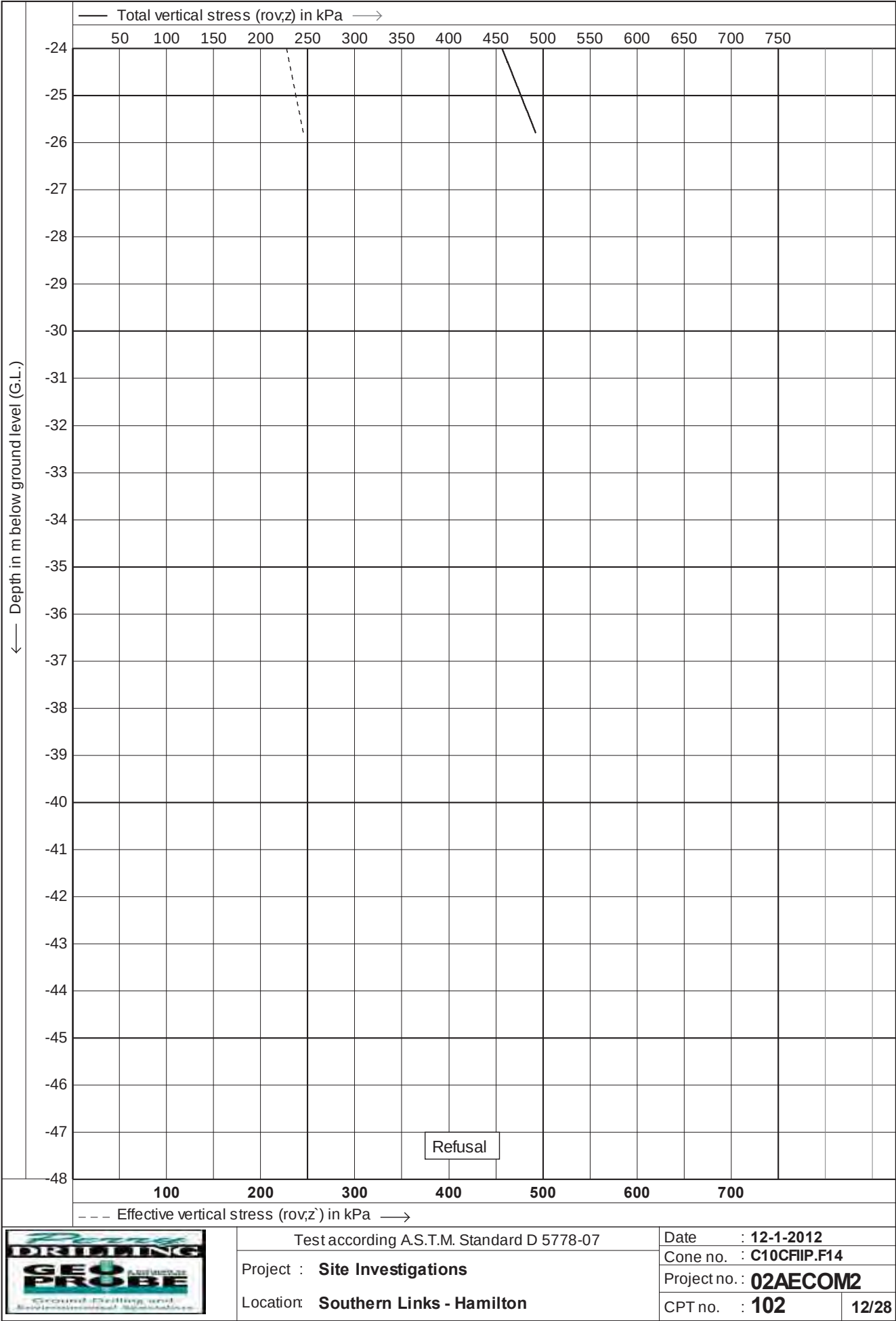


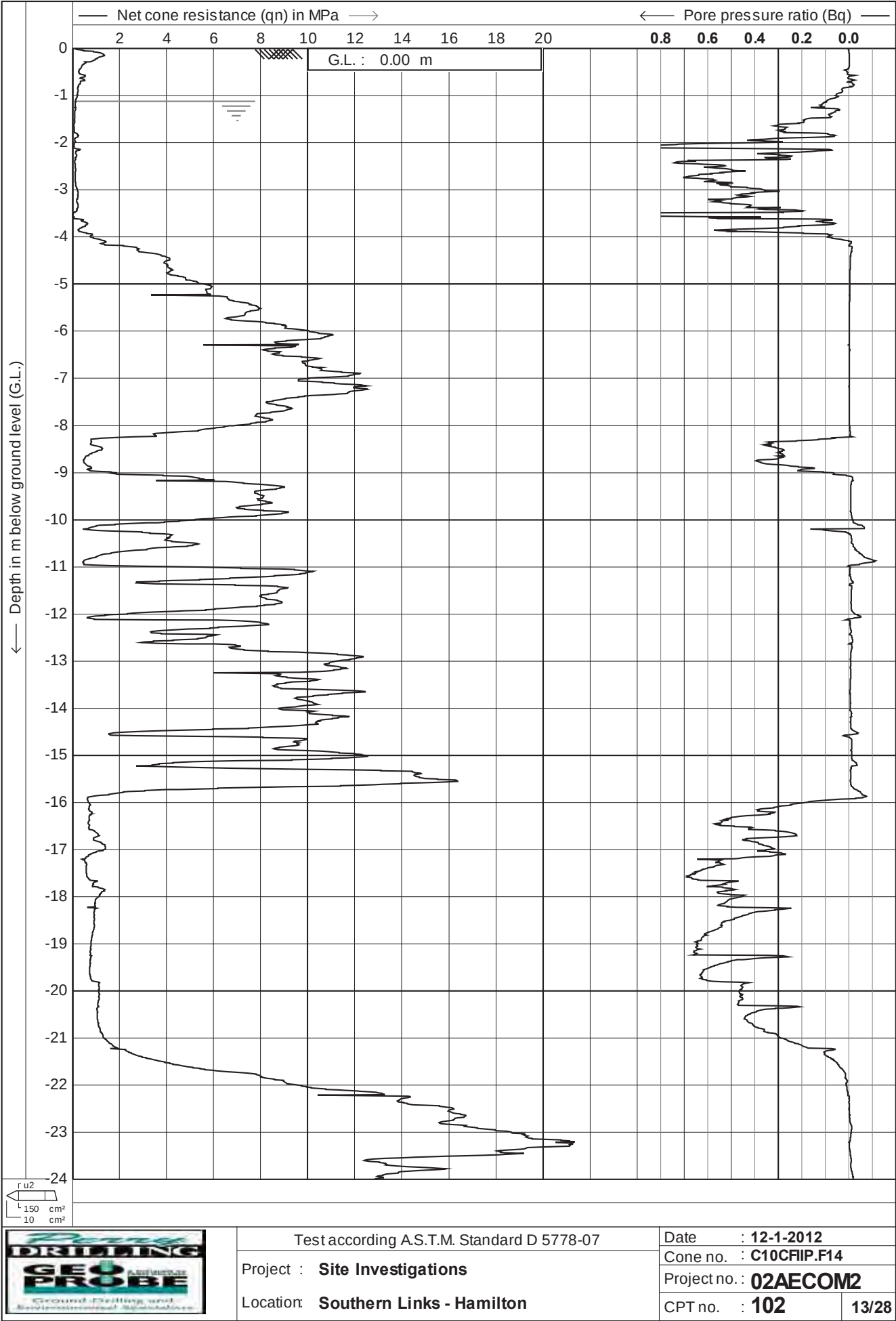


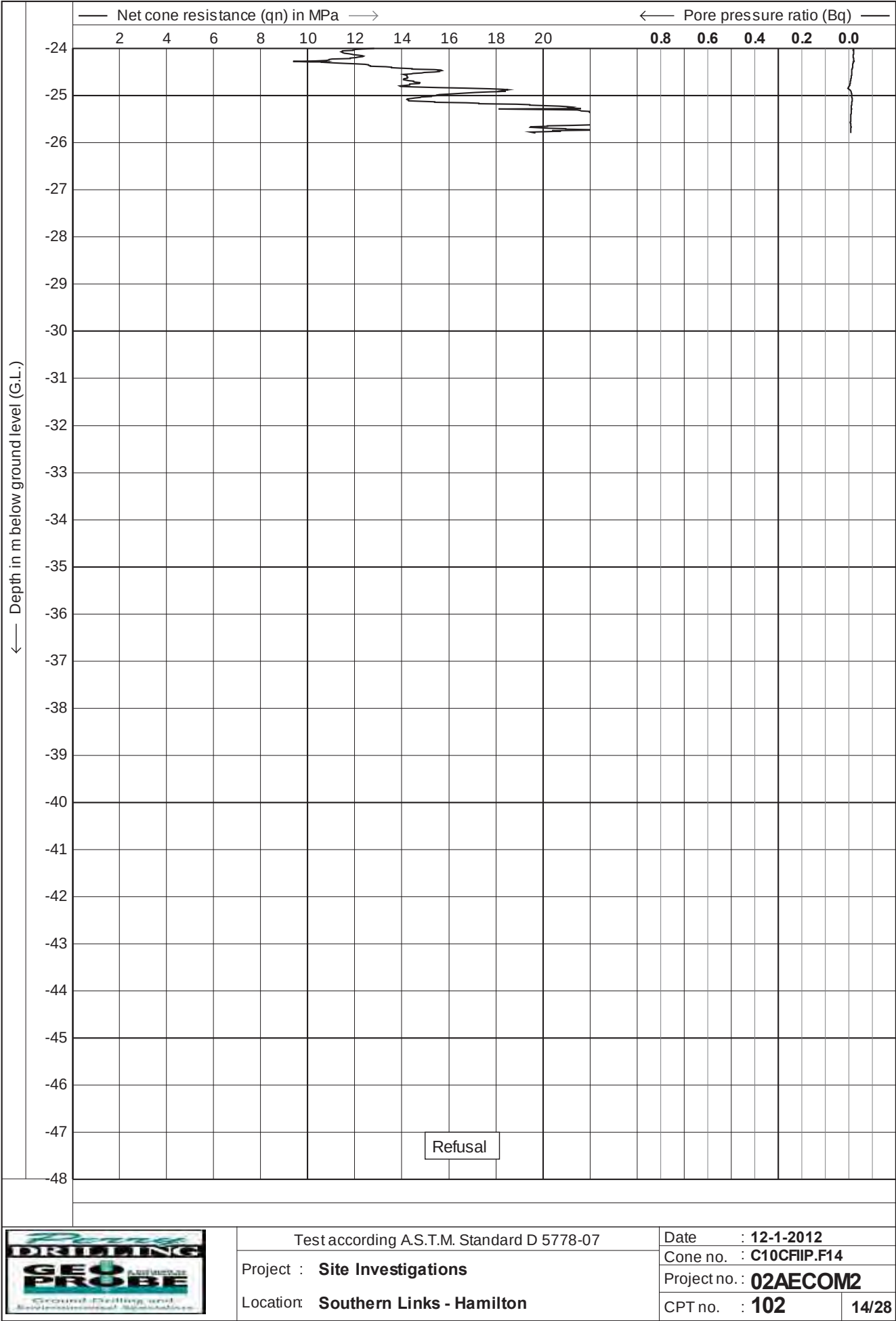


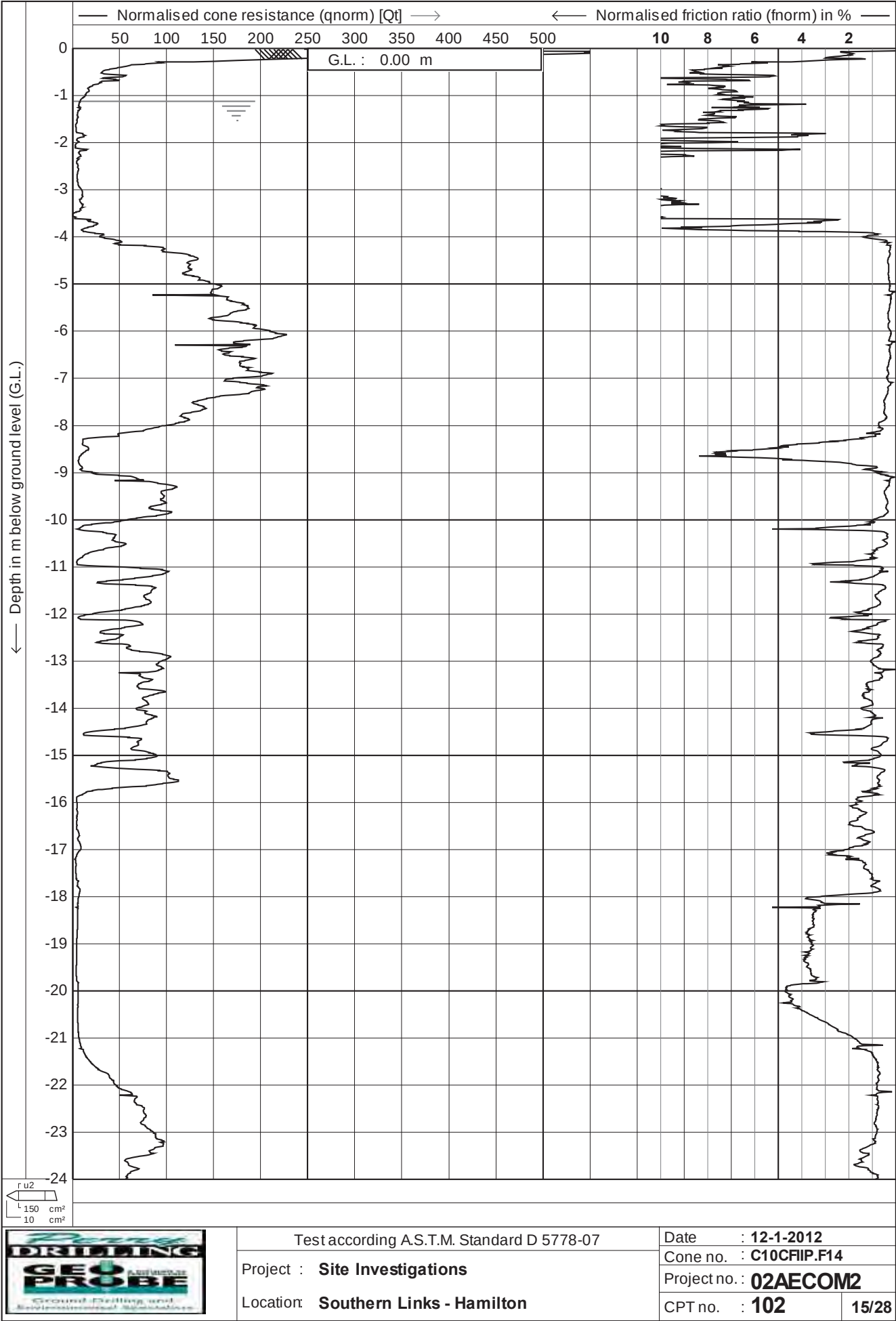




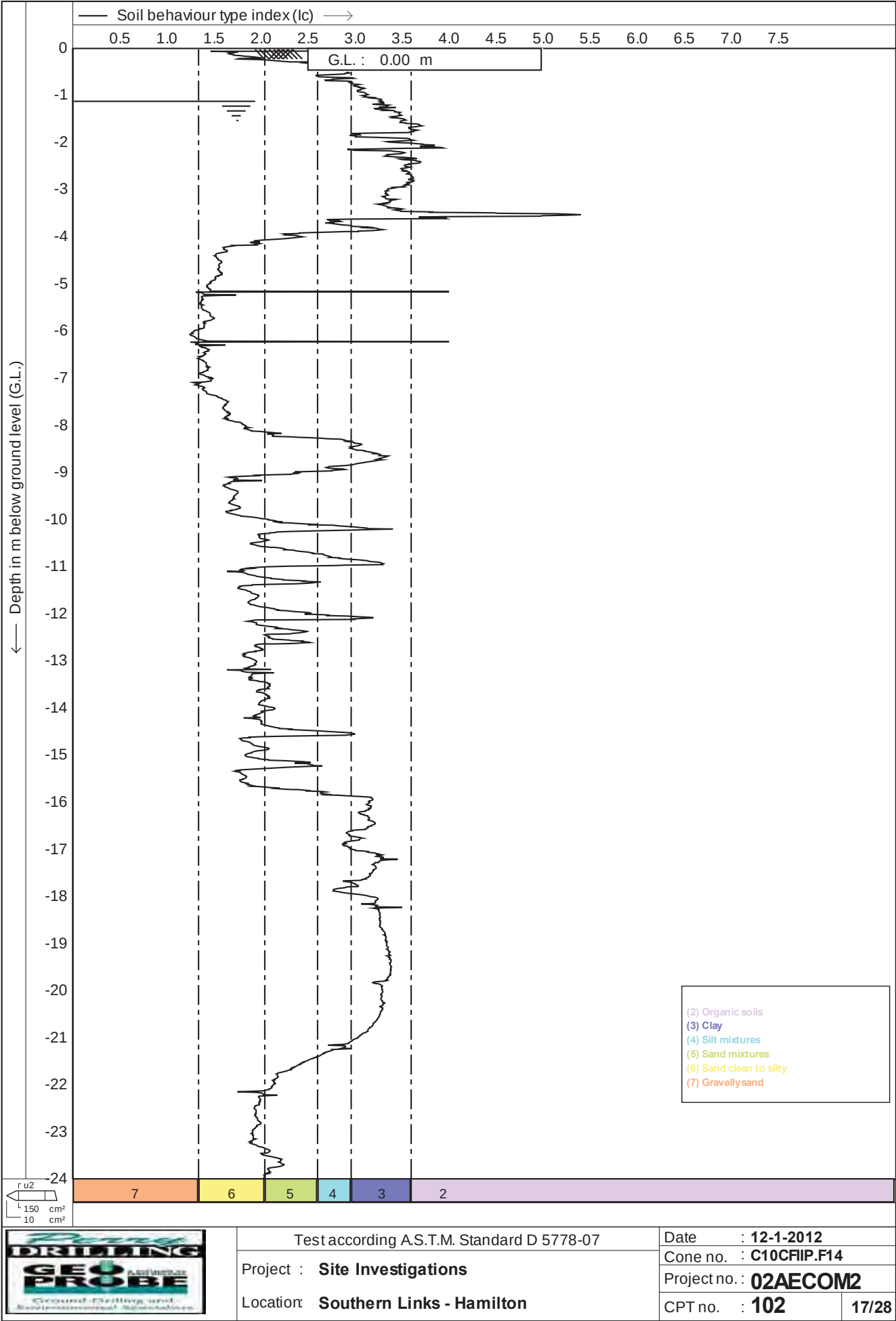


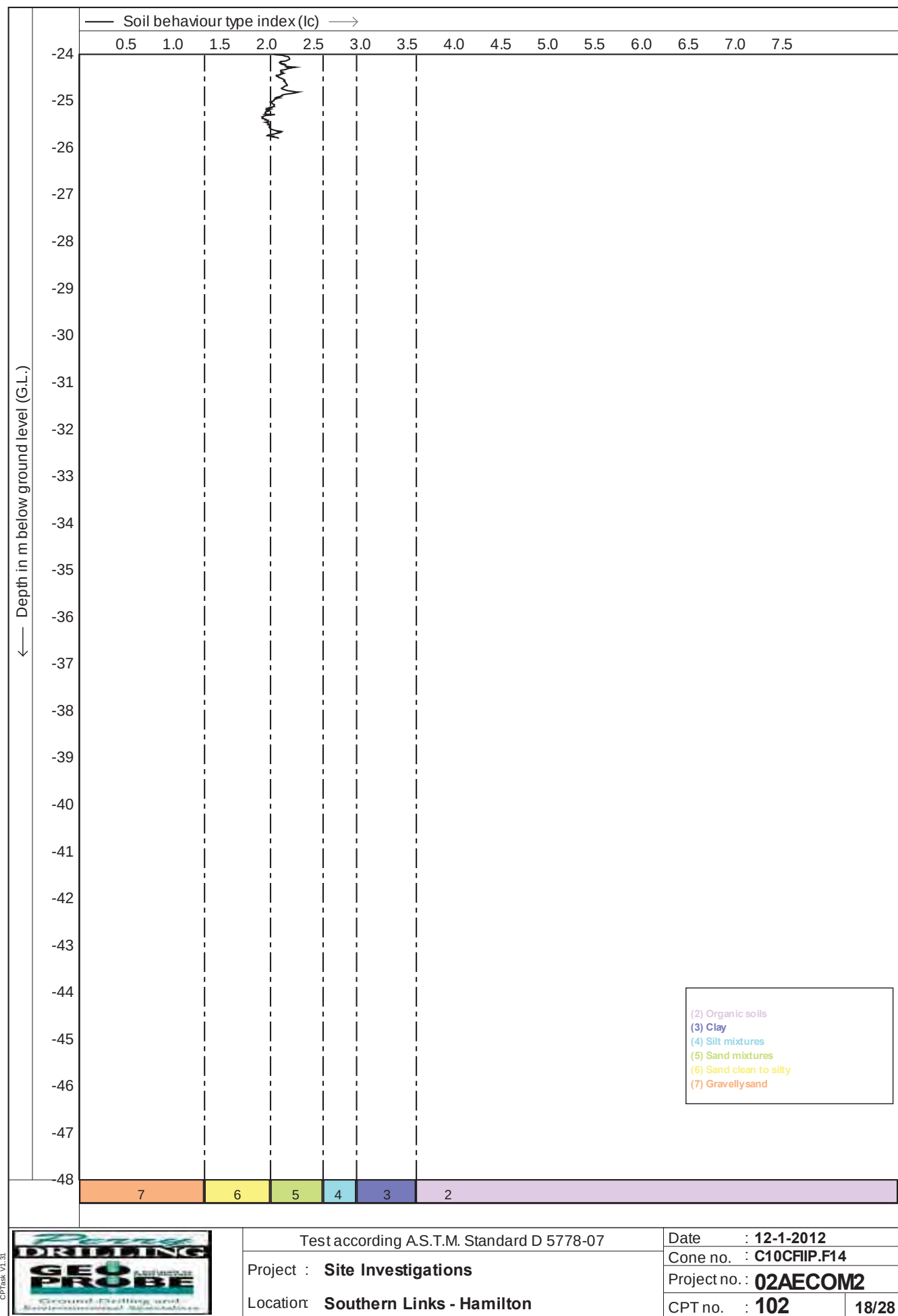


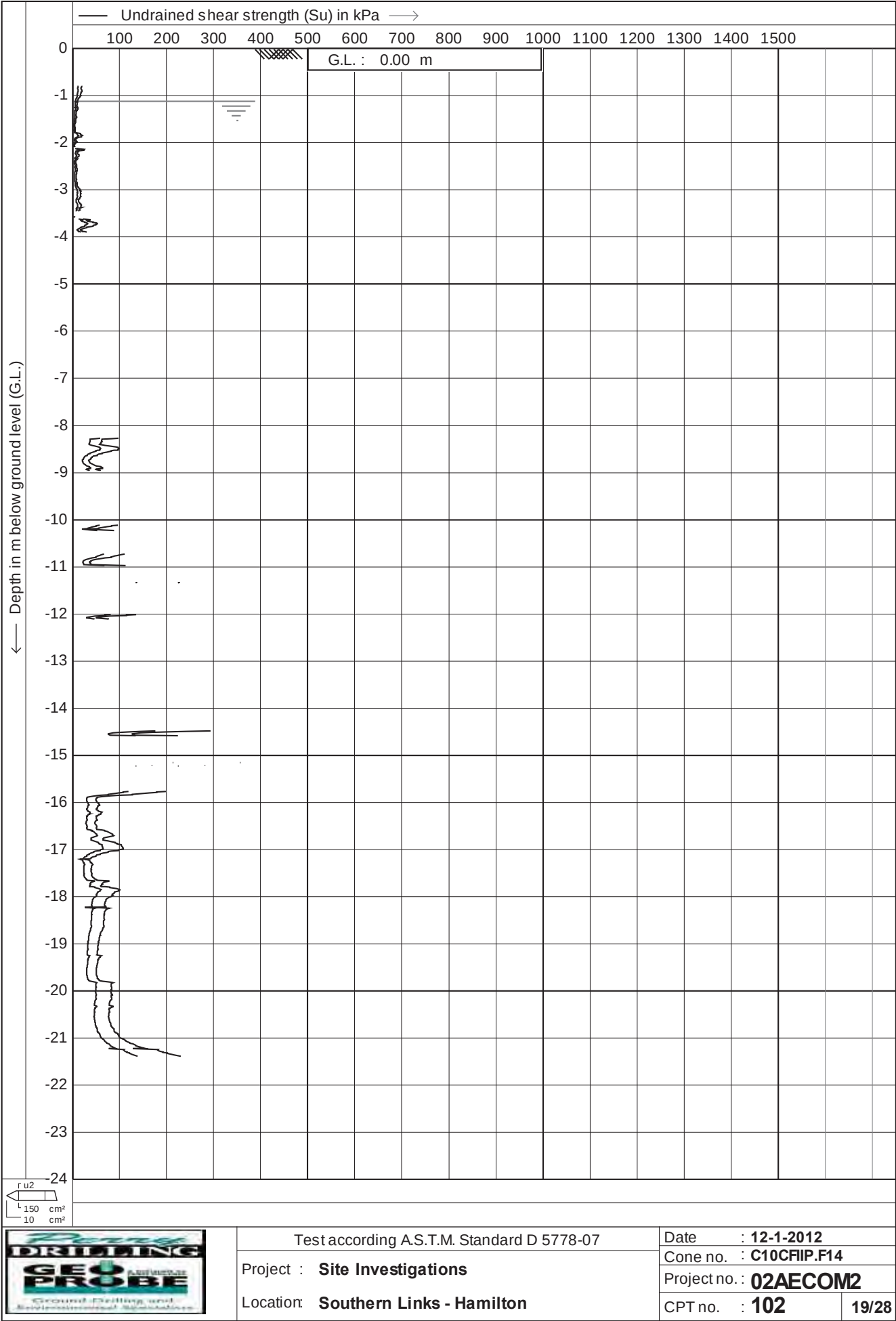


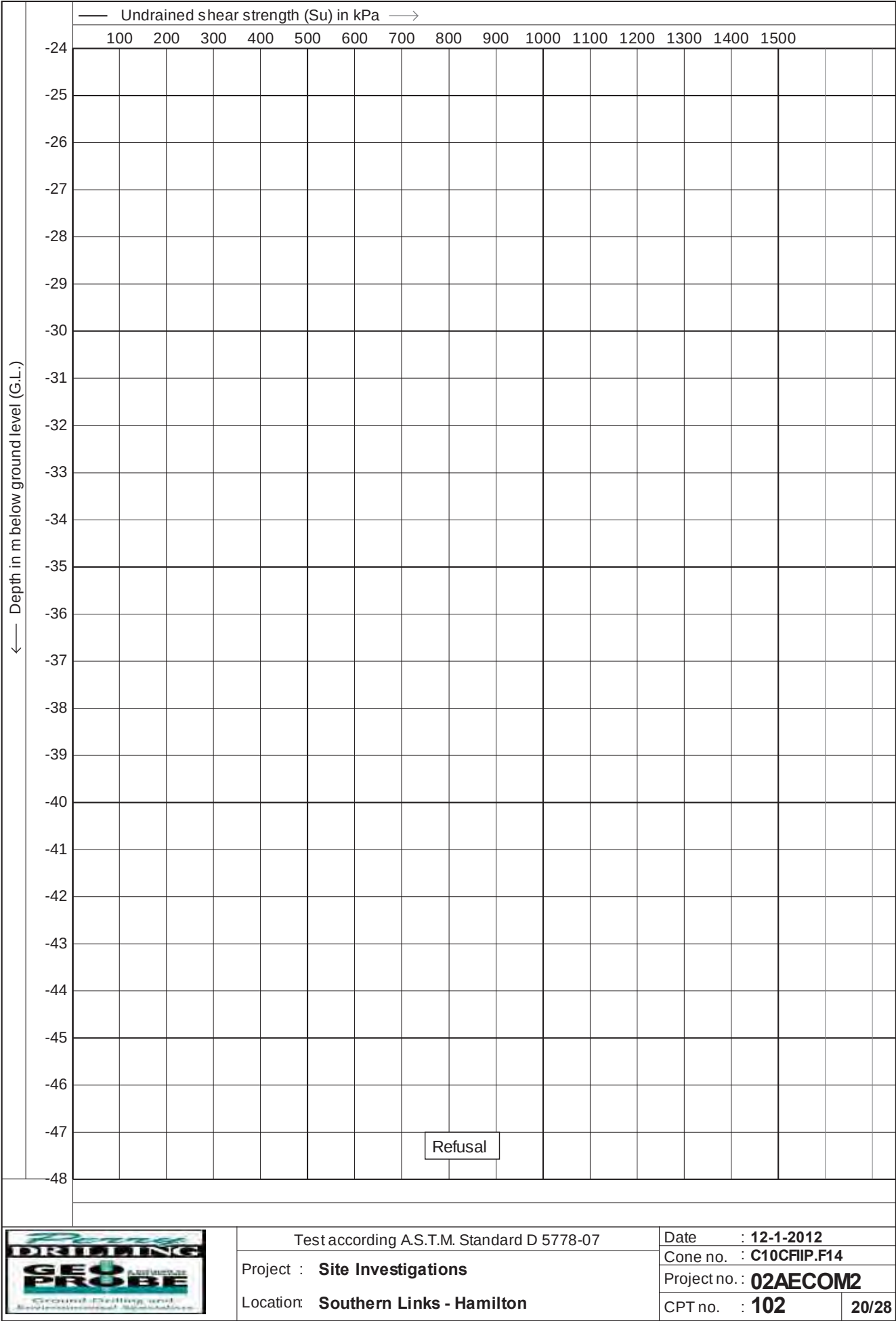


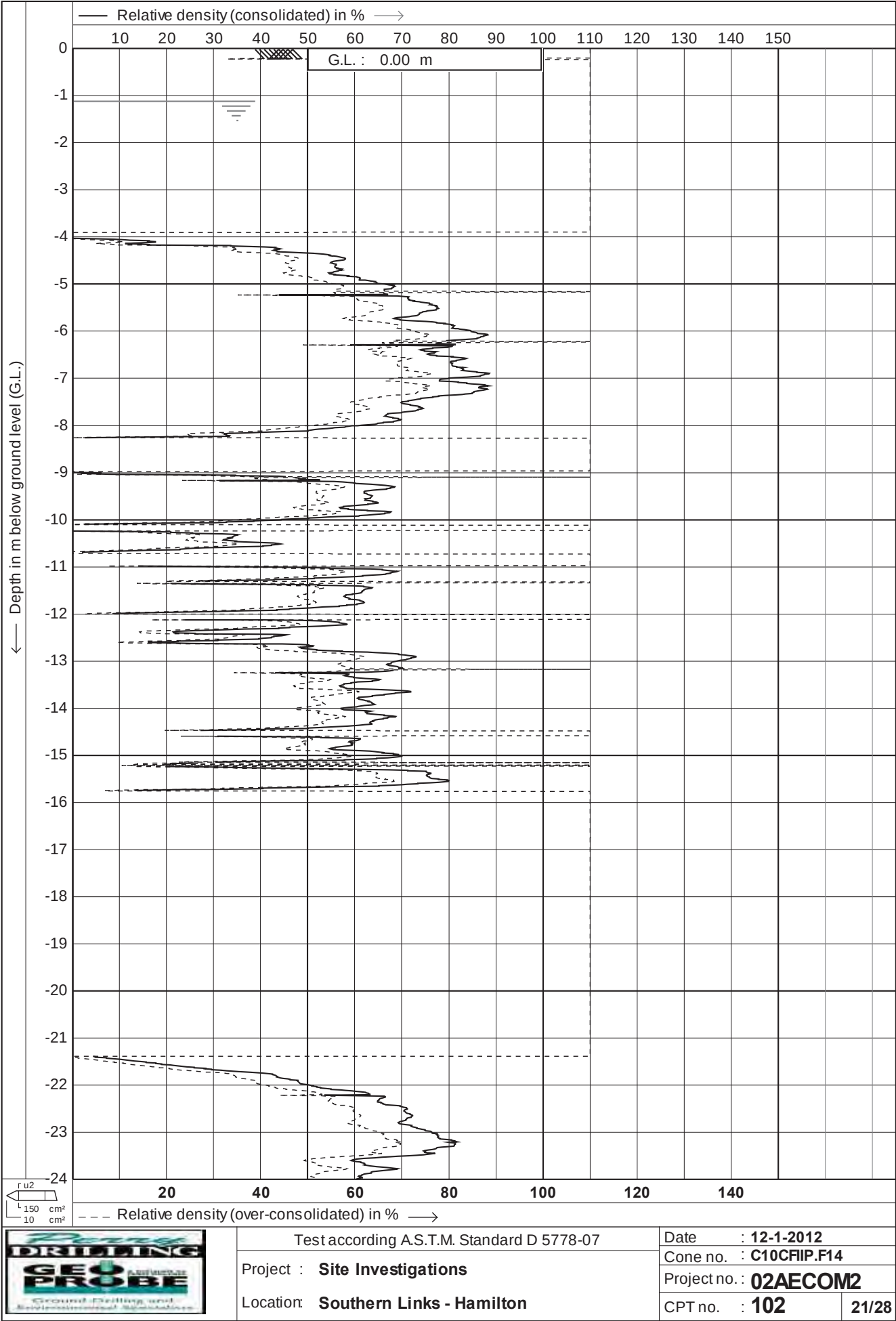


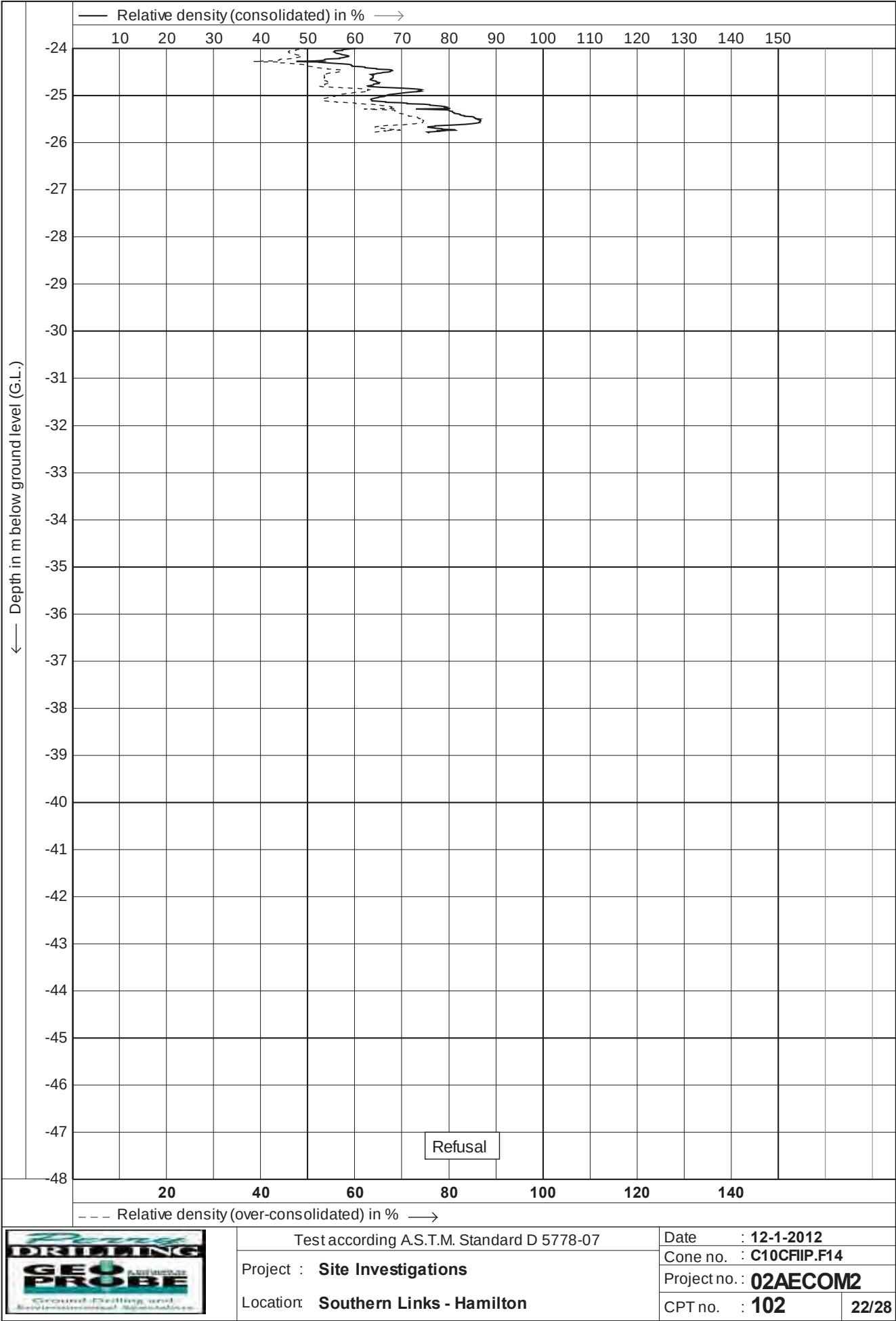


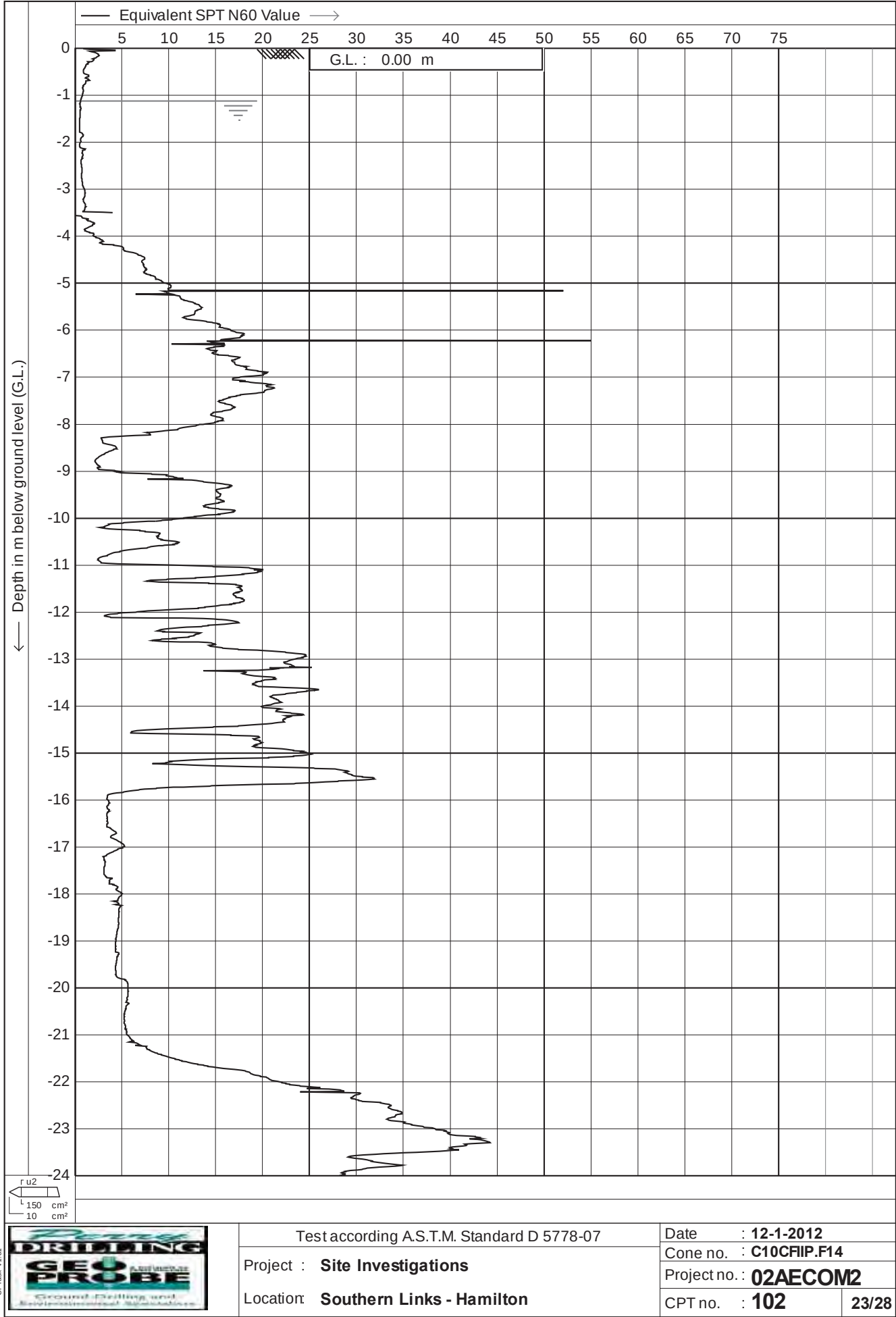


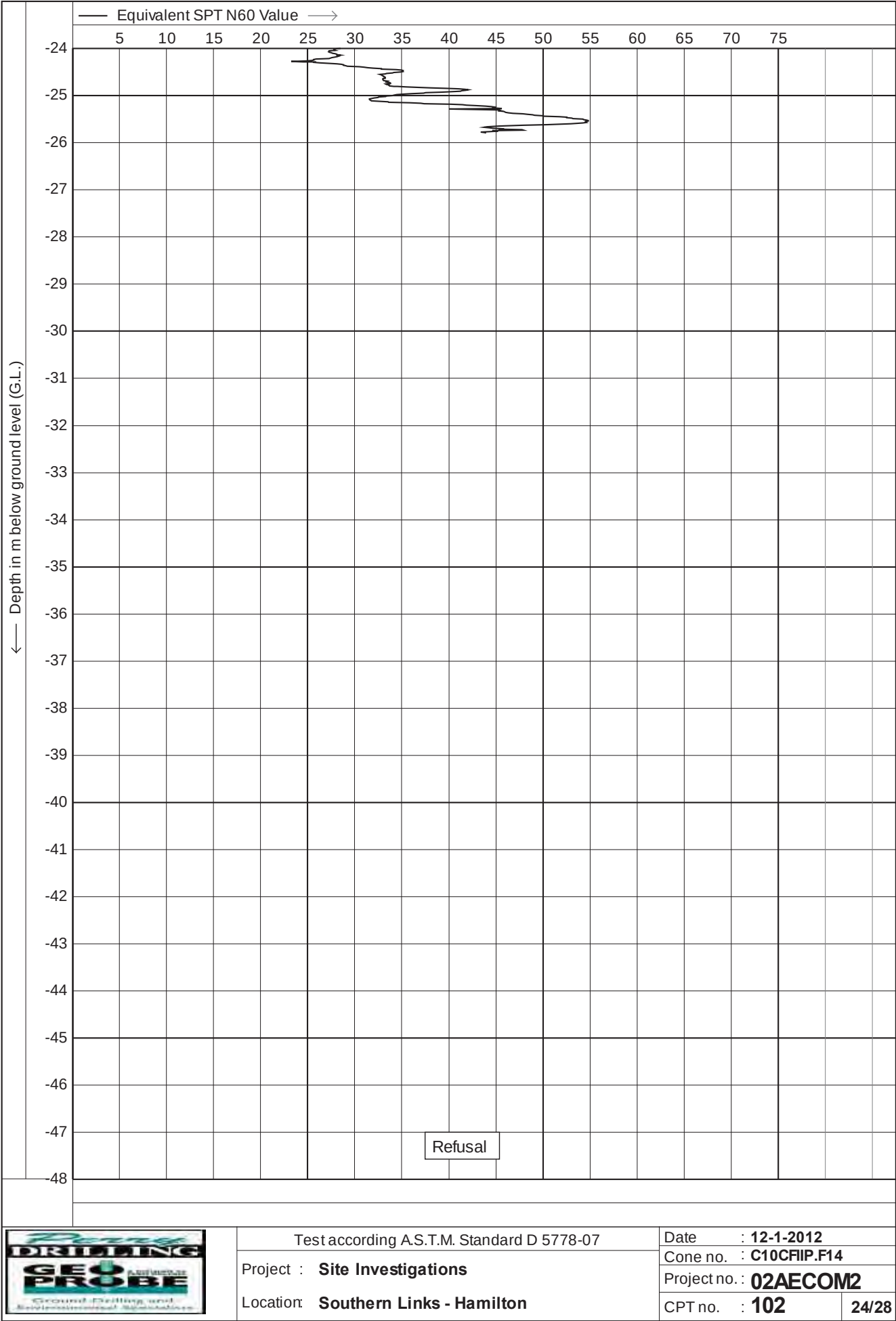


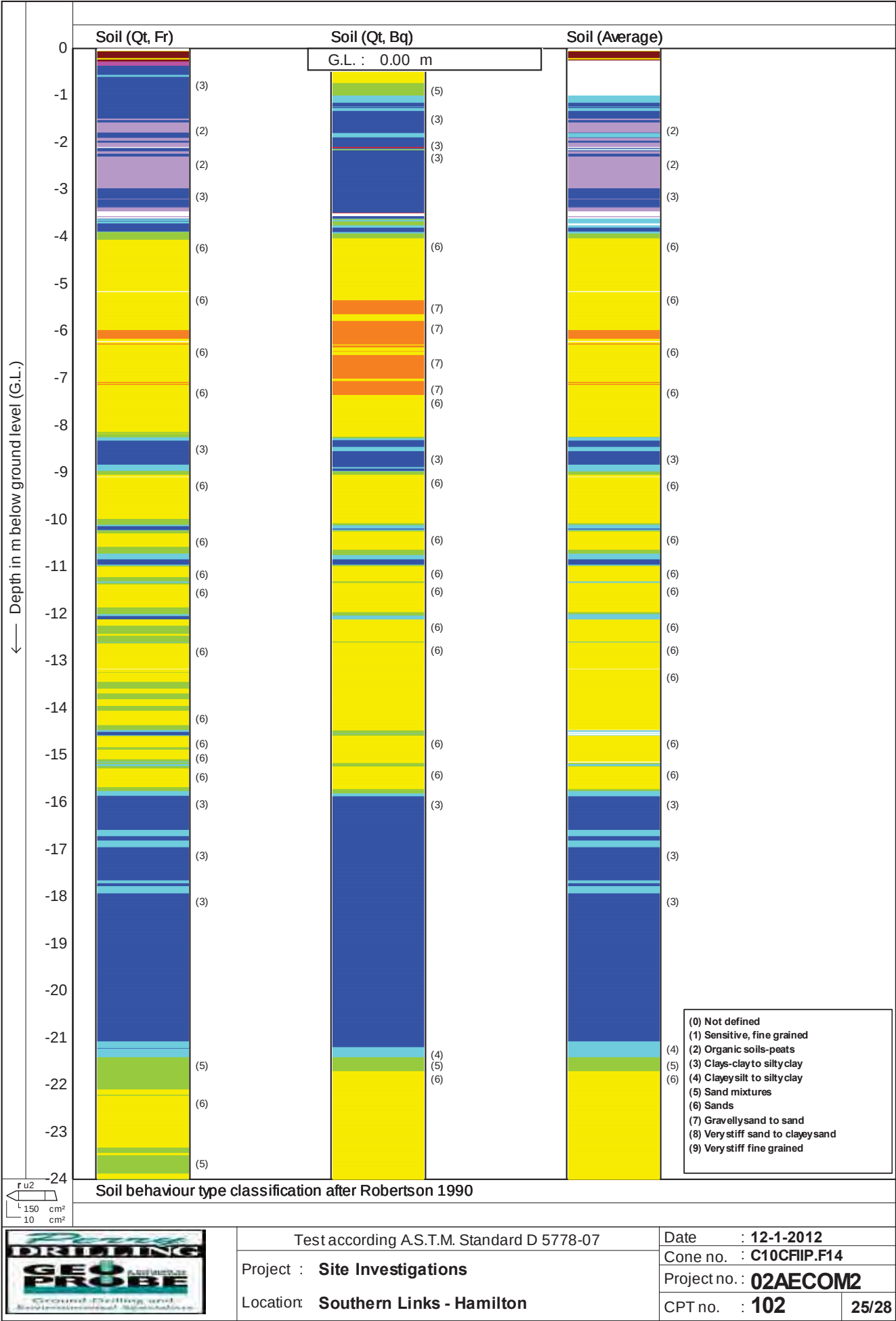






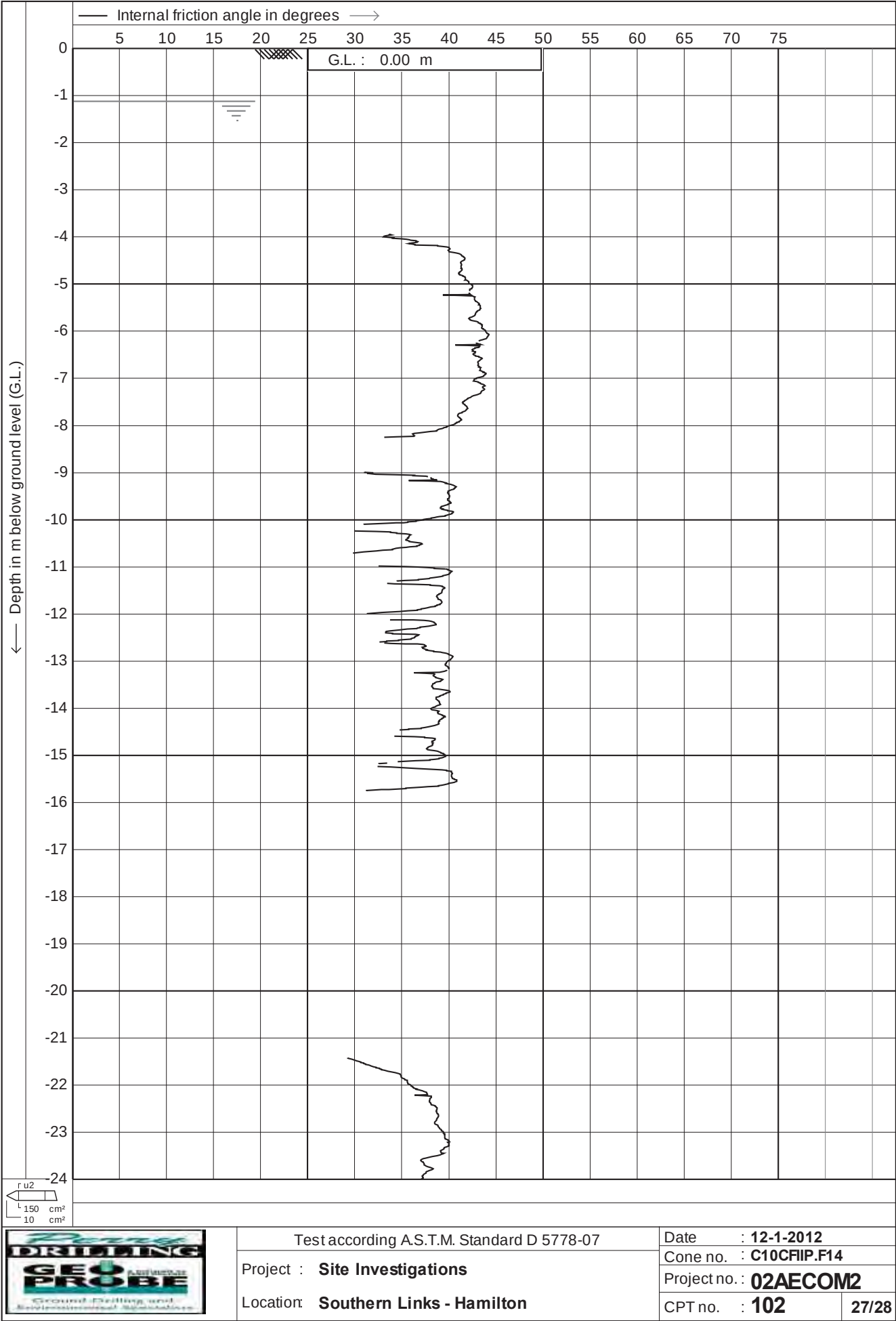




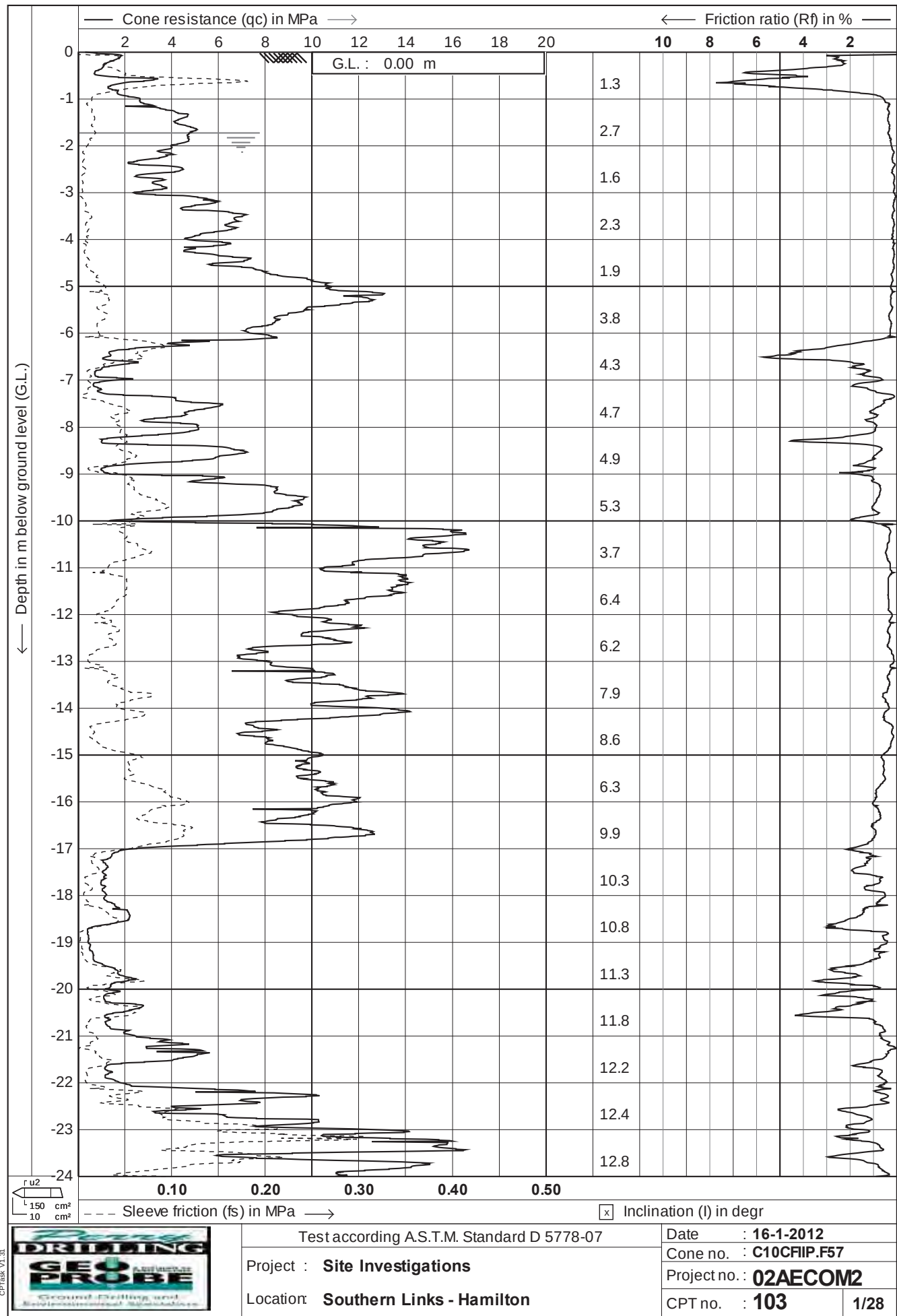


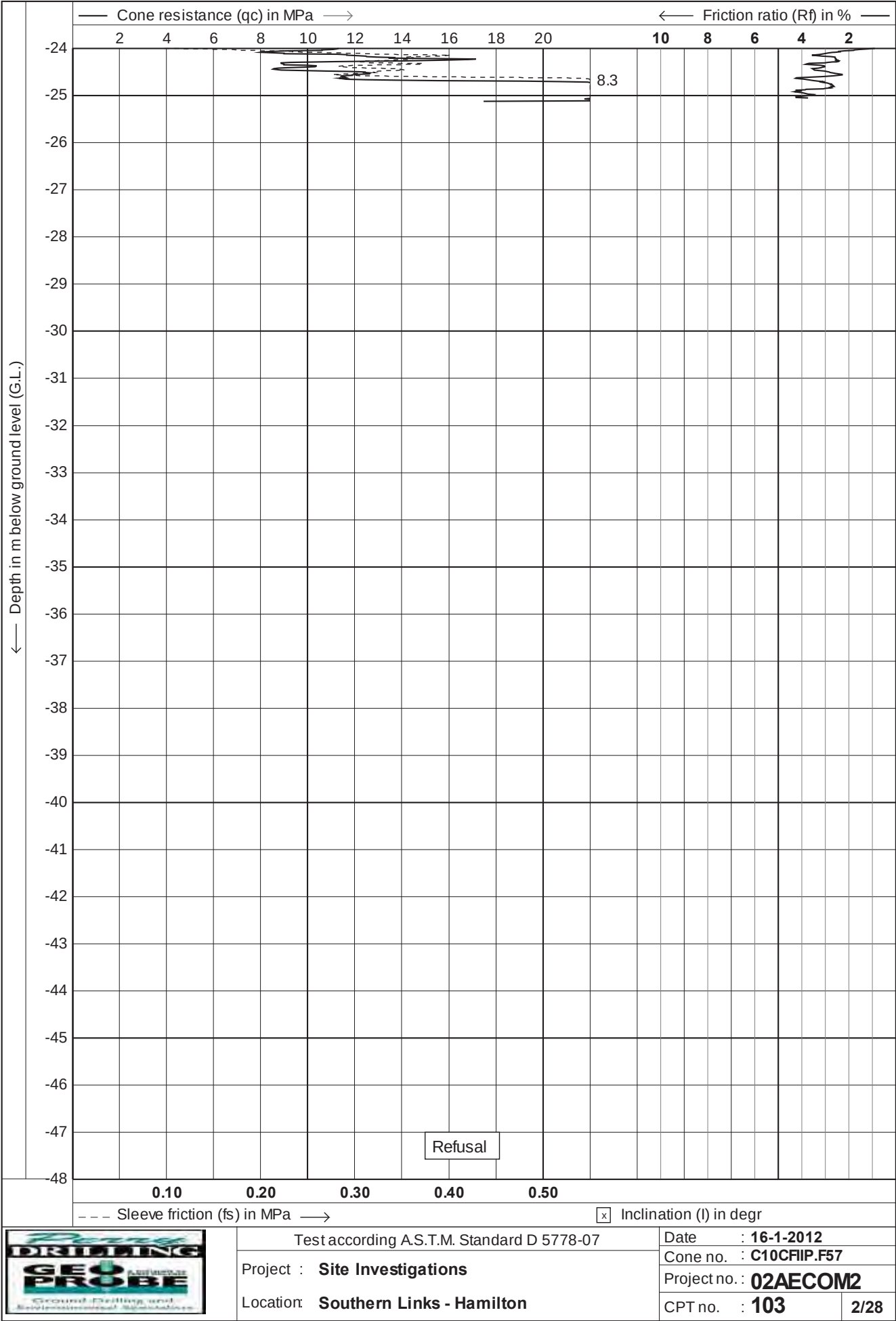
	Soil (Qt, Fr)	Soil (Qt, Bq)	Soil (Average)	
-24	(5)			
-25				
-26				
-27				
-28				
-29				
-30				
-31				
-32				
-33				
-34				
-35				
-36				
-37				
-38				
-39				
-40				
-41				
-42				
-43				
-44				
-45				
-46				
-47				
-48				
Soil behaviour type classification after Robertson 1990				
CPTask V1.31	Test according A.S.T.M. Standard D 5778-07		Date : 12-1-2012	
	Project : Site Investigations		Cone no. : C10CFIP.F14	
	Location: Southern Links - Hamilton		Project no.: 02AECOM2	
			CPT no. : 102	26/28

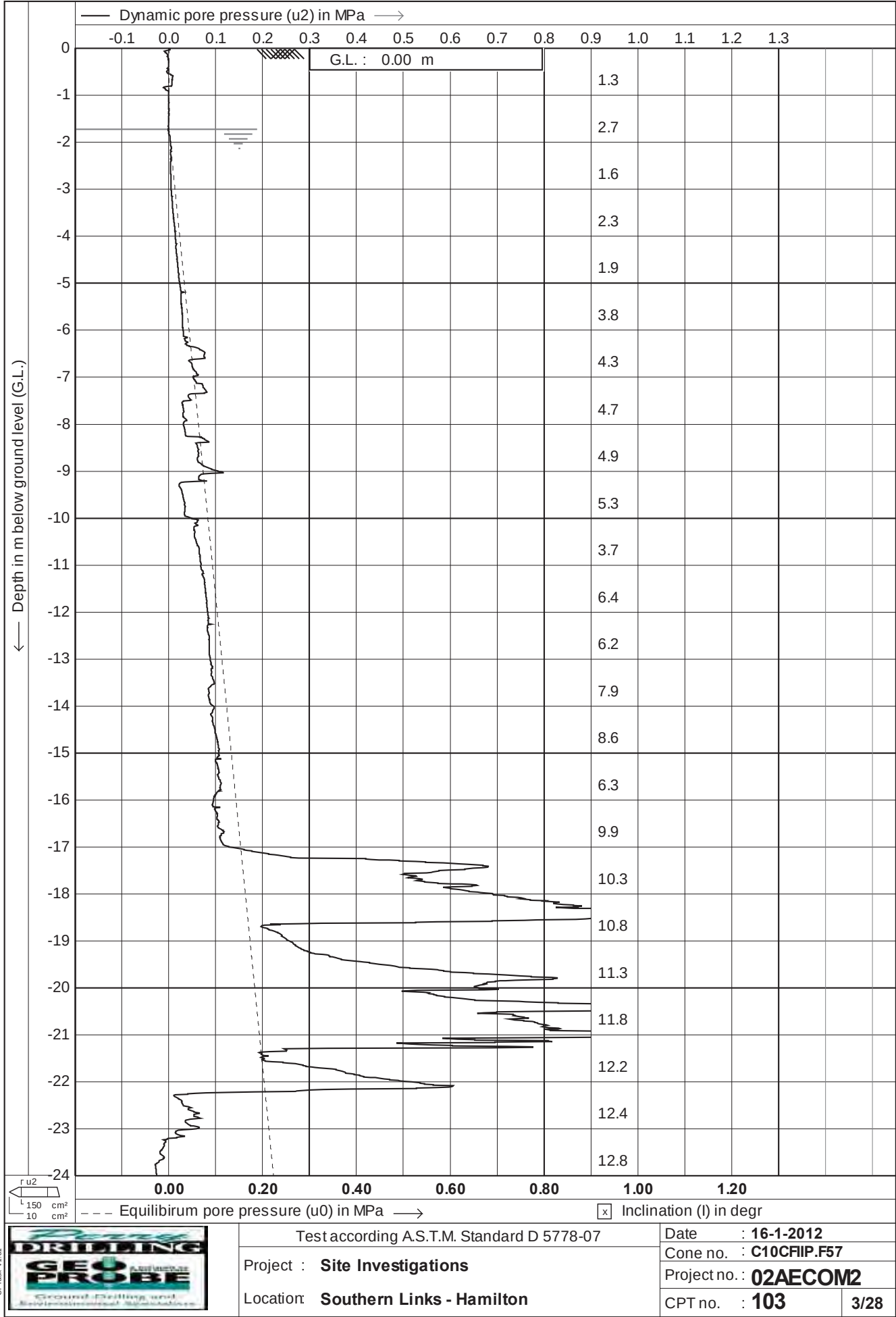
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



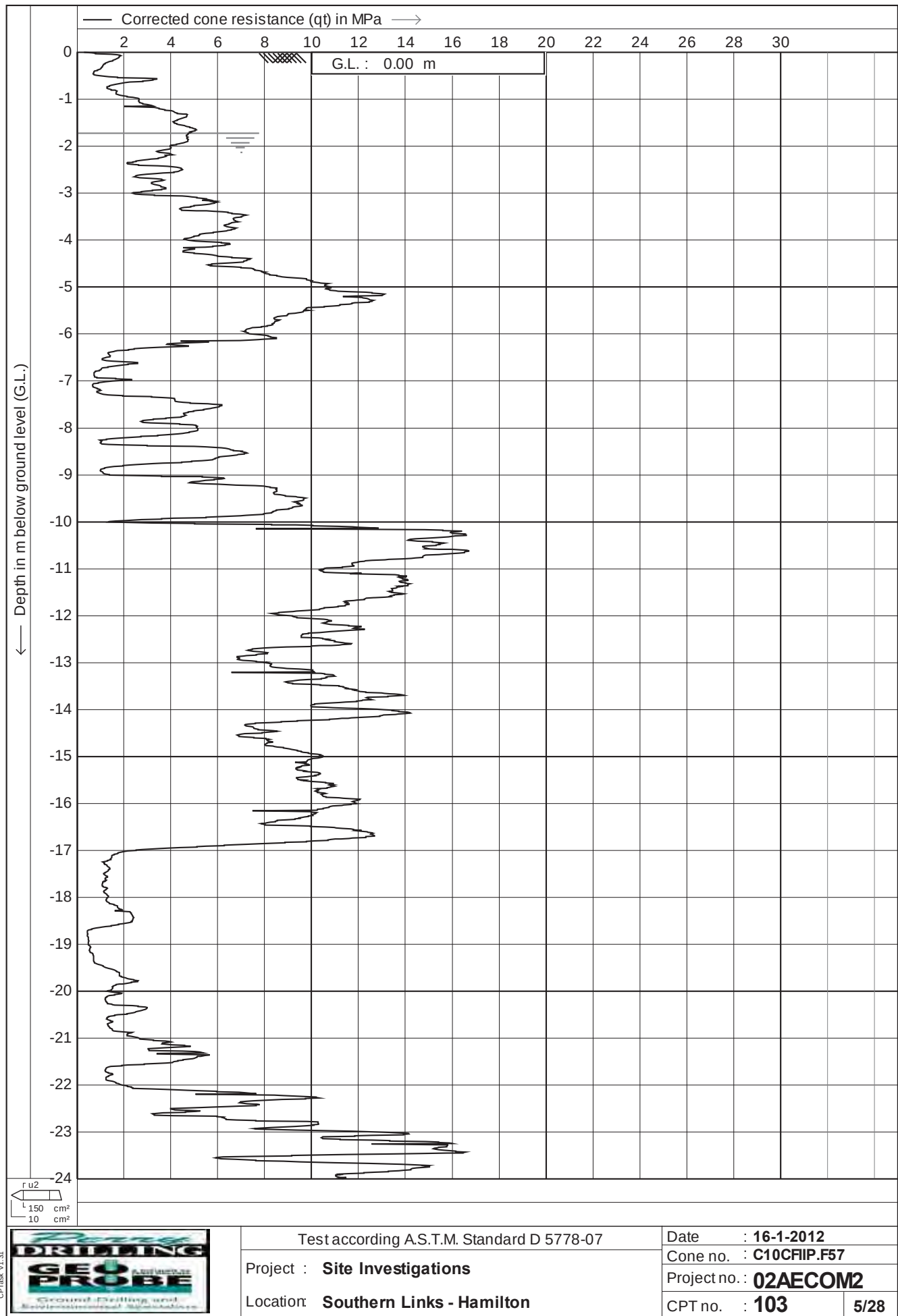


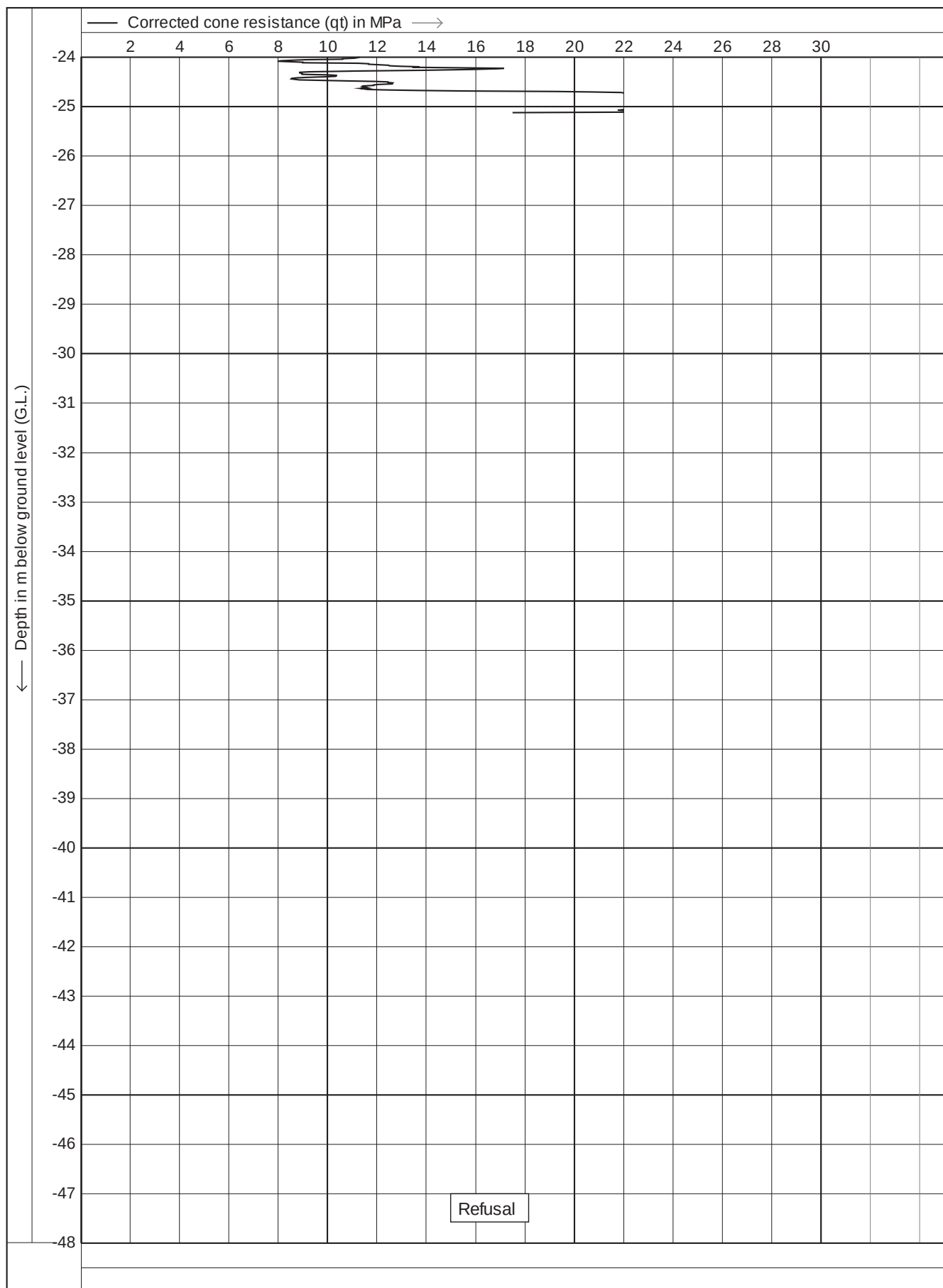












Test according A.S.T.M. Standard D 5778-07

Project : **Site Investigations**

Location: **Southern Links - Hamilton**

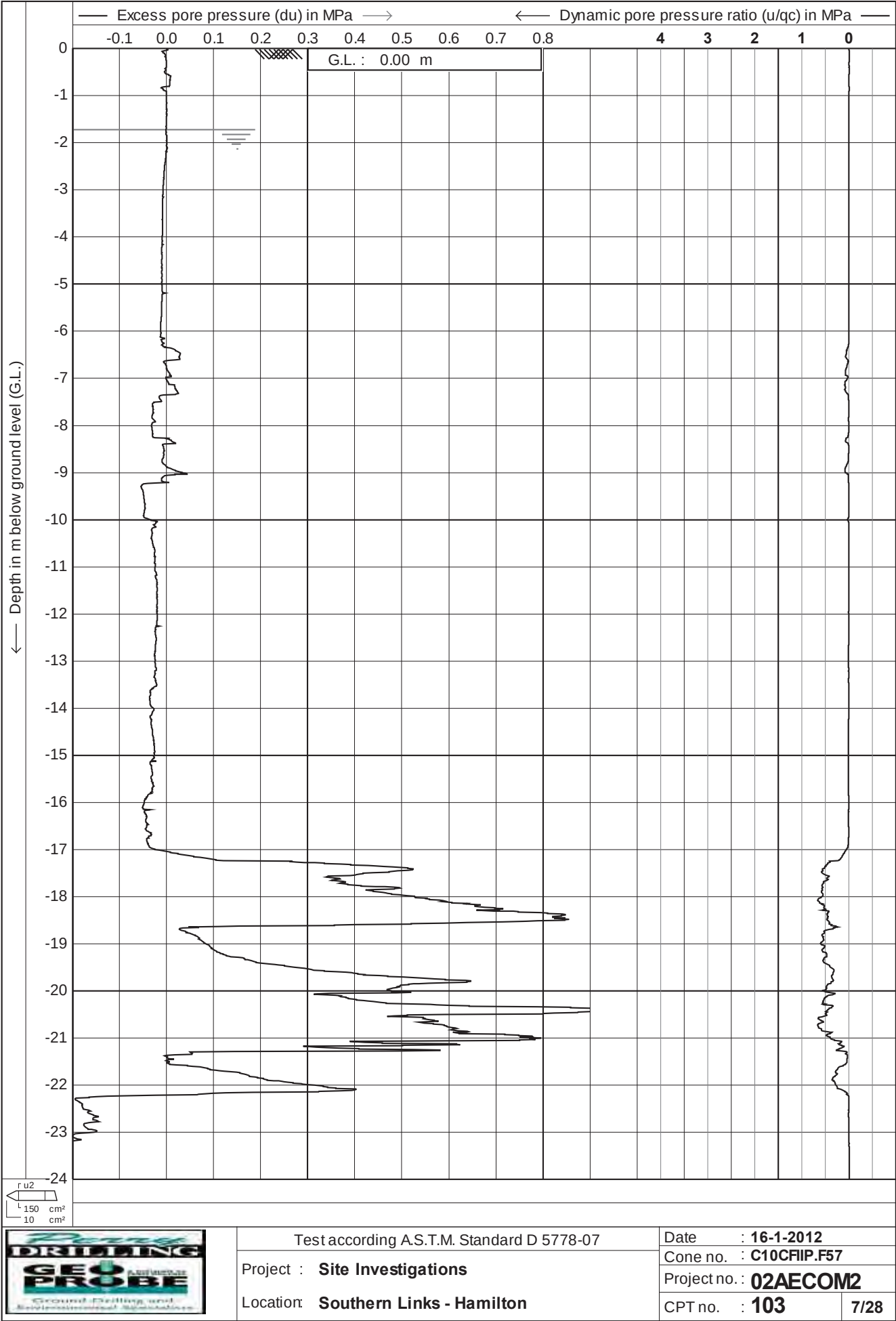
Date	: 16-1-2012
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Cone no.	: C10CFIP.F57
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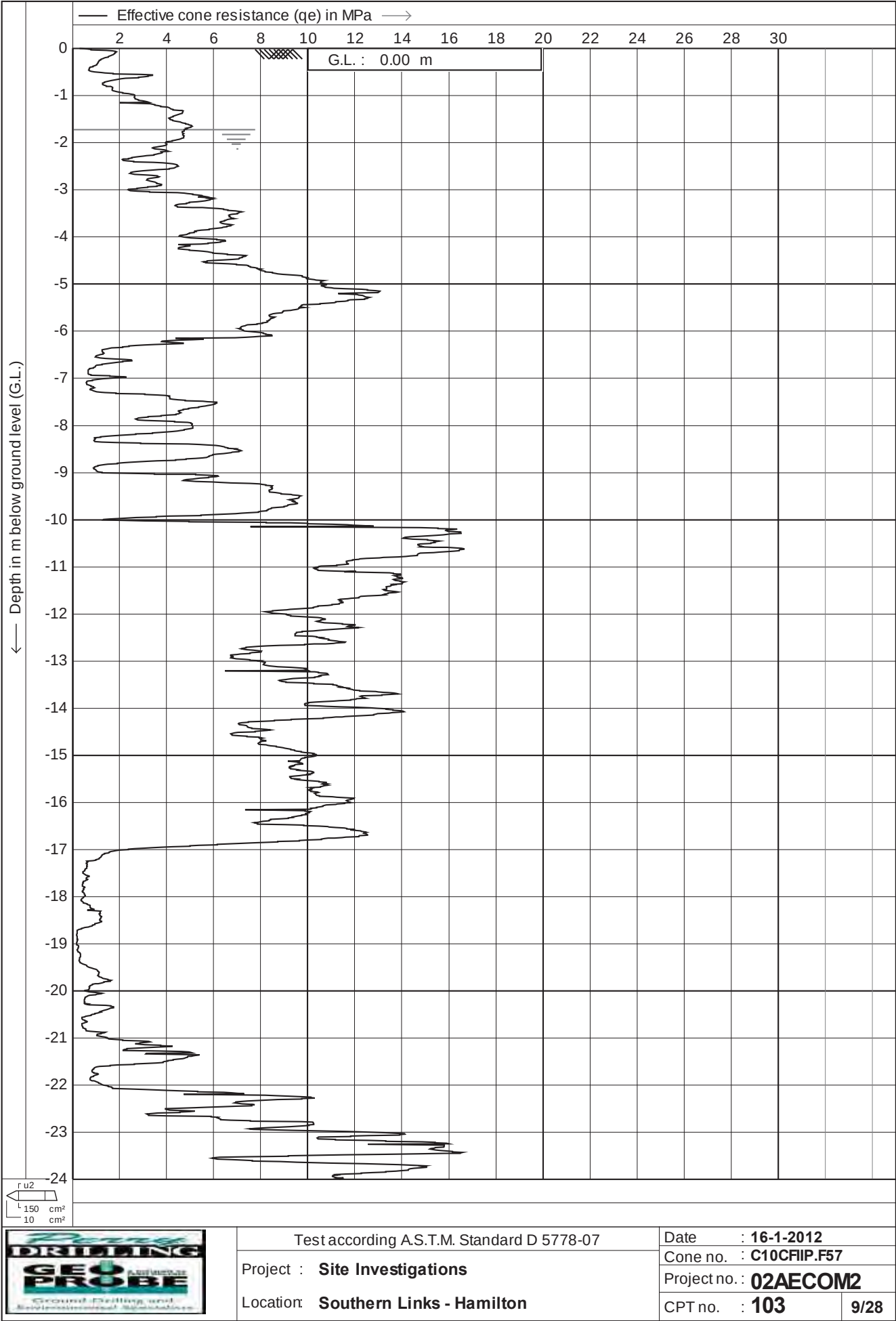
Project no.: **02AECOM2**

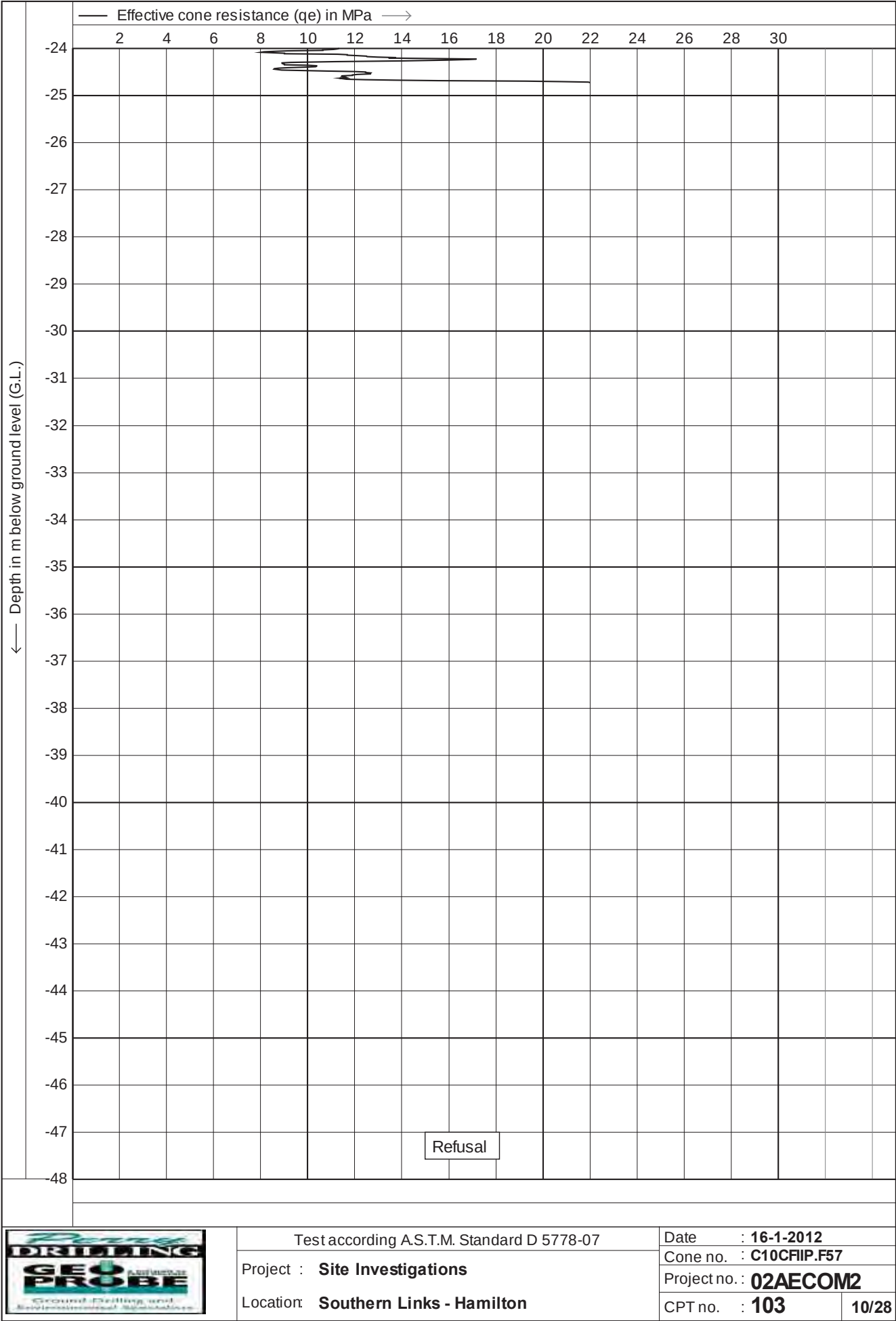
CPT no. : **103**

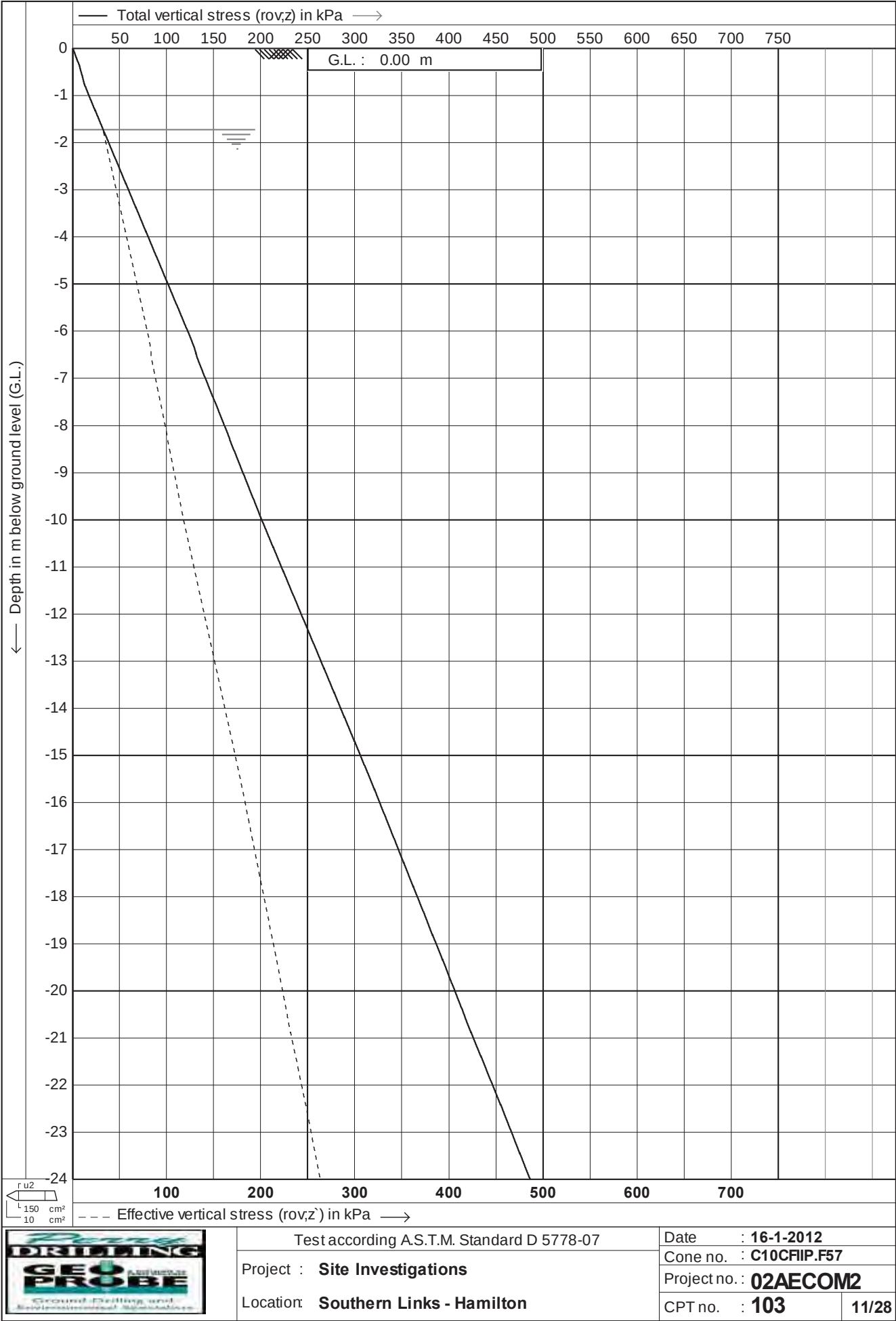
6/28

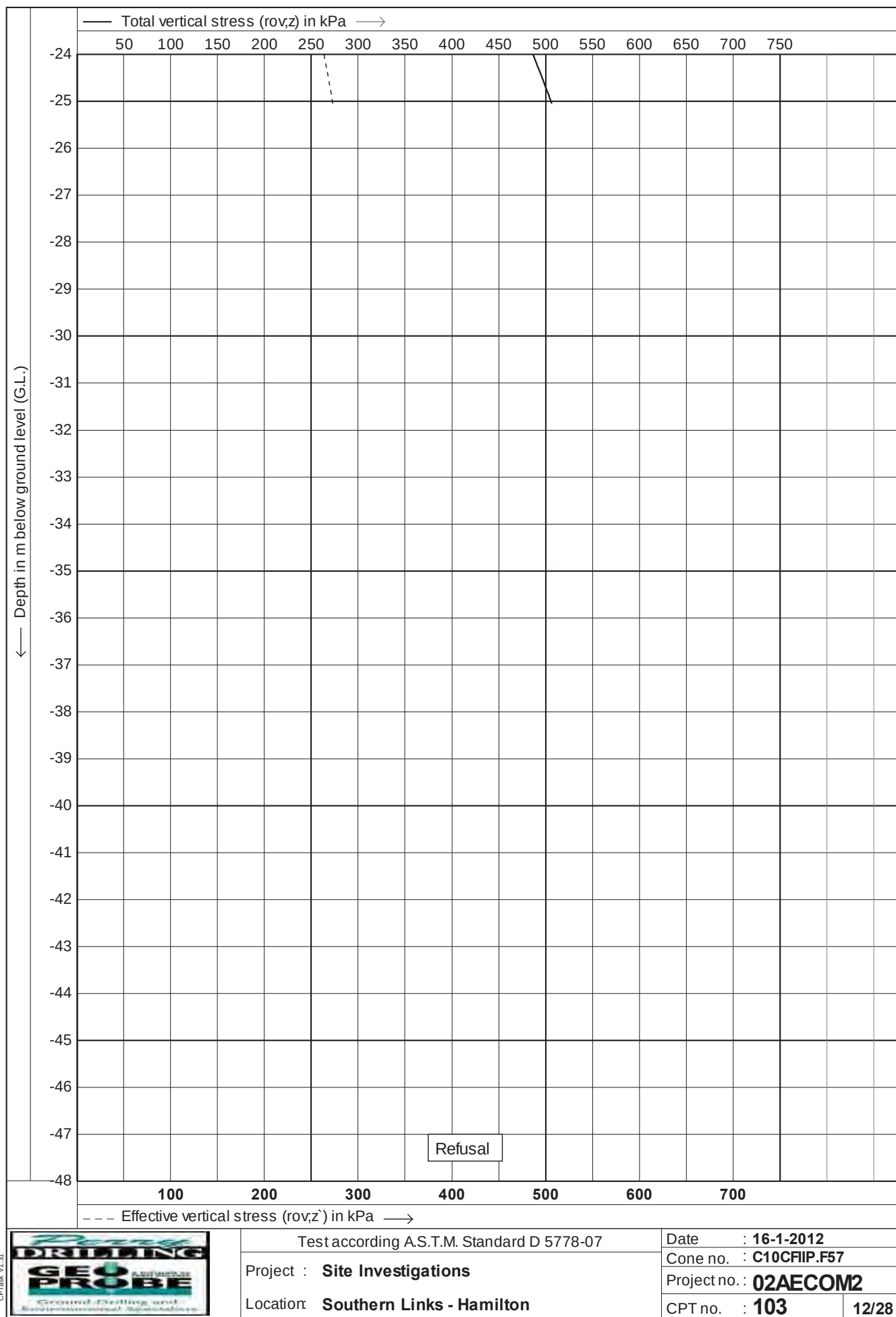


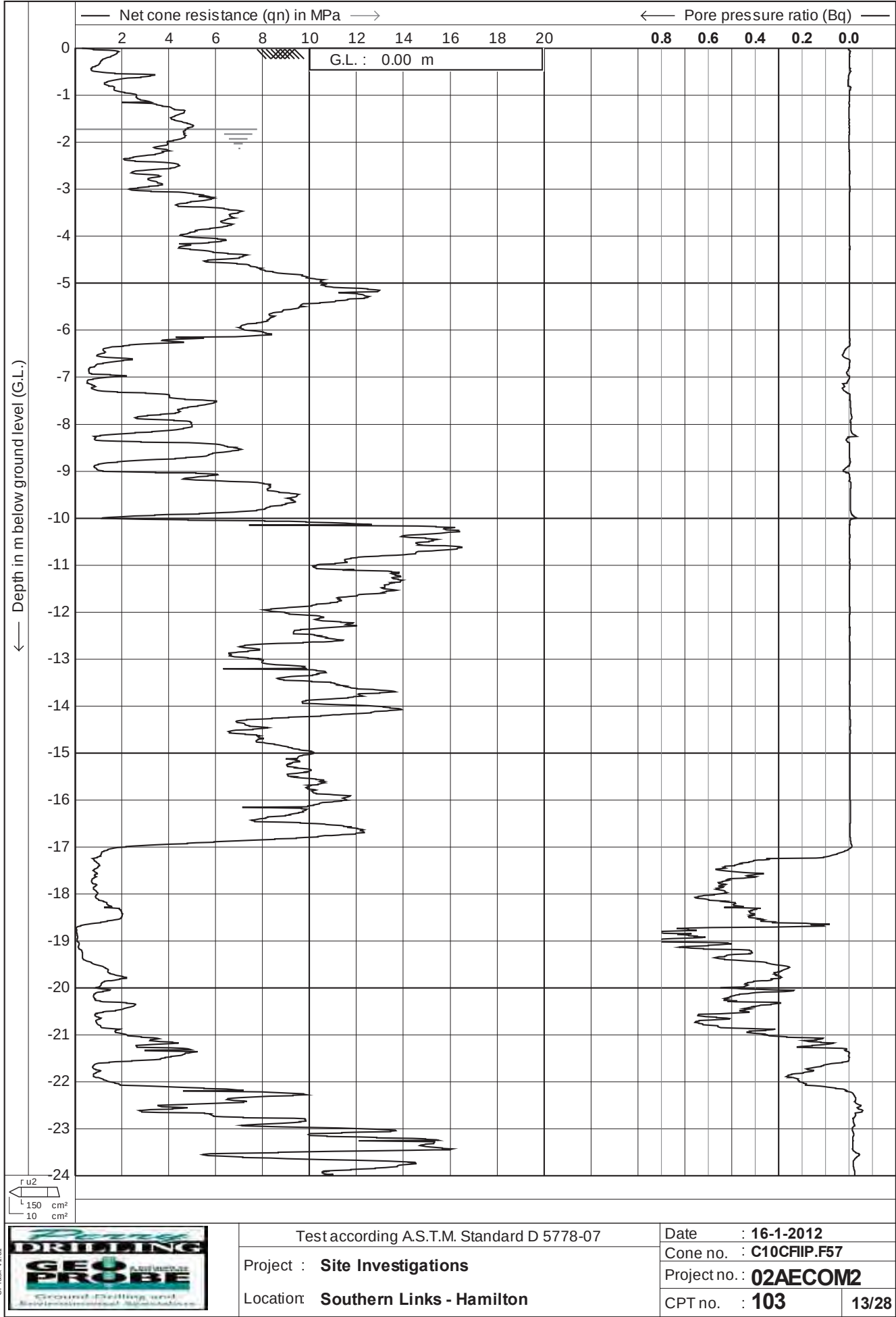


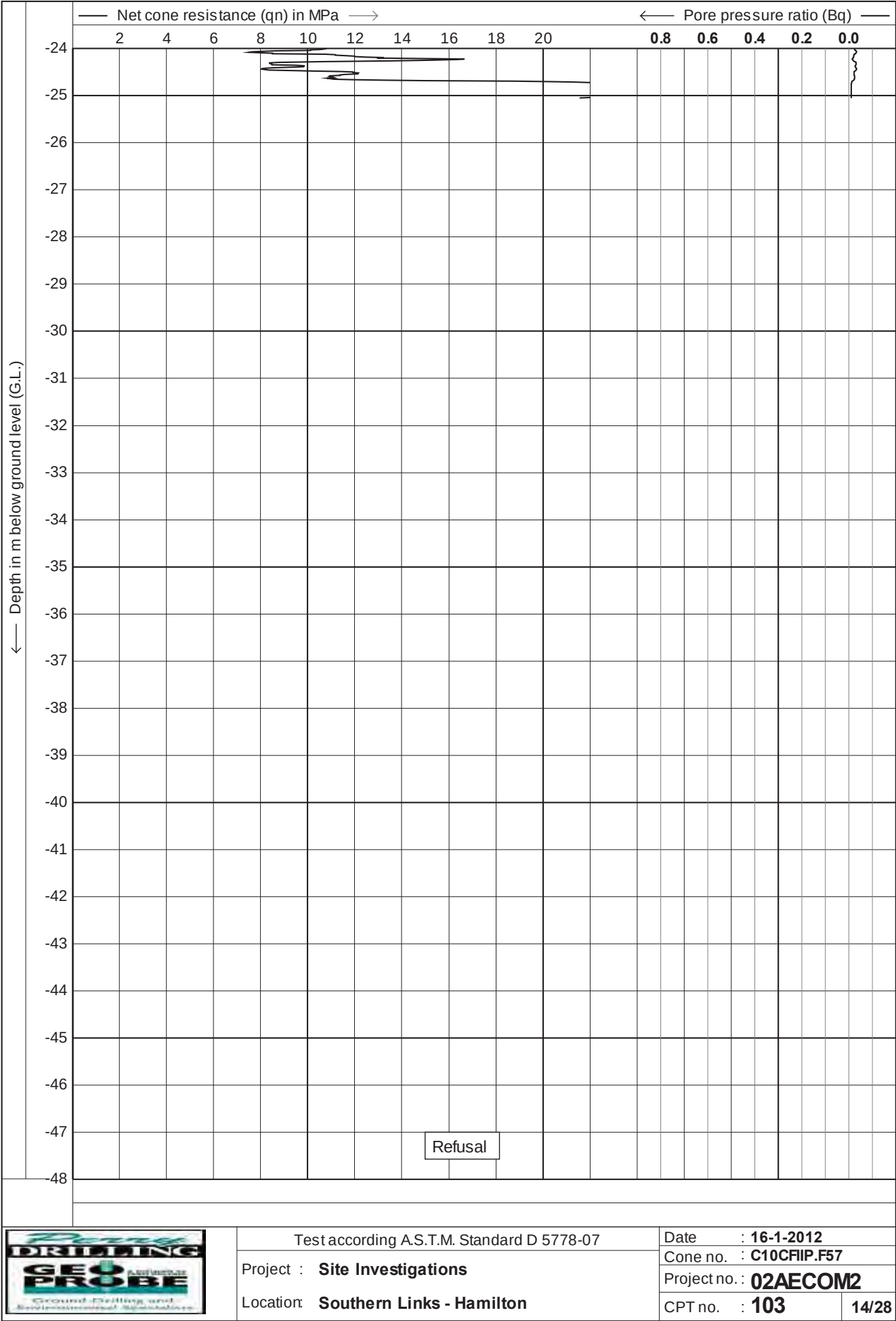


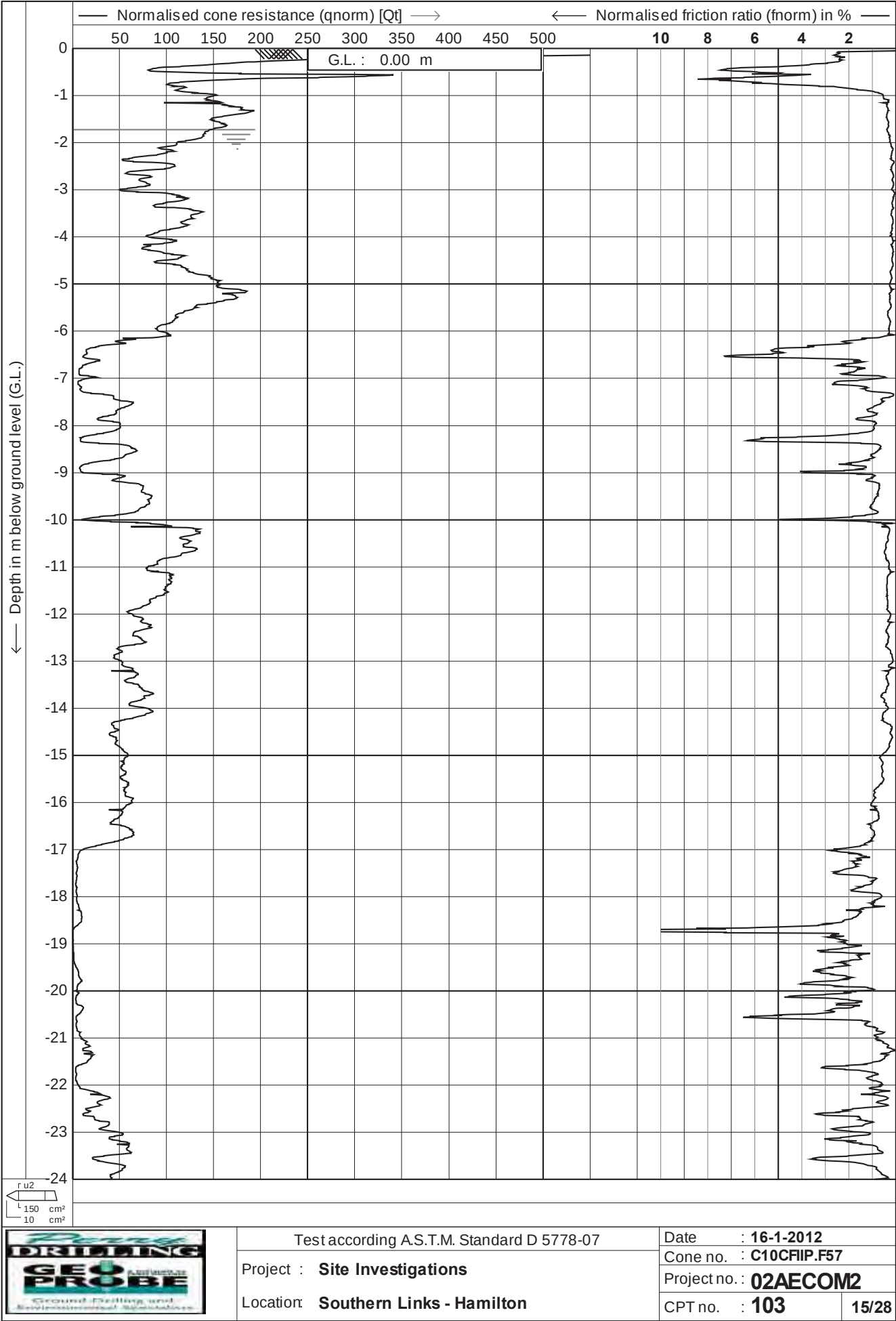


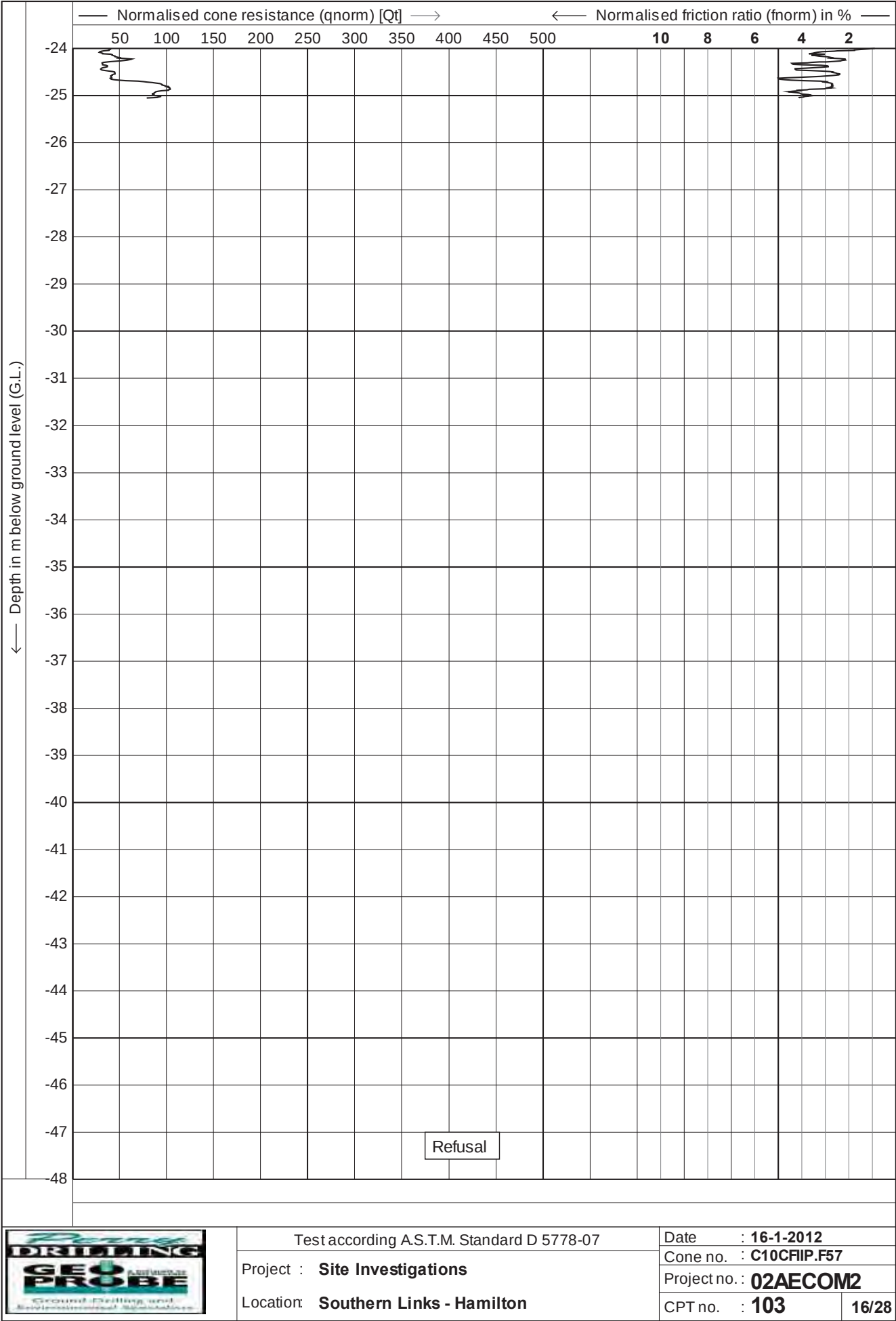


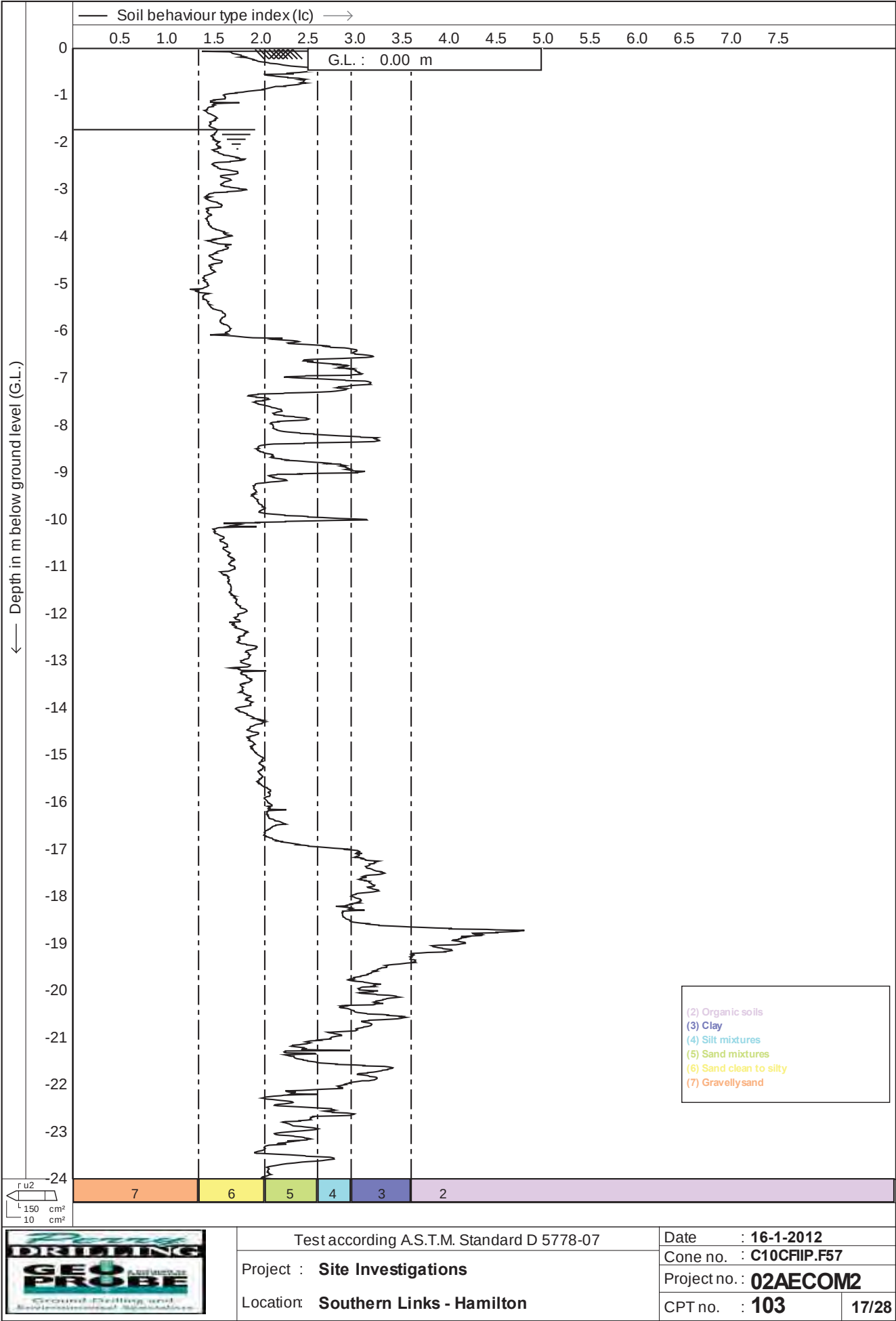


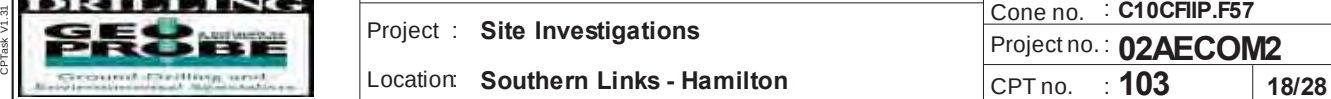


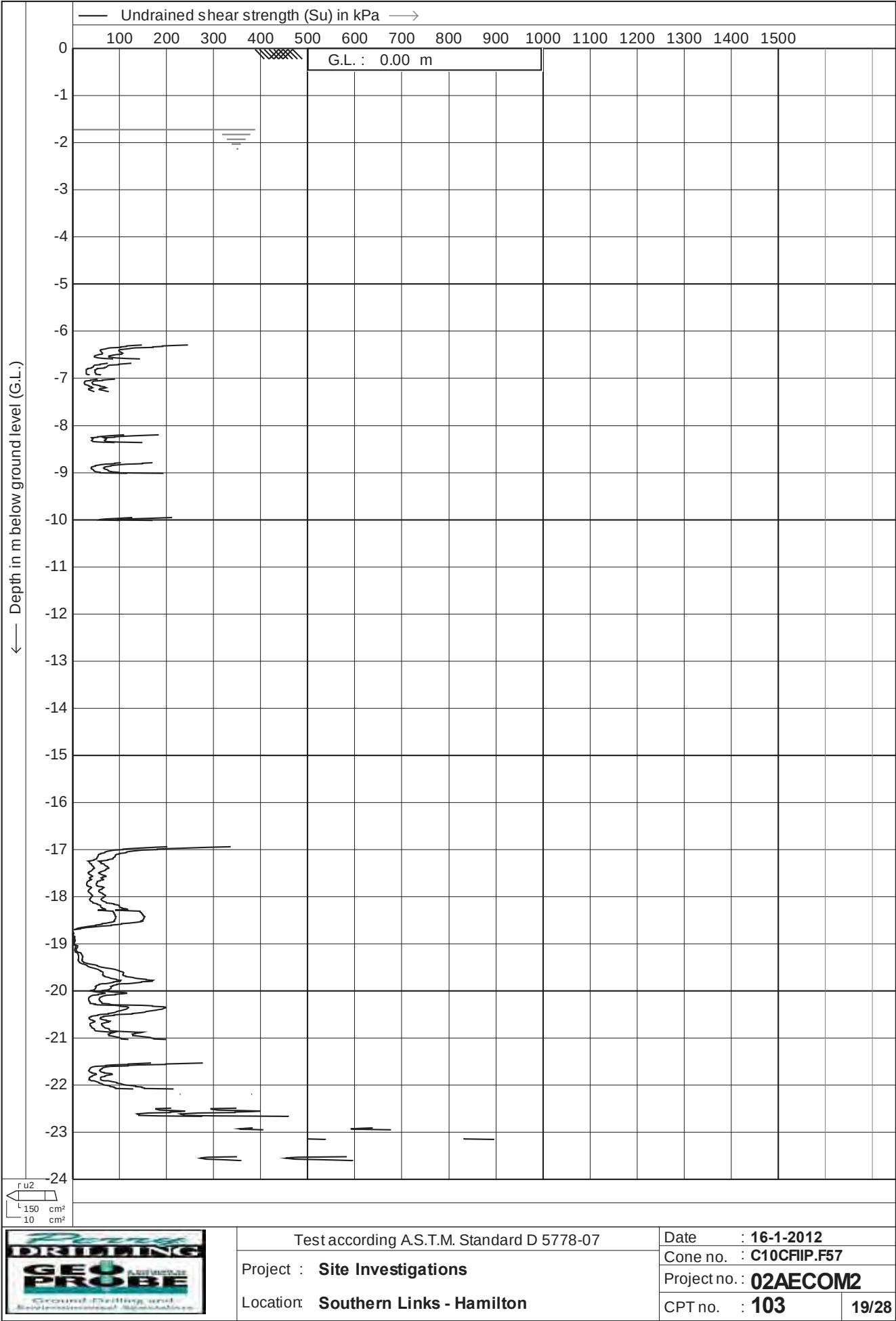


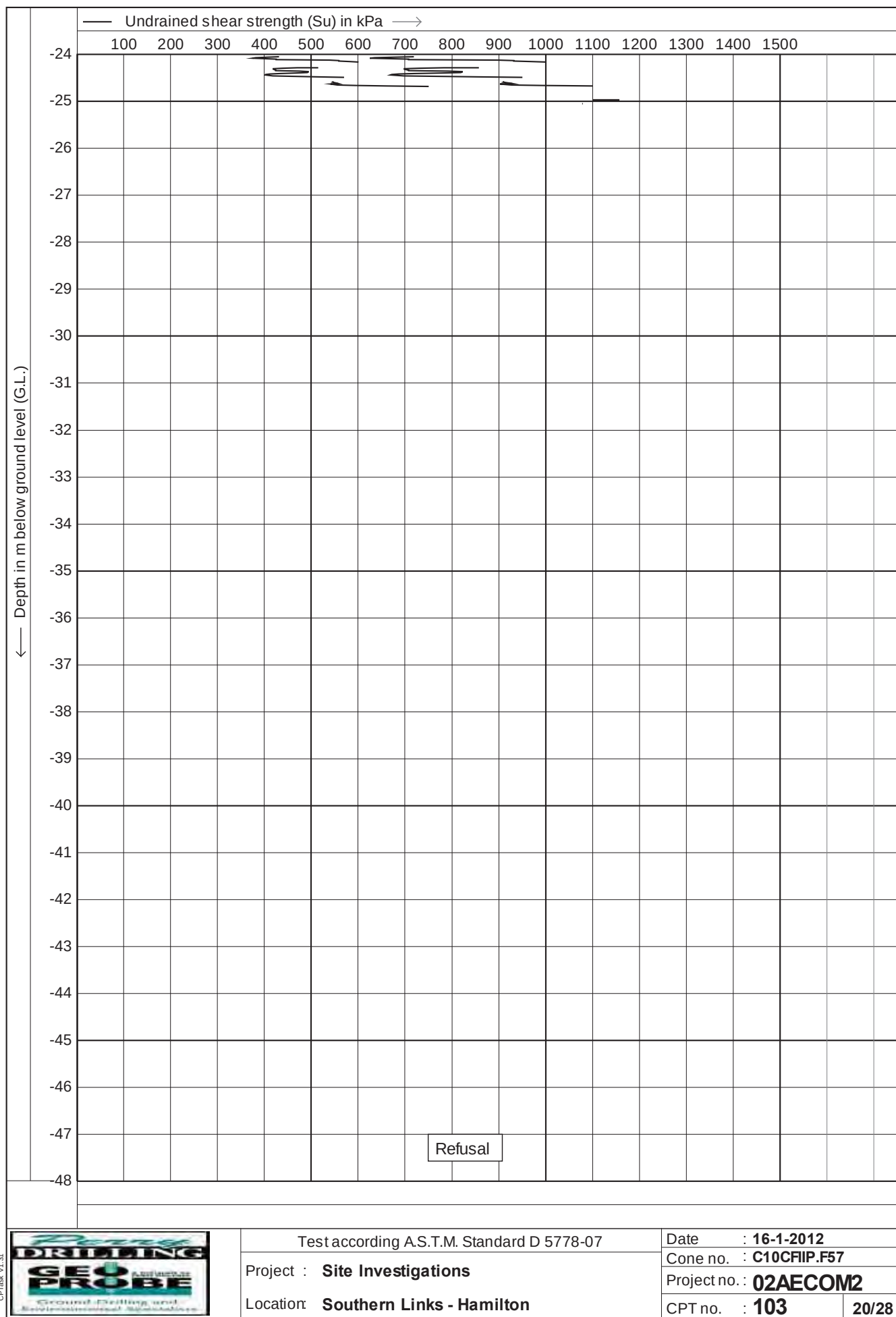


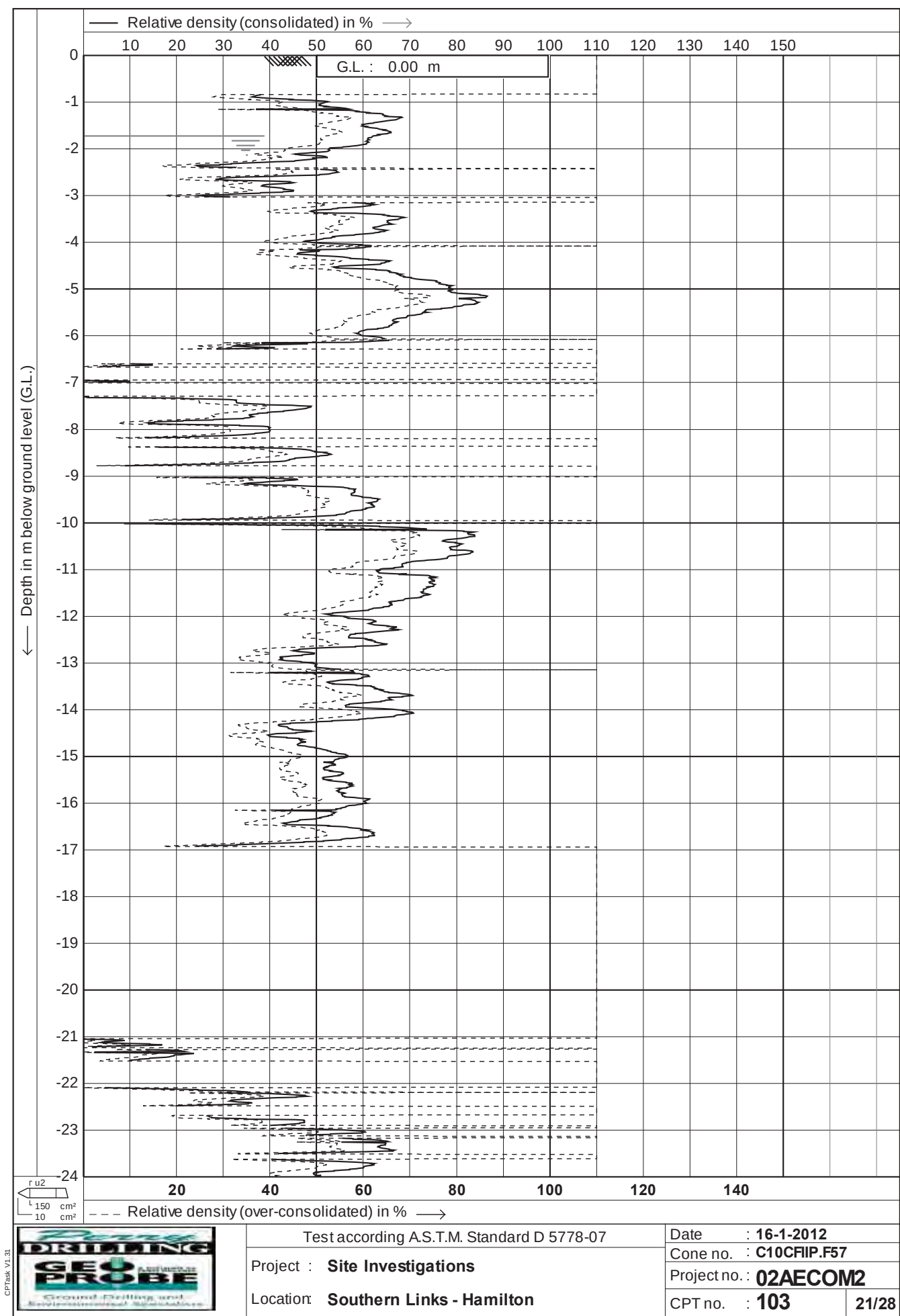


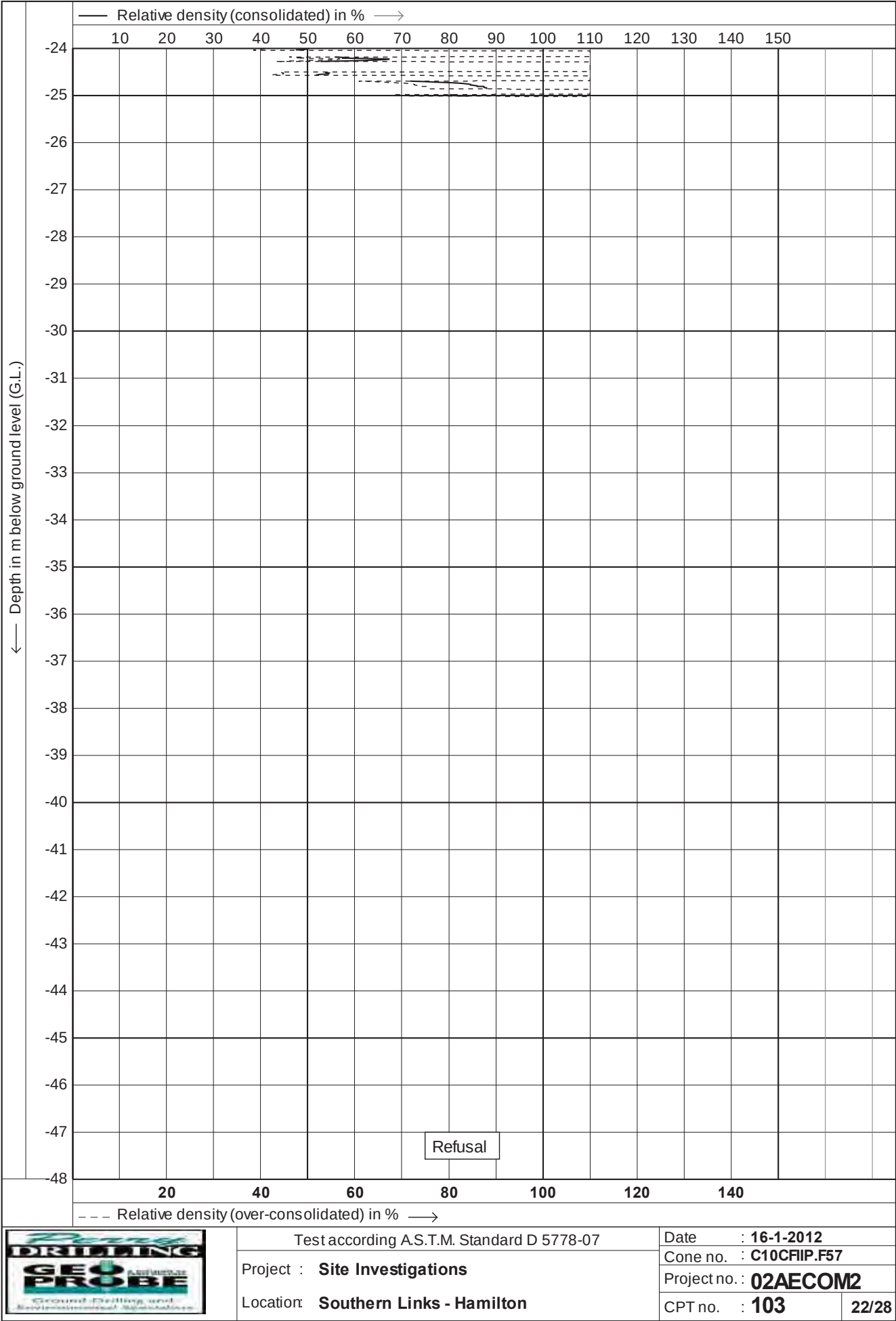


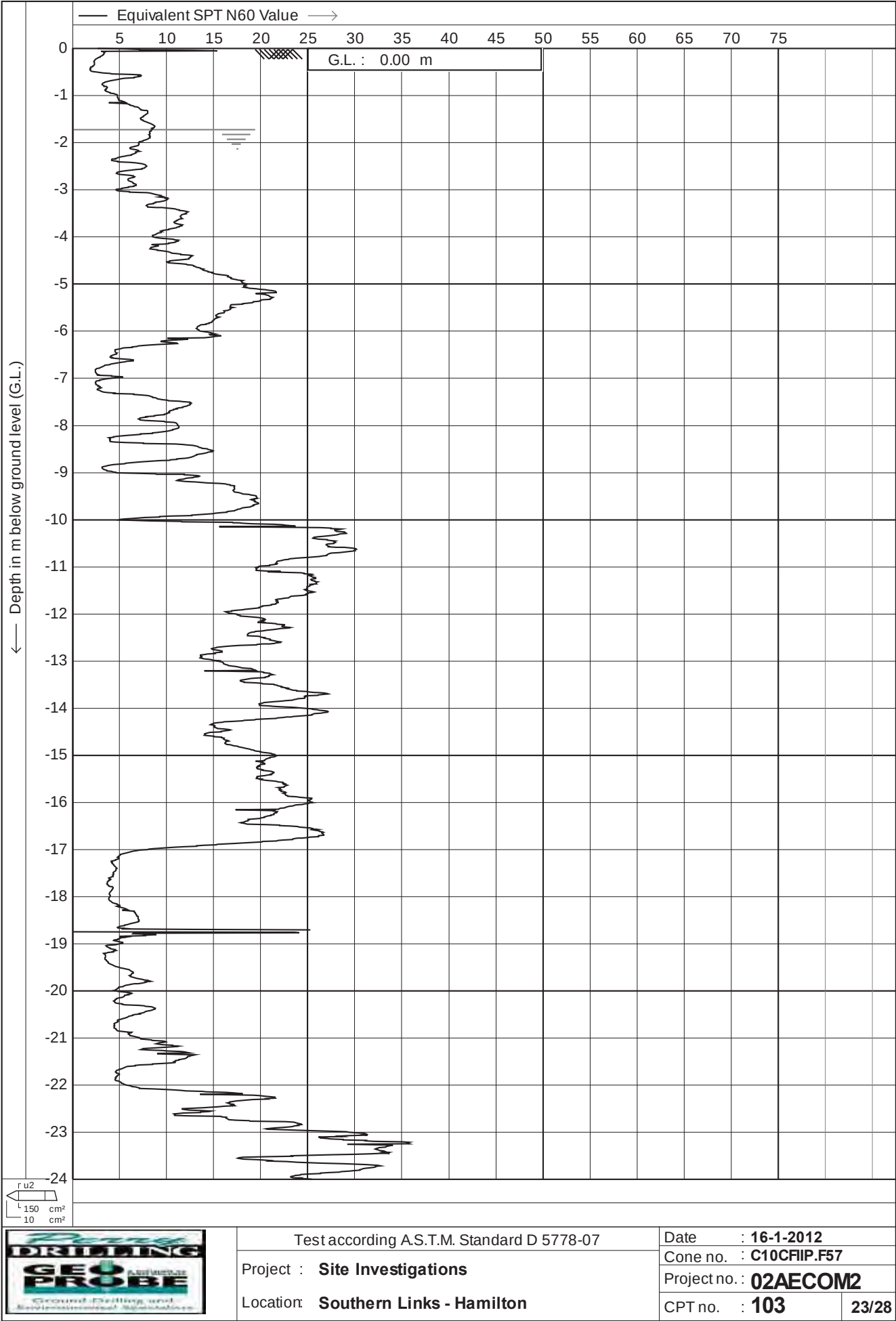


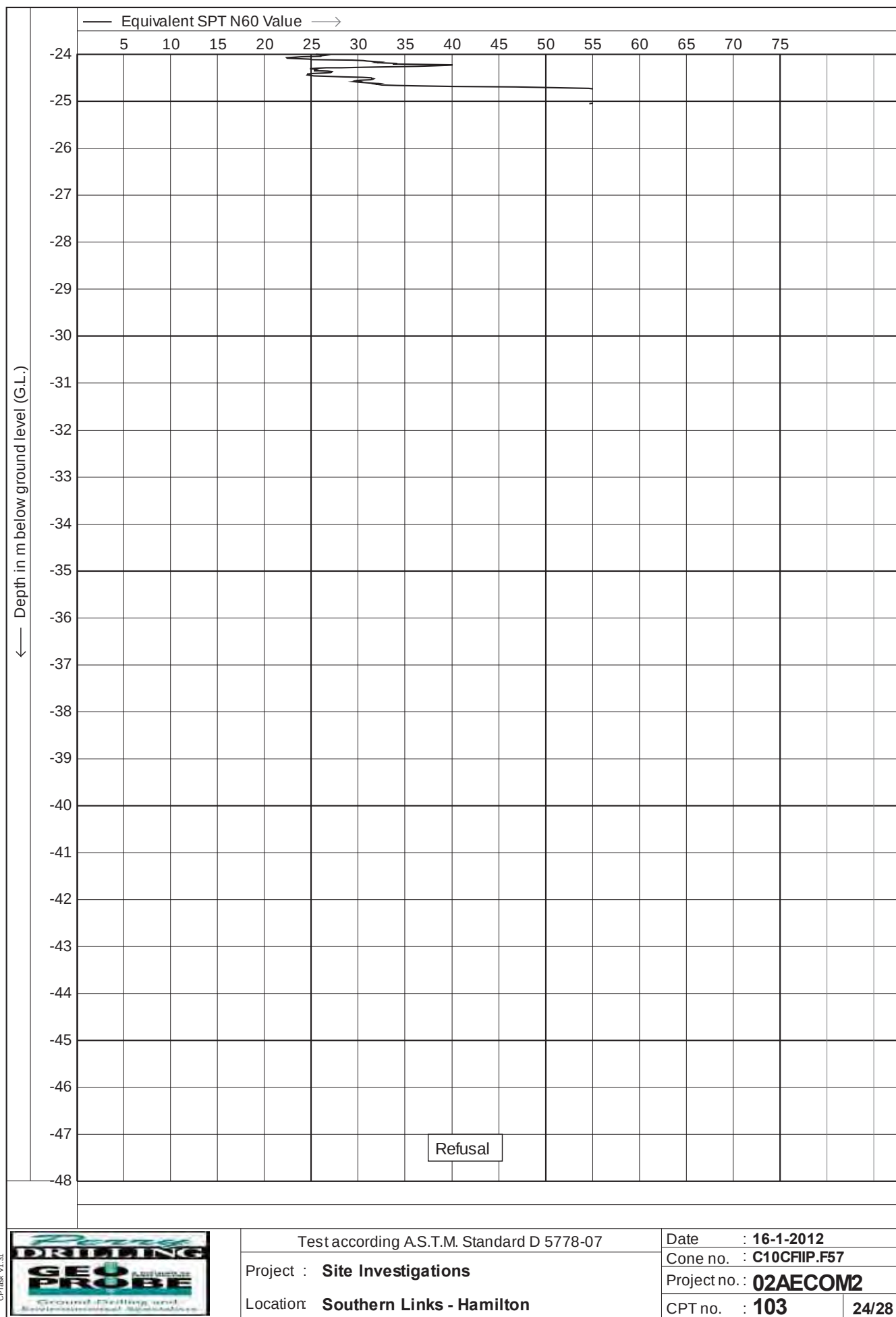


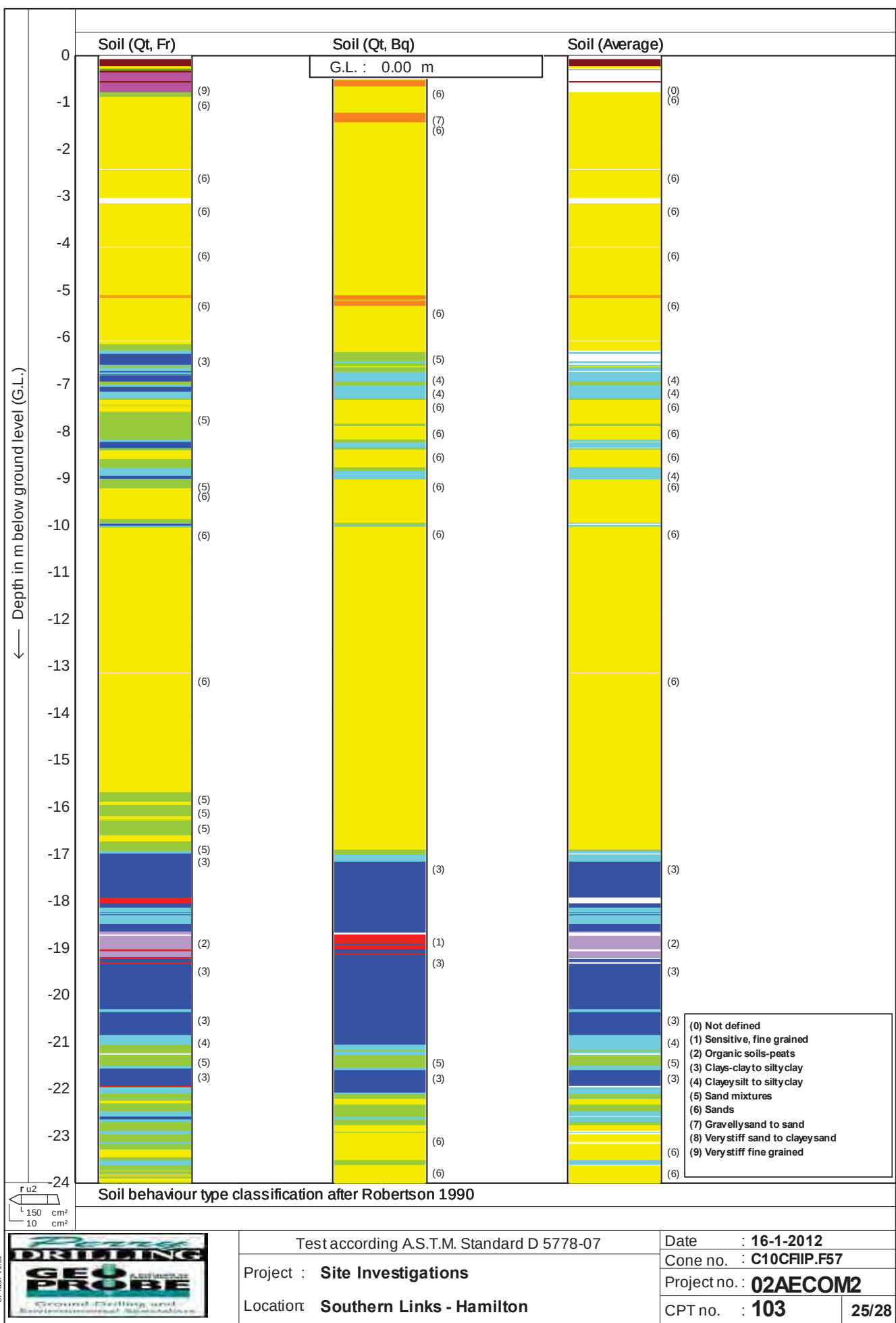


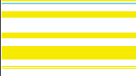




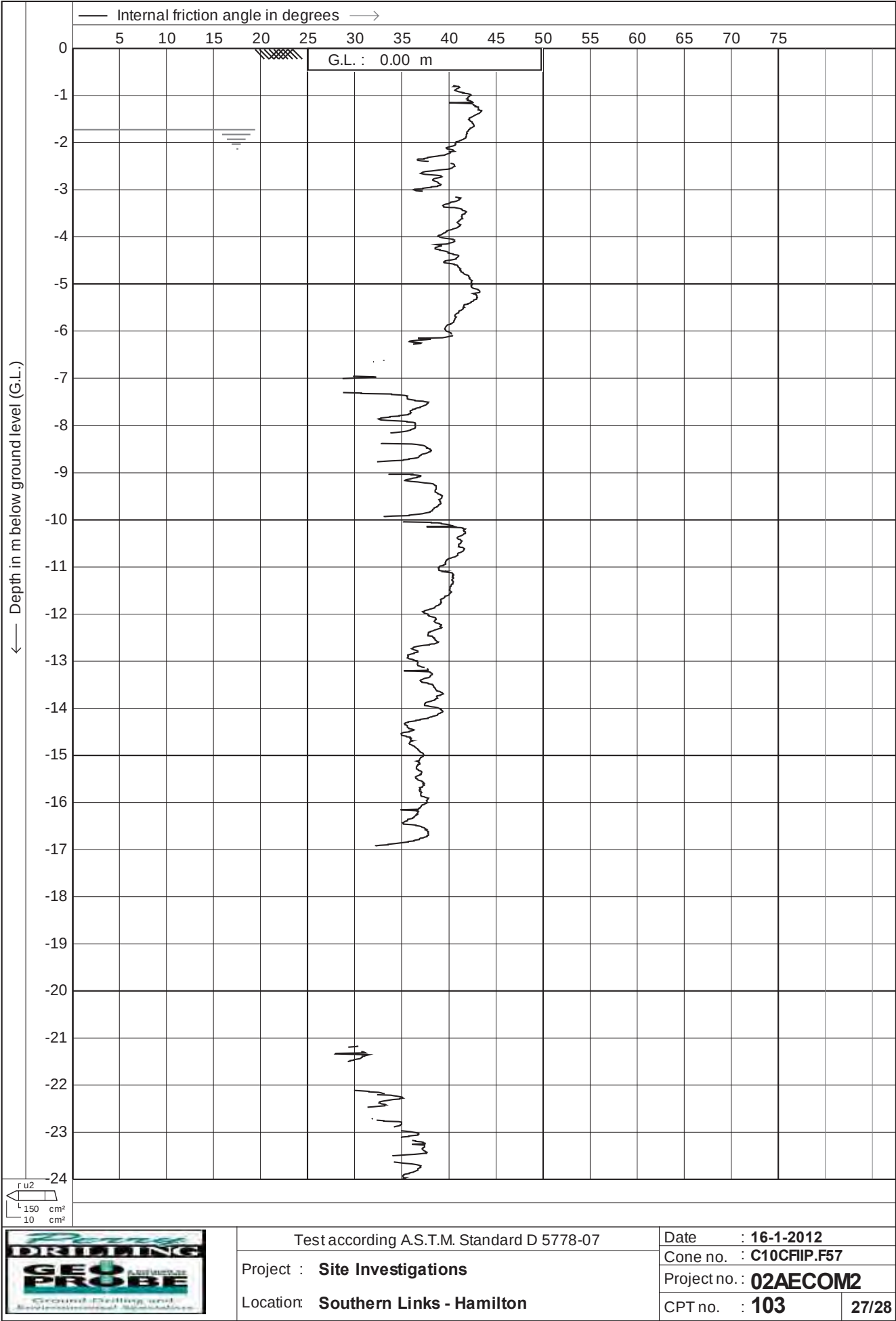


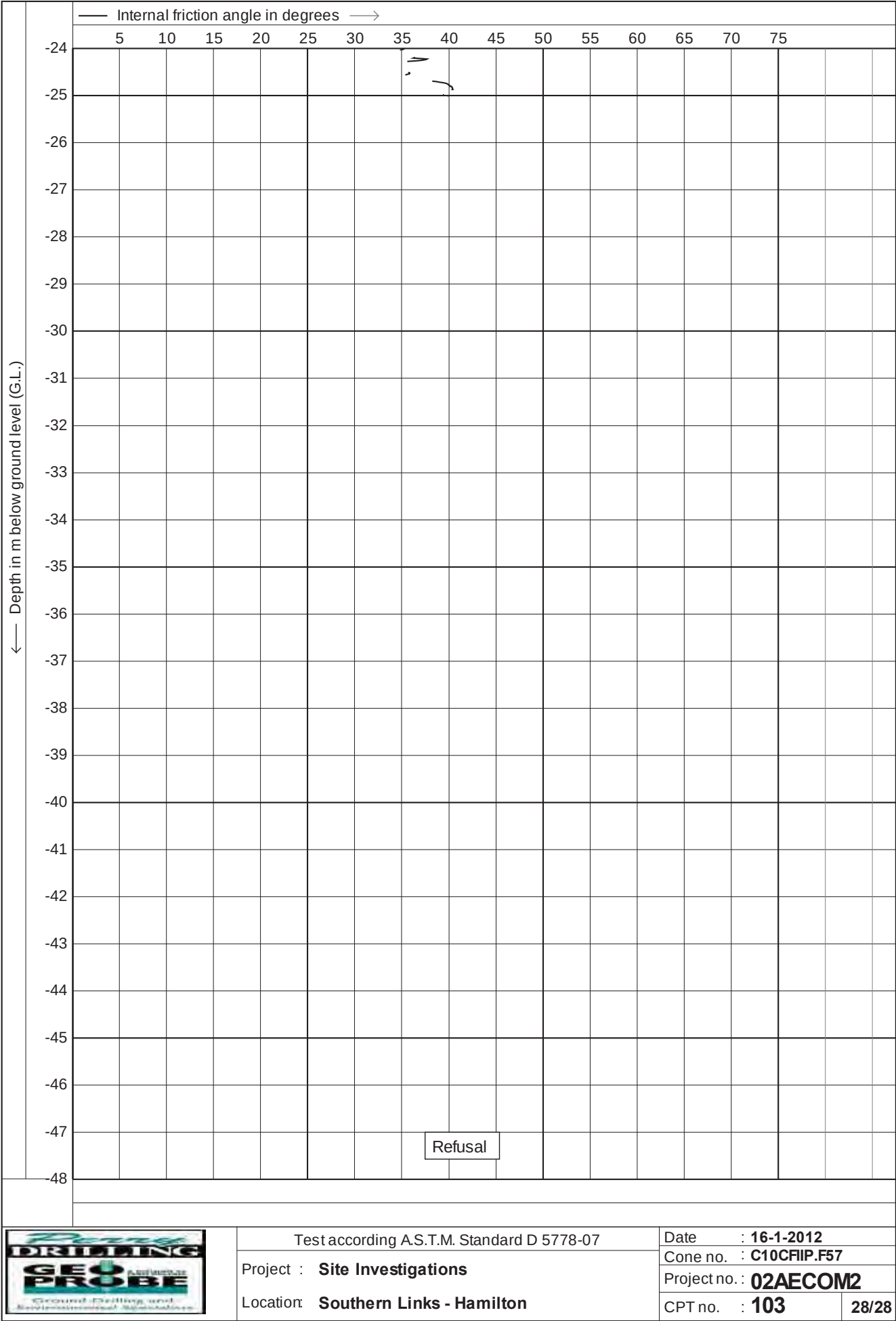


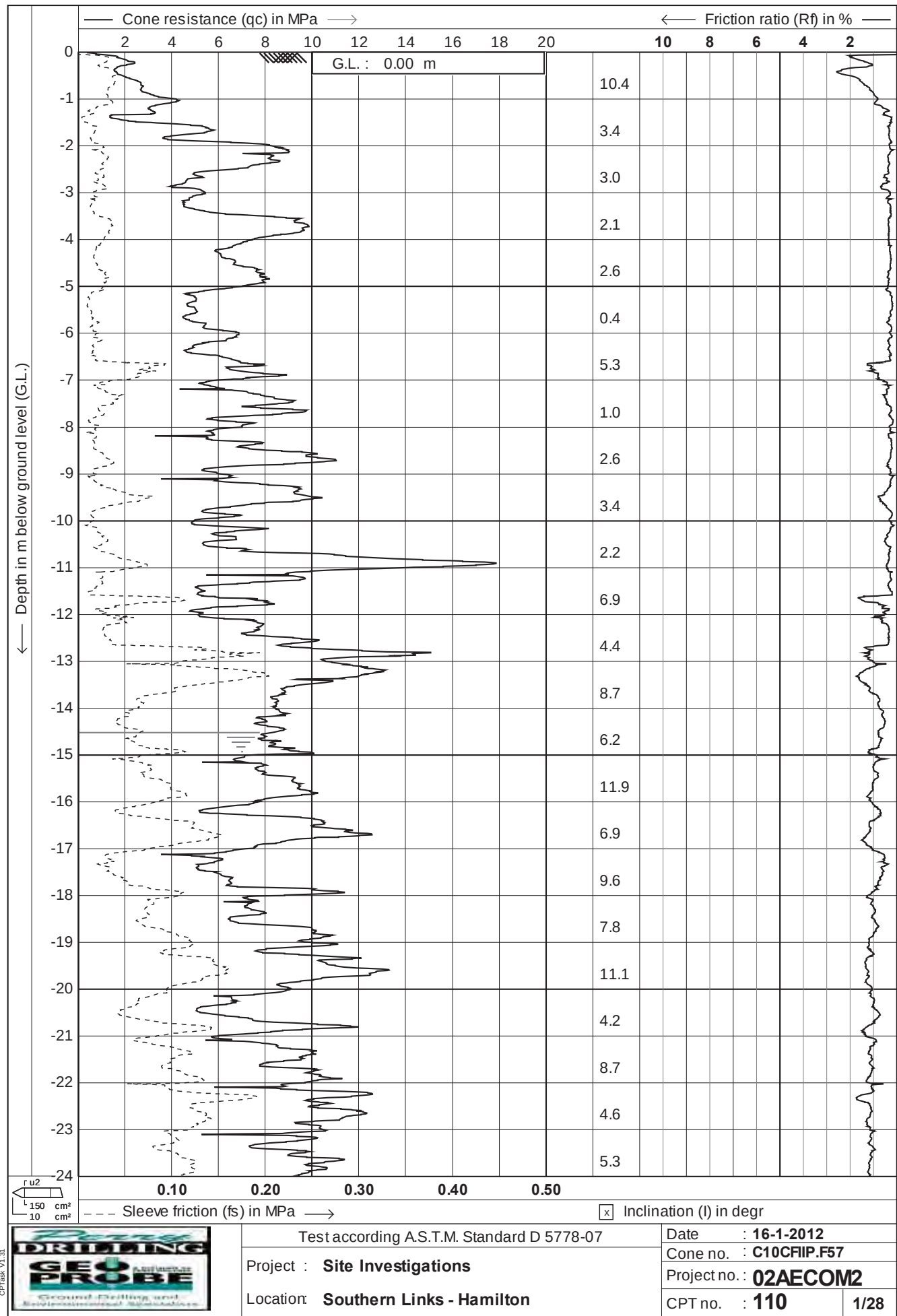


	Soil (Qt, Fr)		Soil (Qt, Bq)		Soil (Average)	
-24		(4)		(6)		(0)
-25		(5)				(6)
-26						
-27						
-28						
-29						
-30						
-31						
-32						
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-45						
-46						
-47						
-48						
Soil behaviour type classification after Robertson 1990						
	Test according A.S.T.M. Standard D 5778-07				Date : 16-1-2012	
	Project : Site Investigations				Cone no. : C10CFIIP.F57	
	Location: Southern Links - Hamilton				Project no.: 02AECOM2	
					CPT no. : 103	26/28

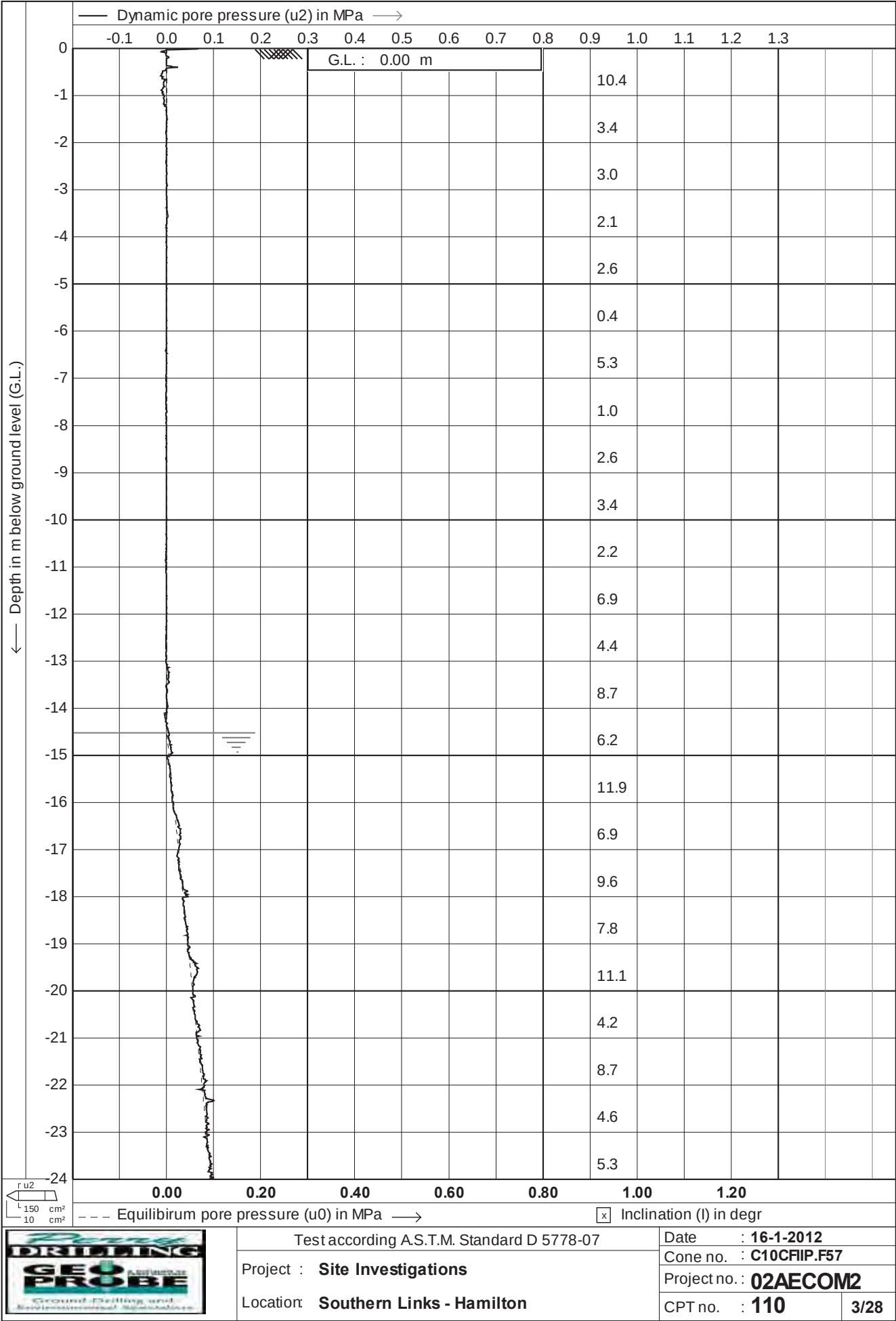
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

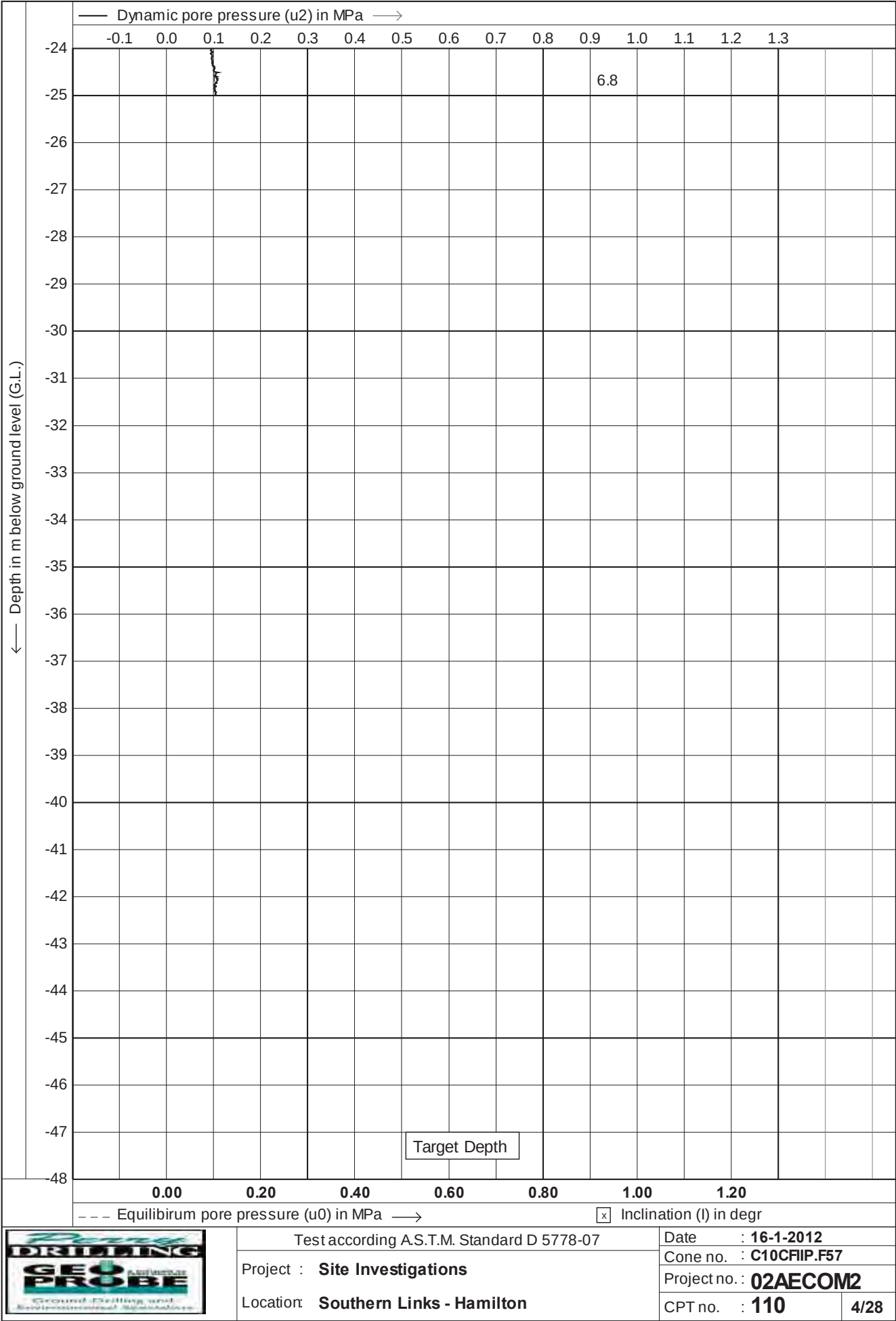


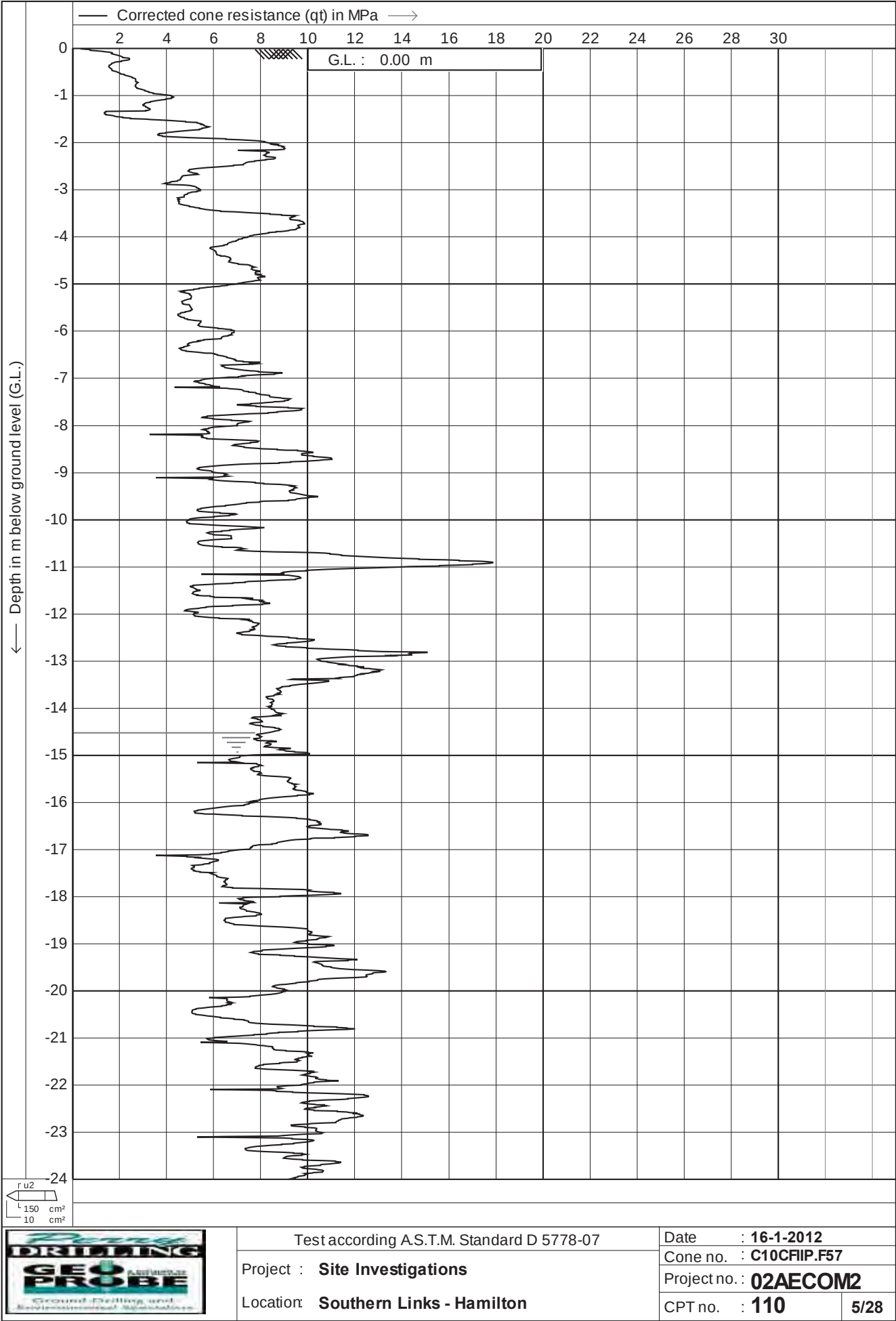


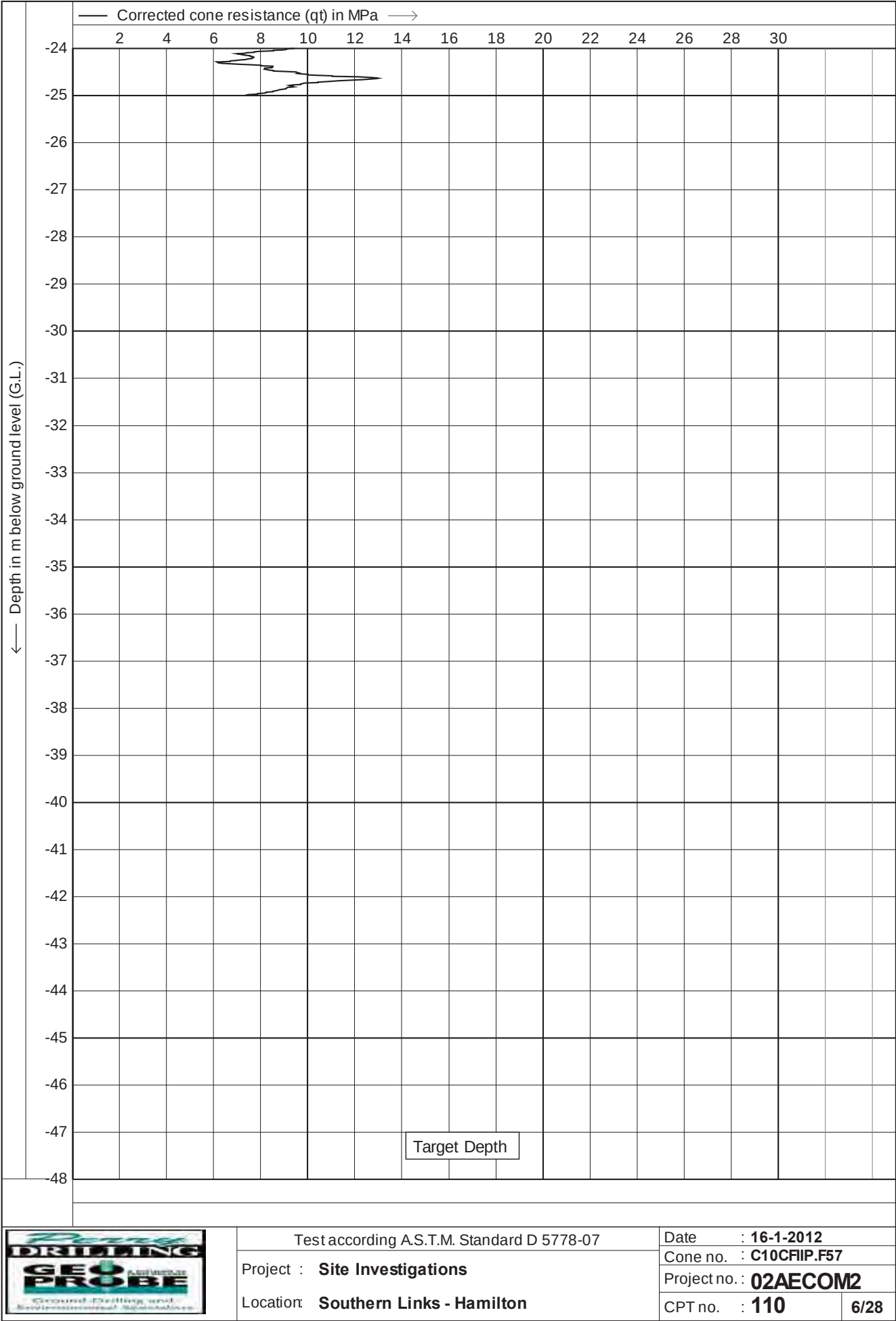


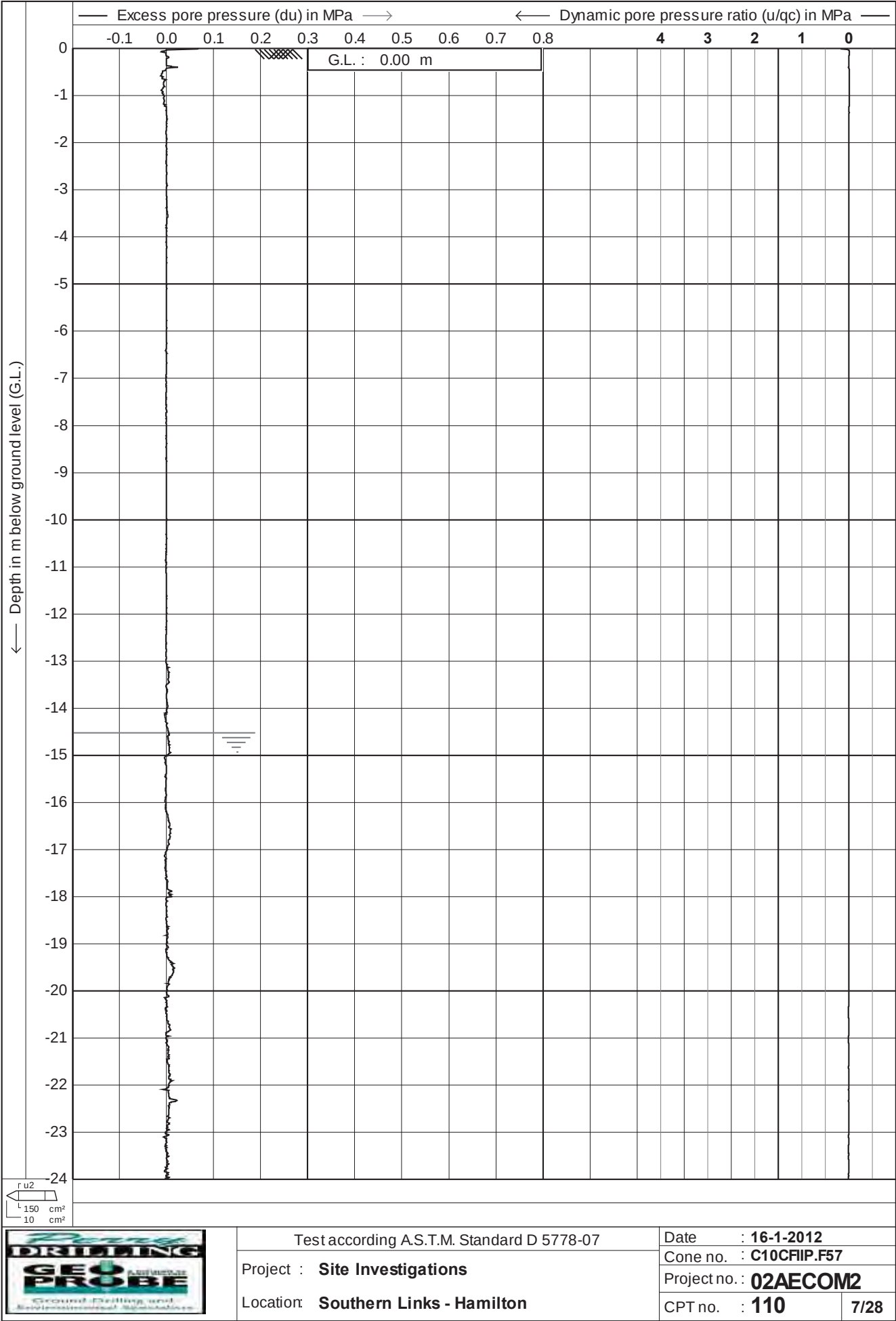




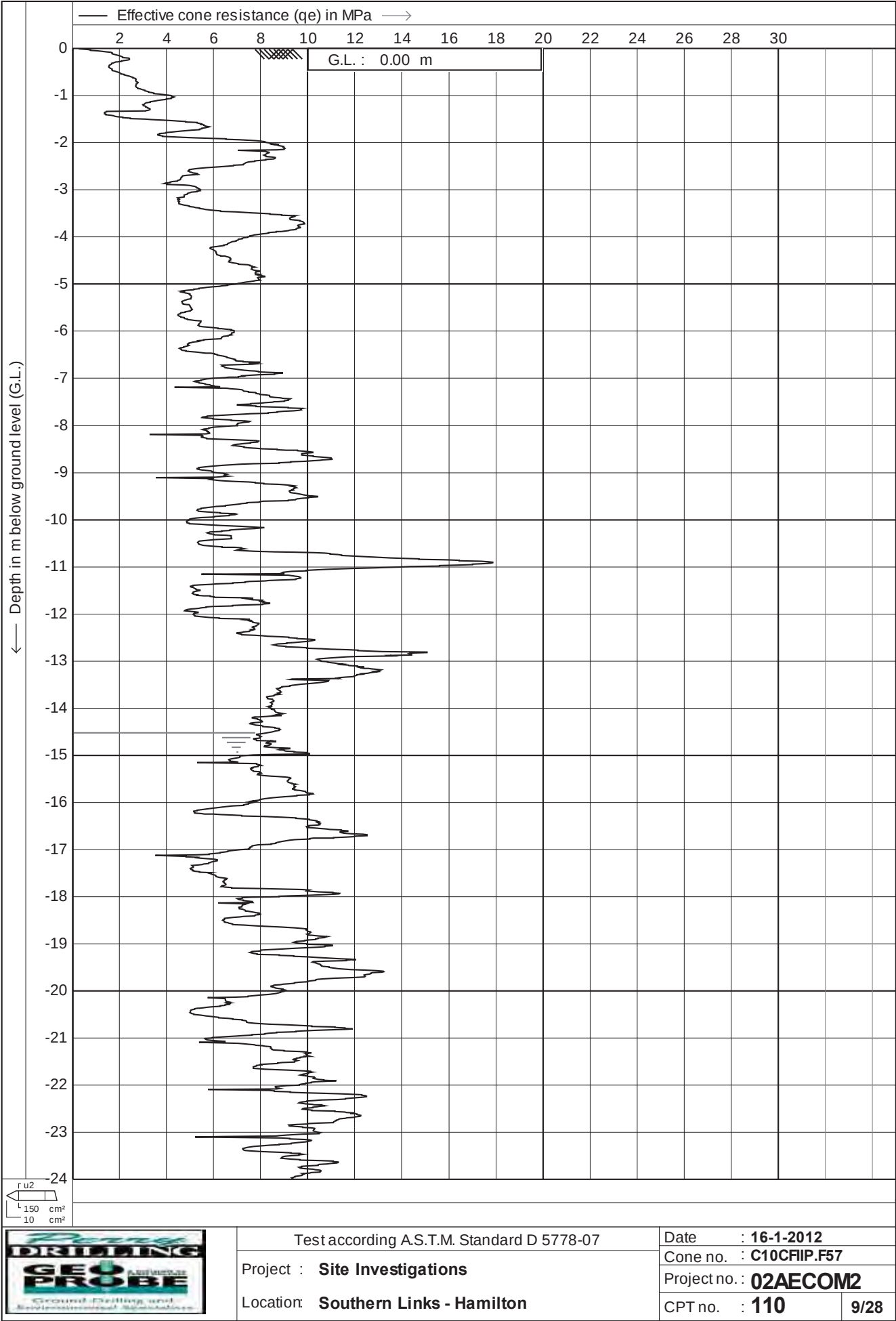


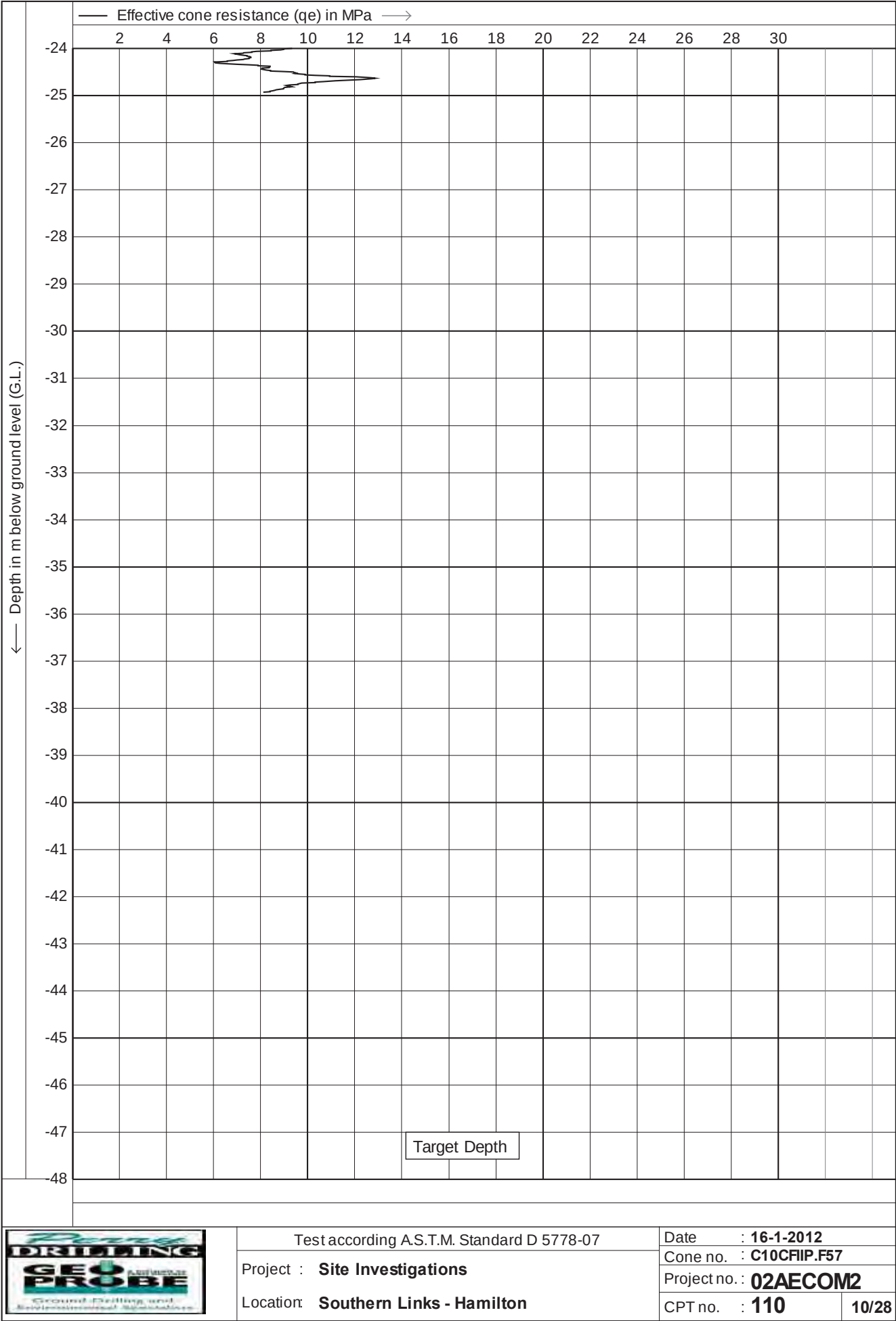


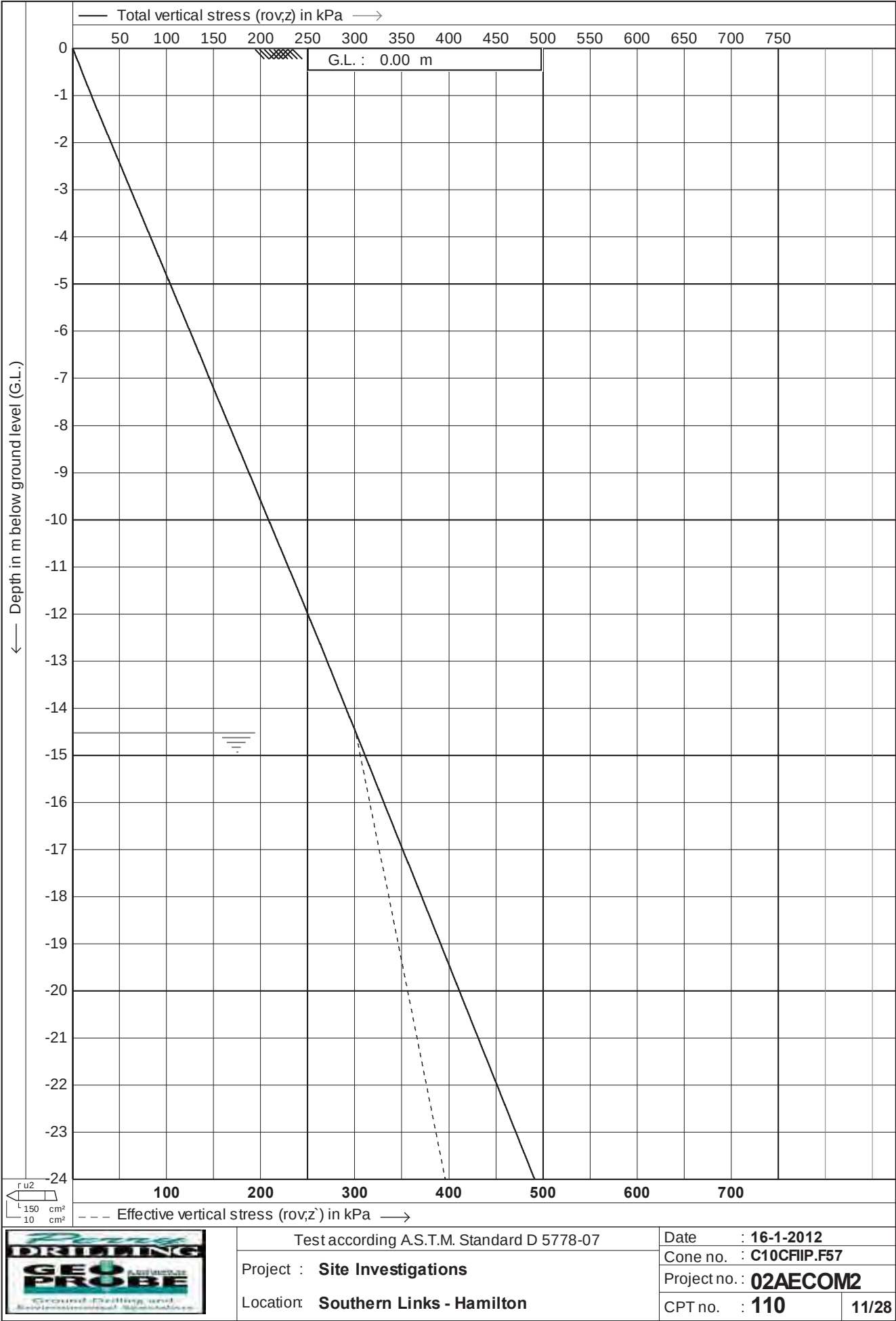


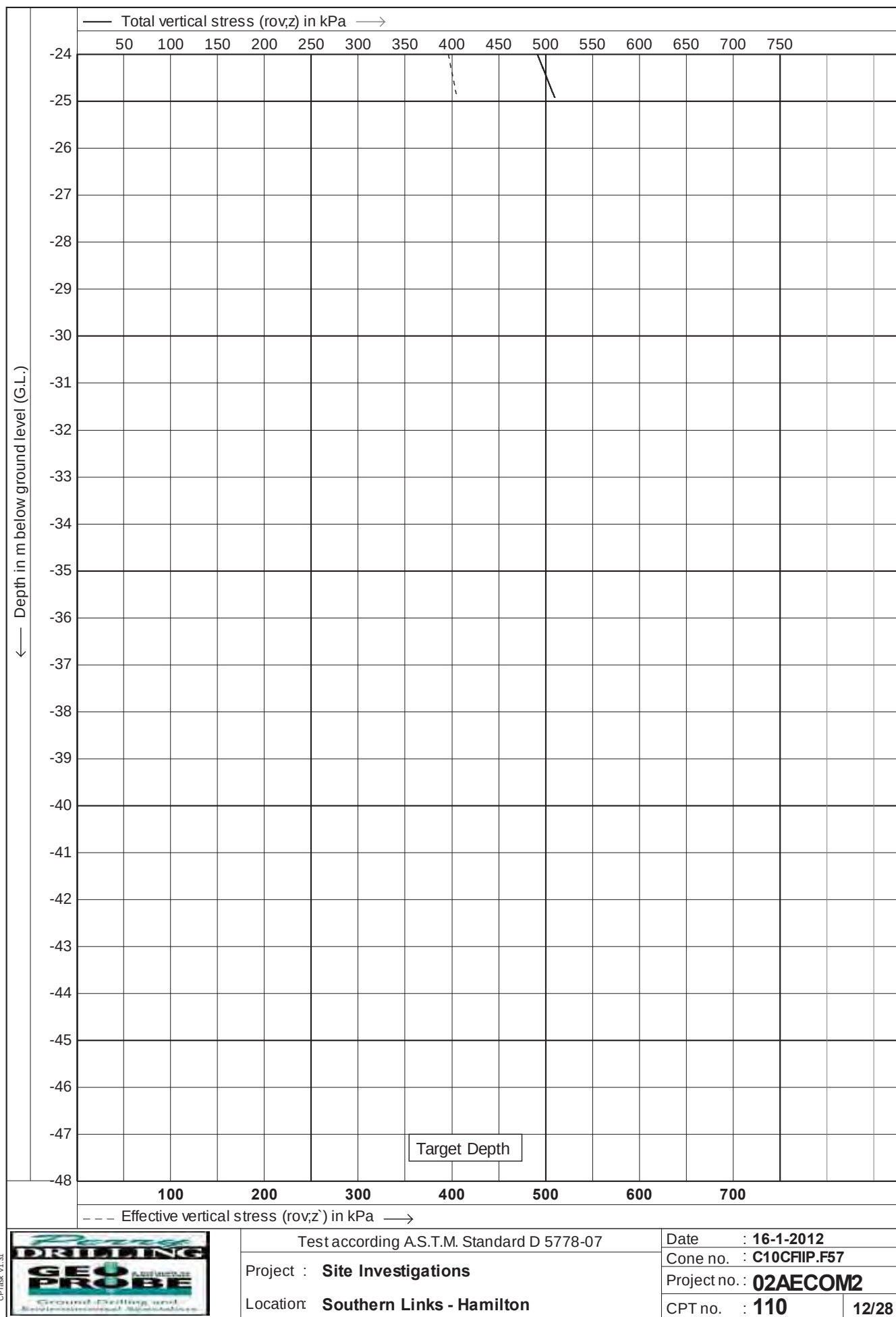


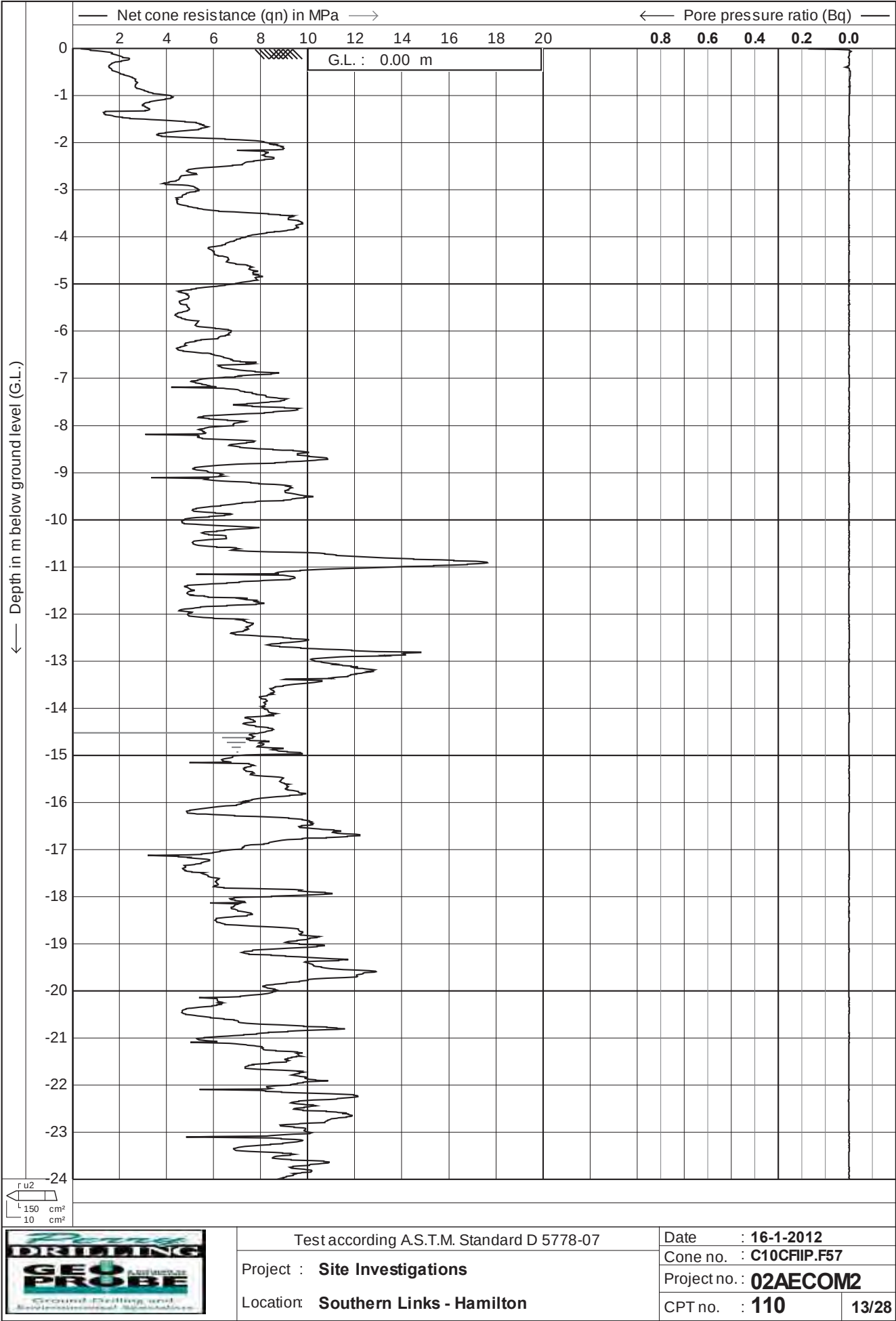


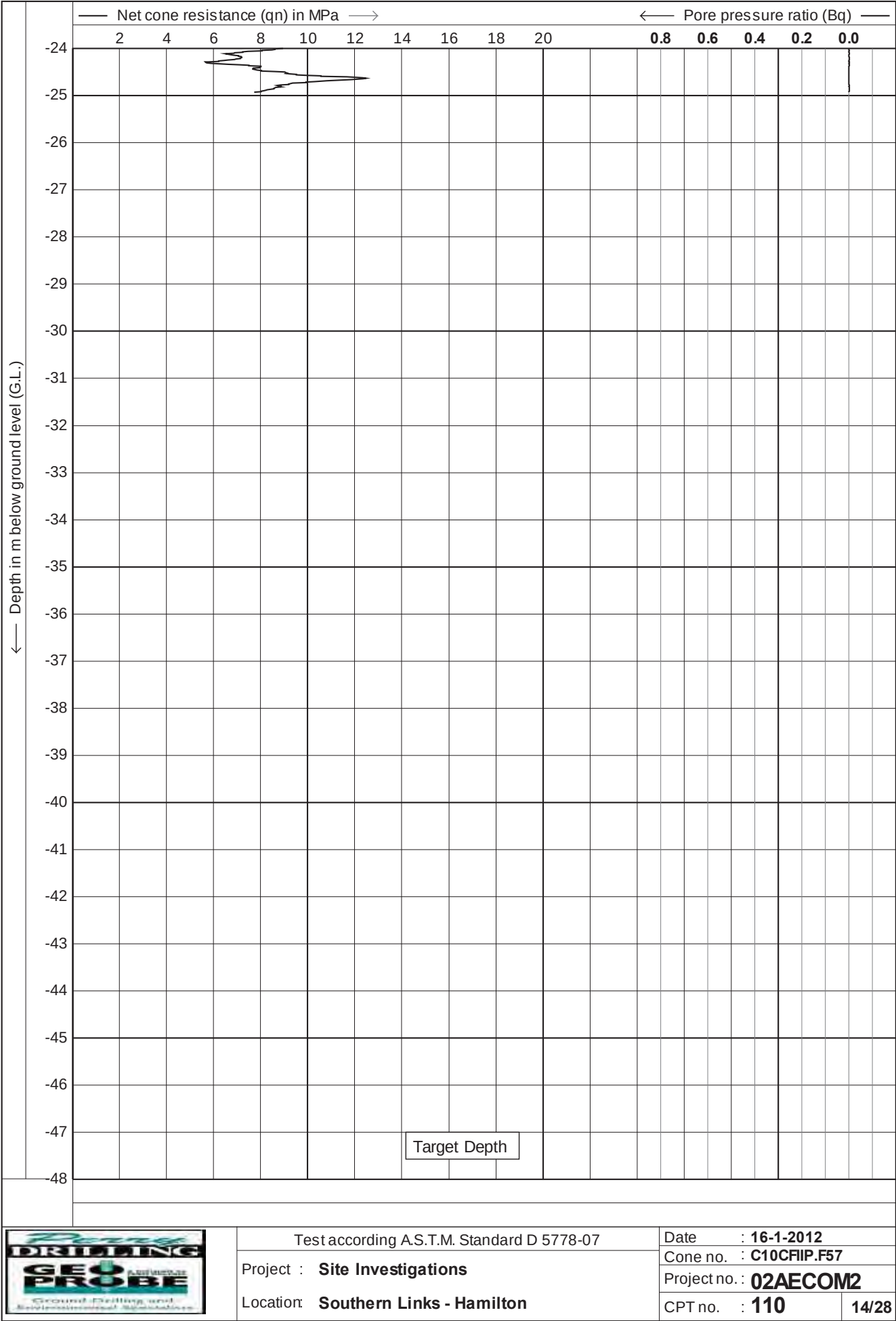


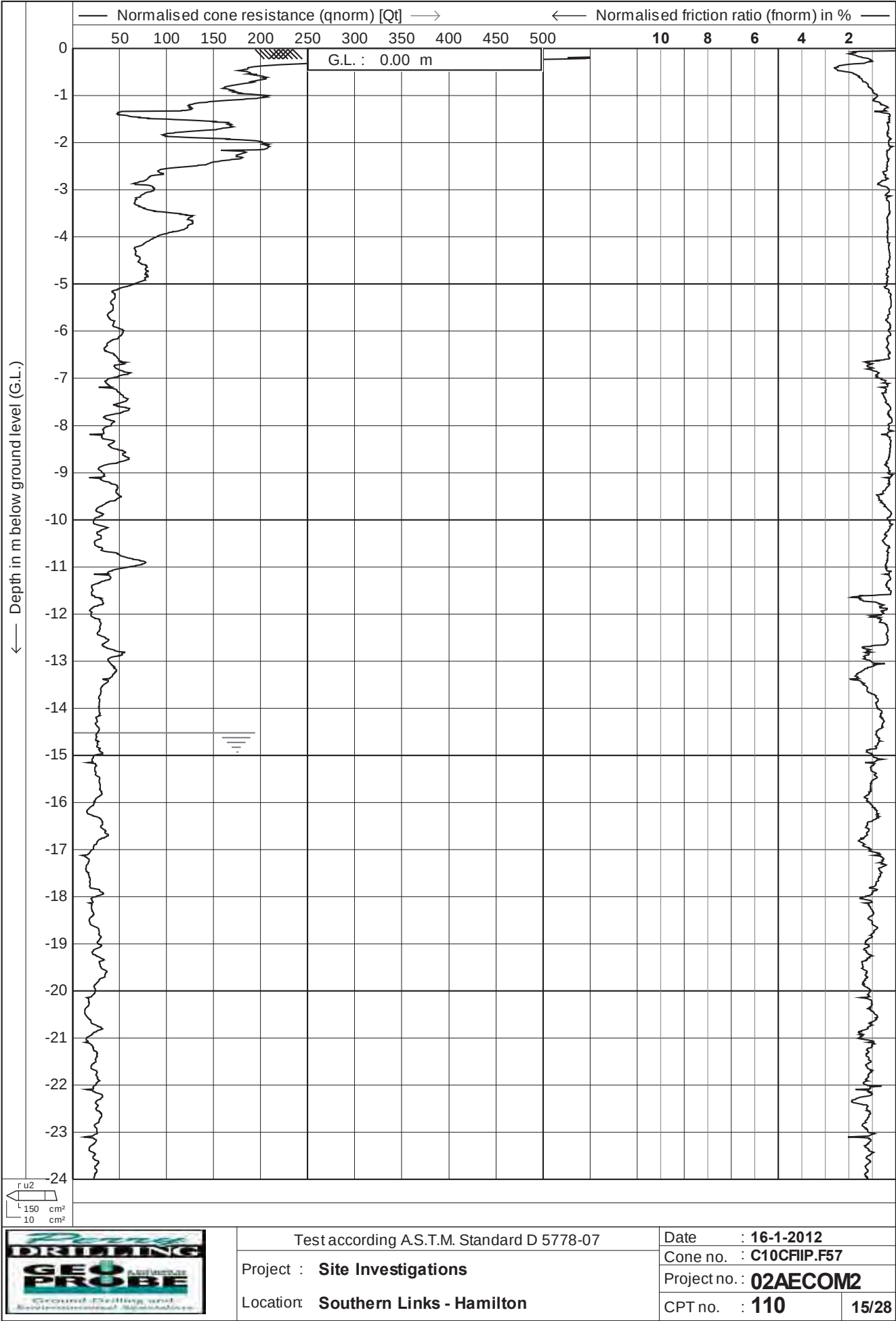












← Depth in m below ground level (G.L.)

→ Normalised cone resistance (qnorm) [Qt]

← Normalised friction ratio (fnorm) in %

50100150200250300350400450500

108642

-24																				
-25																				
-26																				
-27																				
-28																				
-29																				
-30																				
-31																				
-32																				
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-41																				
-42																				
-43																				
-44																				
-45																				
-46																				
-47																				
-48																				

Target Depth

DRILLING

GEO PROBE

Ground Penetrating and Seismic/Geological Investigations

CPTask V1.31

Test according A.S.T.M. Standard D 5778-07

Project : Site Investigations

Location: Southern Links - Hamilton

Date : 16-1-2012

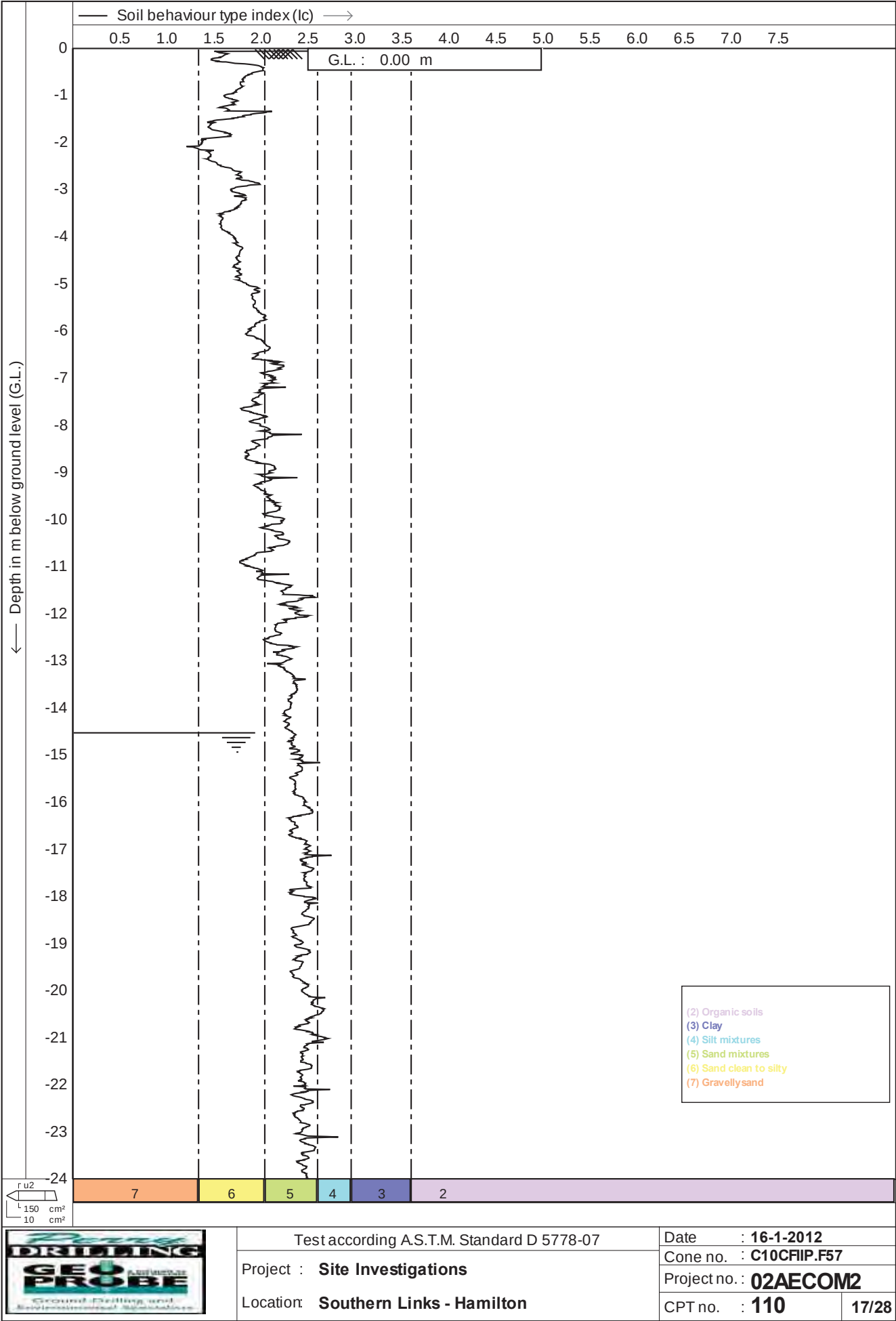
Cone no. : C10CFIP.F57

Project no.: 02AECOM2

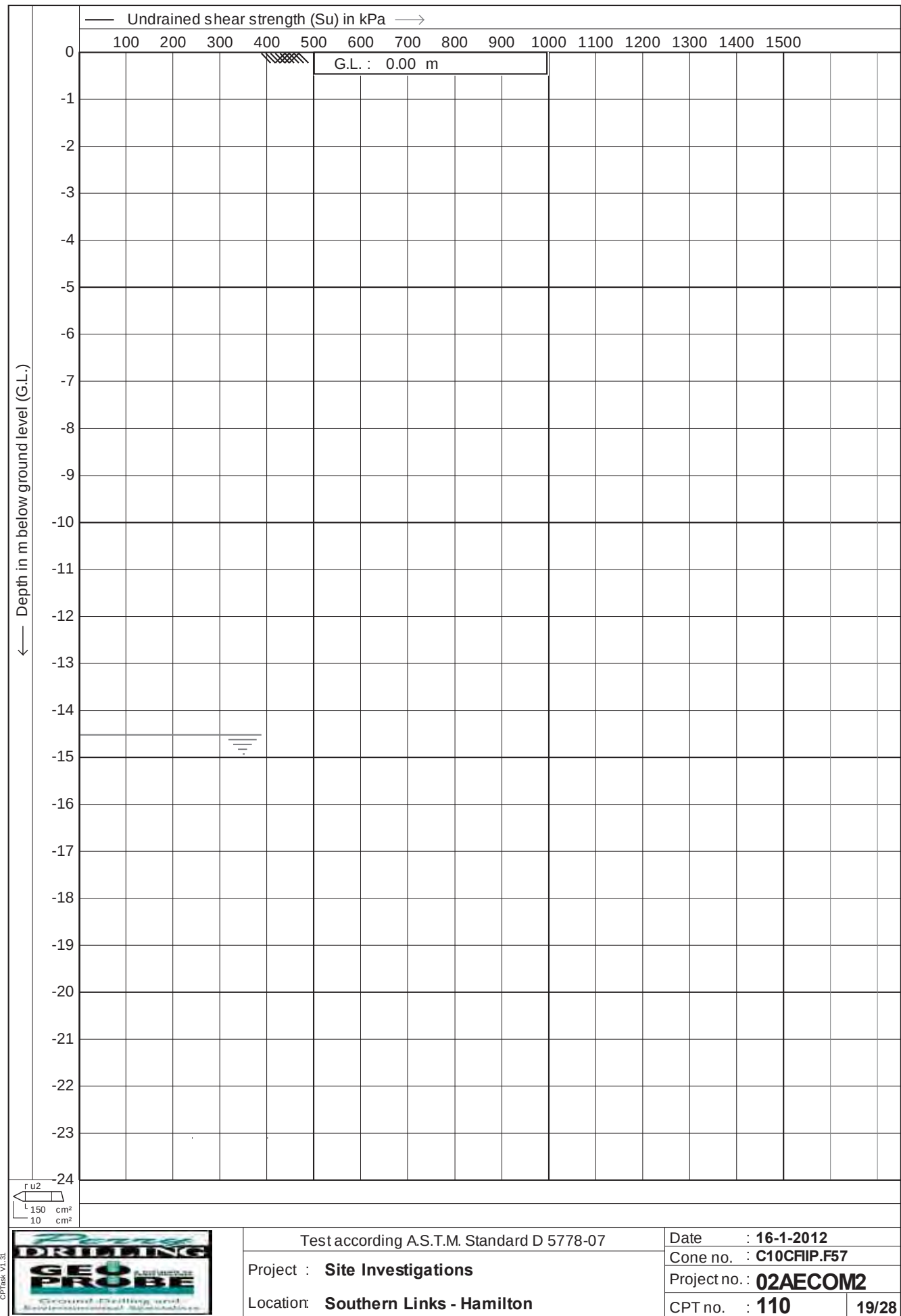
CPT no. : 110

16/28

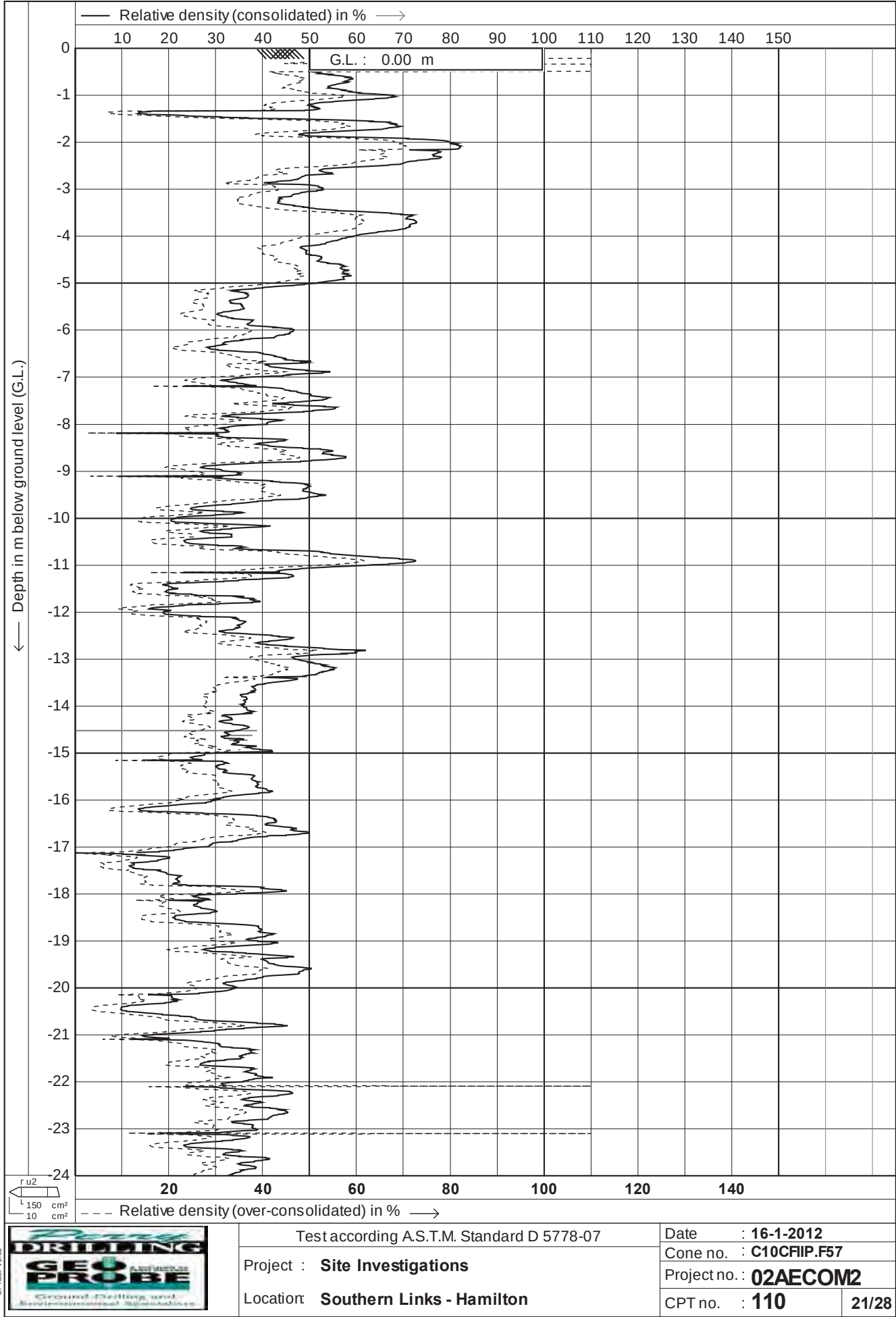
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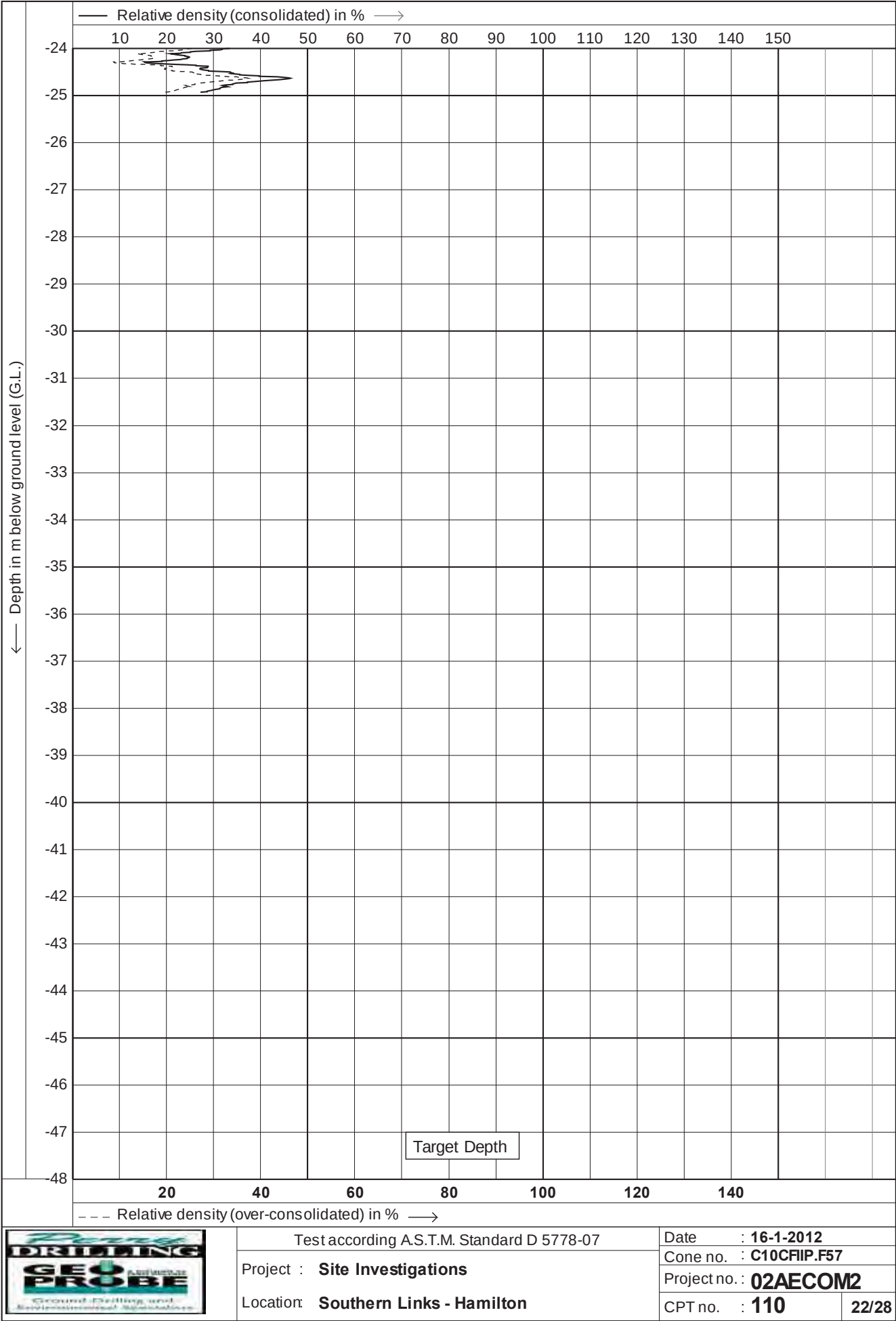


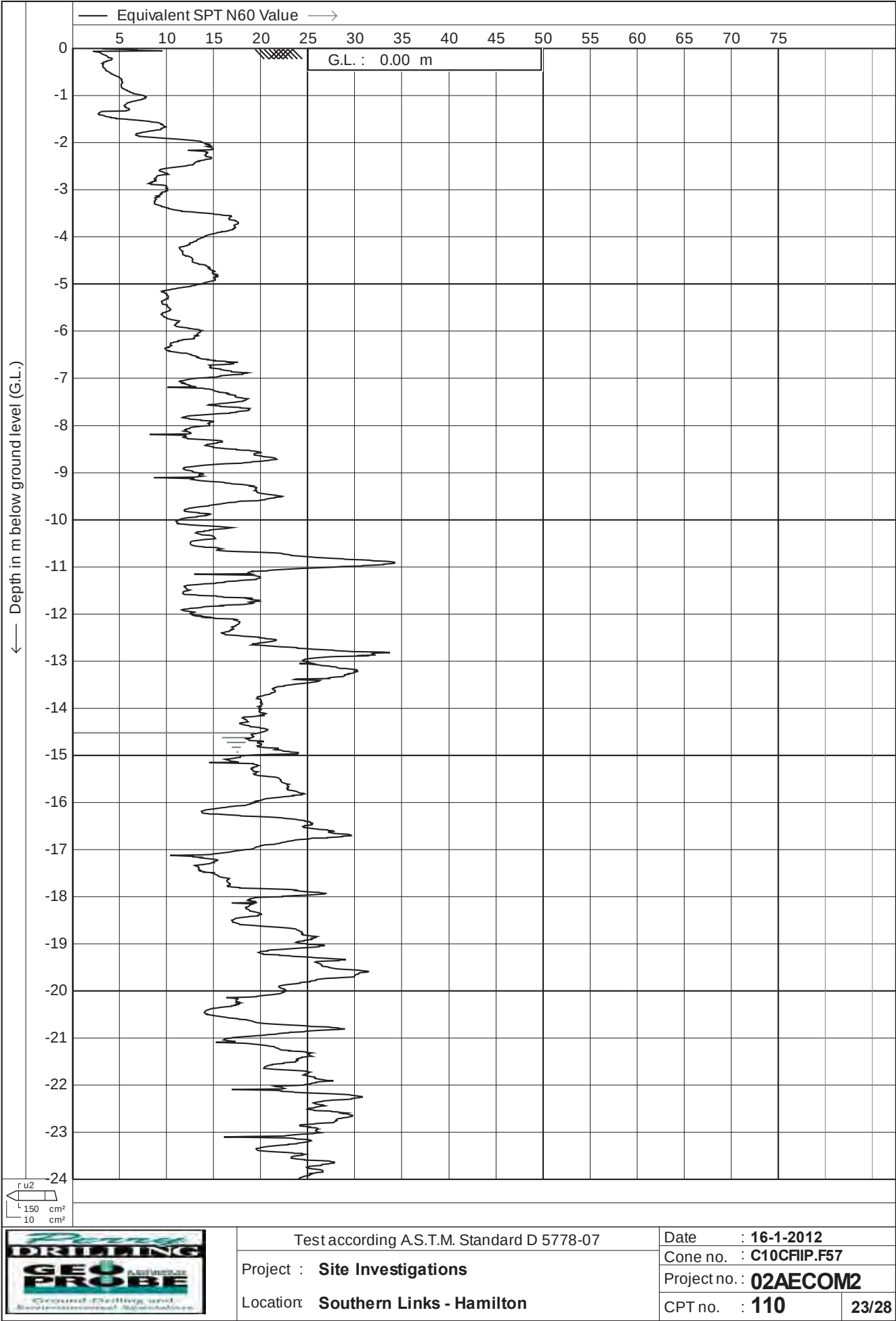


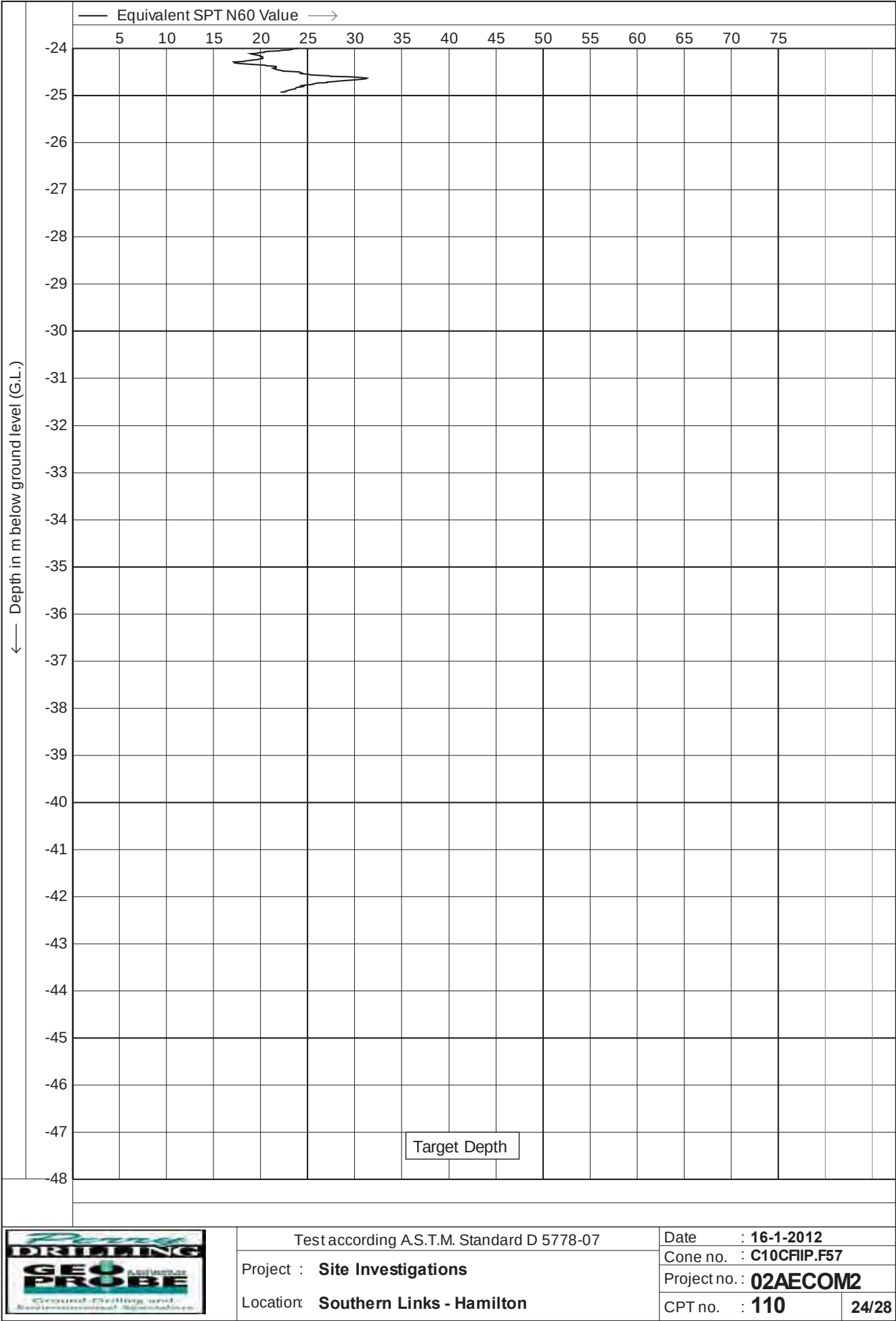




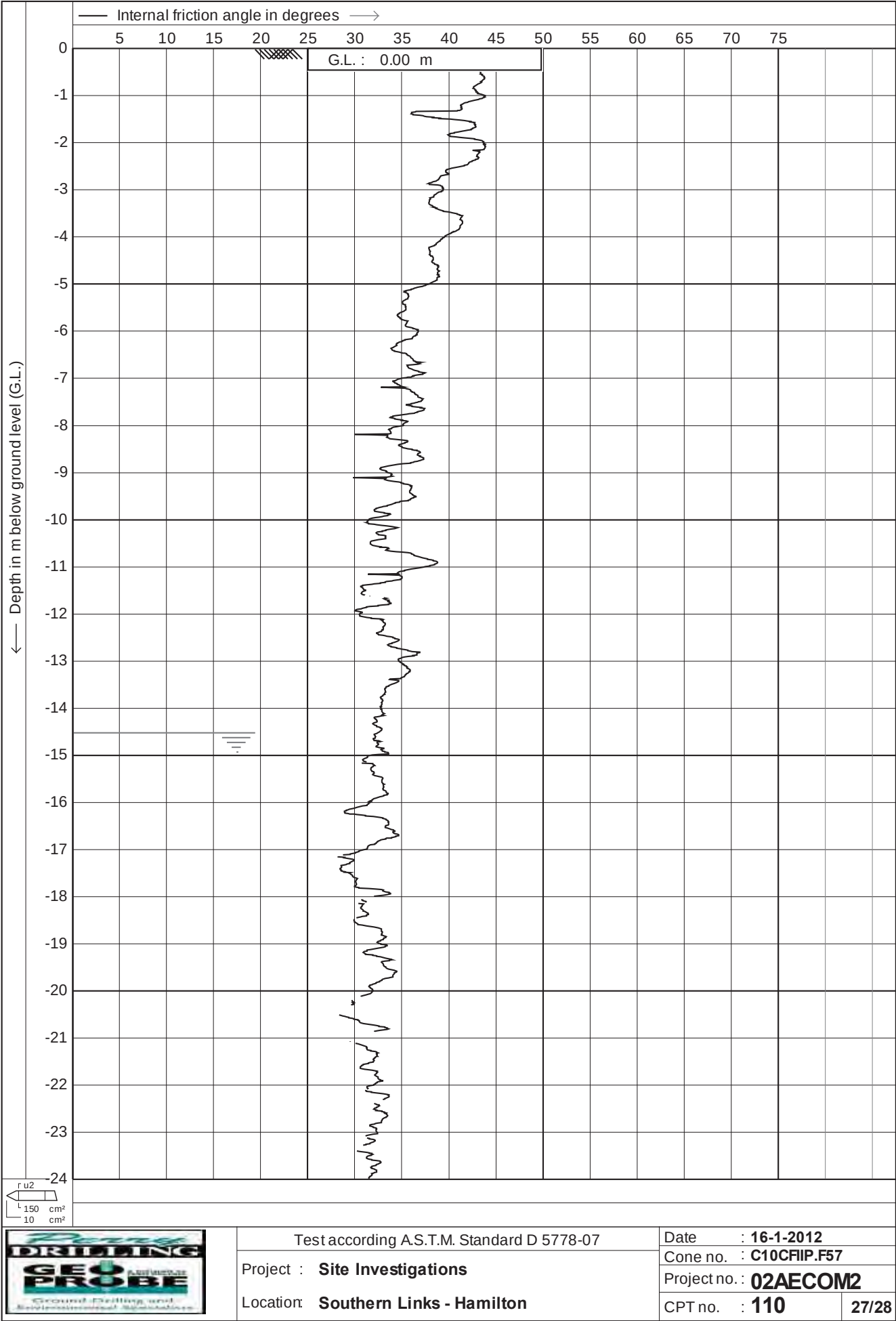


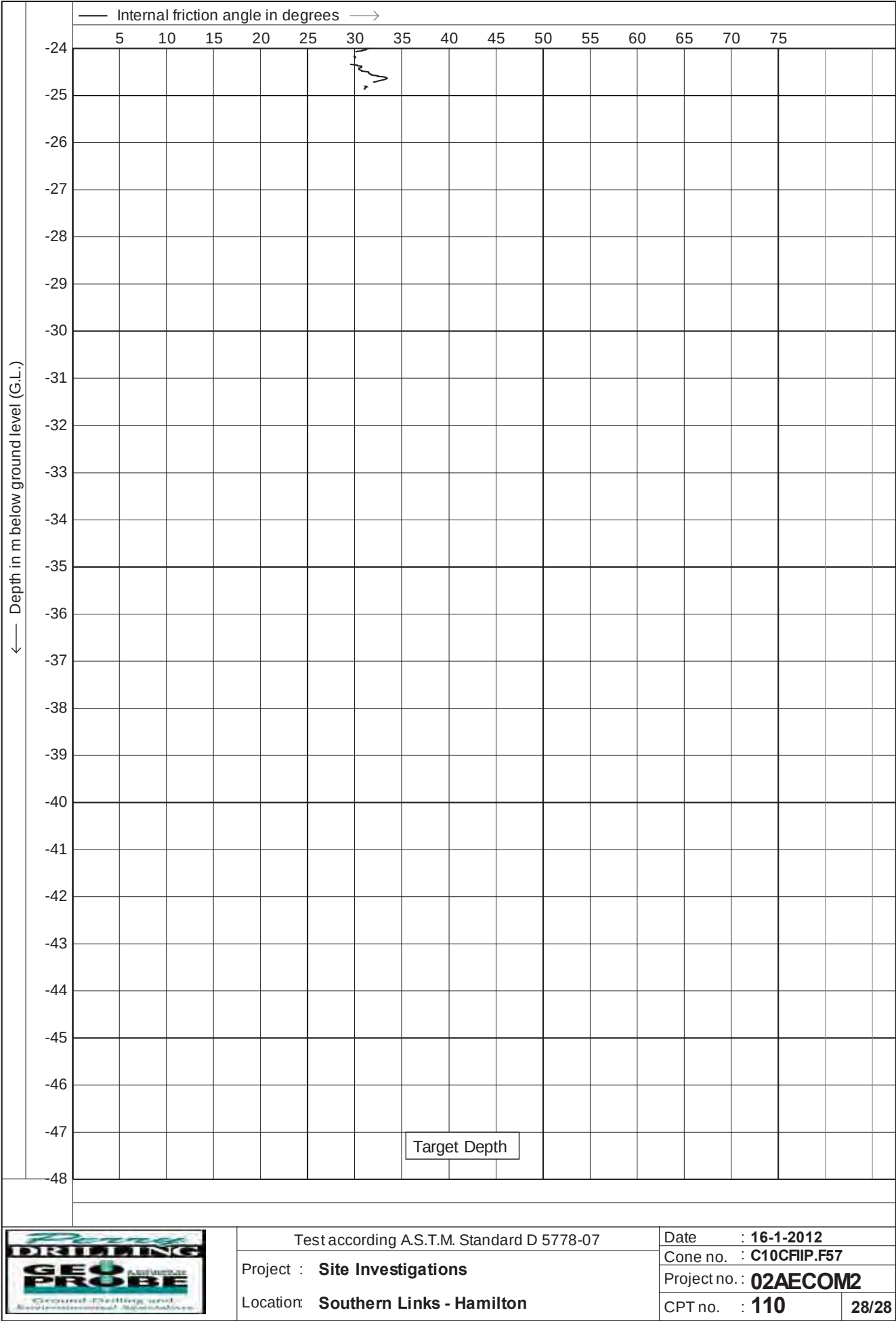






	Soil (Qt, Fr)		Soil (Qt, Bq)		Soil (Average)	
← Depth in m below ground level (G.L.)	-24	(5)	-24	(5)	-24	(5)
	-25		-25		-25	
	-26		-26		-26	
	-27		-27		-27	
	-28		-28		-28	
	-29		-29		-29	
	-30		-30		-30	
	-31		-31		-31	
	-32		-32		-32	
	-33		-33		-33	
	-34		-34		-34	
	-35		-35		-35	
	-36		-36		-36	
	-37		-37		-37	
	-38		-38		-38	
	-39		-39		-39	
	-40		-40		-40	
	-41		-41		-41	
	-42		-42		-42	
	-43		-43		-43	
	-44		-44		-44	
	-45		-45		-45	
	-46		-46		-46	
	-47		-47		-47	
	-48		-48		-48	
Soil behaviour type classification after Robertson 1990						
	Test according A.S.T.M. Standard D 5778-07				Date : 16-1-2012	
	Project : Site Investigations				Cone no. : C10CFIP.F57	
					Project no.: 02AECOM2	
	Location: Southern Links - Hamilton				CPT no. : 110	26/28





		INVESTIGATION LOG					Job No.: HD2422												
		Client: Project: 41 Aloma Way, Hamilton					No.: HA02												
		Location: Within proposed Lot 3. Co-ordinates: 1801410mE, 5810439mN Elevation: Ground					Date: 19.07.22 Logged By: SW Checked By: BK												
Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)	Legend	Scala Penetrometer (Blows / 100 mm)	Vane Shear Strength (kPa) Vane: 2639		Water												
To ps oil	TOPSOIL; blackish grey. Moist; trace rootlets.			2 4 6 8 10 12 14 16 18	50 100 150 200 250														
Colluvium	SILT, with trace clay and sand and gravel; light brownish white, mottled orange. Stiff to very stiff; moist; moderate to high dilatency, sensitive; sand, fine, gravel, fine, subangular. 0.4 m: becomes saturated.	0.2 0.4 0.6			122 21 95 18		0.4 m												
	CLAY, with minor silt; brown. Very stiff; saturated; high plasticity, moderately sensitive to extra sensitive. 1.5 m - 2.4 m: no recovery.	0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4			101 12 104 42														
Holocene Swamp Deposits	SILT, with trace sand; grey. Firm to very stiff; saturated; moderate to high dilatency, insensitive to sensitive; sand, medium to coarse, limited recovery. 3.4 m: becomes stiff, moderately sensitive.	2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0			45 33 134 33 104 33 80 39 74 36 74 36														
	EOH: 4.00 m																		
Photo			Remarks																
			End of log at 4 m - target depth achieved.																
			<table border="0"> <tr> <th>Shear Vanes</th> <th>Water</th> <th>Investigation Type</th> </tr> <tr> <td> Peak</td> <td> Standing Water Level</td> <td>☒ Hand Auger</td> </tr> <tr> <td> Remoulded</td> <td> Out flow</td> <td>☐ Investigation Pit</td> </tr> <tr> <td></td> <td> In flow</td> <td>☐ Machine Borehole</td> </tr> </table>					Shear Vanes	Water	Investigation Type	 Peak	 Standing Water Level	☒ Hand Auger	 Remoulded	 Out flow	☐ Investigation Pit		 In flow	☐ Machine Borehole
Shear Vanes	Water	Investigation Type																	
 Peak	 Standing Water Level	☒ Hand Auger																	
 Remoulded	 Out flow	☐ Investigation Pit																	
	 In flow	☐ Machine Borehole																	

SHEAR VANE & HAND AUGER RESULTS



Client: s 9(2)(a)
 Site Address: 22 Acacia Crescent
 Town/City: Hamilton

Scala Penetrometer:
 Hand Auger No. HA-01
 Job No.: 2220364

Logged By: BM
 Logged Date: 27/07/22
 Checked By: SBT
 Checked Date: 01/08/22

Date: 26/07/22
 Weather: Rainy
 Operator: NS + BM

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	Dr	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration																		
								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Tops oil		Organic SILT (OL); dark brown. Moist, non-plastic; [TOPSOIL].		OL																						
Walton Subgroup	0.5	Silty CLAY (CL); dark brown. Stiff, moist, low plasticity.		CL			123/41																			
							142/55																			
	1.0	0.7m: Becomes orange brown, very stiff					164/60																			
		1.2m: Becomes light brown					UTP																			
	1.5						191+																			
	2.0						153/27																			
							175/93																			
	2.5						191+																			
	3.0						184/77																			
		3.0m: Becomes brown					143/85																			
	3.5	3.3m: Becomes light brown					150/55																			
							134/57																			
	4.0	3.8m: Contains grey streaks 3.9m: Becomes whitish grey, contains brown and dark brown streaks					163/44																			
		4.0m: Becomes reddish brown 4.1m: Becomes pinkish brown, contains grey streaks					123/66																			
	4.5	4.2m: Becomes brown					191+																			
		4.8m: Becomes light grey, contains light orange streaks					UTP																			
	5.0	EOH: 5.00m 4.9m Contains brown mottles					UTP																			
		5.0m: Target depth achieved																								

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Level 1, 633 Cameron Road, TAURANGA 3141

SHEAR VANE & HAND AUGER RESULTS



Client:	s 9(2)(a)	Scala Penetrometer:	
Site Address:	22 Acacia Crescent	Hand Auger No.	HA-02
Town/City:	Hamilton	Job No.:	2220364
Logged By:	BM	Checked By:	SBT
Logged Date:	27/07/22	Checked Date:	01/08/22
		Date:	26/07/22
		Weather:	Rainy
		Operator:	NS + BM

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	Dr	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration																		
								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Topsoil		Organic SILT (OL); dark brown. Moist, non-plastic; [TOPSOIL].		OL																						
alton Subgroup	0.5	Silty CLAY (CL). Stiff, moist, low plasticity.		CL		26/07/2022	131/44																			
		0.7m: Becomes orange brown					167/74																			
	1.0	1.1m: Becomes light brown					191+																			
							UTP																			
	1.5						152/55																			
							UTP																			
	2.0						UTP																			
							191+																			
	2.5						171/93																			
							178/93																			
	3.0	3.4m: Becomes light brownish grey, contains black mottles					UTP																			
		3.6m: Becomes pinkish grey					191+																			
	3.5	3.8m: Becomes dark brown, contains black mottles					137/56																			
		3.9m: Becomes reddish brown					138/68																			
	4.0	4.1m: Becomes brown					137/55																			
		4.2m: Contains black specks					UTP																			
	4.5	4.8m: Becomes reddish brown																								
		4.9m: Becomes light brown																								
	5.0	5.0m: Contains black mottles, trace amounts of EOH: 5.00m																								
		5.0m: Target depth achieved																								
	5.5																									

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

SHEAR VANE & HAND AUGER RESULTS



Client: s 9(2)(a)

Site Address: 22 Acacia Crescent

Town/City: Hamilton

Scala Penetrometer:

Hand Auger No. HA-03

Job No.: 2220364

Logged By: BM

Checked By: SBT

Date: 26/07/22

Logged Date: 27/07/22

Checked Date: 01/08/22

Weather: Rainy

Operator: NS + BM

Geological Formation	Depth (m)	Sample Description	Graphic	USCS	Dr	Water Table	Undrained Shear Strength Su (kPa)	Blows per 100 mm of Penetration																			
Fill	—			S				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Walton Subgroup		SAND (S); grey. Moist, sand, fine to medium; [PAVING SAND]. *HA undertaken below paving stone*.		S			68/14																				
	0.5	SILT (M); dark brown. Firm to stiff, moist, high plasticity.		M			156/68																				0.5
	1.0	Silty CLAY (CL); dark brown. Very stiff, moist, low plasticity.					191+																				1.0
	1.5	0.7m: Contains grey streaks					UTP																				1.5
	2.0	0.9m: Becomes brown					167/66																				2.0
	2.5	1.3m: Becomes light brown		CL			UTP																				2.5
	3.0	2.0m: Becomes brown					150/68																				3.0
	3.5	2.7m: Contains orange and grey streaks, trace amounts fine whitish sand					150/79																				3.5
	4.0	2.9m: Becomes greyish brown, contains black mottles					191+																				4.0
	4.5	SILT (M), with some clay; brown. Very stiff, moist, low plasticity.		M			UTP																				4.5
	5.0	3.3m: Contains black mottles, orange streaks					160/79																				5.0
		Silty CLAY (CL); brown Very stiff, moist, low plasticity; contains black mottles, orange streaks.					191+																				
	4.0	4.2m: Becomes light orange brown, contains brown streaks		CL			191+																				4.0
	4.5	4.4m: Becomes light greyish brown. contains orange streaks					180/55																				4.5
	5.0	EOH: 5.00m					158/55																				5.0
	5.5	5.0m: Target depth achieved																									5.5

Remarks:

Scala Penetrometer and Test Bore log tests give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations.

Address:249 Houchens Road

Date:12/04/2022

Testers:AmalroyT

HA1

Project №:13563

Water Table:	Depth (mm):	Geology:	Graphic Log:	Material Description:	Blows /100mm:			Shear Strength (kPa):		
					5	10	15	Undrained:	Remoulded:	Sensitivity:
Not Found	100	Undefined		Topsoil						
	200									
	300	Holocene swamp deposits		SILT, brownish grey mottled orange, low plasticity, moist, stiff				95	36	2.6
	400									
	500									
	600									
	700	Pleistocene River Deposits and Ignimbrite		CLAY with some silt, brown mottled black, high plasticity, moist, stiff to very stiff				127	76	1.7
	800									
	900									
	1000									
	1100									
	1200									
	1300			End of Borehole @1200mm				174	71	2.4
	1400									
	1500									
	1600									
	1700									
	1800									
	1900									
	2000									
	2100									
	2200									

HA2

Address:249 Houchens Road

Date:12/04/2022

Testers:AmalroyT

Project №:13563

Water Table:	Depth (mm):	Geology:	Graphic Log:	Material Description:	Blows /100mm:			Shear Strength (kPa):		
					5	10	15	Undrained:	Remoulded:	Sensitivity:
Not Found	100	Undefined		Topsoil						
	200									
	300	Pleistocene River Deposits and Ignimbrite		SILT, brownish grey, low plasticity, dry to moist, stiff				127	52	2.4
	400									
	500									
	600			Silty CLAY, light brown, high plasticity, moist, stiff						
	700									
	800							141	54	2.6
	900									
	1000									
	1100			CLAY, light brown mottled black, high plasticity, moist, stiff to very stiff						
	1200							159	63	2.5
	1300									
	1400									
	1500									
	1600							127	43	3
	1700									
	1800									
	1900									
	2000							135	59	2.3
	2100			End of Borehole @2000mm						

HA3

Address: 249 Houchens Road

Date: 12/04/2022

Testers: AmalroyT

Project No: 13563

Water Table:	Depth (mm):	Geology:	Graphic Log:	Material Description:	Blows /100mm:			Shear Strength (kPa):		
					5	10	15	Undrained:	Remoulded:	Sensitivity:
	100	Undefined		FILL (medium GRAVEL), light greyish blue, poorly graded, dry						
	200									
	300	Holocene swamp deposits		SILT, brownish grey, low plasticity, moist, stiff				125	41	3
	400									
	500									
	600	Pleistocene River Deposits and Ignimbrite		CLAY, light brown mottled orange and grey, high plasticity, moist, stiff				127	54	2.4
	700									
	800									
	900			CLAY with some silt, light brown, high plasticity, moist, stiff						
	1000									
	1100									
	1200							143	63	2.2
	1300									
	1400									
	1500									
	1600			CLAY, dark brownish bluish grey, high plasticity, moist, stiff				146	48	3.1
	1700									
	1800									
	1900									
	2000							146	48	3.1
	2100			End of Borehole @2000mm						

Address:249 Houchens Road

Date:12/04/2022

Testers:AmalroyT

HA4

Project №:13563

Water Table:	Depth (mm):	Geology:	Graphic Log:	Material Description:	Blows /100mm:			Shear Strength (kPa):		
					5	10	15	Undrained:	Remoulded:	Sensitivity:
Not Found	100	Undefined		Topsoil						
	200									
	300	Pleistocene River Deposits and Ignimbrite		SILT, brownish grey, low plasticity, moist, stiff				127	52	2.4
	400									
	500			Clayey SILT, brown mottled orange and grey, low plasticity, moist, stiff				128	59	2.2
	600									
	700			Silty CLAY, brown, high plasticity, moist, very stiff						
	800									
	900									
	1000									
	1100							190	67	2.9
	1200									
	1300									
	1400									
	1500									
	1600							190	35	5.5
	1700			CLAY, brown, high plasticity, moist, very stiff						
	1800									
	1900									
	2000							203	78	2.6
	2100			End of Borehole @2000mm						



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@+.%Ä6Ä46%8%+6 ; %6ÄÄ/(6&>SEQOF R2%\$6 EH/ / -%?1)8E.HK Vane shear strength per NZGS guideline							

		INVESTIGATION LOG				Job No.: HD2422	
		Client: Project: 41 Aloma Way, Hamilton				No.: HA01	
		Location: Within proposed Lot 2.				Date: 19.07.22	
		Co-ordinates: 1801396mE, 5810452mN				Logged By: SW	
		Elevation: Ground				Checked By: BK	
Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)	Legend	Scala Penetrometer (Blows / 100 mm)	Vane Shear Strength (kPa) Vane: 2639	Water	
To ps oil				2 4 6 8 10 12 14 16 18	50 100 150 200 250		
	TOPSOIL; brown. Moist; rootlets.			3			
		0.2		4			
		0.4		4			
		0.6		2			
		0.8		3			
		1.0		4			
		1.2		4			
		1.4		3			
		1.6		5			
		1.8		4			
		2.0		8			
		2.2		9			
		2.4		7			
		2.6		4			
		2.8		4			
		3.0		2			
		3.2		2			
		3.4		4			
		3.6		3			
		3.8		5			
		4.0		4			
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		5.8		3			
		6.0		3			
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		6.8		3			
		7.0		3			
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		8.0		3			
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		8.8		3			
		9.0		3			
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		9.4		3			
		9.6		3			
		9.8		3			
		10.0		3			
		10.2		3			
		10.4		3			
		10.6		3			
		10.8		3			
		11.0		3			
		11.2		3			
		11.4		3			
		11.6		3			
		11.8		3			
		12.0		3			
		12.2		3			
		12.4		3			
		12.6		3			
		12.8		3			
		13.0		3			
		13.2		3			
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		14.0		3			
		14.2		3			
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		14.8		3			
		15.0		3			
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		15.8		3			
		16.0		3			
		16.2		3			
		16.4		3			
		16.6		3			
		16.8		3			
		17.0		3			
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		17.4		3			
		17.6		3			
		17.8		3			
		18.0		3			
		18.2		3			
		18.4		3			
		18.6		3			
		18.8		3			
		19.0		3			
		19.2		3			
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		19.6		3			
		19.8		3			
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		22.0		3			
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		25.6		3			
		25.8		3			
		26.0		3			
		26.2		3			
		26.4		3			
		26.6		3			
		26.8		3			
		27.0		3			
		27.2		3			
		27.4		3			
		27.6		3			
		27.8		3			
		28.0		3			
		28.2		3			
		28.4		3			
		28.6		3			
		28.8		3			
		29.0		3			
		29.2		3			
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		30.4		3			
		30.6		3			
		30.8		3			
		31.0		3			
		31.2		3			
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		31.6		3			
		31.8		3			
		32.0		3			
		32.2		3			
		32.4		3			
		32.6		3			
		32.8		3			
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		33.6		3			
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		34.8		3			
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		35.6		3			
		35.8		3			
		36.0		3			
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		36.4		3			
		36.6		3			
		36.8		3			
		37.0		3			
		37.2		3			
		37.4		3			
		37.6		3			
		37.8		3			
		38.0		3			
		38.2		3			
		38.4		3			
		38.6		3			
		38.8		3			
		39.0		3			
		39.2		3			
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		39.8		3			
		40.0		3			
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		40.4		3			
		40.6		3			
		40.8		3			
		41.0		3			
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		41.4		3			
		41.6		3			
		41.8		3			
		42.0		3			
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		42.4		3			
		42.6		3			
		42.8		3			
		43.0		3			
		43.2		3			
		43.4		3			
		43.6		3			
		43.8		3			
		44.0		3			
		44.2		3			
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		44.6		3			
		44.8		3			
		45.0		3			
		45.2		3			
		45.4		3			
		45.6		3			
		45.8		3			
		46.0		3			
		46.2		3			
		46.4		3			
		46.6		3			
		46.8		3			
		47.0		3			
		47.2		3			
		47.4		3			
		47.6		3			
		47.8		3			
		48.0		3			
		48.2		3			

TEST PIT INVESTIGATION TEST REPORT

Project : SAFE 73
 Location : Chinamans Hill Realignment
 Client : OPUS International Consultants
 Contractor : NA
 Test number : TP 5
 Shear vane no : DR3712
 shear vane corr : 1.49
 Water level (m) : Not Encountered
 Reduced level : NA



Project No : 2-61443.00
 Lab Ref No : 98/343/001
 Client Ref No : 210HL

		Test Results		
Graphic Log	Depth (m)	*Shear Strength (kPa)	Sample (m)	Material Description
0.0 x s x	0.20			Topsoil
0.2 - - - 0.4 - - - 0.6 - - -	0.70	167/46		Dark yellowish brown CLAY, firm - stiff, plastic, moist.
0.8 - x - 1.0 x x	1.10	Refusal		Dark brown Clay SILT (paleosol), hard.
1.2 x - x 1.4 - x - 1.6 x - -	1.60	Refusal	Bulk 0 - 2.50	Yellowish brown homogenous Clay SILT, hard, moist, breaks out in slabs.
1.8 - - - 2.0 - - - 2.2 - - -	2.00	Refusal		Dark yellowish brown CLAY, firm to stiff.
2.4 - - - 2.6 - - - 2.8 - - - 3.0 - - - 3.2 - - - 3.4 - - - 3.6 - - - 3.8 - - -	2.50	89/24		Yellowish brown CLAY, soft to firm, plastic, very moist.
2.6 - - - 2.8 - - - 3.0 - - - 3.2 - - - 3.4 - - - 3.6 - - - 3.8 - - -	3.90	72/15	Bulk 2.50 - 4.00	Light yellowish brown homogenous CLAY, soft to firm, very moist, plastic, wet of OWC.
4.0 x -	4.00			Greyish brown Silty CLAY, soft to firm, very moist, plastic.
				END OF TEST PIT 4.1m

Test Methods	Notes *
Field Description of Soils and Rocks in Engineering Use, NZ Geomechanic Society Shear strength using Pilcon Shear Vane, Manufacturers Notes (BS1372)	Shear Strength (kPa) = Peak / Remoulded

Date tested : 23/06/98

Date reported : 24/06/98

Approved By :

Designation : Senior Civil Engineering Technician

Date : 24/6/98

CSF 2061 (5/98)

Opus International Consultants Limited
 Hamilton Laboratory
 Quality Management Systems Certified to ISO 9001

Fox Street
 Private Bag 3057
 Hamilton, New Zealand

Telephone: +64 7 858 2870
 Facsimile: +64 7 856 2873
 Web site: www.opus.co.nz

Formerly Works
 Consultancy
 Services Limited

TEST PIT INVESTIGATION TEST REPORT

Project : SAFE 73
 Location : Chinamans Hill Realignment
 Client : OPUS International Consultants
 Contractor : NA
 Test number : TP 6
 Shear vane no : DR3712
 shear vane corr : 1.49
 Water level (m) : Not Encountered
 Reduced level : NA



Project No : 2-61443.00
 Lab Ref No : 98/343/001
 Client Ref No : 210HL

Graphic Log		Test Results			
		Depth (m)	*Shear Strength (kPa)	Sample (m)	Material Description
0.0	x				Topsoil
0.2	x	0.30			
0.4	-		171/67		Mottled brown/yellow brown homogeneous CLAY, stiff, moderately plastic, approx OWC.
0.6	-	0.80			
0.8	-		161/54		Dark brown CLAY (paleosol), hard to stiff.
1.0	-	1.10			
1.2	-		Refusal	Bulk 0.30 - 2.00	Orange brown/brown homogeneous CLAY, stiff to hard, moist, plastic.
1.4	-		Refusal		Grey Clay veins throughout. Breaks out in slabs.
1.6	-				Yellowish brown.
1.8	-	2.00			
2.0	-		Refusal		Dark yellowish brown Clay SILT, hard, dry to moist, compact.
2.2	x	2.30			
2.4	x			Bulk 2.30 - 4.00	Yellowish brown/light yellow brown Clay SILT, soft to firm, very moist, plastic, wet of OWC.
2.6	x				
2.8	x	3.00			
3.0	x				Light greyish brown Clay SILT, soft, very moist., slightly plastic, greasy, well wet of OWC.
3.2	x	3.40			
3.4	x				Light yellow brown homogeneous Clay SILT, soft, sticky, very moist, well wet of OWC.
3.6	x				
3.8	x	4.00			
4.0	x				END OF TEST PIT 4.0m

Test Methods	Notes *
Field Description of Soils and Rocks in Engineering Use, NZ Geomechanics Society Shear strength using Pilcon Shear Vane, Manufacturers Notes (BS1372)	Shear Strength (kPa)= Peak / Remoulded

Date tested : 23/06/98

Date reported : 24/06/98

Approved By :

Designation : Senior Civil Engineering Technician

Date : 26/6/98

CSF 2061 (5/98)

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 Consultancy
 Services Limited

TEST PIT INVESTIGATION TEST REPORT

Project : SAFE 73
 Location : Chinamans Hill Realignment
 Client : OPUS International Consultants
 Contractor : NA
 Test number : TP 7
 Shear vane no : DR3712
 shear vane corr : 1.49
 Water level (m) : 2.5m (in borehole)
 Reduced level : NA



Project No : 2-61443.00
 Lab Ref No : 98/343/001
 Client Ref No : 210HL

Graphic Log	Test Results			
	Depth (m)	*Shear Strength (kPa)	Sample (m)	Material Description
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0	0.60	101/30		Dark brown organic Clay SILT, Topsoil.
	1.10	77/37	Pushtube 0.90	Yellow brown CLAY, soft to firm, moderately plastic, very moist.
	1.40	110/30		Dark brown homogeneous Silty CLAY, firm, slightly dry.
	1.70	171		Brown homogeneous Sandy SILT, firm to stiff. HW Gravels, ?, compact. CW Puketoka?
	2.20	201/12		Water seeping in at 1.3m - perched?
	4.20			Mottled orange brown / yellow brown / light grey Gravelly Sandy SILT / Silty HW SAND, stiff. HW rounded Gravels up to 20 mm ø.
				Mottled light pinkish brown / cream interbedded HW / CW Sandy SILT. Some CW Silty Gravelly Sand, occasional CW Gravelly bands. Firm, very moist, sensitive when remoulded. Occasional hard bands.
				END OF TEST PIT 4.2m

Test Methods	Notes *
Field Description of Soils and Rocks in Engineering Use, NZ Geomechanics Society Shear strength using Pilcon Shear Vane, Manufacturers Notes (BS1372)	Shear Strength (kPa) = Peak / Remoulded

Date tested : 23/06/98

Date reported : 24/06/98

Approved By :

Designation : Senior Civil Engineering Technician

Date : 26/6/98

CSF 2061 (5/98)

Opus International Consultants Limited
 Hamilton Laboratory
 Quality Management Systems Certified to ISO 9001

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 Facsimile: +64 7 856 2873
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Formerly Works
 Consultancy
 Services Limited

APPENDIX C

Historical Photographs



06880



84
Hamilton
65
11-6-43

832/48





833/47

Hamilton
14-3-43



0880

354
98872



F-82
Kauai
20-5-53



354
98872



F-82
Kauai
20-5-53



354
99332



F-82
HAWK
20-9-51

22/01/52



HAMILTON
TE HAWAIA
17000
26-4-71

3470



4511 / 15



At 119
19556
209.72





4 5 5

SN 5479 G/23

ALTIMETER
INOPERATIVE
PRESSURIZED
CABIN



TAUPRI -
TAUAMITU
25 500 FT

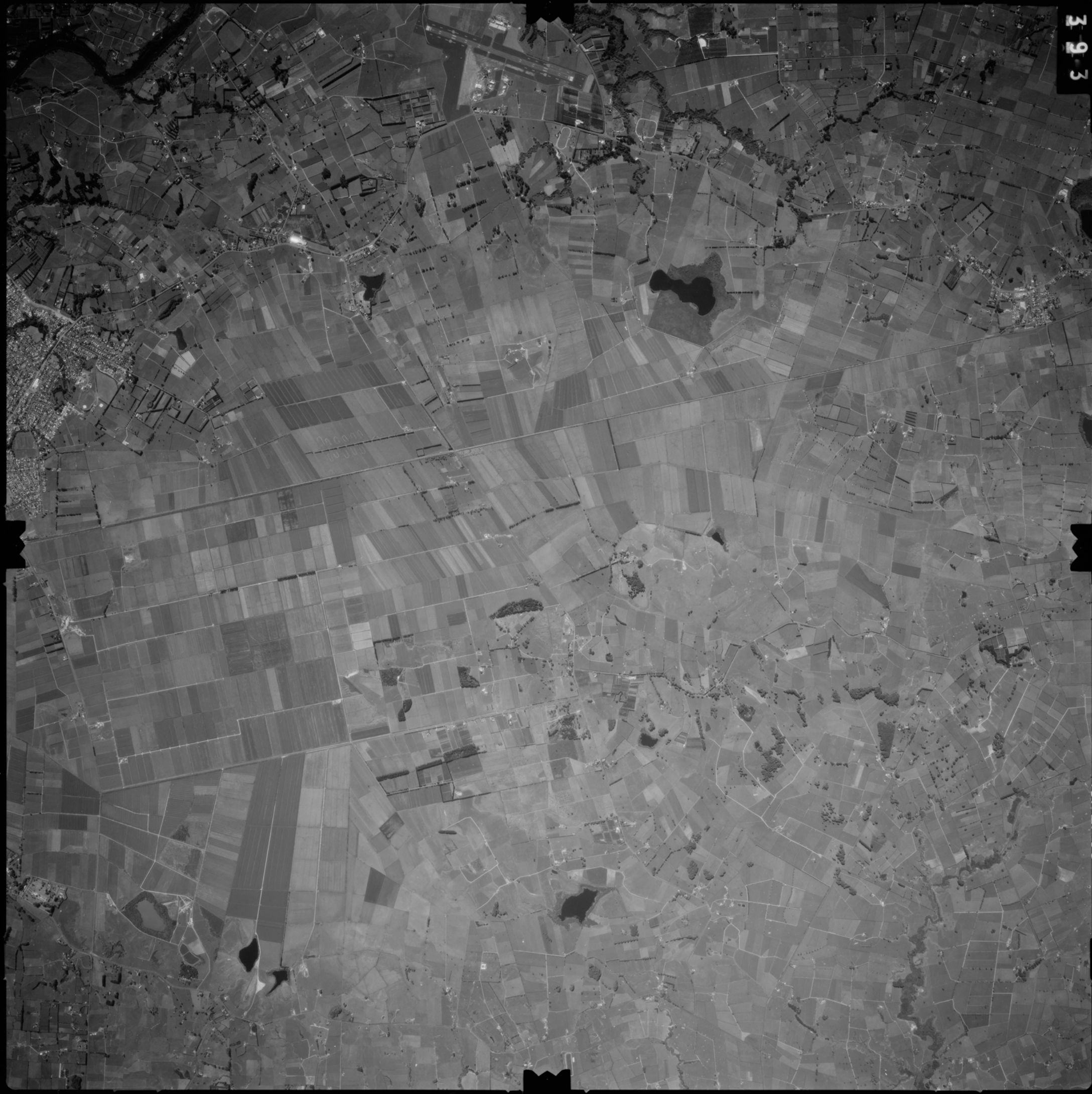


3-4-3

SN 9124

N/22





3 9 3

SN 9401 C/7



16/2/95

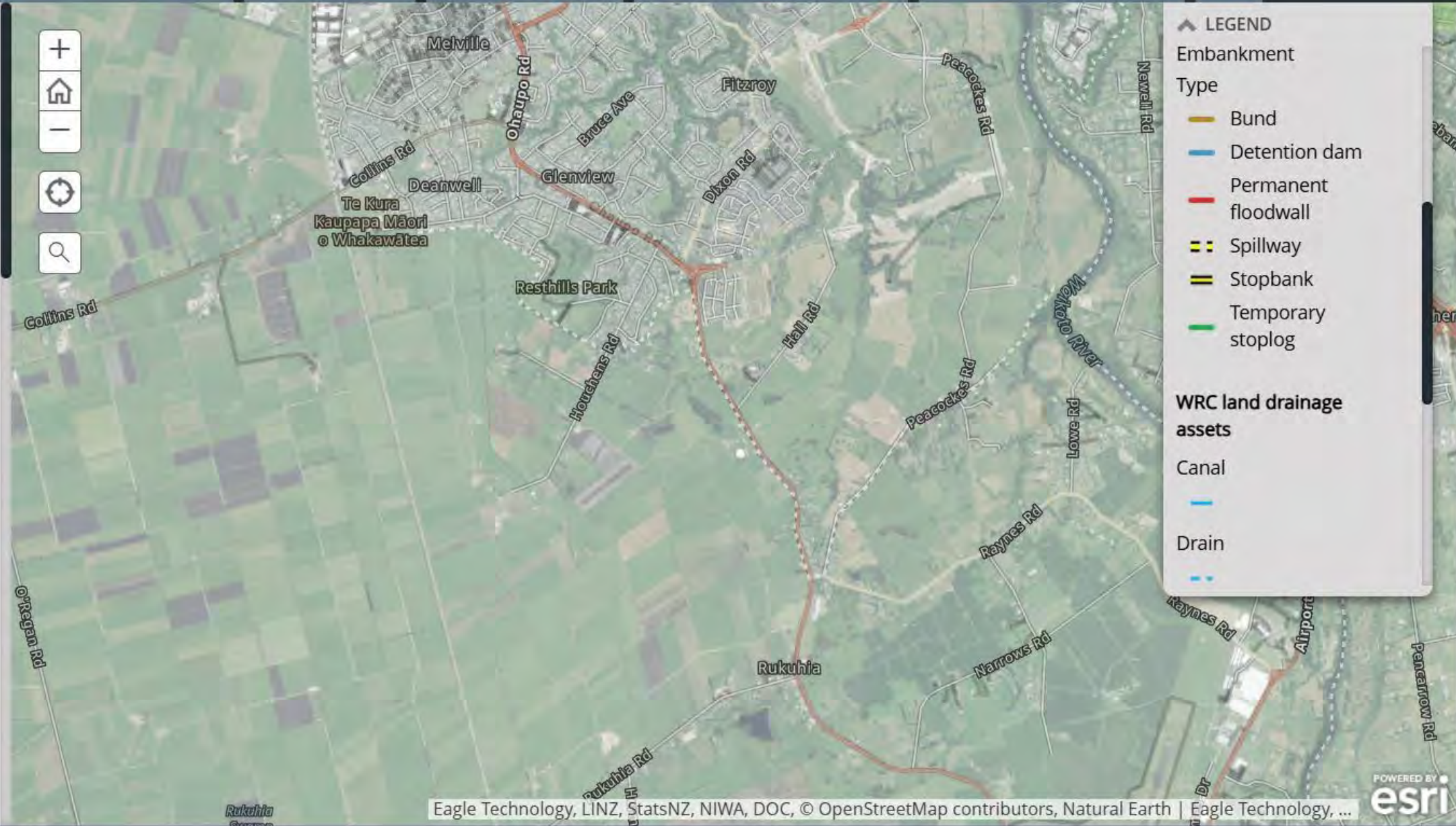
APPENDIX D

WRC Hazard Maps

- Overview
- River flooding
- Flood management
- Waikato District defended areas
- Coastal hazards
- Coastal inundation
- Earthquakes and landslides
- Volcanoes and geothermal

Flood Management

Waikato Regional Council owns and maintains many flood protection schemes. These schemes significantly reduce the risk of river flooding to many low lying areas, through measures such as stopbanks, floodgates and channel maintenance. Each stopbank is designed to provide a certain level of protection - this may be to the 1% AEP event, or it may only be to the 10% AEP event. When a flood event occurs that is greater than the design level, the river may overtop the stopbank and cause flooding. In addition, there is always a small chance that a stopbank will fail (breach). The level of risk that remains for defended properties is known as "residual risk".



Overview

River flooding

Flood management

Waikato District defended areas

Coastal hazards

Coastal inundation

Earthquakes and landslides

Volcanoes and geothermal

☰

River Flooding

Floods are New Zealand's number one hazard in terms of frequency, losses, and declared Civil Defence emergencies. River floods occur due to heavy rain that causes rivers to overflow their banks. Other types of flooding include ponding, contributed to by poorly drained soils and/or high water tables, and urban flooding caused by street drains becoming blocked or overcome.

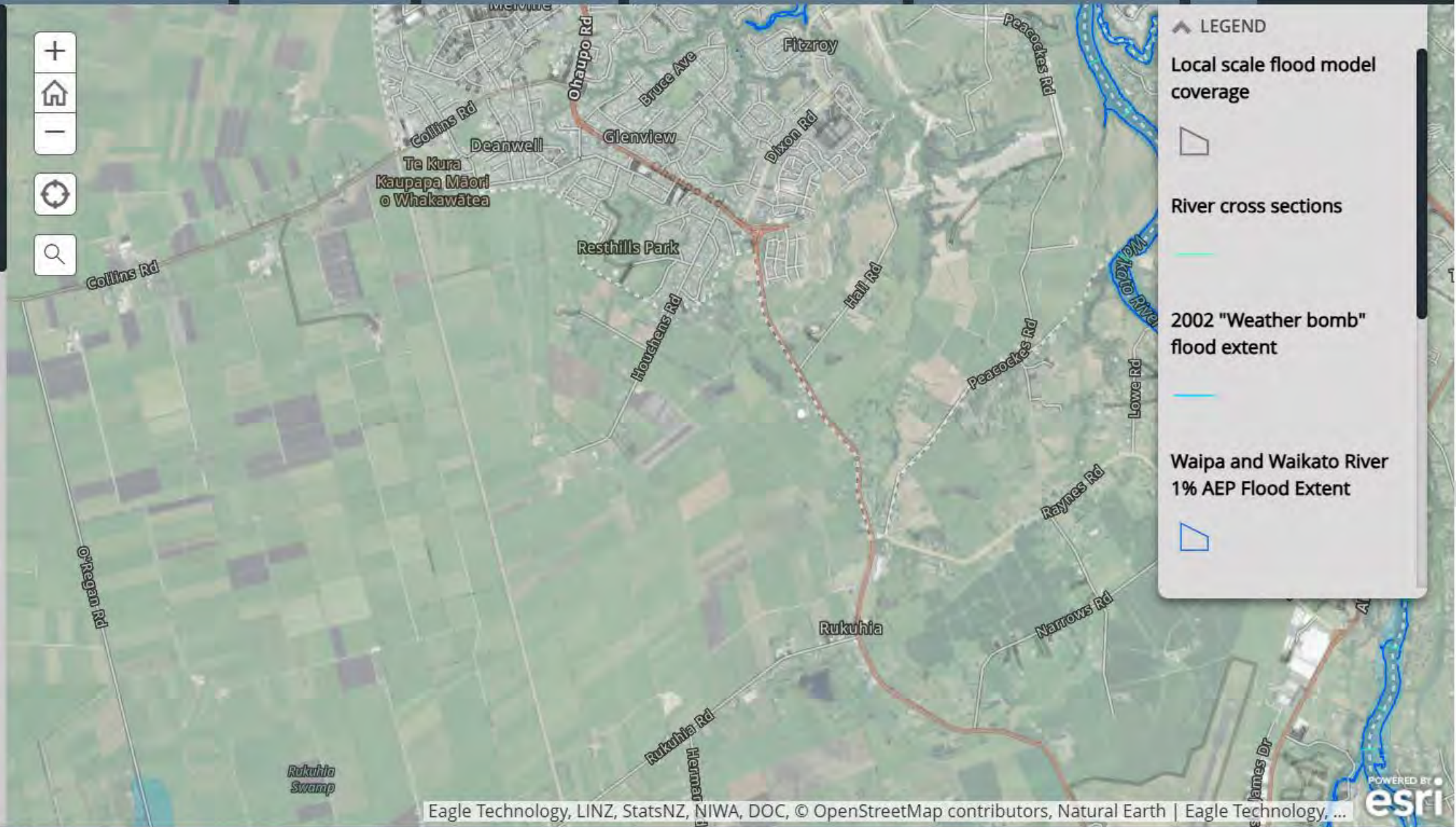
The Waikato region has 20 large rivers and about 1400 small river systems. Many of the region's river systems are prone to flooding and flooding is frequent because of steep terrain, low lying flood plains and areas of high rainfall.

To see a map with local scale flood depth data (instead of hazard) for the same scenario, click [here](#) (and zoom in).

For more information, click [here](#).

For flood warnings and updates for the Waikato, visit [Flood Room Live](#).

For what to do in the event of a flood, click [here](#).



- Overview
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Earthquakes

New Zealand lies on the boundary of the Pacific and Australian tectonic plates. These plates are colliding with huge force, causing one to slowly grind over, under or alongside the other. This results in many faults (cracks extending deep within the earth), including in the Waikato. An earthquake occurs when stress builds up on these faults and is then released suddenly, causing the earth to vibrate as energy radiates away from the fault.

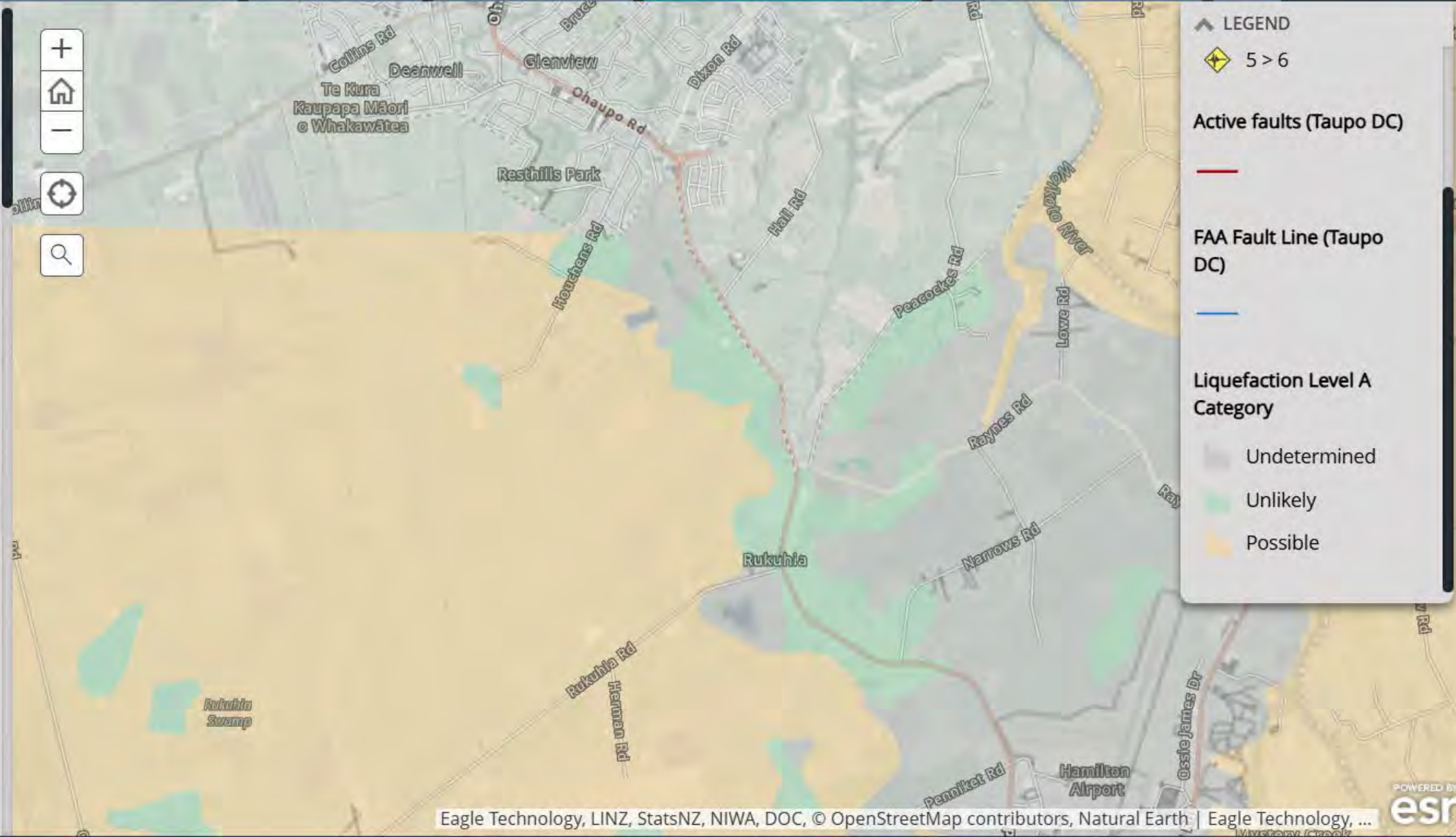
There are thousands of earthquakes in New Zealand every year, however many are not felt. Earthquakes can result in secondary hazards such as ground shaking, liquefaction (see below), land instability and tsunami (tsunami are caused by offshore faults).

To view ground shaking susceptibility data for the Waikato Region in this map, click [here](#).

For more information, click [here](#).

For what to do in an earthquake, click [here](#).

For information on recent earthquakes, visit [GeoNet](#)



- Overview
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Volcanoes

The Waikato region is exposed to volcanic risk from many volcanic centres, both within and outside of the region. These volcanic centres vary in type, risk, and activity (e.g. dormant, unrest, eruption). There are three main types of volcano:

1. Cone volcanoes (e.g. Mt Ruapehu);
2. Caldera volcanoes (e.g. Lake Taupo); and
3. Volcanic fields (e.g. Auckland area).

The different types can produce a wide variety of volcanic hazards including ashfall, pyroclastic flows, bombs and blocks (flying rocks), lahars and lava flows. These hazards are more or less likely to occur in an eruption, depending on the volcano type.

The volcanic hazard most likely to impact the Waikato region is volcanic ash, which is carried by the wind, and can adversely affect agriculture, infrastructure, air transport, human health, etc. Lake Taupo poses the biggest volcanic threat to our region; however, the probability of a large eruption is extremely low.

For more information, click [here](#).

For what to do in a volcanic eruption, click [here](#).

For more detailed information on volcano status, visit [GeoNet](#).

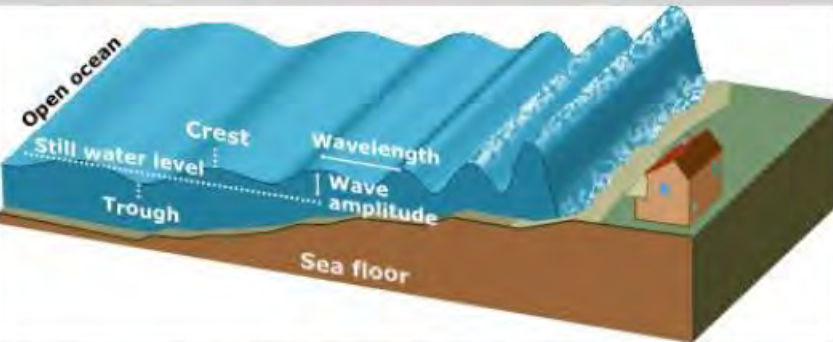


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Tsunami

A Tsunami is a series of travelling ocean waves caused by disturbances of the ocean. Most tsunami are generated by earthquakes under the sea floor, but they can also be generated by landslides or volcanic eruptions.

Tsunami waves travel quickly, rapidly flooding and damaging coastal communities, picking up debris as they go. Tsunami waves can also travel inland along rivers. This map shows tsunami inundation zones and safe zones for an expected worst case tsunami. Other tsunami may occur that are less hazardous than what is mapped.



Change in tsunami wave shape and height as it approaches land

To see a map with detailed tsunami hazard data for the same scenario (Coromandel, Peninsula, Firth of Thames, Kawhia Harbour, Marokopa, Awakino and Mokau only), click [here](#) (and zoom in).

For more information on tsunami, click [here](#).

For what to do in a tsunami, click [here](#).





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