

D Out-of-Pit Tailings Storage Facility: Geotechnical Assessment





Final Report

Alpha Coal Project

Out-of-Pit Tailings Storage Facility (TSF):

Geotechnical Investigation

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Abbreviations

Abbreviation	Description
BFS	Bankable Feasibility Study
DERM	Department of Environment and Resource Management of Queensland
DP	Douglas Partners
EIS	Environmental Impact Statement
HCPL	Hancock Coal Pty Ltd
LiDAR	Light Detection And Ranging
NATA	National Association of Testing Authorities
PVC	Polyvinyl Chloride
PB	Parsons Brinkerhoff
SEIS	Supplementary Environmental Impact Statement
SPT	Standard Penetration Test
URS	URS Australia Pty Ltd

Executive Summary

As part of the Supplementary Environmental Impact Statement (SEIS), URS carried out a geotechnical investigation to assess the suitability of the Tailings Storage Facility (TSF) proposed in the Environmental Impact Statement (EIS) Bankable Feasibility Study (BFS) for the Alpha Coal Project. The objective of the investigation was to satisfy the Queensland Department of Environmental Management's (DERM) concerns regarding:

- Potential for tailings liquor to migrate through surface and/or near surface soils into Lagoon Creek
- Potential for tailings liquor to seep through the floor of the TSF and contaminate groundwater

The investigation comprised geologic mapping; drilling 14 exploratory boreholes to depths ranging from 10.0m to 20.0m, with in situ standard penetration tests (SPT) and falling head permeability tests in soil, and packer tests in rock; excavation of 52 test pits; and laboratory testing of soil and rock samples from the boreholes and test pits.

Based on the current investigation and review of data from previous investigations, the geologic model for the entire TSF footprint can generally be described as:

0.0m to 0.7m	Topsoil/Alluvium (loose to medium dense, silty, fine to medium grained sand)
0.7m to 1.8m	Residual Soil derived from weathering of Colinlea Sandstone (very dense silty/clayey sand and low plasticity sandy silt/clay mixes)
Below 1.8m	Low strength, completely weathered (CW) to highly weathered (HW) Colinlea Sandstone

In situ falling head permeability and packer tests in the floor of the TSF indicate a permeability ranging from 2.3×10^{-7} m/sec to 7.3×10^{-9} m/sec.

It is therefore concluded that, the TSF site as proposed in the BFS is suitable for the intended purpose. This conclusion is based on the following:

Surface Water Contamination: Surficial geologic mapping and subsurface investigations by borehole and test pit showed that it is unlikely that well-developed Lagoon Creek palaeochannels or deep cross drainage alluvial channels are present beneath the proposed TSF footprint. Slight horizontal migration of tailings liquor through surficial alluvial or low density residual soils can be expected during the life-of-mine, however, construction of an engineered cutoff trench that intercepts the soil/weathered rock interface should mitigate the risk of seepage into Lagoon Creek.

Groundwater Contamination: The low hydraulic conductivities measured during in situ falling head permeability tests and packer tests in the residual soils and weathered sandstone in the floor of the TSF footprint show that significant vertical migration of tailings liquor into the groundwater table is unlikely. Therefore, it is recommended that the low permeability blanket/liner proposed in the BFS report be substituted by moisture conditioning and proof rolling the soils in the floor of the TSF prior to tailings storage. It is recommended that a groundwater monitoring program comprising a series of piezometers be established to regularly assess the groundwater depth and quality around the perimeter of the proposed TSF.

Embankment Foundation: The soils and weathered rock in the area of the proposed TSF should provide a suitable strength, low permeability foundation to support the proposed TSF embankments.

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Construction Materials: The upper 1.0m to 3.0m of silty/clayey sand and silty/sandy clay that occurs over most of the TSF footprint should be suitable for use as borrow material for construction of the proposed TSF embankments. Crushing and processing of basalt from a potential quarry approximately 20km northeast of the site is expected to produce sand and gravel for filters and drains, and slope protection.

Construction Considerations: Excavation of the surface material to a depth of about 3.0m for TSF embankment construction can be effected with conventional earthmoving equipment such as scrapers, and hydraulic excavators. Compaction of the final exposed subgrade within the footprint of the TSF storage area would be expected to further mitigate downward migration of tailings liquor.

Introduction

1.1 General

Hancock Coal Pty Ltd (HCPL) is developing the Alpha Coal Project (Project), a 30 Mtpa open-pit thermal coal mine with a life-of-mine planned for 30 years and the potential for future development of underground reserves. The project is located in the Galilee Basin, 50km northwest of the township of Alpha, 160km west of Emerald and 250km east of Longreach, in central Queensland, Australia. Figure 1-1 shows the project location.

The TSF Geotechnical Investigation characterises the surface and subsurface geology and geotechnical conditions at the site of the TSF, as proposed in the EIS BFS, prepared in 2011. The investigation was carried out by URS between July and October, 2011.

This report is organised with an Executive Summary; an Introduction which gives a brief background of the investigation, states the objectives, describes the site, and summarises previous investigations; Geotechnical Investigation details the scope of the investigation and methodology; Geological and Geotechnical Characterisation describes the findings of the investigation; and Conclusions and Recommendations emphasise the implications of the findings and outlines the path forward. A map showing the location of the exploratory boreholes and test pits, a surface geology map, a soil thickness isopach map, a series of geologic sections and a permeability contour map; information from previous investigations; borehole and test pit logs and photographs; results of in situ testing; and laboratory test results are included as appendices to the report.

1 Introduction

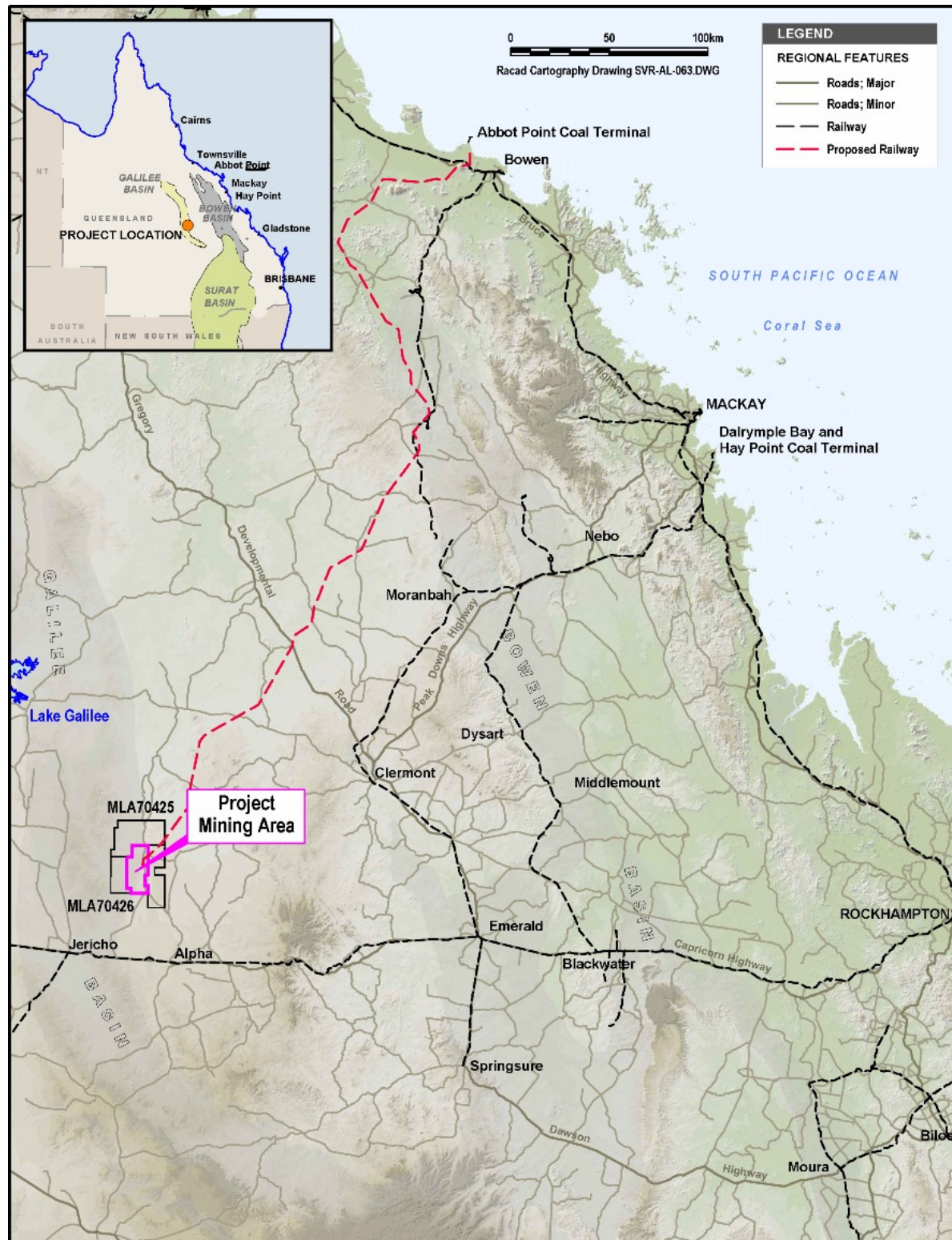


Figure 1-1 Project Location

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1.2 Background

In November 2010, Parson Brinckerhoff (PB) prepared a report entitled “*Alpha Coal Project Tailings Storage Facility - Location Options Report*” which identified the location of the out-of-pit TSF included in the BFS and EIS. In April 2011, PB prepared a report entitled “*Alpha Coal Tailings Storage Facility - Concept Design Report*”. During preparation of the SEIS, in order to satisfy the Queensland DERM that the proposed TSF site was suitable from a geotechnical perspective, an additional geotechnical investigation was requested to supplement previous findings.

1.3 Objective

The objective of the TSF geotechnical investigation was to determine if the assumptions regarding the geotechnical characteristics of the TSF included in the BFS and EIS render the site suitable for storing tailings safely, with minimal impact to the environment for the life-of-mine. Specific risks to be addressed are:

- Potential for tailings liquor to migrate through surface and/or near surface soils into Lagoon Creek
- Potential for tailings liquor to seep through the floor of the TSF and contaminate groundwater

1.4 Site Description

The site proposed for the TSF in the EIS and BFS covers an area of around 2,600ha, spanning approximately 10.5km (north to south) by 3.2km (east to west) at its greatest extent.

The proposed TSF is bounded to the west by Lagoon Creek, which runs parallel to and around 2.0km east of the site, and by a northerly trending, low ridge that also runs parallel to the TSF and defines the eastern site limits.

The site generally slopes very gently (around 1°) and drains from the eastern ridge crest at approximate elevation 380mAMD towards Lagoon Creek in the west, at approximately 310mAMD. Representative topography at the site is depicted in Plates 1-1 and 1-2.



Plate 1-1 Typical topographic relief across the western half of the TSF site.

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Plate 1-2 Greater vertical relief along the eastern TSF site boundary.

All creeks and drainage lines within the investigation area are ephemeral and predominantly poorly defined. They typically provide channels for westerly flowing runoff from the slightly elevated land to the east. Recognisable drainage lines typically fan out on encountering the more level land on the eastern flank of the Lagoon Creek flood plain. Runoff continues westward across the grassland either as sheet flow or in ill defined watercourses towards Lagoon Creek. Plates 1-3 and 1-4 show examples of drainage pathways observed across the site.



Plate 1-3 Typical poorly-defined east-west drainage channel.



Plate 1-4 Incised drainage channel, as observed along the eastern TSF site boundary.

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Plate 1-5 Typical eastern site vegetation, comprising low-lying shrubbery and moderately-dense woodland.



Plate 1-6 Typical western site vegetation, comprising tall grassland with patchy woodland.

The site is generally covered with light to moderately-dense vegetation, ranging from tall grass, to medium sized shrubs, to eucalyptus (iron bark and short bark) woodland, as shown in Plates 1-5 and 1-6. Some very dense vegetation was also encountered along sections of the eastern site boundary.

1.5 Previous Investigations

1.5.1 Historical Geological Investigations through 2009

Coal exploration began in the Galilee Basin with drilling by the Queensland Department of Mines in the early 1970s. Later that decade, BHP Limited drilled 148 coal exploration holes, but determined the resource was uneconomical because of the thickness of Tertiary overburden. 82 of these boreholes were located in the northern part of the Project area. Subsequently Shell (Aust) Pty Ltd and Western Mining Company Ltd drilled an additional 50 exploration boreholes in the area.

In 2008 HPPL commissioned topographic mapping using LiDAR technology which resulted in aerial photographic coverage of the site as well as the development of a digital terrain model (DTM). Also in that year historical geological and geophysical coal related data was compiled into an electronic data base (Golder 2008). This allowed the development of a geologic model for the Project that was utilised for the EIS and BFS.

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In 2008 HPPL initiated a drilling program of 153 holes totalling 15,729m to confirm and compliment the existing data. Subsequent to that in 2009 an additional 46 boreholes totalling 3,230m were drilled as part of a bridging study. Cross hole geophysics was carried out between 220 boreholes drilled in 2008 – 2009 for coal seam correlation. Laboratory analysis was also carried out on coal samples obtained from the 2008 – 2009 drilling programs.

To estimate the Project resource, geological data was compiled in Geological Database (GDB) in 2010.

1.5.2 2010 Geotechnical Investigation

Douglas Partners (DP) carried out a preliminary geotechnical investigation in 2010 and produced a report entitled *“Interim Report on Preliminary Geotechnical Investigation”*, 3 November 2010. The investigation was undertaken to provide information for ongoing feasibility studies for Project related infrastructure including the proposed area for the TSF contained in the EIS and BFS.

The investigation comprised drilling 15 boreholes, six hand augured bores and excavation of 58 test pits across the mine infrastructure area (MIA). Four of these boreholes, and 15 test pits were located in the area of the TSF. Holes were drilled by solid flight augers, washboring, and NMLC coring techniques to depths up to 27 m. Standard penetration tests (SPT) were conducted at 1.5 m intervals. Core was recovered in split inner tube, triple tube samplers. Standpipe piezometers were installed in each borehole upon completion. Falling head permeability tests were carried out in situ during the investigation. In addition, samples were collected from the drill holes and test pits, and subjected to laboratory testing. Boreholes and test pits were logged and photographed, and included in the report as well as the results of laboratory testing.

Borehole and test pit logs, results of falling head permeability tests, and laboratory test results from the DP 2010 investigation are include in Appendix B.

1.5.3 2011 Supplemental Geotechnical Investigation

A supplementary geotechnical investigation was carried out by DP between March and July 2011. The objective was to add to the level of information gained from the 2010 investigation, especially with regard to further delineating the extent of possible on-site borrow material sources, and assessing options to stabilise and improve the characteristics of subgrade and other borrow materials.

The investigation included the drilling of nine boreholes and the excavation of 32 test pits over the MIA, followed by laboratory testing. The investigation included six additional test pits excavated in the area of the TSF.

Test pit logs from this investigation in the area of the proposed TSF can also be found in Appendix B.

Geotechnical Investigation

2.1 General

The fieldwork phase of the geotechnical investigation was undertaken during the period of 17 July to 12 August, 2011. It comprised a site walkover assessment (including surficial geologic mapping), 52 machine excavated test pits, together with 14 exploratory boreholes, including in-situ testing. There was a provision for geophysical investigations within the scope of work but this was deemed to be unnecessary. Samples obtained in the field were transported to a National Association of Testing Authorities (NATA) registered laboratory and tested.

The investigation was carried out under the supervision of a senior URS Engineering Geologist who, in conjunction with URS field staff, nominated sampling and testing depths, and logged the recovered subsurface conditions. The descriptions of the boreholes were logged in general accordance with the "Australian Guidelines for Soil and Rock Descriptions" (AS1726).

In advance of the investigation, the locations of the exploratory boreholes and test pits were pegged, cultural heritage clearances were obtained, and access was pioneered by Salva Resources. Final coordinates and elevations of the boreholes and test pits were measured using hand held GPS equipment, accurate to approximately +/- 5m.

Borehole and test pit locations relative to the footprint of the TSF are shown on URS Drawing No. 42626683-GE001, as presented in Appendix A.

2.2 Site Walkover Assessment/Geologic Mapping

Prior to commencing the subsurface investigation, a walkover assessment was undertaken to evaluate the site. This included documenting and photographing notable surface features, prominent vegetation types, drainage pathways, and the exposed surface soils/rock across the site as well as at each exploratory test location. This assessment has been compiled as a surficial geologic map (URS Drawing No. 42626683-GE002) of the area to be covered by the proposed TSF, as presented in Appendix A.

2.3 Boreholes

2.3.1 General

A total of 14 exploratory boreholes were drilled during the investigation. All boreholes reached their target depths, with nine drilled to a depth of approximately 10.0m and five to a depth of around 20.0m (located along the western edge of the site). A summary of the locations, depths, and ground surface elevations for each borehole is presented in Table 2-1. The borehole logs and corresponding core photographs are included in Appendix C.

Table 2-1 Exploratory Borehole Summary

Borehole Location	GPS Coordinates		Collar Elevation (mAHD)	Depth (m)
	Northing	Easting		
BH-01	7429510	0451020	322	20.0
BH-02	7429351	0452227	329	10.0
BH-03	7429250	0453345	338	10.0

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Borehole Location	GPS Coordinates		Collar Elevation (mAHD)	Depth (m)
	Northing	Easting		
BH-04	7427970	0450695	321	20.0
BH-05	7427936	0451853	329	10.0
BH-06	7427953	0452859	338	12.0
BH-07	7425884	0450748	322	20.2
BH-08	7425936	0451854	331	10.0
BH-09	7426169	0452755	338	10.0
BH-10	7424122	0450696	323	20.0
BH-11	7424103	0451745	330	10.0
BH-12	7423924	0452644	339	10.0
BH-13	7422312	0450717	328	20.0
BH-14	7421310	0452120	340	10.0

The exploratory boreholes were advanced from the ground surface using a 120mm solid flight auger and mud rotary techniques, with in situ testing by Standard Penetration Test (SPT). When refusal with these methods was reached or as subsurface conditions allowed, NQ3 wireline coring was then adopted and water pressure (packer) testing carried out where possible. The drilling was performed by *TerraTest*, using a Drillcat Explorer 200 track-mounted rig. Following completion of the exploratory drilling, piezometers were installed in select borehole locations.

Soil samples and core recovered from the boreholes was logged, stored in boxes and photographed accordingly. Selected samples were then sent to a NATA registered laboratory for testing.

Holes were also augered through a section of the soil horizon adjacent to each of the exploratory borehole locations, for the purpose of conducting in situ soil permeability tests.

2.3.2 Soil Permeability Tests

Fourteen (14) in situ, falling head tests were carried out in 120mm diameter auger holes, drilled into the surficial soils adjacent to each respective exploratory borehole. Falling head tests were performed between the depths of 1.5m and 3.2m to assess the in situ permeability.

Following drilling, the holes were filled with water to the ground surface level and left to “soak” overnight. The following morning, the standing water level within the holes was measured prior to refilling, with the subsequent drop in water level then recorded at specific time intervals over a 4 hour period. While care was taken during the soaking process, due to the loose, granular nature of the near surface soils, inevitably some soil was displaced to the bottom of the test holes as water was introduced, resulting in the boreholes typically caving an additional 0.3m from the final augured depth. At the end of testing, boreholes were backfilled with drill cuttings and levelled.

2.3.3 SPT

SPTs were conducted at nominal 1.0m to 1.5m intervals in each exploratory borehole to assess the in situ soils resistance to dynamic penetration (strength).

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SPT comprises the measurement of the penetration resistance of the soil or rock to a 60kg hammer falling 760mm driving a 50mm diameter split sampler tube. The number of blows to drive an initial 150mm (for "seating" the apparatus into the testing stratum) is recorded, and similarly the number of blows required to drive the next two increments of 150mm is also recorded.

The number of blows required to drive the final 300mm following the seating is summed and recorded as the Raymond (or "N") number. In cases where the hammer is bouncing on the anvil, and where the resistance results in negligible penetration, or where the total number of blows per 150mm following "seating" reach 50, then "SPT refusal" is deemed to have occurred. While this is never intended to imply that rock has been encountered, based on the nature of the geology observed across the site and for the purpose of this report, the "SPT refusal" criteria has been adopted to establish the soil/rock interface.

2.3.4 Water Pressure (Packer) Testing

Water pressure (Packer) tests were conducted in seven of the 14 boreholes drilled within the footprint of the proposed TSF, to evaluate the in-situ hydraulic conductivity of the bedrock. These tests were performed in general accordance with the procedures for "Pressure Permeability Tests in Stable Rock", described in the Groundwater Manual (US Bureau of Reclamation, 1995). This data is needed in order to evaluate possible exfiltration rates of tailings liquor into the underlying bedrock and for liner design (if required). Packer tests were generally carried out within bedrock (cored section of the boreholes) over 3m intervals, and performed from the top down (as the boreholes were advanced), using a single packer arrangement.

Three-stage pressure tests were generally performed over each interval, conducted at 75%, and 100% of the baseline pressure, defined as 22.6kPa/m of depth from the ground surface to the centre of the test interval. The third stage was conducted at the same pressure as the first stage, following the test at 100% baseline pressure.

Packer tests were typically run for 5 minutes at each pressure step once the pressure stabilised. Water take, pressure data, borehole diameter, and testing intervals were used to calculate hydraulic conductivity values in both cm/sec (Zangar Pg. 48) and Lugeons (Houlsby) for each test. These water pressure tests allowed for interpretation of fracture changes during testing such as dilation, washout, and fracture filling.

Due to the limitations of testing at such shallow depths (i.e. very low pressures involved), the standard five-stage approach to testing each interval (conducted at 50%, 75%, and 100% of the baseline pressure) was not adopted during this investigation.

2.3.5 Monitoring Wells

Piezometers (monitoring wells) were installed in 11 of the 14 exploratory boreholes between the depths of 10.0m and 20.0m, to provide both groundwater level data and samples for groundwater testing. Piezometer installation was performed by *TerraTest* following borehole completion (drilling).

The monitoring wells were constructed using 50mm inside diameter polyvinyl chloride (PVC) pipe with 1mm factory slotted screens and an upright steel monument. Each flush jointed casing string had a threaded bottom cap. At the bottom of the piezometer, a 6.0m screen was installed. A sand pack consisting of clean wash sand was installed in the piezometer annulus at least 0.5m above the screened interval. A 0.5m thick bentonite seal was then installed above the sand pack filter. Above the

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bentonite seal, cement grout was installed in the annular space to approximately 0.3m below the ground surface. Following grouting, an above-grade, upright locking monument was installed to 0.7m above ground level (approximate height of riser), and concreted in place. The piezometer locations were surveyed using hand held GPS equipment.

2.4 Test Pits

Under the supervision of URS field staff, a total of 52 of the planned 55 test pits were carried out, using a tracked Hitachi 200LC excavator. The purpose of the test pits was to observe and record the various lithologies, determine the stratigraphic profile across the footprint of the proposed TSF, and to collect bulk soil samples for laboratory testing and subsequent engineering analyses. A summary of the locations, depths, and ground surface elevations for each test pit is presented in Table 2-2.

Table 2-2 Test Pit Summary

Test Pit Location	GPS Coordinates		Ground Elevation (mAHD)	Depth of Overburden (m)	Total Depth (m)
	Northing	Easting			
TP-01	7430598	0452197	341	3.8	3.9
TP-02	7430596	0452947	353	4.0	4.4
TP-03	7429845	0450696	322	1.8	2.5
TP-04	7429846	0451447	326	1.7	1.8
TP-05	7429846	0452945	339	2.6	2.9
TP-06	7429844	0453695	346	2.8	3.7
TP-07	7429095	0450695	321	1.5	1.6
TP-08	7429096	0451448	329	0.6	1.5
TP-09	7429097	0452195	334	0.5	0.8
TP-10	7429095	0452949	335	0.9	3.5
TP-11	7429137	0453695	344	1.0	2.1
TP-12	7428345	0450697	321	2.0	2.8
TP-13	7428343	0451449	327	1.1	1.6
TP-14	7428346	0452196	338	1.0	1.2
TP-15	7428346	0452947	344	1.4	1.7
TP-16	7428345	0453697	347	2.1	2.9
TP-17	7427597	0450697	321	2.5	3.1
TP-18	7427596	0451448	331	0.5	1.2
TP-19	7427597	0452196	335	0.6	1.0
TP-20	7427597	0452949	343	1.0	1.1
TP-21	7427596	0453694	356	1.7	1.9
TP-22	7426846	0450695	318	1.1	1.35
TP-23	7426846	0451446	330	1.5	1.75
TP-24	7426849	0452947	352	1.5	4.7
TP-26	7426095	0452944	342	1.2	2.2
TP-27	7426098	0453694	352	5.0	5.0
TP-28/1	7425345	0451444	321	1.5	2.3

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Test Pit Location	GPS Coordinates		Ground Elevation (mAHD)	Depth of Overburden (m)	Total Depth (m)
	Northing	Easting			
TP-28/2	7425349	0450697	328	0.6	3.5
TP-29	7425340	0452198	338	2.5	2.9
TP-30	7425346	0452946	350	1.8	2.3
TP-31	7425346	0453699	364	2.7	4.0
TP-32	7424596	0450697	322	1.5	3.8
TP-33	7424595	0452194	339	1.4	2.9
TP-34	7424595	0452949	350	1.2	2.2
TP-35	7424588	0453696	363	1.3	1.5
TP-37	7423846	0451450	329	2.7	2.9
TP-38	7423844	0452195	335	0.9	1.0
TP-39	7423845	0452946	342	1.2	2.4
TP-40	7423671	0453520	351	2.0	2.8
TP-41	7423096	0450699	323	1.8	2.8
TP-42	7423095	0451445	329	1.2	1.9
TP-43	7423094	0452195	337	0.8	1.0
TP-44	7423095	0452947	353	0.6	1.5
TP-45	7423100	0453459	361	1.7	1.7
TP-46	7422346	0452199	342	2.1	2.2
TP-47	7421599	0451446	335	2.1	2.3
TP-48	7421596	0452944	350	0.9	1.0
TP-50	7420845	0451445	336	1.2	1.4
TP-51	7420847	0452197	345	1.8	2.7
TP-52	7420848	0452948	349	1.6	2.4
TP-54	7420095	0452195	351	0.8	3.5
TP-55	7420095	0452944	362	1.0	1.2

A total of 102 soil samples were collected from the test pits during the investigation and transported to a NATA registered laboratory for testing. The exact depths where samples were collected were dependant on the soil/rock conditions encountered in each test location, which varied across the site. In general, samples were collected from near surface deposits and subsequently at successive major changes in lithology. Test pits were scheduled to be excavated to 5.0m or when “refusal” was attained. All excavations were terminated when either rock was encountered, or when subsurface conditions were too hard to penetrate with the machine-operated equipment. Test pits were excavated at approximate 750m centres.

A list of the samples collected is indicated on the test pit logs, which can be found in Appendix D, together with a selection of representative test pit photographs.

2.5 Laboratory Testing

A series of laboratory tests were carried out on select samples in order to determine pertinent physical and engineering properties of the soil and rock that underlie the site and that may be used during

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construction of the TSF. The results of these tests have been used to confirm previous findings and to provide quantitative data over the TSF footprint that can be used during engineering analyses and/or design.

A summary of the test results is presented in Section 3, with complete test results included in Appendix F. All testing was performed by a NATA registered laboratory, in accordance with AS1289 *"Methods of testing soils for engineering purposes"*. The general purpose of each test is summarized below:

2.5.1 Atterberg Limits Tests

The Atterberg limits are the primary form of classification for cohesive soils, helping to distinguish between silt and clay (and the various forms they may take). Depending on the water content of the soil, it may appear in one of four states (solid, semi-solid, plastic or liquid). In each state the consistency and behavior of a soil is different and thus so are its engineering properties, in particular its strength and settlement characteristics.

The liquid limit (LL) and plastic limit (PL) define the water content boundaries between non-plastic, plastic and viscous fluid states. Moreover, the LL is the water content (%) where a soil changes from plastic to liquid behavior, with the PL being the water content at which soil transitions between semi-solid (brittle) and plastic behavior. The plasticity index (PI) defines the complete range of the plastic state, defined as $PI = LL - PL$. In addition to these classifications, the shrinkage limit (SL) is occasionally used. The SL is the water content that defines where the soil volume will no longer reduce even if the moisture content is further lowered.

A total of 57 Atterberg Limit tests were performed as part of this investigation.

2.5.2 Particle Size Distribution Tests

Particle Size Distribution (PSD) Tests (dry sieving method and hydrometer) were carried out on 70 soil samples recovered during the TSF geotechnical investigation. The basic objective of grain size analysis is to determine the composition and distribution of particle sizes within the soils sampled, typically expressed as a percentage and plotted as a grading curve. Particle size is one of the most important physical characteristics of soils, and many engineering, geotechnical and hydrological properties of soils are related to/determined from it.

2.5.3 Emerson Dispersion Tests

Soil dispersion potential is the likelihood that soils will release a "cloud" of fine particles when brought into contact with water, which may remain suspended for an indefinite period of time. Accordingly, the Emerson Dispersion Test (a simple semi-quantitative dispersion test) is used to classify this potential, recorded as the Emerson Class number (EC1 through EC8), which considers soil consistency, depth, and in one case the presence of calcium-rich minerals. Testing was carried out on eight representative samples (i.e. - soils with suitable aggregates. Sands and gravels with little fines are unsuitable for this test). It should be noted that weathered parent rock can also show dispersive tendencies.

2.5.4 Standard Compaction Tests

Standard Compaction tests were undertaken in order to determine the relationship between the moisture content and dry density of the soils. Understanding how the soils at the site will behave

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when subjected to earthworks is crucial for a development of this size and nature, and furthermore, aids the contractor in the selection of appropriate machinery.

2.5.5 Effective Stress Triaxial Tests

The triaxial test is one of the most reliable methods available for determining shear strength parameters. Multi-stage, consolidated undrained (CU) triaxial testing is the most common of these and was undertaken on four remoulded soil samples collected during the investigation.

2.5.6 Constant Head Permeability Tests

The rate at which water flows through a soil media is an important aspect of soil mechanics, and is critical to evaluate when designing water-bearing structures. As part of this investigation, four constant head permeability tests were performed to give an indication of hydraulic conductivity and to compare with the in situ tests performed in the field.

2.5.7 Unconfined Compressive Strength Tests

Unconfined Compressive Strength (UCS) testing was undertaken on three select rock core samples (minimum Length:Diameter ratio of 2.5). The UCS test for rock is used to measure intact mechanical strength, whereby, a core sample is loaded axially between two platens of a compression testing machine. The stress value at failure is then defined as the uniaxial compressive strength of the specimen. It is important to note that due to the fractured and generally high weathered and low strength nature of the recovered core, not all test depths and locations could be sampled for UCS testing. For the purpose of this investigation, only the higher strength samples were selected.

Geological and Geotechnical Characterisation

3.1 Regional Geology

The Project is located at the eastern edge of the Galilee Basin which is a sequence of Late Carboniferous to Middle Triassic sedimentary rocks that overlie Late Devonian to Early Carboniferous sedimentary and volcanic rocks of the Drummond Basin. The rocks are exposed in a linear belt between the towns of Pentland in the north and Tambo to the south. Figure 3-1 shows the regional geology (BFS). A cross section through the sedimentary sequence is shown in Figure 3-2 (BFS).

The Galilee Basin rocks are similar in age to those of the Bowen Basin (i.e. Late Permian) and are exposed to the east of the Drummond Basin. The Bowen and Galilee basins are separated by a north-trending structural ridge between Anakie and Springsure that is referred to as the Springsure Shelf. Much of the western portion of the Galilee Basin occurs beneath Mesozoic sediments of the Eromanga Basin.

Late Permian, coal bearing strata of the Galilee Basin sub-crop along a linear, north trending belt in the central portion of the exposed section and dip 0.5° to 3° west. No major regional-scale fold and or fault structures are identified by regional mapping.

Quaternary sediments dominate the regional landscape, while Tertiary aged argillaceous sandstone, sandy mudstone and limestone and similarly aged basalt has been mapped within 20km of the Project site.

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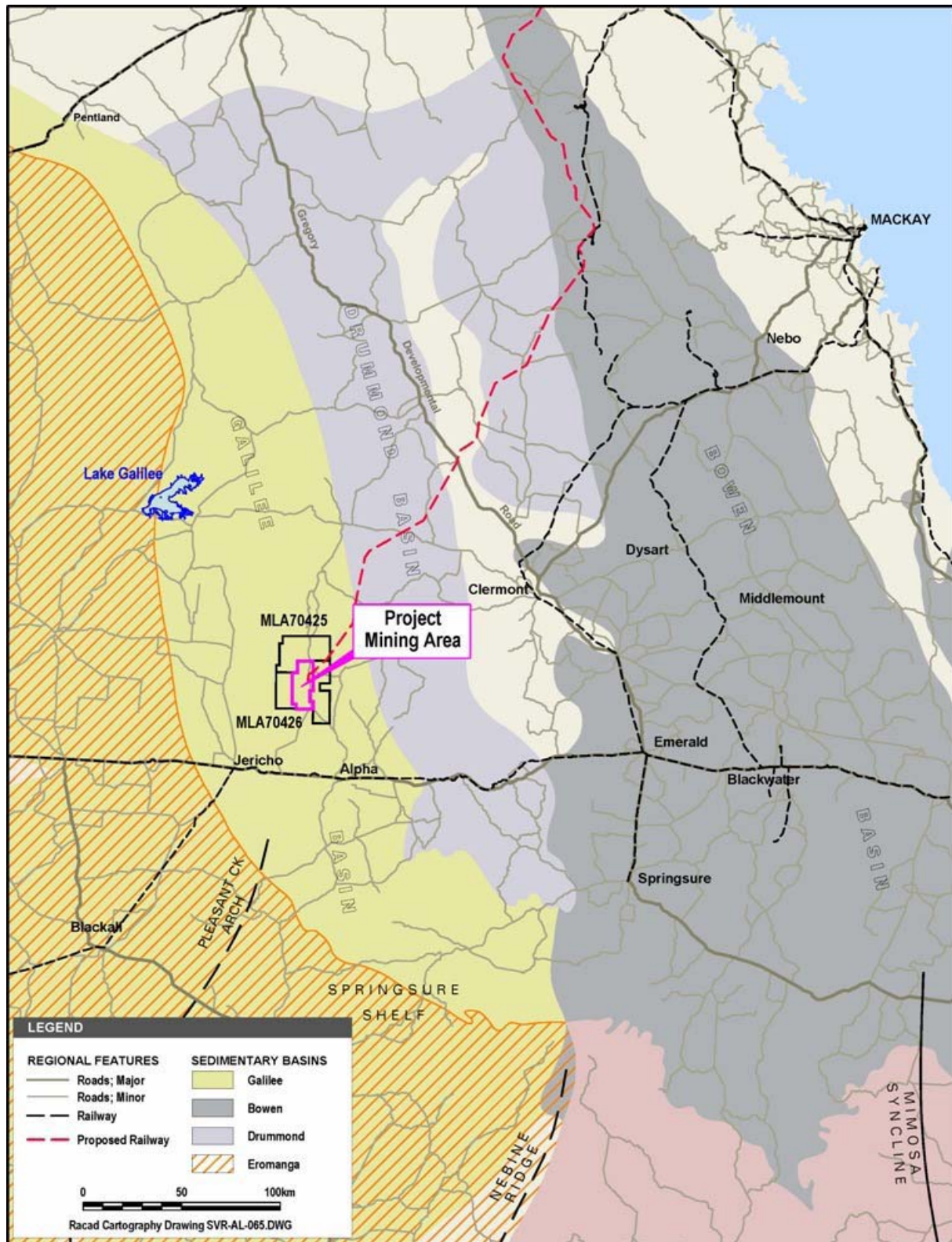


Figure 3-1 Regional Geologic Map (Figure 05-3 from BFS report)

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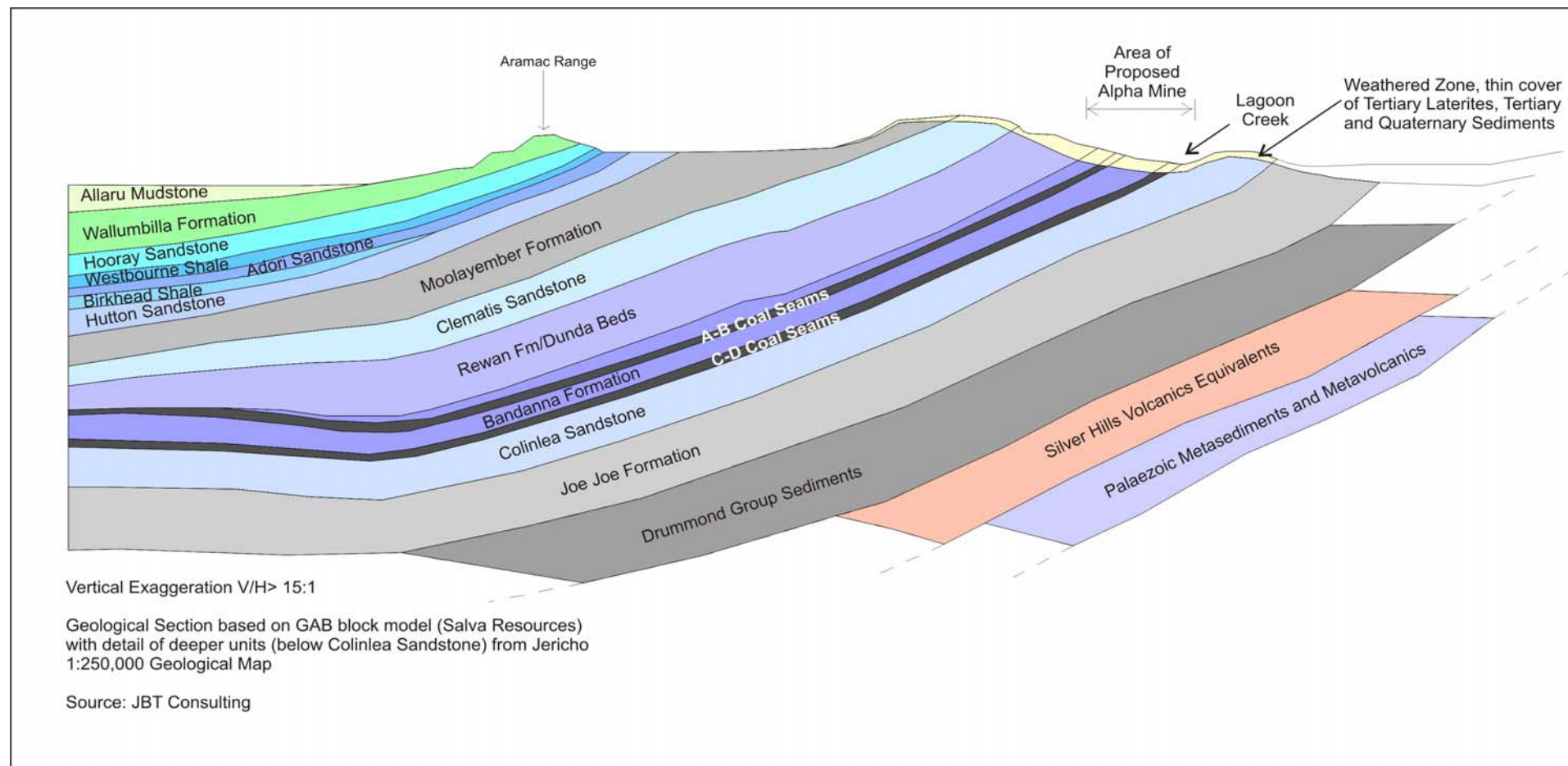


Figure 3-2 Regional Geology Cross Section (Figure 05-4 from BFS report)

3 Geological and Geotechnical Characterisation

3.2 Project Geology

In assessing the geology of the site, we have referred to the following geological maps and records:

- 1972 First Edition, Sheet SF-55-14, Jericho, "Australia 1:250,000 Geological Series", Bureau of Mineral Resources, Geology and Geophysics, Canberra, ACT, Australia.

Geology in the Project area is characterised by westerly dipping Permian age sediments overlain by Tertiary and Quaternary sediments. The Tertiary and Quaternary (ie. Cainozoic era) sediments vary from 20m to 60m thick over the site.

The unconsolidated Quaternary deposits comprise recent alluvial sand, silt and fine gravel. These sediments are thickest in Lagoon Creek, thinning to the east and west. The remainder of the Cainozoic stratigraphy comprises Tertiary sandy clays and minor ironstone lenses. This overburden is thickest in the central and eastern portions of the mining area up to 56m with an average thickness of about 22m. Potentially expansive and dispersive Kaolinite, montmorillonite (Al smectite) and nontronite (Fe smectite) clay minerals were identified in these deposits. Testing indicated that soils derived from claystone and mudstone are dispersive or potentially dispersive, whereas soils from the siltstone and sandstone are only slightly dispersive. It is thought that the majority of the overburden from these deposits can be managed as non-acid forming (NAF). However approximately 11% of spoil comprising stoney coal and mudstone may have the potential for acid generation and required special management strategies to prevent acid generation.

The Cainozoic sediments unconformably overlie the Bandanna Formation of Permian age. Drilling shows that the contact undulates. This has been interpreted as Tertiary sediments filling an ancient land surface that had been eroded into the Permian coal measures of the Bandanna Formation and underlying Colinslea Sandstone.

A geologic model was developed for the BFS based on 710 boreholes drilled to the west of Lagoon Creek but none in the area of the TSF. The model considered the base of the Tertiary age rocks to coincide with an extensive lateritic horizon of mottled (ie. re/white) clay paleosols which is present at the top of the Permian sediments. The Permian Bandanna Formation contains four economically viable coal seams. (A through D). Figure 3-3 depicts the Project stratigraphy.

No faulting has been identified in the Project area from the various investigations.

Minor, localised perched groundwater was recorded during exploration within the Cainozoic with confined aquifers in the coal measures. Static groundwater level in the mining area is at a depth of less than 10m.

3 Geological and Geotechnical Characterisation

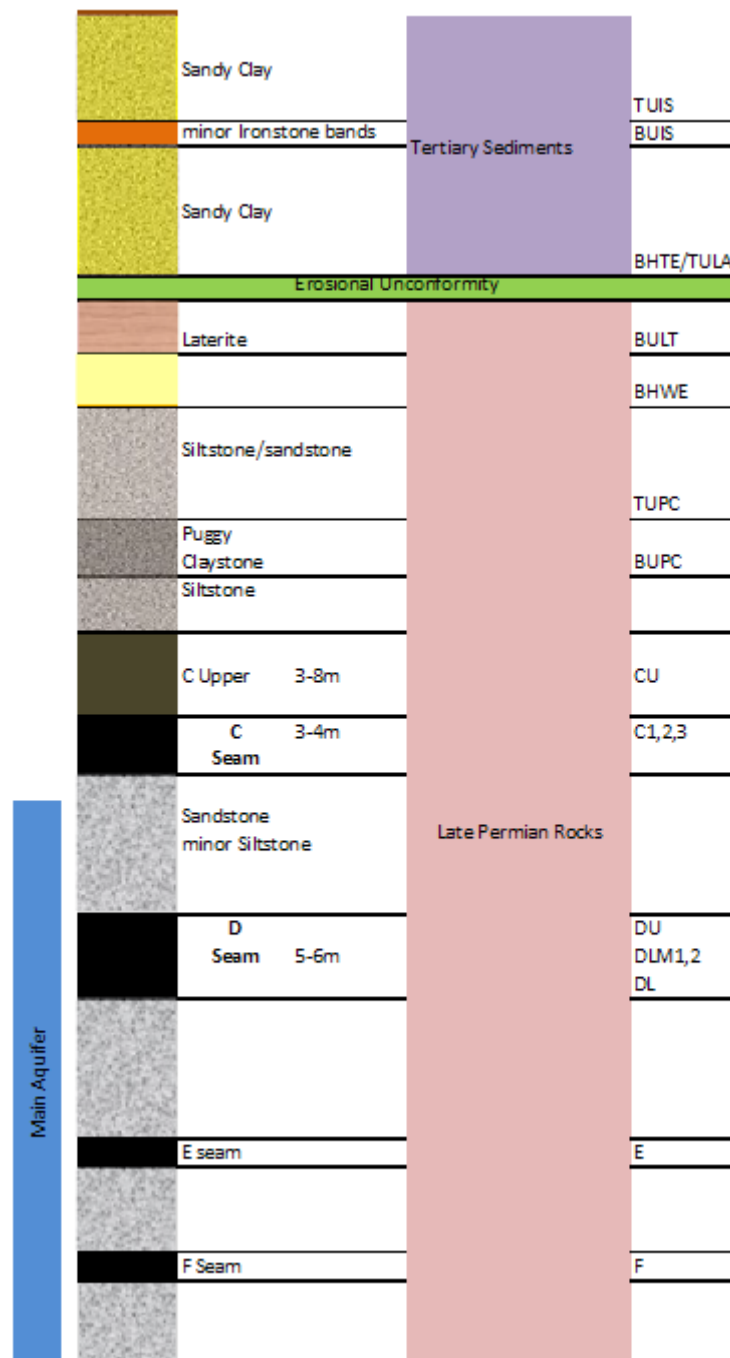


Figure 3-3 Figure 05-14 from BFS

3.3 Tailings Storage Facility Characterisation

Geological and Geotechnical Characterisation

This section of the report presents the geological and geotechnical conditions at the proposed TSF site, based on a review of previous investigations, together with the findings from the current investigation. An exploratory test location plan, geologic map of the site, borehole and test pit logs, core/test pit photographs, and laboratory results of the current investigation are presented in the appendices, as well as pertinent data from previous investigations referenced. This information should be read in conjunction with this Section.

Soil and Rock

Surficial geologic mapping, along with test pit and borehole subsurface investigations show the site to be typical of the published geology and consistent with previous investigations, being underlain by residual to weathered Colinlea Sandstone.

The sandstone bedrock is generally light grey to reddish brown, extremely low to medium strength, fine to medium grained, sometimes arkose, quartz-rich or oxidised, with thin inter-beds of siltstone and conglomerate. The rock mass is weathered to varying degrees, typically ranging from residual soil (over the majority of the site) to moderately weathered (MW) rock, where it is exposed as relatively resistant outcrops along the eastern ridge. Rock fabric is sometimes evident, ranging from crude, horizontal laminations to sub-horizontal (low angle), well defined thin bedding. The Colinlea Sandstone strikes approximately north-south and dips around 3° west.

Higher elevations on the east–west trending “rises” (perpendicular to the ridge) are generally oxidized reddish brown, whereas in the relatively lower elevation parallel “swales”, the ground surface was observed to be light grey to cream in colour. The Colinlea Sandstone is in some locations covered to a depth of up to 1.8m by Quaternary alluvial deposits, comprising silty, fine to medium grained sand with occasional gravel, derived from erosion of the underlying sandstone and conglomerate bedrock. However, due to the composition of the parent rock and apparent minimal transportation of these materials, differentiation between the alluvial and residual soils was not readily apparent. Topsoil cover across the site was thin (< 500mm), where observed in test pits.

The residual soil typically comprised dry to moist, light greyish brown to reddish brown silty/clayey sand or sandy silt/clay mixes, with varying degrees of gravel, occasionally cemented and typically dense to very dense. Residual soil was typically encountered within the upper 2.0m, to a maximum depth of approximately 6.5m. A review of the soil cover across the TSF footprint has been undertaken to produce a soil thickness isopach map, as presented in Appendix A (URS Drawing No. 42626683-GE003).

Geologic Sections A-A' through H-H' (URS Drawing No's 42626683-GE004 to 42626683-GE07) present the subsurface conditions encountered across the site during the URS investigation and are included in Appendix A.

Soil Permeability Tests

In-situ falling head tests conducted during the investigation indicate that the soils at the site have low permeability, ranging from 2.3×10^{-7} m/s to 7.3×10^{-9} m/s. These results are consistent with the six falling head permeability tests performed by DP in the area of the TSF, which showed permeability's in the order of 1.5×10^{-7} m/s to 7.6×10^{-8} m/s. URS Drawing No. 42626683-GE08 presents a permeability contour map of the site (included in Appendix A), with complete URS test results presented in Appendix C and summarised in Table 3-1. Figures 3-4 and 3-5 present the falling head permeability results with respect to test depth and soil density (SPT N value).

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Table 3-1 Falling Head Permeability Test Summary

Test Location	Depth of Test (m)	Soil Description	Permeability (m/sec)
BH01A	GL - 2.7	Silty/Clayey Sand	5.6×10^{-8}
BH02A	GL - 3.0	Sandy Silt/Clayey Sand	7.3×10^{-9}
BH03A	GL - 3.0	Sand/Silt	1.1×10^{-8}
BH04A	GL - 2.9	Silty/Clayey Sand	1.3×10^{-7}
BH05A	GL - 2.3	Sand/Clay	1.2×10^{-7}
BH06A	GL - 3.0	Silt/Sand	2.3×10^{-7}
BH07A	GL - 3.0	Sand/Clay	3.7×10^{-8}
BH08A	GL - 1.5	Silt/Clay	1.2×10^{-8}
BH09A	GL - 3.0	Silt/Clayey Sand	4.3×10^{-8}
BH10A	GL - 2.7	Clay/Silty Sand	2.9×10^{-8}
BH11A	GL - 1.5	Silty Sand	1.9×10^{-7}
BH12A	GL - 1.8	Sandy Silt/Sandy Clay	1.4×10^{-7}
BH13A	GL - 3.2	Sand/Clay	8.6×10^{-8}
BH14A	GL - 3.2	Sand/Clayey Silt	1.4×10^{-7}

GL – Ground Level

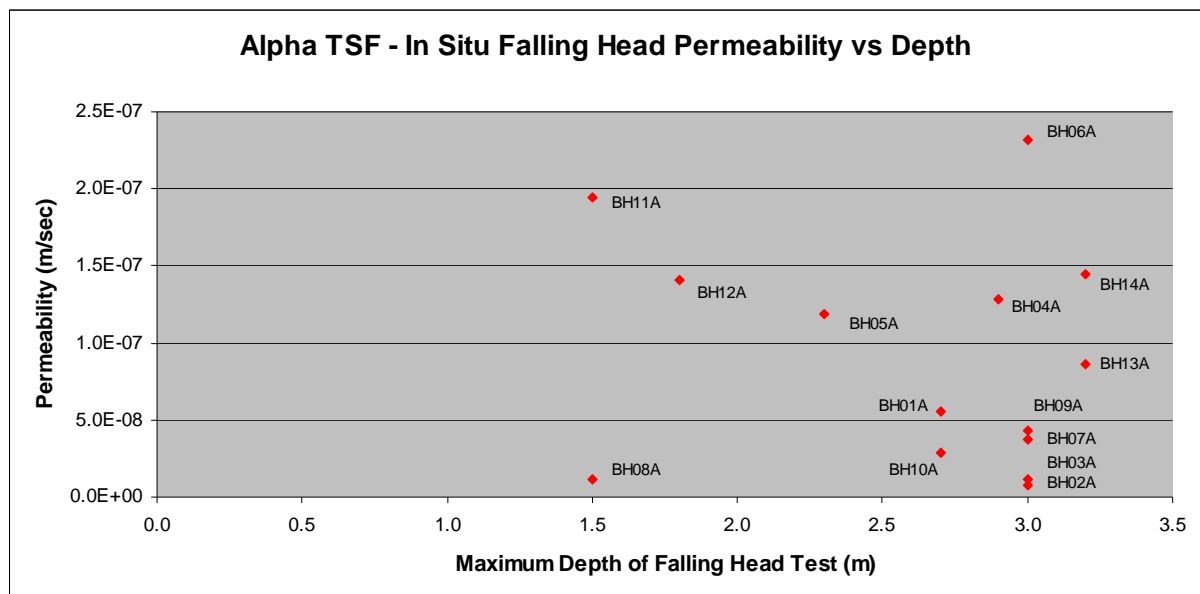


Figure 3-4 In situ Falling Head Permeability Correlation with Depth

3 Geological and Geotechnical Characterisation

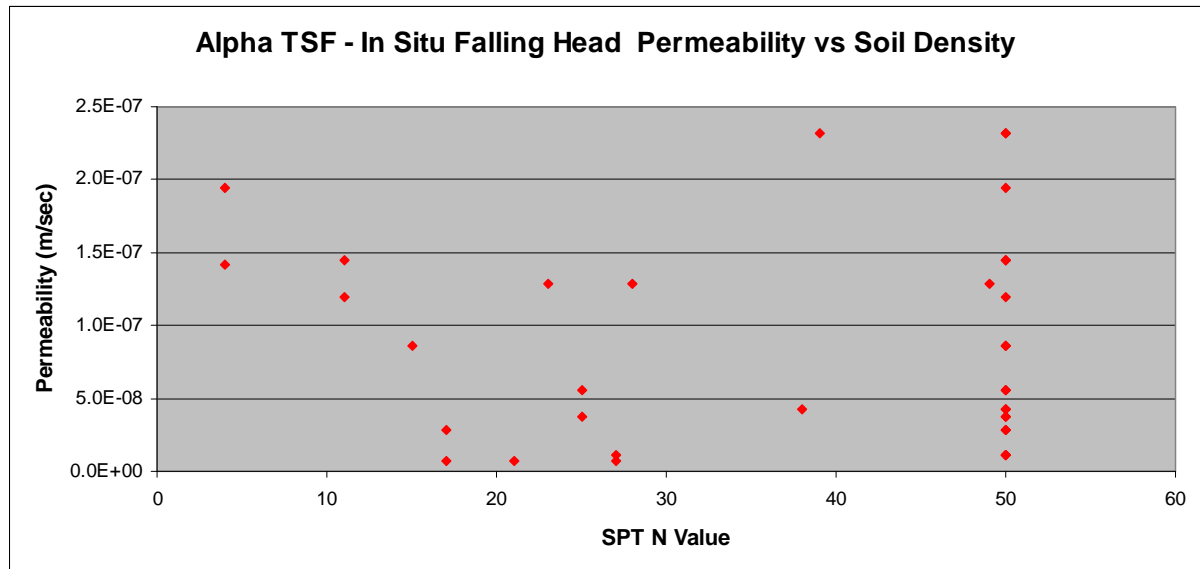


Figure 3-5 In situ Falling Head Permeability Correlation with Soil Density

SPT

SPTs were carried out in the exploratory boreholes, with "N" values ranging from 4 to 50+. The "N" values indicate that the subsurface conditions encountered across the site generally show high resistance to dynamic penetration, resulting in "SPT refusal" in all boreholes (with the exception of BH12), and commonly first recorded at depths of around 2.0m. The SPT results are indicated on the exploratory boreholes logs and have been summarised in Table 3-2.

Table 3-2 Standard Penetration Testing Summary

Borehole Location	Minimum "N" Value	Maximum "N" Value	Minimum "SPT Refusal" Depth (m)
BH-01	22	50+	3.0
BH-02	17	50+	6.0
BH-03	27	50+	2.0
BH-04	23	50+	4.5
BH-05	11	50+	2.0
BH-06	39	50+	2.0
BH-07	25	50+	2.0
BH-08	NR	50+	1.0
BH-09	35	50+	2.0
BH-10	17	50+	2.0
BH-11	4	50+	2.0
BH-12	4	4	NA
BH-13	15	50+	2.0
BH-14	11	50+	2.0

3 Geological and Geotechnical Characterisation

Water Pressure (Packer) Tests

Packer tests performed during the investigation indicate the Colinlea Sandstone bedrock has low hydraulic conductivity, with no “Lugeon take” recorded during the 12 test intervals, inferred to be a result of the lack of well developed discontinuities (degree of weathering) and possible swelling of the in situ soil/rock. Depths where packer tests were performed ranged from 4.0m to 20.2m. A summary of the water pressure testing is shown in Table 3-3, with full results presented in Appendix C, including the details for each pressure stage.

Table 3-3 Water Pressure (Packer) Test Summary

Borehole Location	Test Interval Depth (m)	Hydraulic Conductivity (Lugeons)
BH04	13.0 – 16.0	0
BH05	7.0 – 10.0	0
BH06	9.0 – 12.0	0
BH07	9.2 – 12.2	0
	12.2 – 15.2	0
	15.2 – 18.2	0
	18.2 – 20.2	0
BH08	4.0 – 7.0	0
BH11	4.0 – 7.0	0
	7.0 – 10.0	0
BH12	4.0 – 7.0	0
	7.0 – 10.0	0

Groundwater

With the exception of BH03, BH09 and BH13 (which were exclusively augered), groundwater levels within the exploratory boreholes were unable to be accurately measured at the time of drilling, due to the methodology involved (i.e. the addition of water). However, as previously detailed, piezometers were installed within 11 of the 14 boreholes following drilling, and subsequently monitored over the duration of the fieldwork phase to allow elevated levels to normalise and to assess the influence of heavy rainfall events on groundwater levels, if any. Groundwater was not encountered during the drilling of boreholes BH03, BH09 and BH13. Table 3-4 summarises the groundwater levels measured in the piezometers during the final day of fieldwork (12 August, 2011) and one month following (13 September, 2011).

Table 3-4 Groundwater Summary

Borehole Location	Date Installed	Piezometer Depth (m)	Groundwater Depth (m)	
			12/08/11	13/09/11
BH01	21/07/2011	20.0	>20.0	>20.0
BH02	22/07/2011	10.0	>10.0	>10.0
BH03	23/07/2011	10.0	>10.0	>10.0
BH04	10/08/2011	17.5	15.0	>20.0
BH05	26/07/2011	10.0	7.0	>10.0

3 Geological and Geotechnical Characterisation

Borehole Location	Date Installed	Piezometer Depth (m)	Groundwater Depth (m)	
			12/08/11	13/09/11
BH07	04/08/2011	20.0	19.2	>20.0
BH09	25/07/2011	10.0	>10.0	>10.0
BH10	09/08/2011	20.0	17.1	>20.0
BH11	30/07/2011	10.0	>10.0	>10.0
BH13	02/08/2011	20.0	14.0	>20.0
BH14	31/07/2011	10.0	>10.0	>10.0

The monitoring results indicate that groundwater levels across the site are at least 10.0m below the existing ground surface, and likely at a depth greater than 20.0m, as evidenced by the five “dry” 20.0m piezometers and measured levels in surrounding wells from previous investigations.

Groundwater was not encountered within the excavated test pits, with the exception of TP46 (2.1m) and TP34 (1.2m) where groundwater “ponding” was observed at the soil/rock interface, inferred to be a localised perched water table.

It is important to note, however, that groundwater levels and flows are transient, and are affected by such factors as soil and rock permeability, earth moving operations and preceding climatic conditions.

Laboratory Test Results

The laboratory test results indicate that the soils encountered in the upper 2.0m at the site are generally granular in nature, with typically in excess of 25% fines (silt and clay). Residual soils derived from partial to complete weathering of the underlying rock generally indicate a more cohesive nature, with fines in the order of 45 to 55%. The soils are predominantly of low plasticity, low permeability and non-dispersive in their behaviour. Laboratory tests performed on select rock core (refer Section 2.5.7) indicates the sandstone is of low to medium strength. Tables 3-5 to 3-7 summarize the test results.

3 Geological and Geotechnical Characterisation

Table 3-5 Laboratory Test Summary – Test Pits A (MC, Atterberg Limits, % Fines, Emerson Class, Standard Compaction)

Test Pit - Sample	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Fines (%)	Soil Particle Density (t/m ³)	Emerson Class	Maximum Dry Density (t/m ³)	Optimum Moisture Content (%)
TP01-03	3.0	9.3	31	18	13	5.0*	23				
TP01-04	3.4	9.8					38				
TP03-02	1.0	11.4	43	16	27	9.5+	55	2.63	2	1.80	14.5
TP04-01	0.3	8.8	21	11	10	3.0*	37	2.65	5	2.05	9.0
TP05-01	0.6	7.8	15	12	3	0.5	36	2.66			
TP05-02	1.7	12.2	29	13	16	6.0*	41	2.67	5		
TP05-03	2.8	10.1					19				
TP08-02	0.9	11.5					9				
TP09-02	0.7	10.3					61				
TP10-01	0.6	4.2					35				
TP10-03	2.0	11.7					10				
TP12-02	1.2	11.0	23	12	11	6.0+	53	2.67	1	1.94	10.5
TP13-01	0.4	3.8					29				
TP14-01	0.3	4.5					29				
TP15-01	0.6	7.7					50		5	1.91	11.5
TP19-02	0.9	7.2	27	18	9	2.5*	12				
TP23-01	0.5	6.7					29				
TP23-02	1.3	11.3	39	12	27	7.5+		2.60			
TP24-01	0.7	5.0	24	13	11	3.5*	28				

NO – not obtainable; + curling occurred; * crumbling occurred

3 Geological and Geotechnical Characterisation

Test Pit - Sample	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Fines (%)	Soil Particle Density (t/m ³)	Emerson Class	Maximum Dry Density (t/m ³)	Optimum Moisture Content (%)
TP24-02	2.5	11.7	29	14	15	7.0	43		5	1.86	14.0
TP26-02	0.9	10.0	31	11	20	5.5+	55	2.62			
TP28-02	1.2	11.6					41				
TP28/2-02	2.0	12.3	35	13	22	7.5+	42	2.62			
TP29-01	0.4	5.4	NO	NO	Non Plastic	NO	25		5	1.97	8.5
TP30-02	1.2	8.0					13				
TP33-02	1.3	9.4					7		2		
TP34-03	1.5	10.7					22				
TP37-01	0.4	3.1					40				
TP39-02	1.3	8.3					45				
TP41-02	2.2	17.0					41				
TP43-01	0.6	8.2					38				
TP46-02	1.7	16.9	22	15	7	3.0*	32	2.68			
TP47-02	1.6	12.4	25	10	15	4.5	45	2.65			
TP51-02	1.3	8.3	23	11	12	6.0	40	2.63			

NO – not obtainable; + curling occurred; * crumbling occurred

3 Geological and Geotechnical Characterisation

Table 3-6 Laboratory Test Summary – Test Pits B (Triaxial Testing)

Test Pit - Sample	Depth (m)	Effective Cohesion c' (kPa)	Effective Angle of Friction Ø (°)	Permeability (m/sec)
TP04-01	0.3	8.8	34.7	8×10^{-10}
TP05-02	1.7	12.6	29.1	4×10^{-10}
TP12-02	1.2	3.8	29.4	2×10^{-10}
TP24-02	2.5	11.2	32.1	3×10^{-9}

Table 3-7 Laboratory Test Summary – Exploratory Boreholes (MC, Atterberg Limits, % Fines, UCS)

Borehole - Sample	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Fines (%)	Soil Particle Density (t/m ³)	UCS (MPa)
BH01-01	1.0	5.7	18	10	8	2.0*	54		
BH01-04	6.4	23.8	90	20	70	12.5*+	60		
BH01-06	8.5	10.4	17	10	7	2.5*	42		
BH01-08	10.5	10.6	20	13	7	2.5*	52		
BH01-10	12.5	12.1					59	2.70	
BH01-11	13.5	11.9	18	12	6	4.0	54		
BH01-12	14.5	12.3	20	-	-	3.5			
BH01-13	15.5	12.0	19	13	6	3.0*	56		
BH02-02	2.0	8.1	20	12	8	1.0*	31		
BH02-04	4.0	11.5	21	-	-	1.5			
BH02-05	5.0	8.1	25	13	12	3.0+	23		
BH02-07	7.0	18.6	32	22	10	6.0	55		
BH03-05	5.0	9.0	20	11	9	3.0*	48		

3 Geological and Geotechnical Characterisation

Borehole - Sample	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Fines (%)	Soil Particle Density (t/m ³)	UCS (MPa)
BH03-06	6.0	6.6	45	-	-	7.5			
BH03-07	7.0	25.6	121	25	96	17.0*+	90		
BH04-01	1.0	10.2	31	13	18	8.0+	58		
BH04-02	2.0	7.9	19	12	7	3.0*	35		
BH04-05	6.0	14.6	30	20	10	5.5	59		
BH04-09	19.0	16.6	33	23	10	6.5	95		
BH04-Run 1									15.8
BH05-01	1.0	12.4	25	12	13	5.5	46		
BH06-03	3.0	9.0	24	13	11	4.0*	32		
BH06-04	4.0	14.8	25	14	11	4.0*			
BH06-05	5.0	11.1	24	17	7	3.0*	48		
BH07-01	1.0	5.3	22	10	12	5.5	49		
BH07-05	6.0	8.4	31	13	18	8.0	26		
BH07-Run 4									4.8
BH07-Run 4									5.2
BH08-01	1.0	10.4	26	13	13	5.5+	51		
BH09-04	4.0	4.3	23	15	8		46		
BH09-07	7.0	7.2	24	13	11	2.5*			
BH09-08	8.0	6.7	22	11	11	2.0*	37		
BH10-01	1.0	13.5	43	16	27	11.5+	63		
BH10-06	7.5	10.2	23	13	10	4.5	43		
BH10-08	10.5	21.2	46	17	29	7.0+	51		
BH10-10	13.5	13.7	31	14	17	8.0			
BH10-12	16.5	10.1					47	2.65	

3 Geological and Geotechnical Characterisation

Borehole - Sample	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Fines (%)	Soil Particle Density (t/m ³)	UCS (MPa)
BH10-14	19.5	14.6	22	12	10	3.5*	33		
BH11-01	1.0	10.2	20	15	5	1.5*	16		
BH12-01	1.0	12.6	32	13	19	7.0*	46		
BH13-01	1.0	10.0	40	12	28	11.0	51		
BH13-05	6.0	10.9	35	16	19	10.0	55		
BH13-14	19.5	14.8	31	17	14	6.0	56		
BH14-03	3.0	5.9	16	11	5	1.0*	35		
BH14-05	6.0	22.3	15	-	-	1.5			
BH14-07	9.0	16	12	4	1.5	7.9	34		

Conclusions and Recommendations

Based on the results of this investigation and a review of data previously collected, the TSF site is considered suitable for storing tailings as proposed in the EIS and BFS. This conclusion assumes that the TSF will be designed based on good engineering practice and constructed accordingly. Following are the conclusions and recommendations from the investigation.

4.1 Surface Water Contamination

It is considered highly unlikely that well-developed Lagoon Creek palaeochannels or extensive former drainage pathways are present beneath the proposed TSF footprint. Slight horizontal migration of tailings liquor through surficial alluvial or low density residual soils (if any) can be expected during the life-of-mine, however, the construction of an engineered cutoff trench that intercepts the soil/weathered rock interface (where liquor may accumulate over time) would mitigate the risk of contamination into Lagoon Creek to acceptable levels.

4.2 Groundwater Contamination

Due to the low groundwater level and low hydraulic conductivity measured during in situ falling head and packer testing, the residual soil and weathered sandstone in the floor of the TSF footprint appears to be sufficiently impermeable to limit significant vertical migration of tailings liquor into the groundwater table. Given the relatively low permeability of these materials, it is expected that the TSF can be designed to mitigate adverse impacts to the regional groundwater system. To the extent prudent engineering and best practice are adopted during design and construction, no adverse effect to groundwater quality is expected. Therefore, there is no need for an impermeable blanket/liner, as proposed in the BFS report. As such, it is recommended that the low permeability blanket/liner proposed in the BFS report be substituted by moisture conditioning and proof rolling the soils in the floor of the TSF prior to tailings storage.

At the time of construction, it is recommended that a groundwater monitoring program comprising a series of piezometers be established to regularly assess the groundwater depth and quality around the perimeter of the proposed TSF.

4.3 Embankment Foundation

The soils and weathered rock in the area of the proposed TSF should provide a suitable strength, low permeability foundation to support the proposed TSF embankments. Consolidation of foundation material is not anticipated.

4.4 Construction Materials

The upper 1.0m to 3.0m of silty/clayey sand and/or sandy silt/clay that occurs over most of the TSF footprint should be an excellent borrow material for construction of the proposed TSF embankments and haul roads, based on the low plasticity and generally non-dispersive characteristics of the soils.

The soils tested indicate that the addition of water may be required in order to achieve optimum compaction.

It may be possible to wash sand adjacent to Lagoon Creek and in other drainages in the surrounding area to produce sand for filters.

4 Conclusions and Recommendations

Crushing and processing of basalt from a potential quarry (Surbiton Quarry) located approximately 20km northeast of the site is expected to produce sand and gravel for filters and drains, as well as slope protection.

Should a clay liner be considered a requirement to lower the risk of vertical tailings liquor migration into the underlying soil, rock and groundwater, it is anticipated that the clayey materials required for construction would be sourced from the mine pre-strip area west of Lagoon Creek.

4.5 Construction Considerations

Excavation of the surface material to a depth of about 3.0m for TSF embankment construction can be effected with conventional earthmoving equipment such as scrapers, and hydraulic excavators. Particular care should be taken during periods of heavy or extensive precipitation, as the soils in this region are noted as becoming difficult to work and traffic in.

Compaction of the final exposed subgrade within the footprint of the TSF storage area is recommended and would be expected to further mitigate downward migration of tailings liquor.

References

- “Alpha coal Project Bankable Feasibility Study”, Hancock Coal Pty Ltd, 2011.
- “Alpha Coal Project Tailings Storage Facility – Location Options Report”, Parsons Brinckerhoff, November 2010.
- “Alpha Coal Project Tailings Storage Facility – Concept Design Report”, Parsons Brinckerhoff, April 2011.
- Bankable Feasibility Study (BFS), Section 05 – Geology, Hancock Coal, 2011.
- Houlby, A.C., 1976. Routine Interpretation of the Lugeon Water-Test, Quarterly Journal of Engineering Geology, Vol. 9, pp. 303-313.
- “Interim Report on Preliminary Geotechnical Investigation”, Douglas Partners, 3 November 2010.
- Potential Surbiton South Quarry, Alpha to Clermont Rd. via Alpha – Preliminary Investigation Report, 13 October 2008.
- Zangar, Carl N. 1953, *Theory And Problems Of Water Percolation*, United States Department of the Interior, Bureau Of Reclamation, Denver, Colorado, April 1953.

Limitations

6.1 Geotechnical & Hydro Geological Report

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Hancock Coal and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 17 June 2011.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 15 August 2011 and 14 October 2011 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

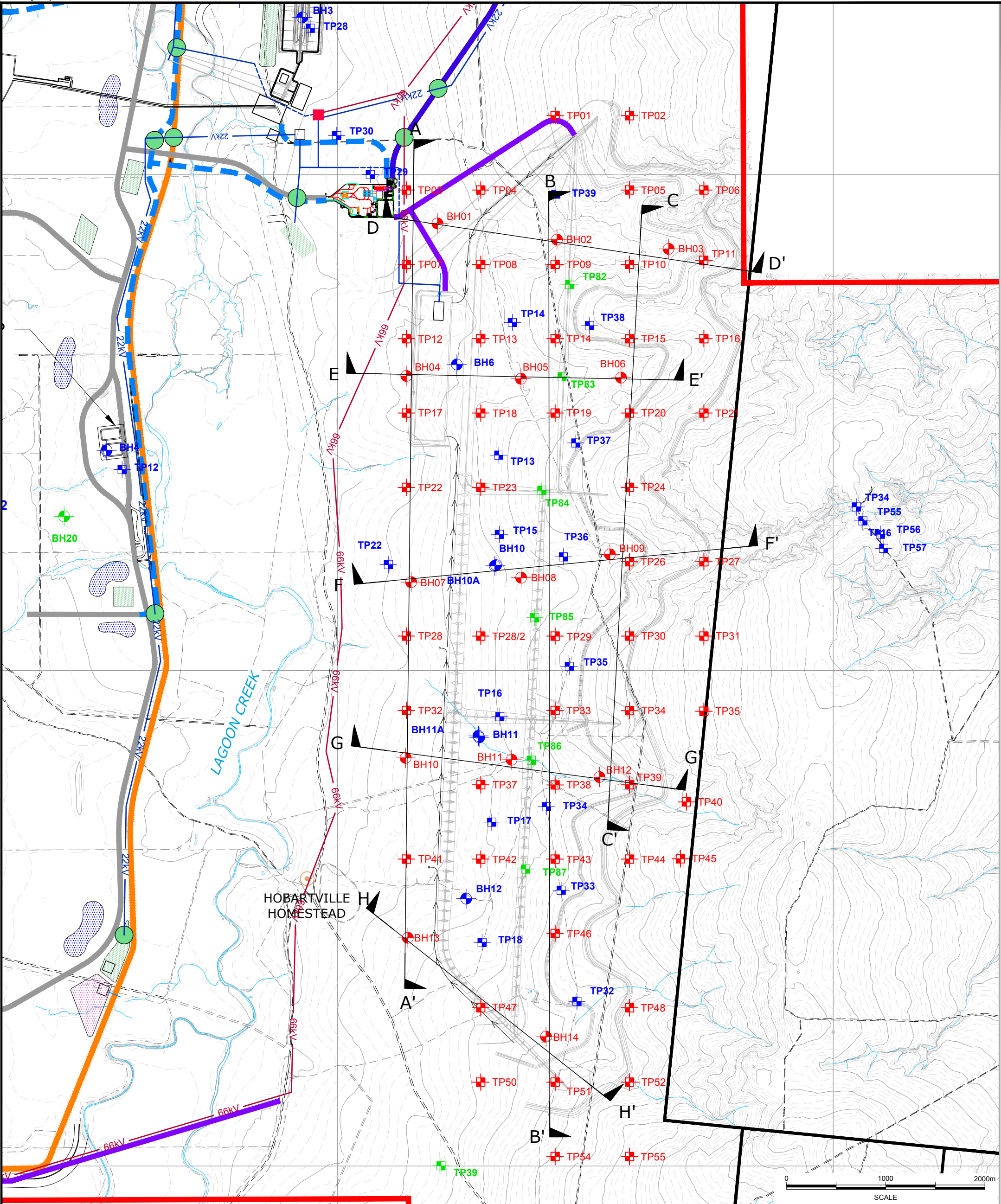
This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

This report contains information obtained by inspection, sampling, testing or other means of investigation. This information is directly relevant only to the points in the ground where they were obtained at the time of the assessment. The borehole logs indicate the inferred ground conditions only at the specific locations tested. The precision with which conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of conditions as constrained by the project budget limitations. The behaviour of groundwater and some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report and our experience. Future advances in regard to the understanding of chemicals and their behaviour, and changes in regulations affecting their management, could impact on our conclusions and recommendations regarding their potential presence on this site.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, URS must be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time. Therefore this document and the information contained herein should only be regarded as valid at the time of the investigation unless otherwise explicitly stated in this report.

Appendix A Drawings



NOTES:

1. GEOLOGICAL SECTIONS A-A' TO H-H' ARE PRESENTED ON URS DRAWING No's 42626683-GE004 TO 42626683-GE007

Source: Parsons Brinckerhoff Dwg No. HC-PBA-50000-SKI-0500 (Rev P - 17/03/2011)

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KEY:

A A' GEOLOGIC SECTION

TP86 Existing Test Pit Location (DP June/July 2010)

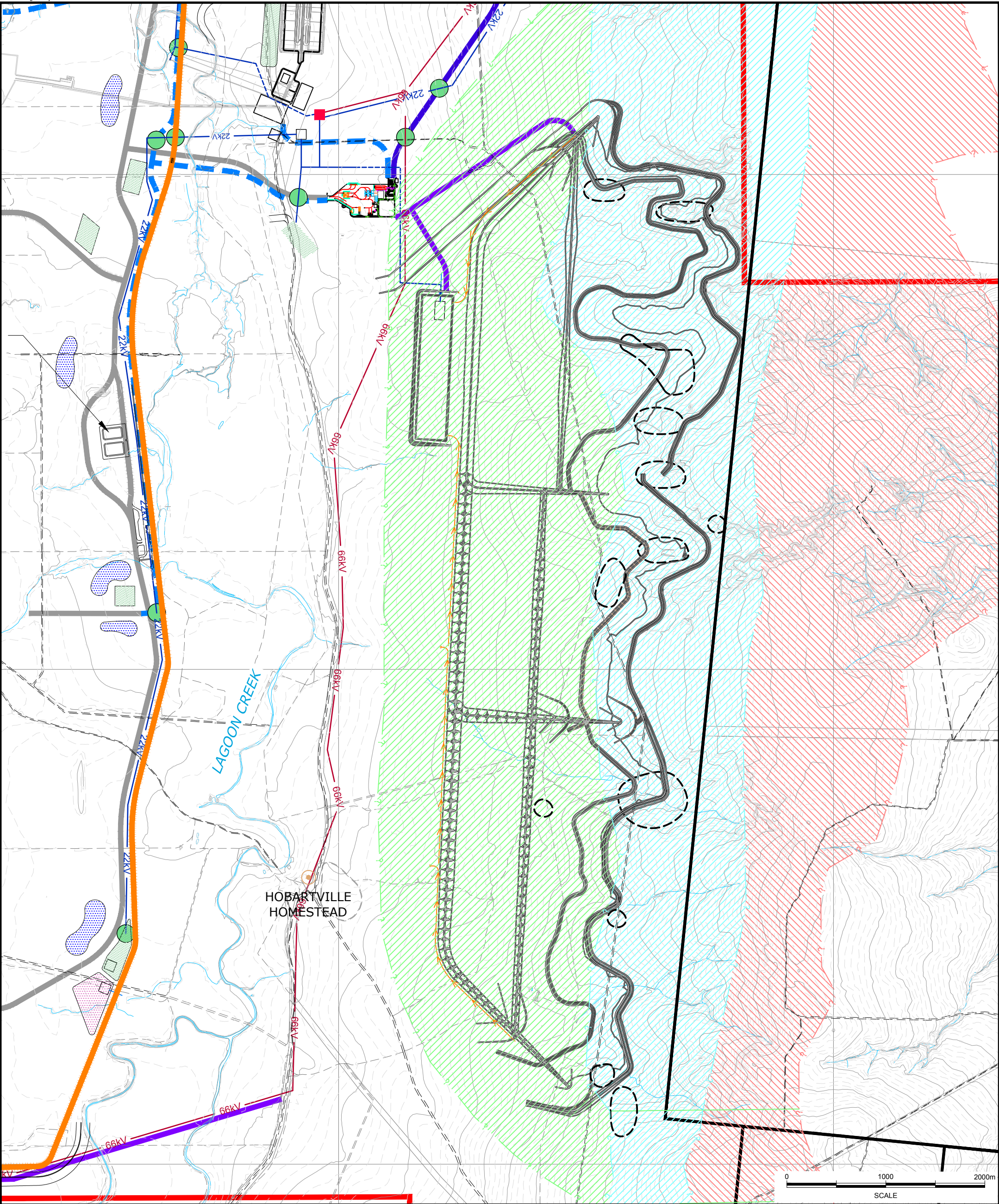
BH11 Existing Borehole Location (DP June/July 2010)

TP34 Existing Test Pit Location (DP March/May 2011)

BH20 Existing Borehole Location (DP March/May 2011)

TP01 Approximate Test Pit Location (URS July/Aug 2011)

BH01 Approximate Exploratory Borehole Location (URS July/Aug 2011)



NOTES:

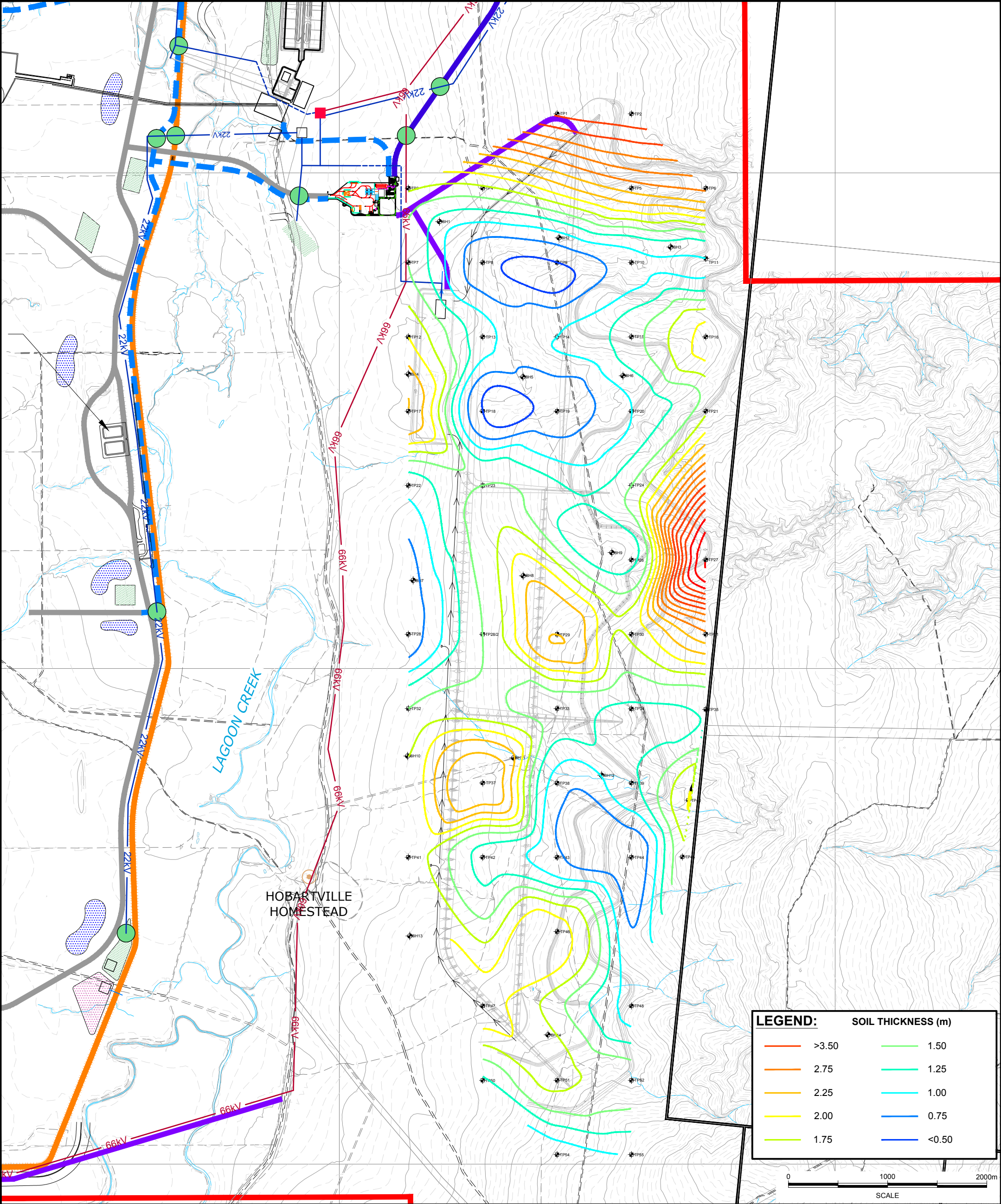
1. THIS IS OUR INTERPRETATION OF THE EXISTING SURFACE GEOLOGY

Source: Parsons Brinckerhoff Dwg No. HC-PBA-50000-SKI-0500 (Rev P - 17/03/2011)

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KEY:

- Approximate location of Colinlea Sandstone outcrops as observed during fieldwork
- Residual Colinlea Sandstone with up to 1.8m of alluvial soil cover as observed during fieldwork
- Inferred general limits of Jo Joe Formation rock outcrops
- Inferred general limits of Colinlea Sandstone rock outcrops



NOTES :

1. SOIL THICKNESS IS BASED ON SUBSURFACE CONDITIONS ENCOUNTERED DURING TEST PIT EXCAVATION

Source: Parsons Brinckerhoff Dwg No. HC-PBA-50000-SKI-0500 (Rev P - 17/03/2011)

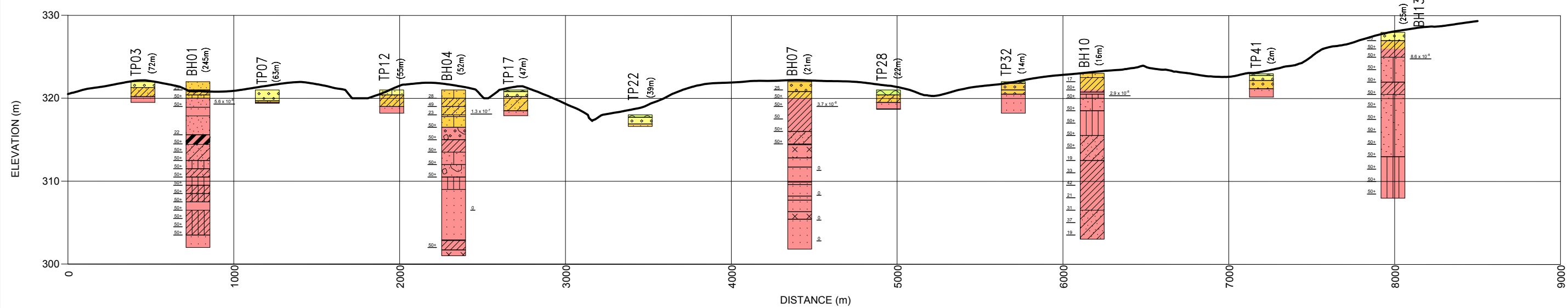
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KEY :

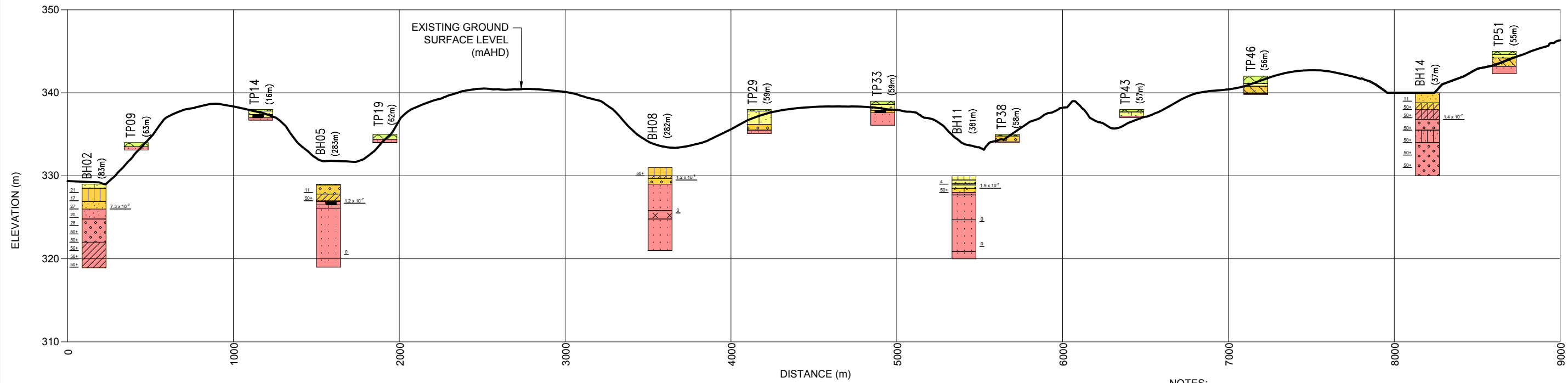
TP01 Approximate Test Pit Location (URS July/Aug 2011)

BH01 Approximate Exploratory Borehole Location (URS July/Aug 2011)

This drawing is subject to COPYRIGHT. BNE Plotted: 13/10/2011 12:01 PM File Path: U:\JOBS\42626683\ALPHA - TSF\10.Reports\01. (General Information Figures) Printed By: —



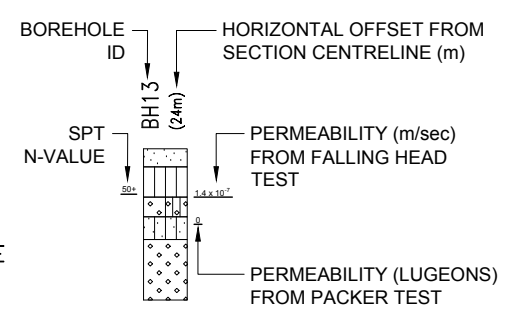
SECTION A-A'



SECTION B-B'

LEGEND:

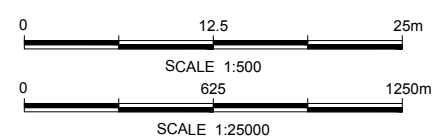
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	USCS Silt		USCS Elastic Silt		USCS Well-graded Sand		ALLUVIUM
	USCS Poorly-graded Sand		USCS Well-graded Sand with Silt		Topsoil		RESIDUAL SOIL
	USCS Well-graded Gravel		USCS Well-graded Sandy Gravel		USCS Sandy Silt		CW - MW COLINLEA SANDSTONE
	USCS Low Plasticity Silty Clay		Siltstone		USCS High Plasticity Clay		



NOTES:

- THIS IS OUR INTERPRETATION OF THE SUBSURFACE CONDITIONS.
- EXPLORATORY BOREHOLE AND TEST PIT LOCATIONS ARE APPROXIMATE ONLY. A HORIZONTAL OFFSET HAS BEEN PROVIDED FOR EACH OF THE TEST LOCATIONS FROM THE SECTION CENTRELINE.
- MAXIMUM EXPLORATORY BOREHOLE DEPTH - 20.0m. MAXIMUM TEST PIT DEPTH - 5.0m.
- FOR THE PURPOSE OF THESE SECTIONS, A SPT N-VALUE OF 50+ HAS BEEN USED TO DEFINE THE SOIL/ROCK INTERFACE IN EXPLORATORY BOREHOLES. OBSERVATIONS MADE DURING EXCAVATION HAVE BEEN USED TO DEFINE THIS INTERFACE IN TEST PITS.
- REFER URS DRAWING NO. 42626683-GE001 FOR SECTION ALIGNMENTS.
- CROSS SECTION HAS 50x VERTICAL EXAGGERATION.

VERTICAL SCALE: 1:500 (A3)
HORIZONTAL SCALE: 1:25000 (A3)



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GEOLOGICAL SECTIONS
A-A' AND B-B'

URS

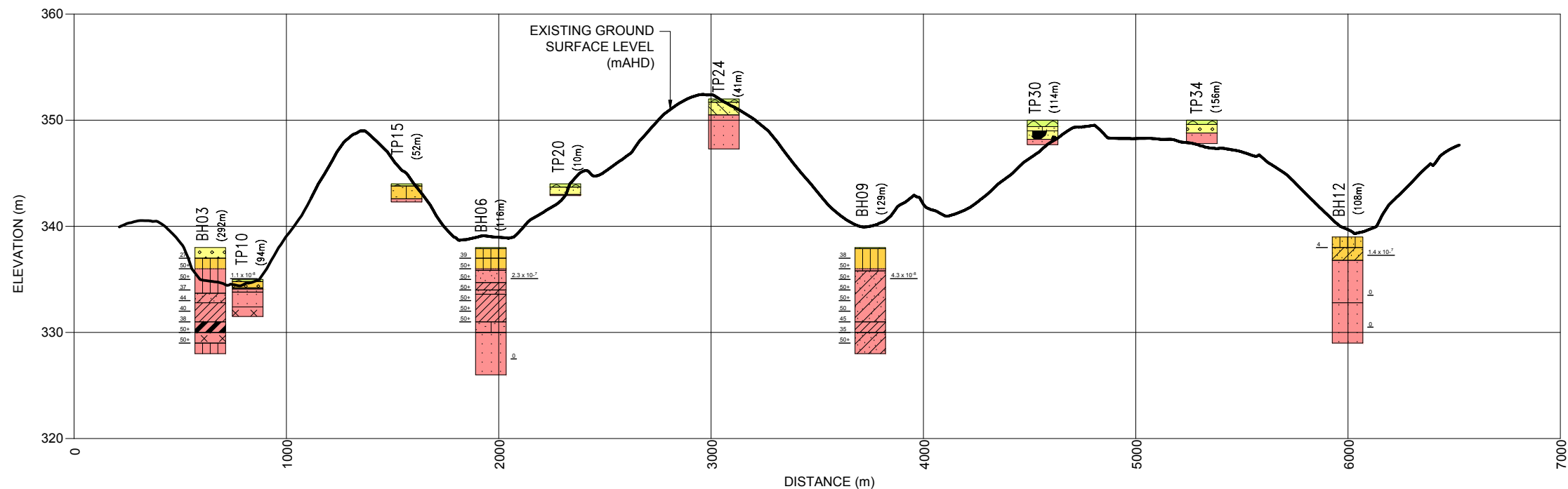
OUT-OF-PIT TAILINGS STORAGE FACILITY (TSF) : GEOTECHNICAL INVESTIGATION

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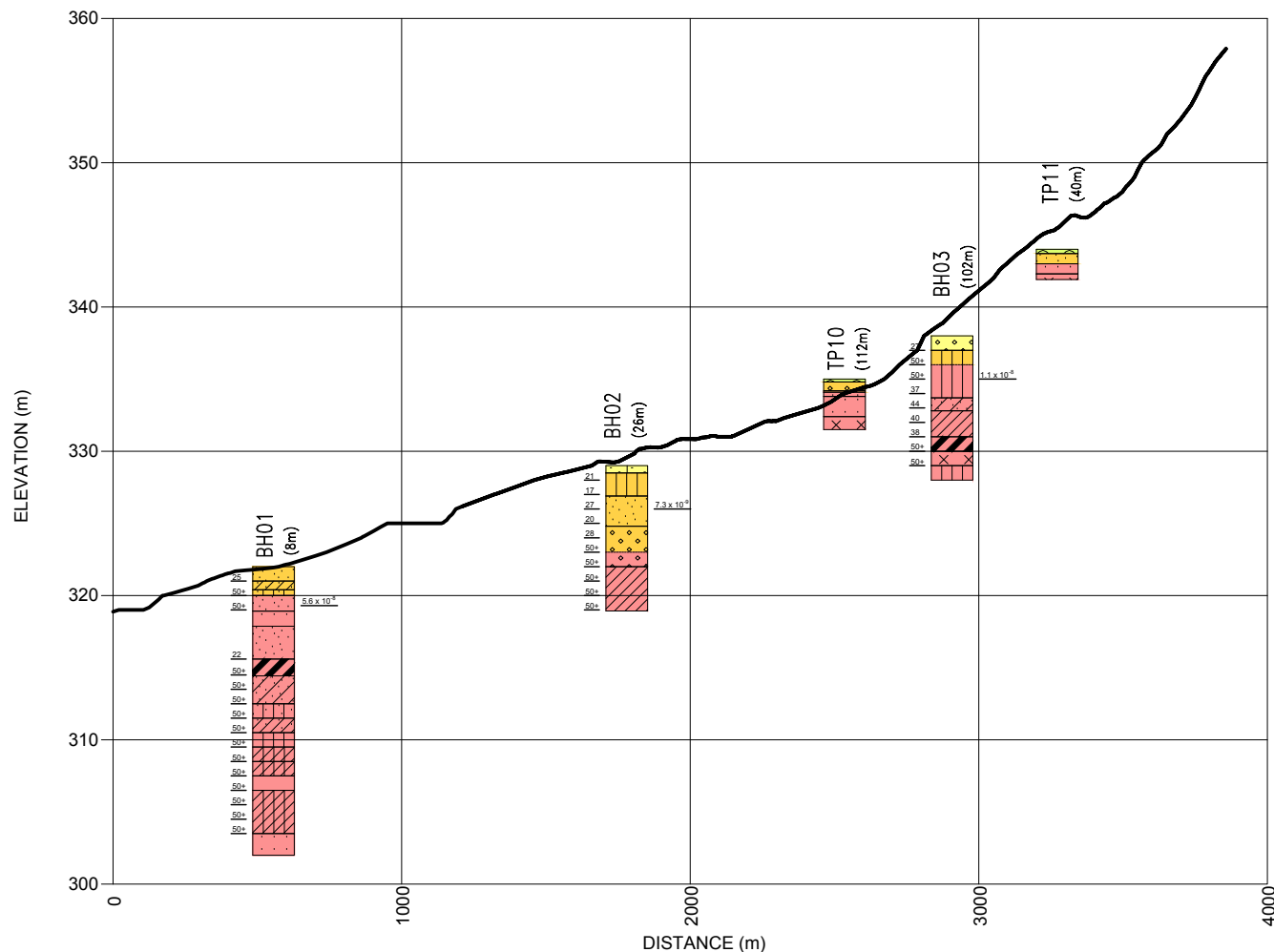
Drawing No: 42626683-GE004

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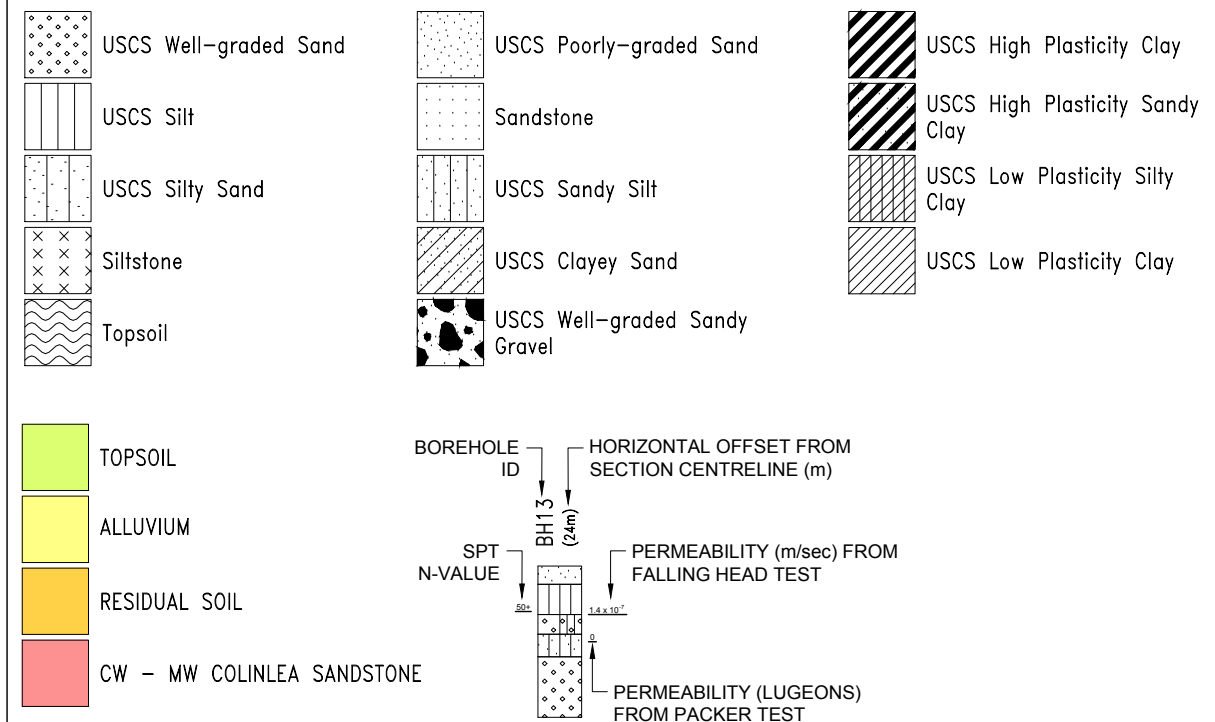


SECTION C-C'



SECTION D-D'

LEGEND:

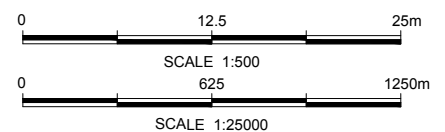


NOTES:

1. THIS IS OUR INTERPRETATION OF THE SUBSURFACE CONDITIONS.
2. EXPLORATORY BOREHOLE AND TEST PIT LOCATIONS ARE APPROXIMATE ONLY. A HORIZONTAL OFFSET HAS BEEN PROVIDED FOR EACH OF THE TEST LOCATIONS FROM THE SECTION CENTRELINE.
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5. REFER URS DRAWING NO. 42626683-GE001 FOR SECTION ALIGNMENTS.
6. CROSS SECTION HAS 50x VERTICAL EXAGGERATION.

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VERTICAL SCALE: 1:500 (A3)
HORIZONTAL SCALE: 1:25000 (A3)



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GEOLOGICAL SECTIONS
C-C' AND D-D'

URS

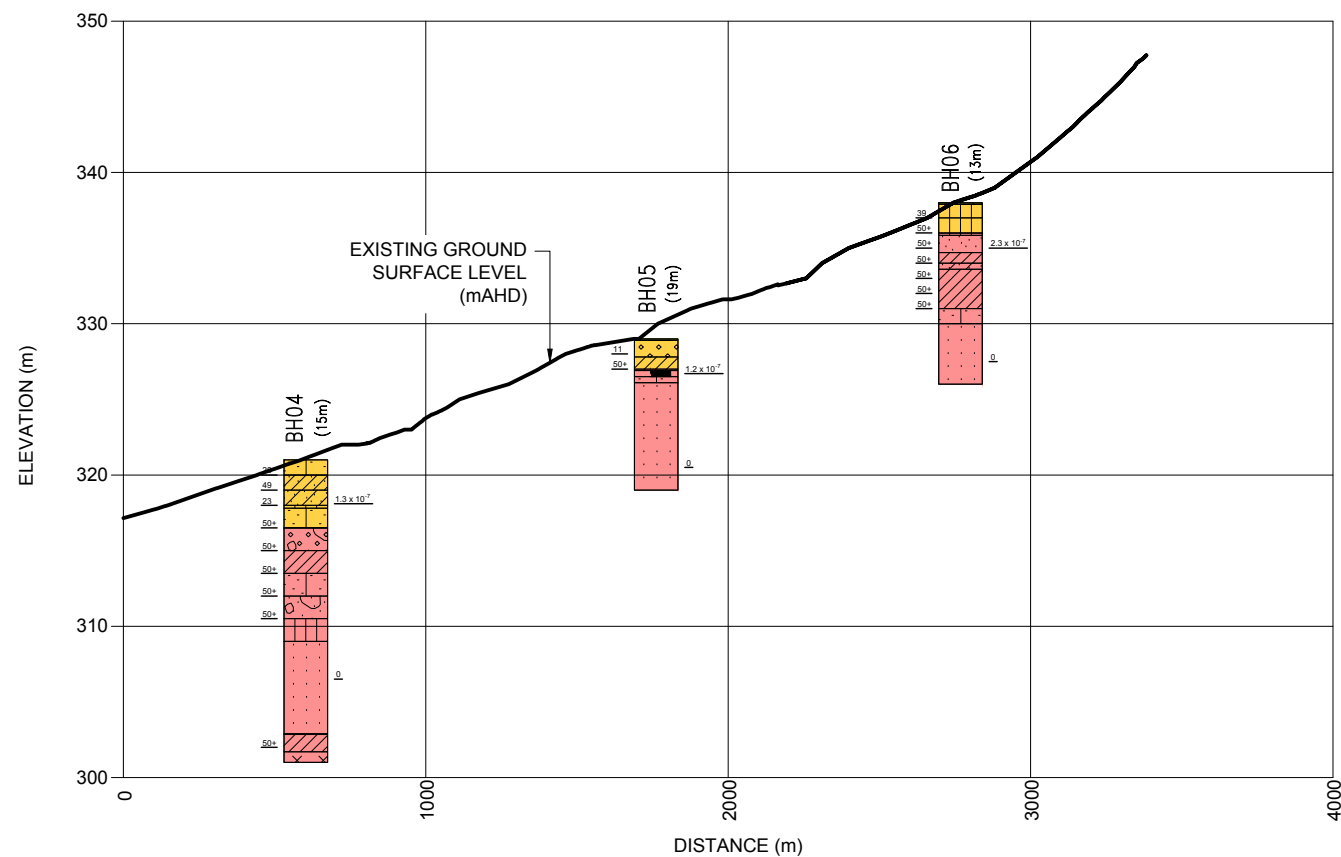
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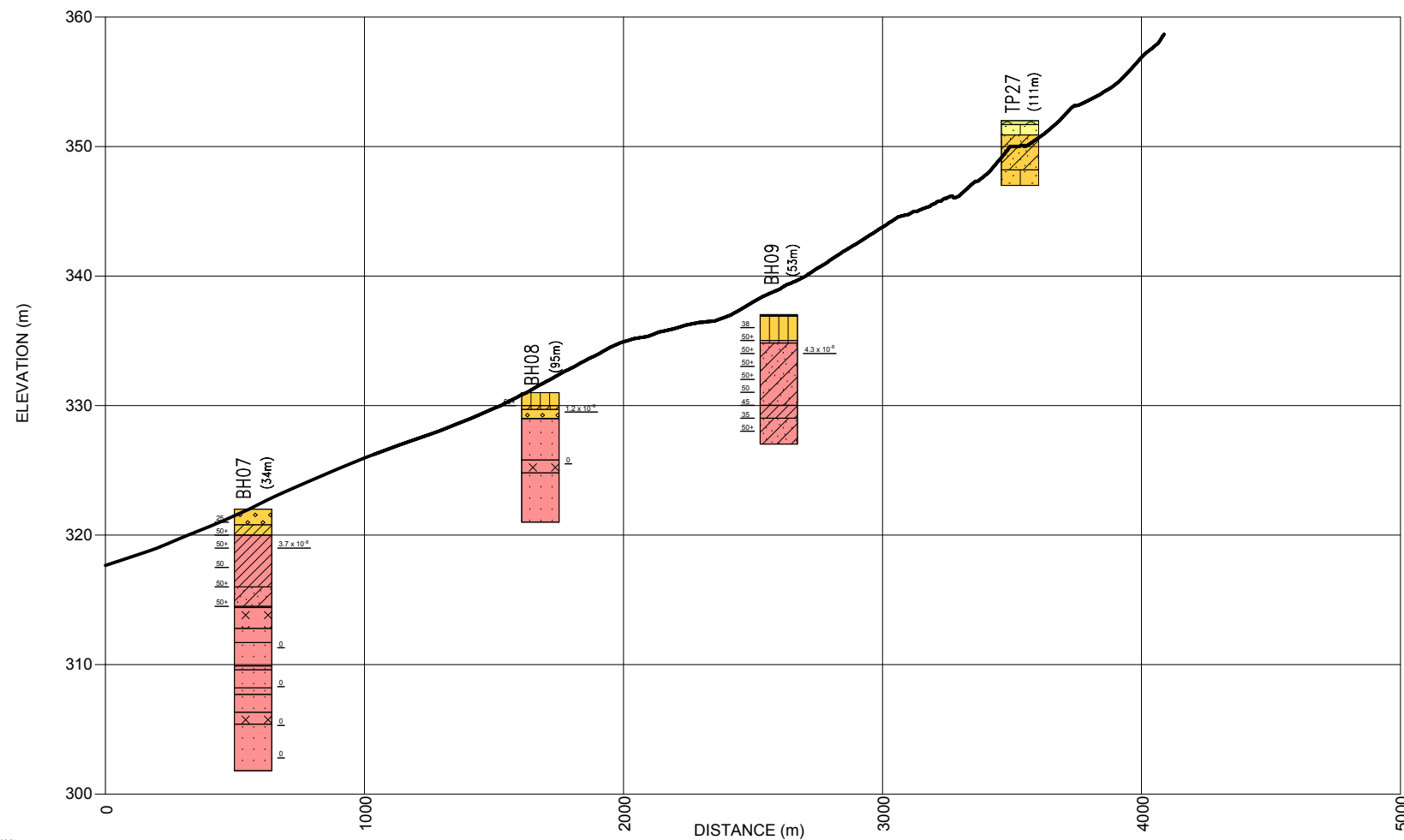
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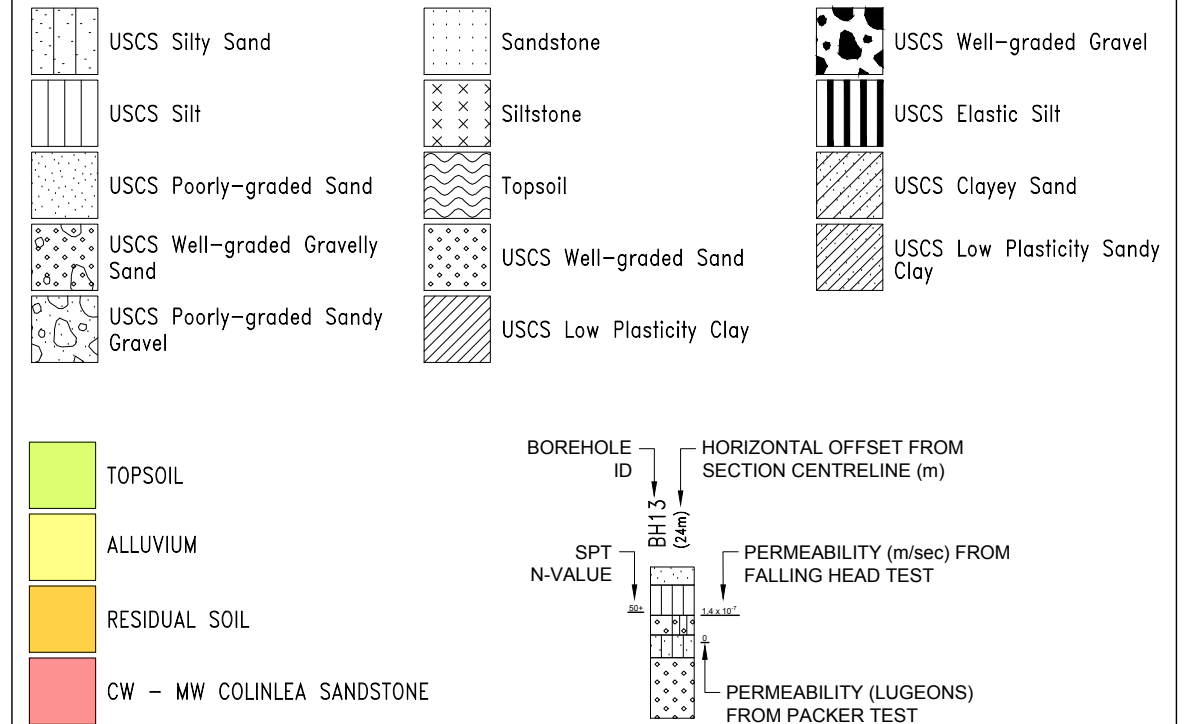


SECTION E-E'



SECTION F-F'

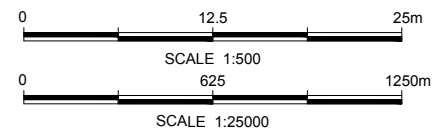
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NOTES:

1. THIS IS OUR INTERPRETATION OF THE SUBSURFACE CONDITIONS.
2. EXPLORATORY BOREHOLE AND TEST PIT LOCATIONS ARE APPROXIMATE ONLY. A HORIZONTAL OFFSET HAS BEEN PROVIDED FOR EACH OF THE TEST LOCATIONS FROM THE SECTION CENTRELINE.
3. MAXIMUM EXPLORATORY BOREHOLE DEPTH - 20.0m. MAXIMUM TEST PIT DEPTH - 5.0m.
4. FOR THE PURPOSE OF THESE SECTIONS, A SPT N-VALUE OF 50+ HAS BEEN USED TO DEFINE THE SOIL/ROCK INTERFACE IN EXPLORATORY BOREHOLES. OBSERVATIONS MADE DURING EXCAVATION HAVE BEEN USED TO DEFINE THIS INTERFACE IN TEST PITS.
5. REFER URS DRAWING NO. 42626683-GE001 FOR SECTION ALIGNMENTS.
6. CROSS SECTION HAS 50x VERTICAL EXAGGERATION.

VERTICAL SCALE: 1:500 (A3)
HORIZONTAL SCALE: 1:25000 (A3)



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GEOLOGICAL SECTIONS
E-E' AND F-F'

URS

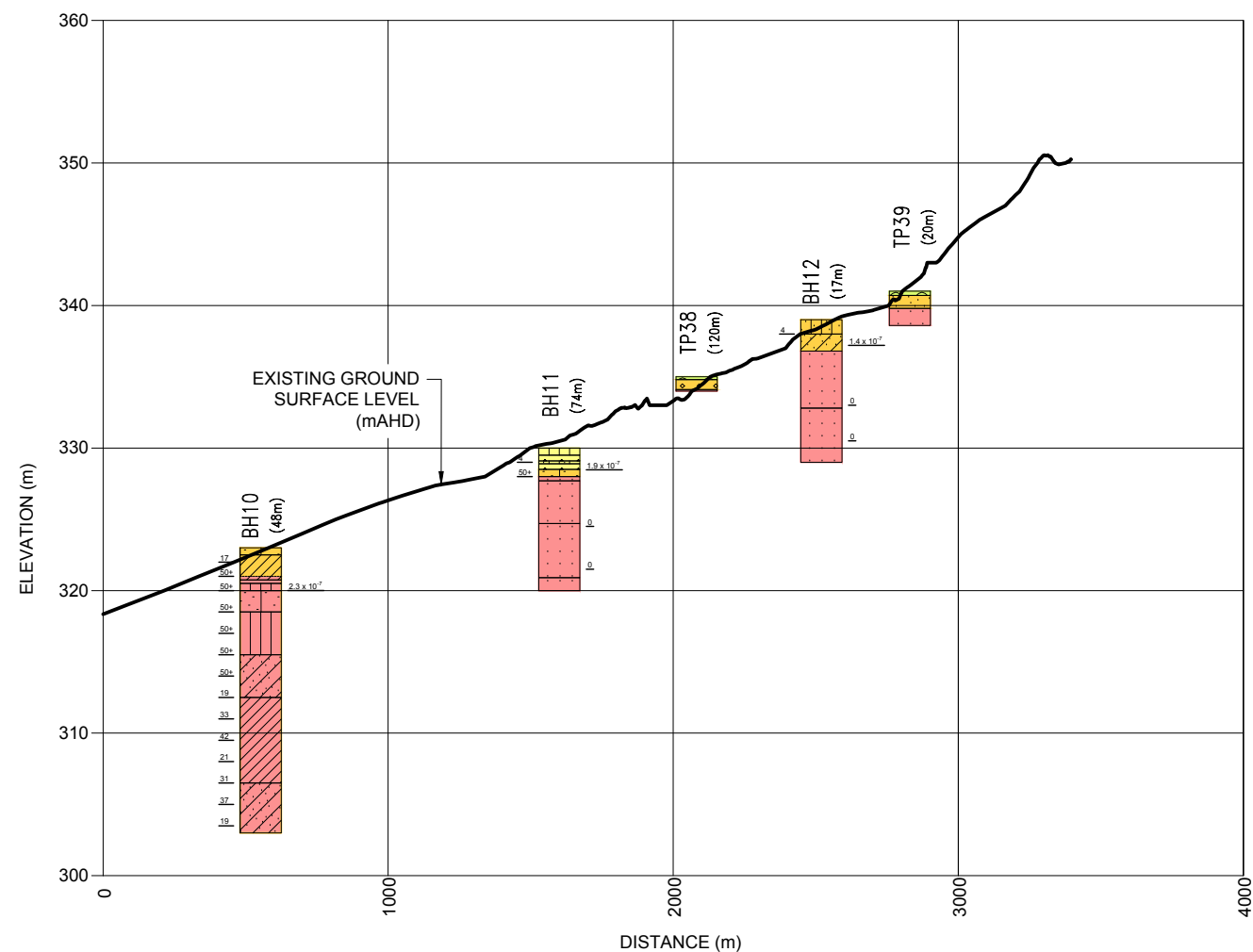
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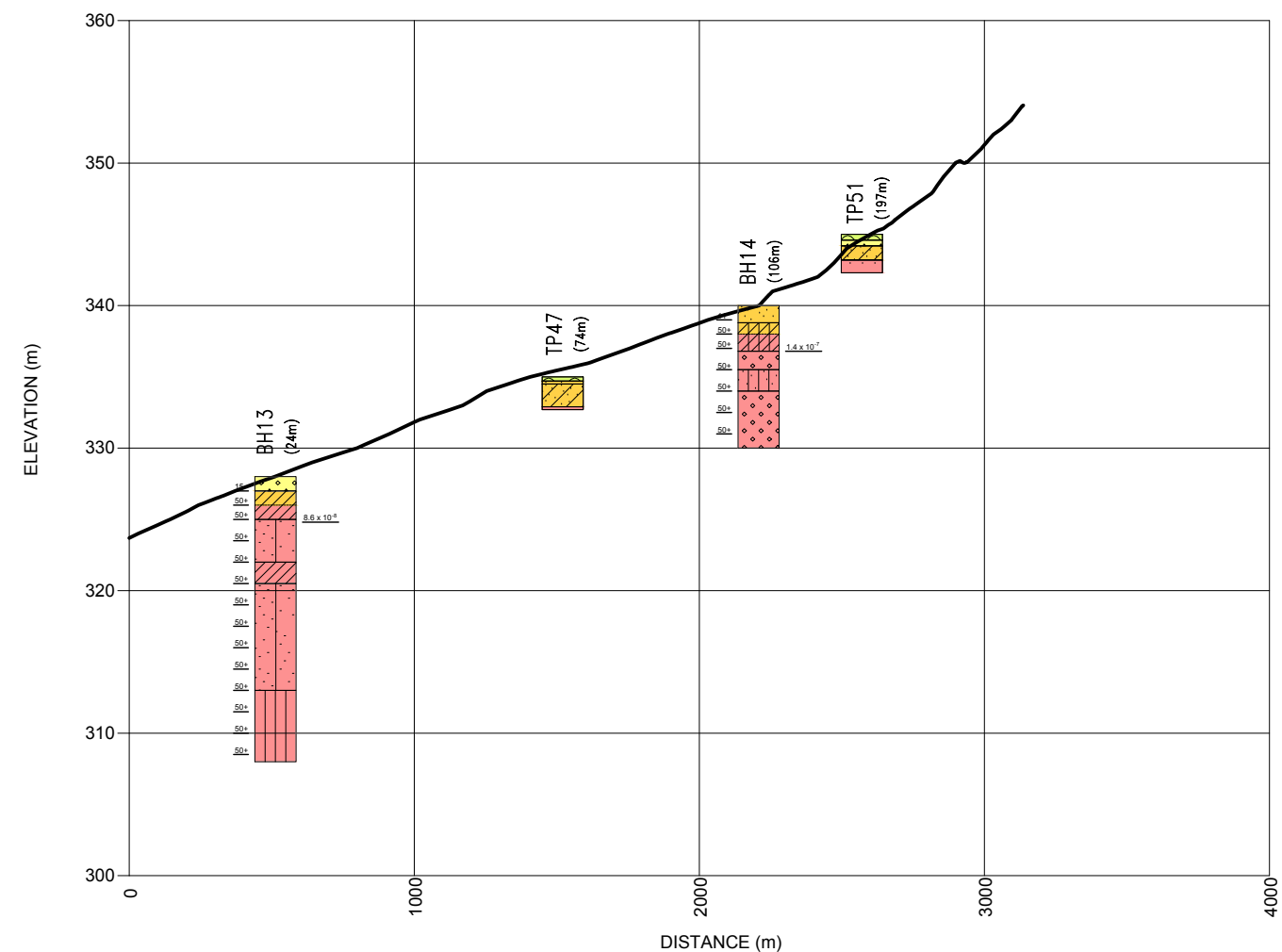
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SECTION G-G'



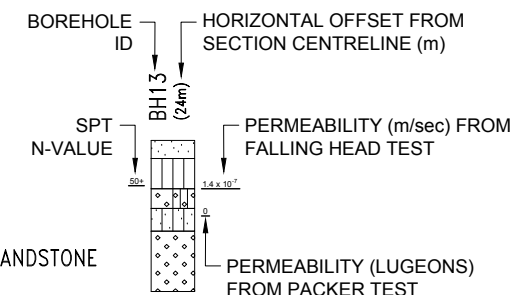
SECTION H-H'

NOTES:

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2. EXPLORATORY BOREHOLE AND TEST PIT LOCATIONS ARE APPROXIMATE ONLY. A HORIZONTAL OFFSET HAS BEEN PROVIDED FOR EACH OF THE TEST LOCATIONS FROM THE SECTION CENTRELINE.
3. MAXIMUM EXPLORATORY BOREHOLE DEPTH - 20.0m. MAXIMUM TEST PIT DEPTH - 5.0m.
4. FOR THE PURPOSE OF THESE SECTIONS, A SPT N-VALUE OF 50+ HAS BEEN USED TO DEFINE THE SOIL/ROCK INTERFACE IN EXPLORATORY BOREHOLES. OBSERVATIONS MADE DURING EXCAVATION HAVE BEEN USED TO DEFINE THIS INTERFACE IN TEST PITS.
5. REFER URS DRAWING NO. 42626683-GE001 FOR SECTION ALIGNMENTS.
6. CROSS SECTION HAS 50x VERTICAL EXAGGERATION.

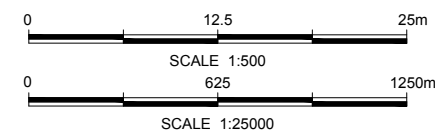
LEGEND:

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	USCS Silt		Topsoil		USCS Low Plasticity Silty Clay		ALLUVIUM
	USCS Well-graded Sand		USCS Poorly-graded Sand		RESIDUAL SOIL		CW - MW COLINLEA SANDSTONE
	USCS Sandy Silt		USCS Well-graded Sand with Silt				



Source:
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VERTICAL SCALE: 1:500 (A3)
HORIZONTAL SCALE: 1:25000 (A3)



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ALPHA COAL PROJECT

GEOLOGICAL SECTIONS
G-G' AND H-H'

URS

OUT-OF-PIT TAILINGS STORAGE FACILITY (TSF) : GEOTECHNICAL INVESTIGATION

File No: 42626680-g-314.dwg

Drawn: BRH

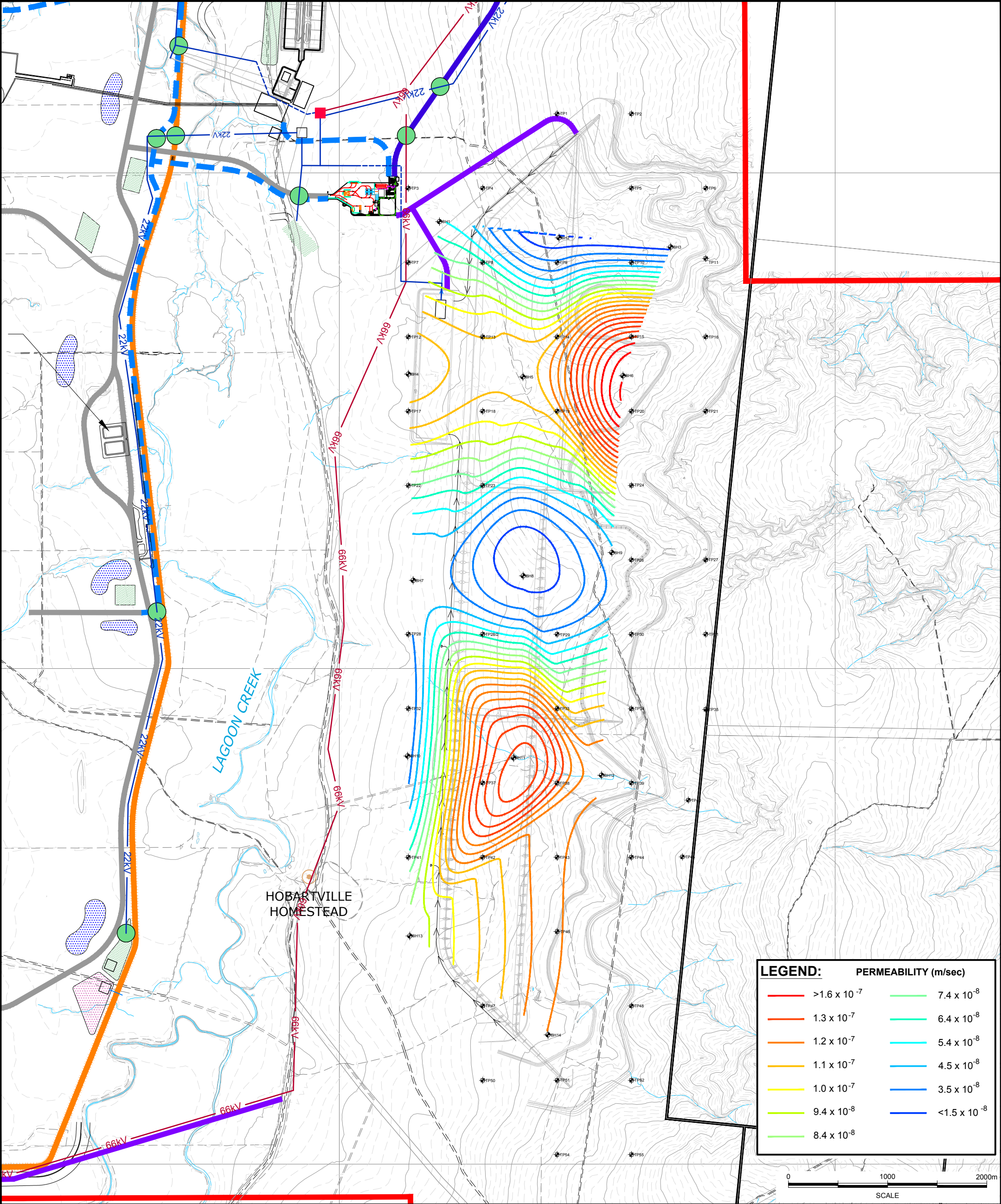
Approved: RJR

Date: 27/09/2011

Drawing No: 42626683-GE007

Rev. -

A3



Appendix B Information from Previous Investigations

Appendix B

B.1 Borehole Logs

BOREHOLE LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 325m AHD* **BORE No:** 6
EASTING: 451213 **PROJECT No:** 74359
NORTHING: 7428084 **DATE:** 05.06.2010
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
			Type	Depth	Sample	Results & Comments		
0.5	SILTY SAND - medium dense, brown grey, fine grained silty sand, trace of clay, moist		S	0.5		4,6,7 N = 13		Seal to 0.4m (Standpipe extended 0.4m above ground level)
0.95	- becoming grey, dry			0.95				
1.5	- becoming grey mottled orange brown		S	1.5		8,7,16 N = 23		
1.95				1.95				
2.7	SANDSTONE - extremely low strength, extremely weathered, light orange grey, fine grained sandstone							Slotted pipe from 0.5m to 4.54m
3.0			S	3.0		30/130mm		
3.13				3.13				
4.5	- becoming low strength, slightly weathered, light grey			4.5				
4.54	Bore discontinued at 4.54m		S	4.54		30/35mm		
5								
6								
7								
8								
9								

RIG: Hydrapower Scout

DRILLER: Ground Test

LOGGED: LWD

CASING: Nil

TYPE OF BORING: Auger to 4.54m

WATER OBSERVATIONS: No groundwater seepage observed

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
			Water level

CHECKED

Initials:

Date:



Douglas Partners
 Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 329m AHD* **BORE No:** 10
EASTING: 451613 **PROJECT No:** 74359
NORTHING: 7426050 **DATE:** 05.06.2010
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.2	SILTY SAND - medium dense, brown, fine grained silty sand, dry to moist		A	0.3		5,5,5 N = 10 30/50mm		(Standpipe extended 0.5m above ground level) Seal to 0.4m Slotted pipe from 0.5m to 2.52m
	0.55	SANDY GRAVEL - medium dense, brown and red brown, fine to medium subrounded sandy gravel, fine grained sand, moist		S	0.5				
	1.02	SANDY CLAY - stiff, yellow grey, light brown and red brown, medium plasticity sandy clay, fine to medium grained sand, trace of subrounded gravel, moist		U ₁₀	0.95				
				S	1.0				
					1.02				
					1.07				
		SANDSTONE - low strength, moderately weathered, red brown, fine to medium grained sandstone							
	2	- becoming orange							
	2.52	- becoming medium strength and light grey Bore discontinued at 2.52m		S	2.5		20/20mm		
	2.52				2.52				
	3								
	4								
	5								
	6								
	7								
	8								
	9								

RIG: Hydrapower Scout

DRILLER: Ground Test

LOGGED: LWD

CASING: Nil

TYPE OF BORING: Auger to 2.52m

WATER OBSERVATIONS: No groundwater seepage observed

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U ₁₀	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		☼	Water level

CHECKED

Initials:

Date:





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BOREHOLE LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 329m AHD* **BORE No:** 10A
EASTING: 451610 **PROJECT No:** 74359
NORTHING: 7426044 **DATE:** 06.06.2010
DIP/AZIMUTH: 90°/-- **SHEET 1 OF 1**

Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
			Type	Depth	Sample	Results & Comments		
0.2	SILTY SAND - medium dense, brown, fine grained silty sand, dry to moist							(Standpipe extended 0.7m above ground level)
0.5	SANDY GRAVEL - stiff, yellow grey, light brown and red brown, fine to medium subrounded sandy gravel, fine grained sand, moist							
1.1	SANDY CLAY - stiff, yellow grey, light brown and red brown, medium plasticity sandy clay, fine to medium grained sand, trace of fine subrounded gravel, moist							Seal from 0.9m to 1.5m
1.1	SANDSTONE - low strength, moderately weathered, red brown, fine to medium grained sandstone - becoming orange grey							
4.4	SILTSTONE - very low to low strength, white and red brown siltstone							Slotted pipe from 1.6m to 4.6m
4.6	Bore discontinued at 4.6m							
5								
6								
7								
8								
9								

RIG: Hydrapower Scout

DRILLER: Ground Test

LOGGED: LWD

CASING: Nil

TYPE OF BORING: Auger to 4.6m

WATER OBSERVATIONS: No groundwater seepage observed

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
		W	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 327m AHD* **BORE No:** 11
EASTING: 451438 **PROJECT No:** 74359
NORTHING: 7424327 **DATE:** 05.06.2010
DIP/AZIMUTH: 90°/-- **SHEET 1 OF 1**

[illegible]

RIG: Hydrapower Scout

DRILLER: Ground Test


LOGGED: LWD

CASING: Nil

TYPE OF BORING: Auger to 3.04m

WATER OBSERVATIONS: No groundwater seepage observed

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL BFS_OPTION A3 a provided by client

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	SL	Standard penetration test
U	Tube sample (x mm dia.)	P	Point load strength is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
			Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 327m AHD* **BORE No:** 11A
EASTING: 451444 **PROJECT No:** 74359
NORTHING: 7424314 **DATE:** 05.06.2010
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.5	SILTY SAND - medium dense, grey, fine grained silty sand, trace of clay, dry - becoming moist							(Standpipe extended 0.35m above ground level)	
	1	CLAYEY SAND - medium dense, grey mottled orange brown, fine grained clayey sand, some silt, dry to moist								
	1.4	SAND - medium dense, light brown and light grey, fine grained sand, trace of clay, moist								
	1.7	CLAYEY SAND - medium dense, brown, fine grained clayey sand, trace of fine subrounded to subangular gravel, moist								
	1.9	SANDSTONE - very low strength, moderately weathered, light grey and brown, fine grained sandstone - becoming orange brown							2	Seal from 1.6m to 2.4m
	3	- becoming light brown							3	
	4	- becoming red brown							4	Slotted pipe from 2.5m to 5.5m
	5								5	
	5.5	Bore discontinued at 5.5m								
	6								6	
	7								7	
	8								8	
	9								9	

RIG: Hydrapower Scout

DRILLER: Ground Test

LOGGED: LWD

CASING: Nil

TYPE OF BORING: Auger to 5.5m

WATER OBSERVATIONS: No groundwater seepage observed

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client.

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	>	Water seep
			Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 328m AHD* **BORE No:** 12
EASTING: 451311 **PROJECT No:** 74359
NORTHING: 7422690 **DATE:** 05.06.2010
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
			Type	Depth	Sample	Results & Comments		
0.8	SILTY SAND - medium dense, brown grey, fine grained silty sand, dry - becoming loose, light brown, moist		S	0.5		3,4,5 N = 9		(Standpipe extended 0.5m above ground level) Seal to 0.4m
1	CLAYEY SAND - medium dense, grey and orange brown mottled clayey sand, fine grained sand, moist - becoming red brown, orange brown and grey mottled, dry to moist		S	0.95				
2			S	1.5		7,12,18 N = 30		
2.9	- becoming dense, red brown, fine to medium grained sand, trace of fine subangular gravel, dry		S	1.95				Slotted pipe from 0.5m to 4.02m
3	SANDSTONE - very low strength, highly weathered, light grey, fine grained sandstone		S	3.0		30/95mm		
4	- becoming low strength, moderately weathered Bore discontinued at 4.02m		S	3.1				
4.02			S	4.0		30/20mm		
4.02			S	4.02				
5								
6								
7								
8								
9								

RIG: Hydrapower Scout

DRILLER: Ground Test

LOGGED: LWD

CASING: Nil

TYPE OF BORING: Auger to 4.02m

WATER OBSERVATIONS: No groundwater seepage observed

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		✱	Water level

CHECKED

Initials:

Date:



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B.2 Test Pit Logs

TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 312m AHD* **PIT No:** 12
EASTING: 447838 **PROJECT No:** 74359
NORTHING: 7427026 **DATE:** 03.07.10
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
			Type	Depth	Sample	Results & Comments		5	10	15	20
0.5	SANDY CLAY - very stiff to hard, brown, high plasticity sandy clay, fine grained sand, dry to moist		B	0.4							
	SILTY CLAY - very stiff to hard, light brown, high plasticity silty clay, trace fine sand, moist			0.5							
1.4			D	1.4							
1.5	- becoming hard			1.5							
2.15	Pit discontinued at 2.15m (Refusal)										
3											
4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
			Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 332m AHD* **PIT No:** 14
EASTING: 451781 **PROJECT No:** 74359
NORTHING: 7428508 **DATE:** 13.06.2010
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.3	SILTY SAND - loose, orange-brown, fine grained silty sand, trace of clay, dry										
	0.6	SANDY GRAVEL - loose, grey sandy gravel, fine to medium subangular to subrounded gravel, fine grained sand, dry		B	0.4							
				B	0.6							
		SANDY CLAY - very stiff to hard, grey mottled orange-brown and red-brown, high plasticity sandy clay, fine grained sand, dry to moist		B	0.8							
	1.1	SANDSTONE - extremely to very low strength, highly weathered, red-brown, light grey and orange-brown, fine to medium grained sandstone		B	1.2							
					1.4							
		- becoming very low strength, moderately weathered, grey with some orange-brown ironstaining										
	2.1	Pit discontinued at 2.1m (Refusal)										
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 334m AHD* **PIT No:** 13
EASTING: 451641 **PROJECT No:** 74359
NORTHING: 7427166 **DATE:** 13.06.2010
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - loose, grey, fine to medium grained silty sand, some rootlets, dry - becoming orange-brown, trace of clay, trace of rootlets, moist		B	0.2							
				B	0.5							
	0.8	GRAVELLY SAND - medium dense, light brown gravelly sand, fine to medium grained sand, fine to medium subrounded to subangular gravel, some clay, moist		B	0.8							
1	1.1	SANDY CLAY - stiff to very stiff, light brown and orange-brown, medium plasticity sandy clay, fine to medium grained sand, trace of subrounded to subangular gravel, moist		B	1.1							
	1.2			B	1.2							
		SANDSTONE - extremely low strength, extremely weathered, light grey and orange-brown, fine to medium grained sandstone - from 1.4m: becoming very low strength, moderately weathered			1.4							
	1.6	Pit discontinued at 1.6m (Refusal)										
-2												
-3												
-4												

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
			Water level

CHECKED
Initials:
Date:

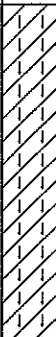
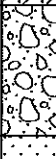



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 332m AHD* **PIT No:** 15
EASTING: 451645 **PROJECT No:** 74359
NORTHING: 7426360 **DATE:** 12.06.2010
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - medium dense, grey, fine grained silty sand, dry - becoming orange-brown, moist		B	0.2							
		- some clay			0.5							
1												
	1.2	SANDY GRAVEL - loose, grey mottled red-brown slightly silty sandy gravel, fine to medium grained sand, subangular to rounded gravel, wet		B	1.2							
					1.5							
	1.65	SANDSTONE - extremely low strength, extremely weathered, grey and orange-brown, medium grained sandstone										
	1.75	- from 1.7m: becoming very low to low strength, moderately weathered Pit discontinued at 1.75m (Refusal)										
2												
3												
4												

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: Groundwater seepage observed at 1.6m.

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		☼	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 330m AHD* **PIT No:** 16
EASTING: 451651 **PROJECT No:** 74359
NORTHING: 7424528 **DATE:** 12.06.2010
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

[illegible]

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength Is(50) MPa
V	Shear Vane (kPa)
▷	Water seep
≡	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 330m AHD* **PIT No:** 17
EASTING: 451567 **PROJECT No:** 74359
NORTHING: 7423459 **DATE:** 12.06.2010
DIP/AZIMUTH: 90°/~ **SHEET** 1 OF 1

[illegible]

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL BFS_OPTION A3_a provided by client

☐ Sand Penetrometer AS1289.6.3.3

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
sp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength Is(50) MPa
V	Shear Vane (kPa)
Δ	Water seep
W	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 332m AHD* **PIT No:** 18
EASTING: 451470 **PROJECT No:** 74359
NORTHING: 7422251 **DATE:** 12.06.2010
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
			Type	Depth	Sample	Results & Comments		5	10	15	20
1.0	SILTY SAND - medium dense, grey, fine grained silty sand, dry - becoming orange-brown, moist, some clay	[Dotted pattern]	B	0.5							
1.1	CLAYEY SAND - medium dense, grey, red-brown and orange-brown fine grained clayey sand, some fine to medium subangular gravel, moist to wet - becoming orange-brown streaked grey and red-brown (no gravel)	[Diagonal lines pattern]	B	1.1							
1.4				1.4							
2.0	SANDSTONE - extremely low to very low strength, highly weathered, grey and light orange-brown, fine to medium grained sandstone	[Dotted pattern]	B	2.0							
2.3	Pit discontinued at 2.3m (Refusal)			2.3							
3.0											
4.0											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		☼	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 343m AHD* **PIT No:** 32
EASTING: 452426 **PROJECT No:** 74359
NORTHING: 7421657 **DATE:** 30.06.10
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - loose, light grey, fine grained silty sand, moist										
	0.9	CLAYEY SAND - medium dense, grey mottled yellow brown and orange brown, fine to medium grained clayey sand, trace fine sub-angular gravel, moist										
	1.3	SANDY CLAY - very stiff, grey mottled yellow brown and orange brown, high plasticity sandy clay, fine sand, moist										
	1.45	SANDSTONE - low strength, moderately weathered, grey mottled orange brown, fine grained sandstone										
	1.5	Pit discontinued at 1.5m (Refusal)										
	2											
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		✱	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 341m AHD* **PIT No:** 33
EASTING: 452269 **PROJECT No:** 74359
NORTHING: 7422771 **DATE:** 30.06.10
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - medium dense, light yellow grey, fine grained silty sand, dry										
	0.4	SANDY GRAVEL - medium dense, light yellow grey, fine to medium sized sub-rounded sandy gravel, fine sand, trace clay, dry										
	0.5	CLAYEY SAND - medium dense, light yellow mottled orange brown, fine to medium grained clayey sand, trace fine sub-angular gravel, dry to moist										
	1.0	SANDY CLAY - stiff, grey mottled orange brown, high plasticity sandy clay, fine sand, moist										
	1.15	SANDSTONE - low strength, moderately weathered, grey mottled red brown, medium grained sandstone										
	1.2	Pit discontinued at 1.2m (Refusal)										
	2											
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
			Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 337m AHD* **PIT No:** 34
EASTING: 452125 **PROJECT No:** 74359
NORTHING: 7423615 **DATE:** 01.07.10
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
			Type	Depth	Sample	Results & Comments		5	10	15	20
1	SANDY GRAVEL - loose, yellow brown and orange brown, fine to medium sized sub-angular to sub-rounded sandy gravel, fine sand, moist										
1.2	SANDY CLAY - very stiff, grey mottled orange brown and red brown, medium plasticity sandy clay, fine sand, moist										
1.4	SANDSTONE - very low strength, highly weathered, grey mottled orange brown, medium grained sandstone		B	1.4							
1.6	- becoming low strength and moderately weathered Pit discontinued at 1.6m (Refusal)			1.6							
2											
3											
4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		⊗	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 341m AHD* **PIT No:** 35
EASTING: 452350 **PROJECT No:** 74359
NORTHING: 7425034 **DATE:** 01.07.10
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - loose, brown, fine grained silty sand, moist - becoming orange										
	1	- trace clay										
	1.8	CONGLOMERATE - extremely low strength, extremely weathered, yellow brown mottled red brown conglomerate, fine to medium sub-rounded gravel sized clasts - becoming very low strength and moderately weathered										
	2	- becoming low strength			2.2							
	2.4	Pit discontinued at 2.4m (Refusal)		B	2.4							
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
			Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd.
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 336m AHD* **PIT No:** 36
EASTING: 452294 **PROJECT No:** 74359
NORTHING: 7426142 **DATE:** 01.07.10
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - loose, grey, fine grained silty sand, trace clay, dry										
	0.4	SANDY CLAY - very stiff, grey, high plasticity sandy clay, fine sand, dry to moist										
	0.8	CLAYEY SAND - medium dense, grey mottled orange brown, fine grained clayey sand, dry to moist										
	1	- becoming orange brown and grey, trace fine rounded gravel										
	1.3	SANDSTONE - extremely low strength, extremely weathered, orange brown and grey, fine to medium grained sandstone										
		- becoming very low strength, moderately weathered, white, fine grained sandstone										
	1.8	- becoming low strength										
		Pit discontinued at 1.8m (Refusal)										
	2											
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		W	Water level

CHECKED
Initials:
Date:

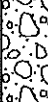





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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 342m AHD* **PIT No:** 37
EASTING: 452414 **PROJECT No:** 74359
NORTHING: 7427287 **DATE:** 01.07.10
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SANDY GRAVEL - loose, yellow brown and red brown, fine to medium sized sub-rounded sandy gravel, fine sand, trace clay, dry										
	0.4	CLAYEY SAND - medium dense, grey mottled red brown, fine grained clayey sand, dry to moist										
	0.6	CONGLOMERATE - extremely low strength, extremely weathered, grey mottled red-brown and orange-brown conglomerate, fine to medium sized gravel clasts										
	0.9	SANDSTONE - extremely low strength, extremely weathered, grey mottled orange brown, fine to medium grained sandstone										
	1	- becoming very low strength										
	1.4	Pit discontinued at 1.4m (Refusal)										
	2											
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	D	Water seep
			Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha

SURFACE LEVEL: 344m AHD* **PIT No:** 38
EASTING: 452555 **PROJECT No:** 74359
NORTHING: 7428474 **DATE:** 01.07.10
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - loose, brown, fine grained silty sand, moist										
	0.3	SANDY GRAVEL - loose, red brown, fine to medium sized sub-angular to sub-rounded sandy gravel, fine sand, trace clay, moist										
	0.8	CONGLOMERATE - extremely low strength, extremely weathered, red brown conglomerate, fine to medium gravel sized clasts										
	1											
	1.5											
	1.8	- becoming very low strength, moderately weathered										
	1.81	SANDSTONE - low strength, slightly weathered, grey, fine to medium grained sandstone Pit discontinued at 1.81m (Refusal)										
	2											
	3											
	4											

RIG: Backhoe JCB 3CX

LOGGED: LWD

WATER OBSERVATIONS: No groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		☼	Water level

CHECKED
Initials:
Date:



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha, Central Queensland

SURFACE LEVEL: 340m AHD* **PIT No:** ATP82
EASTING: 452354 **PROJECT No:** 74359.00
NORTHING: 7428893 **DATE:** 10/3/2011
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SANDY GRAVEL - medium dense, grey sandy gravel with some silt, fine to medium grained sand, fine to medium grained subrounded gravel, dry		B	0.2							
		- cemented			0.5							
	0.8 0.85	SANDSTONE - low strength, highly weathered, grey, fine grained sandstone Pit discontinued at 0.85m (due to refusal)										
	1											
	2											
	3											
	4											

RIG: JCB 3CX

LOGGED: TDL

SURVEY DATUM: WGS84 Zone 55K

WATER OBSERVATIONS: No free groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



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TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha, Central Queensland

SURFACE LEVEL: 333m AHD* **PIT No:** ATP83
EASTING: 452281 **PROJECT No:** 74359.00
NORTHING: 7427956 **DATE:** 10/3/2011
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
1	1.2	SANDY SILT - stiff, grey, low plasticity, fine grained sandy silt, trace of fine gravel, dry - hard - grey with red-brown mottling - red-brown		B	0.2		pp >600					
					0.3							
					0.4		pp >600					
				D	0.6		pp >600					
					0.8		pp >600					
				B	1.0							
2	1.2	SILTY SAND - dense, red-brown, fine to coarse grained silty sand, dry			1.2							
				D	1.6							
3	3.12	SANDSTONE - low strength, highly weathered, grey, fine grained sandstone Pit discontinued at 3.12m (due to refusal)			2.4							
				D								
4												

RIG: JCB 3CX

LOGGED: TDL

SURVEY DATUM: WGS84 Zone 55K

WATER OBSERVATIONS: No free groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W Water seep	S Standard penetration test	
E Environmental sample	W Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha, Central Queensland

SURFACE LEVEL: 340m AHD* **PIT No:** ATP84
EASTING: 452075 **PROJECT No:** 74359.00
NORTHING: 7426816 **DATE:** 10/3/2011
DIP/AZIMUTH: 90°/- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - medium dense, brown, fine to medium grained silty sand, dry			0.2		pp = 150-200					
				B	0.4		pp = 200-250					
					0.5							
					0.6		pp = 200-250					
		- becoming moist			0.8		pp = 150-200					
-1					1.0		pp = 200-250	-1				
					1.2		pp = 200-250					
		- yellow-brown with some fine to medium grained subrounded gravel, trace clay		B	1.4		pp = 200-250					
					1.6							
-2		- grey with orange-brown mottling, wet						-2				
2.6												
2.7		SANDSTONE - low strength, highly weathered, grey, fine grained sandstone										
		Pit discontinued at 2.7m (due to refusal)										
-3								-3				
-4								-4				

RIG: JCB 3CX

LOGGED: TDL

SURVEY DATUM: WGS84 Zone 55K

WATER OBSERVATIONS: No free groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U ₂	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W ₂	Water seep
E	Environmental sample	W ₃	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha, Central Queensland

SURFACE LEVEL: 334m AHD* **PIT No:** ATP85
EASTING: 452000 **PROJECT No:** 74359.00
NORTHING: 7425524 **DATE:** 10/3/2011
DIP/AZIMUTH: 90°/-- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - medium dense, brown, fine to medium grained silty sand, moist		B	0.1							
				B	0.2		pp = 100-125					
		- some fine to coarse grained subrounded gravel			0.4		pp = 150-200					
	0.6	SANDY GRAVEL - dense, brown, fine to coarse sized subrounded sandy gravel, fine to coarse grained sand, some clay, moist		D	0.6		pp = 150-200					
					0.7							
					0.8		pp >600					
	0.9	CLAYEY SAND - medium dense, grey with red-brown mottling, low plasticity, fine to coarse grained clayey sand with some fine to coarse grained subrounded gravel, wet		B	0.9							
					1.0							
	1.4	SANDY CLAY - very stiff, grey with red-brown mottling, fine to coarse grained sandy clay, moist										
				D	1.6							
	1.7	SANDSTONE - low strength, highly weathered, grey, fine grained sandstone		B	1.7							
	1.75	Pit discontinued at 1.75m (due to refusal)			1.75							
	2											
	3											
	4											

RIG: JCB 3CX

LOGGED: TDL

SURVEY DATUM: WGS84 Zone 55K

WATER OBSERVATIONS: No free groundwater observed.

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W Water seep	S Standard penetration test	
E Environmental sample	W Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha, Central Queensland

SURFACE LEVEL: 333m AHD* **PIT No:** ATP86
EASTING: 451965 **PROJECT No:** 74359.00
NORTHING: 7424085 **DATE:** 9/3/2011
DIP/AZIMUTH: 90°/- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SILTY SAND - medium dense, grey, fine grained silty sand, dry		B	0.1		pp = 500-600					
				B	0.2		pp >600					
				B	0.3		pp >600					
				B	0.4		pp >600					
	0.6	CLAYEY SAND - medium dense, orange-brown, low plasticity, fine to medium grained clayey sand with some silt, moist		B	0.6		pp >600					
				B	0.8		pp >600					
	1.0			B	1.0		pp >600					
		- some coarse grained subrounded gravel		D	2.0							
	2.5	SANDSTONE - low strength, highly weathered, grey, fine grained sandstone										
	2.6	Pit discontinued at 2.6m (due to refusal)										
	3											
	4											

RIG: JCB 3CX

LOGGED: TDL

SURVEY DATUM: WGS84 Zone 55K

WATER OBSERVATIONS: No free groundwater observed.

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

☐ Cone Penetrometer AS1289.6.3.2

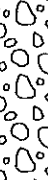

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)
D Disturbed sample	W Water seep	S Standard penetration test
E Environmental sample	W Water level	V Shear vane (kPa)

TEST PIT LOG

CLIENT: Hancock Prospecting Pty Ltd
PROJECT: Alpha Coal Mine
LOCATION: Alpha, Central Queensland

SURFACE LEVEL: 335m AHD* **PIT No:** ATP87
EASTING: 451908 **PROJECT No:** 74359.00
NORTHING: 7422986 **DATE:** 9/3/2011
DIP/AZIMUTH: 90°/-- **SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		GRAVEL - dense, red-brown, fine to coarse sized subrounded gravel, some fine to coarse grained sand and silt, moist		B	0.1		pp >600					
		- cemented		B	0.2							
		- no longer cemented, becoming wet		B	0.3							
				B	0.5		pp >600					
	0.8	SANDSTONE - low strength, highly weathered, grey, fine grained sandstone			0.8							
	0.9	Pit discontinued at 0.9m (due to refusal)										
	1											
	2											
	3											
	4											

RIG: JCB 3CX

LOGGED: TDL

SURVEY DATUM: WGS84 Zone 55K

WATER OBSERVATIONS: No free groundwater observed.

REMARKS: *Elevations interpolated from dxf file 2123204A-OVERALL_BFS_OPTION_A3_a provided by client

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W Water seep	S Standard penetration test	
E Environmental sample	W Water level	V Shear vane (kPa)	

Appendix B

B.3 Falling Head Permeability Test Results



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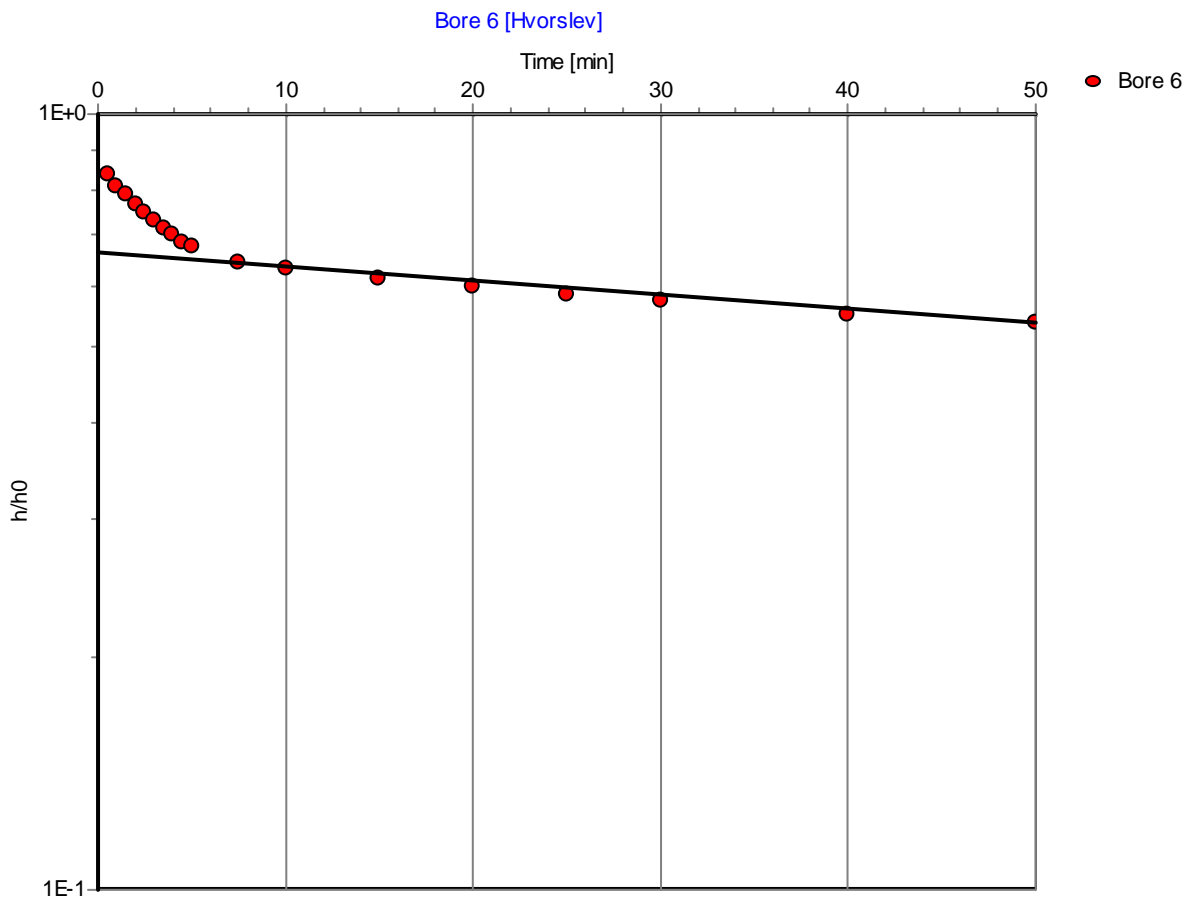
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Slug Test Analysis Report

Project: Alpha Mine Infrastructure

Number: 74359.00

Client: Hancock Prospecting Pty Ltd



Slug Test: **Bore6**

Analysis Method: **Hvorslev**

Analysis Results:

Conductivity: 2.00E-3 [m/d]

Test parameters:

Test Well: Bore 6

Aquifer Thickness:

Casing radius: 0.025 [m]

Screen length: 4 [m]

Boring radius: 0.055 [m]

Comments:

Evaluated by: AP/MB

Evaluation Date: 15/07/2010



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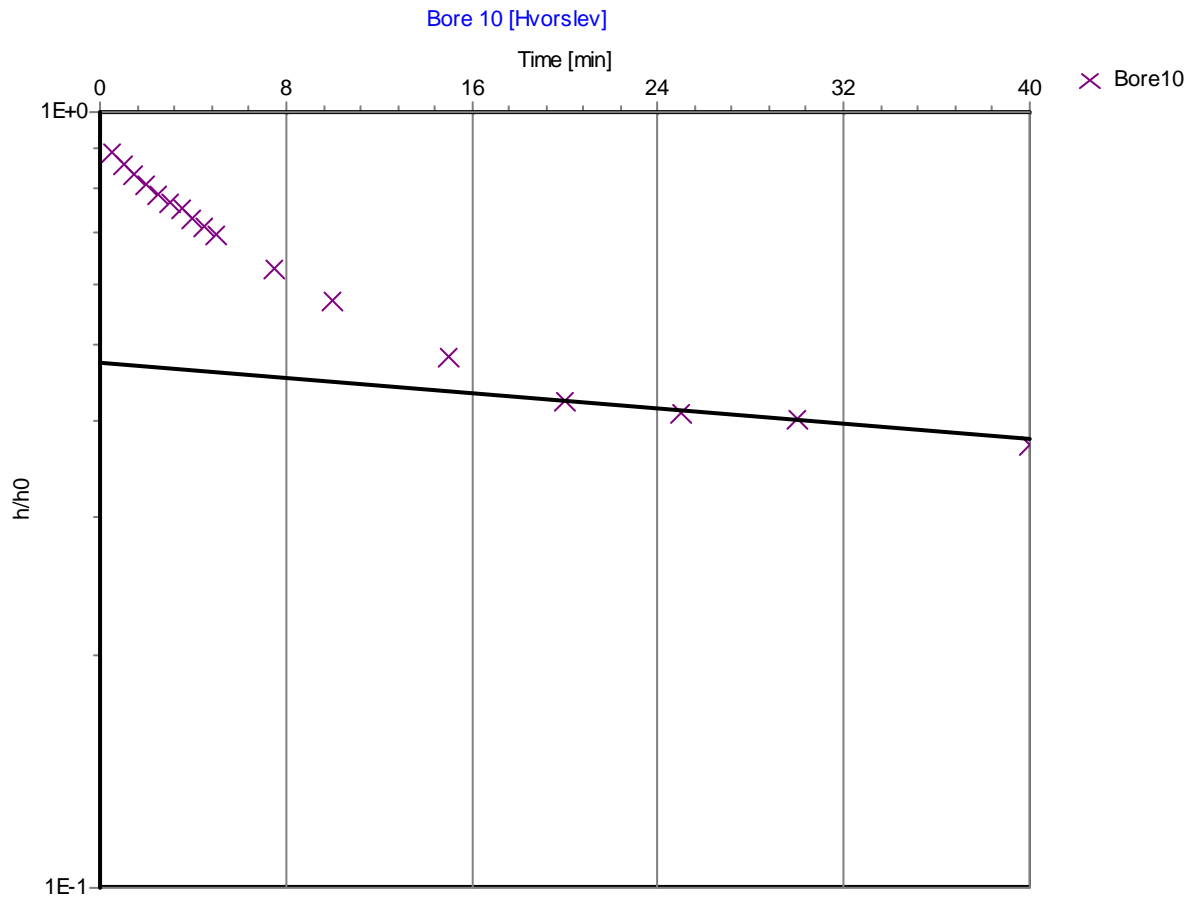
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Slug Test Analysis Report

Project: Alpha Mine Infrastructure

Number: 74359.00

Client: Hancock Prospecting Pty Ltd



Slug Test: **Bore 10**

Analysis Method: **Hvorslev**

Analysis Results:

Conductivity: 4.47E-3 [m/d]

Test parameters:

Test Well: Bore10
Casing radius: 0.025 [m]
Screen length: 2.1 [m]
Boring radius: 0.055 [m]

Aquifer Thickness:

Comments:

Evaluated by: AP/MB

Evaluation Date: 15/07/2010



Douglas Partners

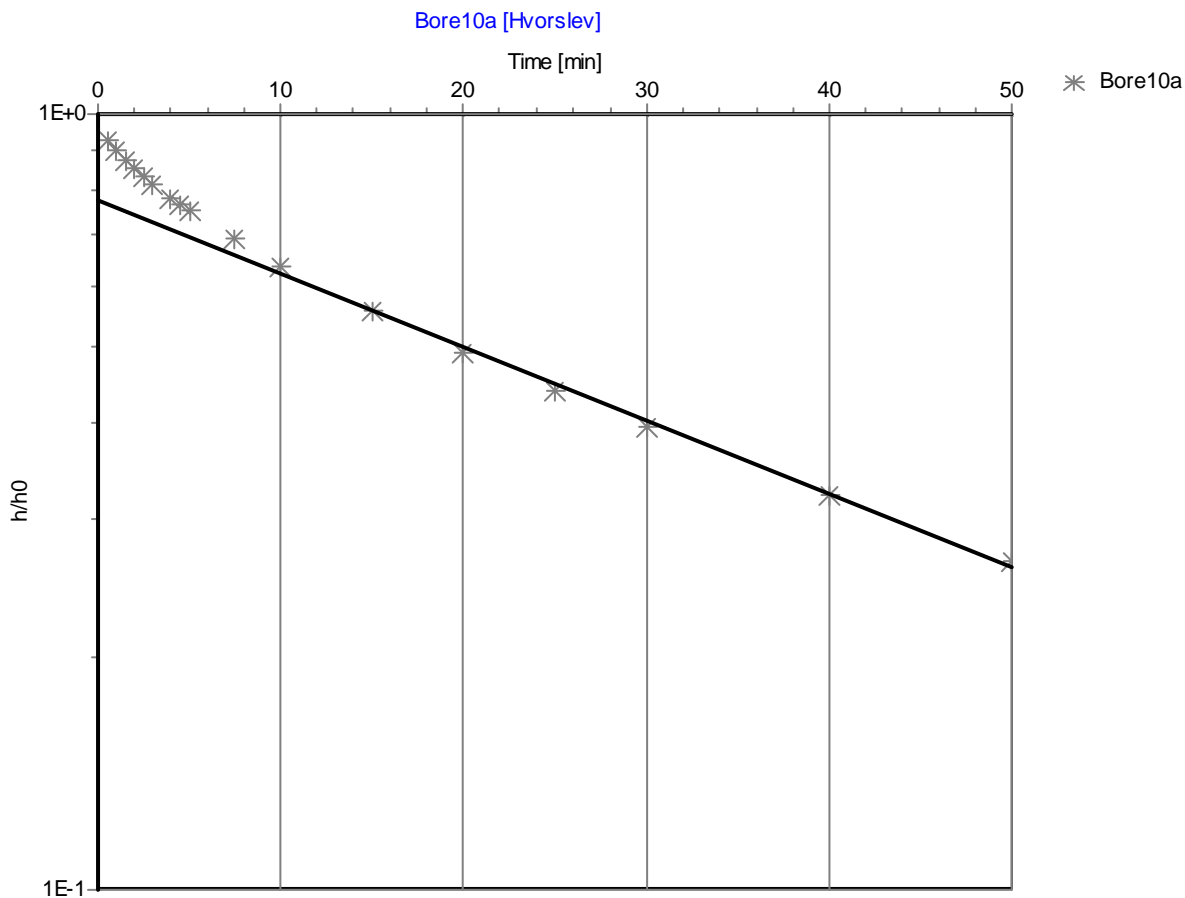
Geotechnics • Environment • Groundwater

Slug Test Analysis Report

Project: Alpha Mine Infrastructure

Number: 74359.00

Client: Hancock Prospecting Pty Ltd



Slug Test: **Bore10a**

Analysis Method: **Hvorslev**

Analysis Results:

Conductivity: 1.32E-2 [m/d]

Test parameters:

Test Well: Bore10a
Casing radius: 0.025 [m]
Screen length: 3 [m]
Boring radius: 0.055 [m]

Aquifer Thickness:

Comments:

Evaluated by: AP/MB

Evaluation Date: 15/07/2010



Douglas Partners

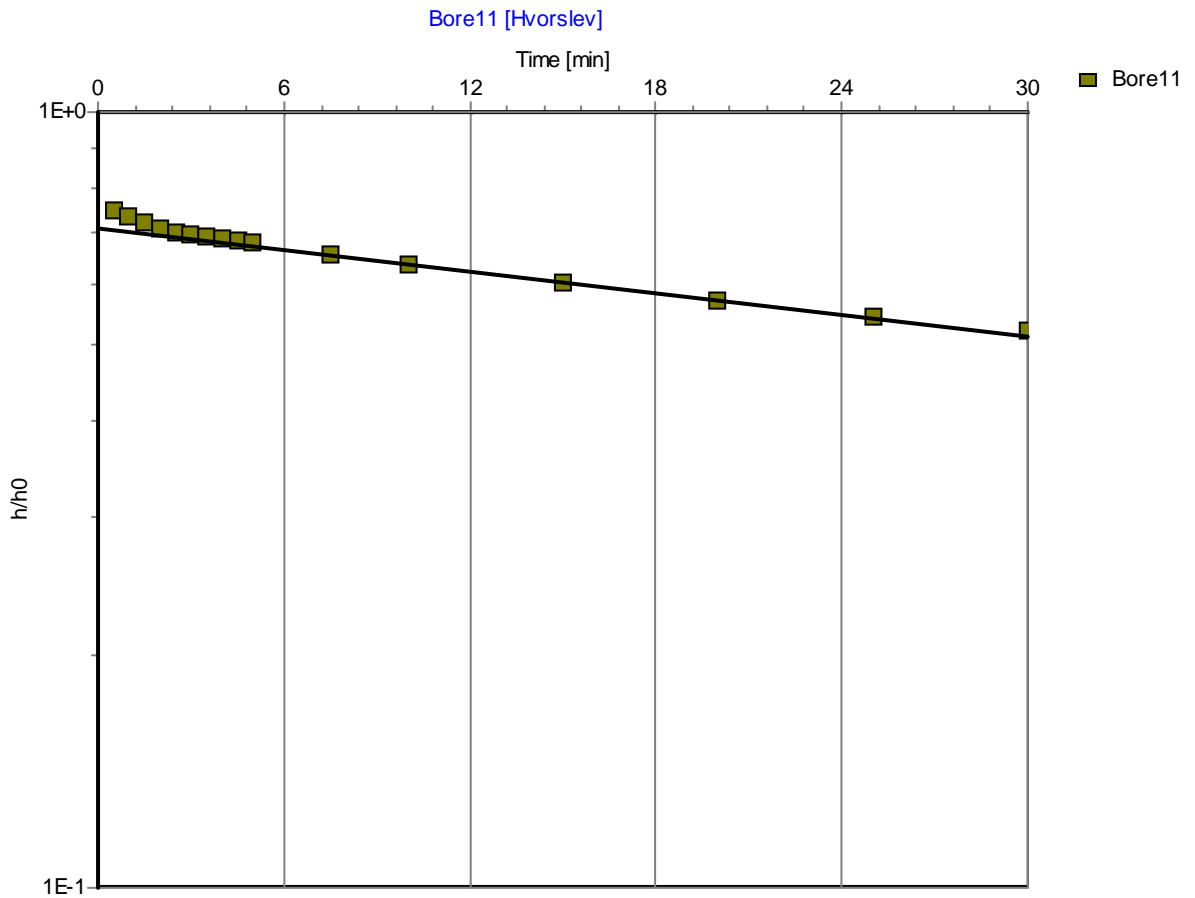
Geotechnics • Environment • Groundwater

Slug Test Analysis Report

Project: Alpha Mine Infrastructure

Number: 74359.00

Client: Hancock Prospecting Pty Ltd



Slug Test: **Bore11**

Analysis Method: **Hvorslev**

Analysis Results:

Conductivity: 6.64E-3 [m/d]

Test parameters:

Test Well: Bore11
Casing radius: 0.025 [m]
Screen length: 2.9 [m]
Boring radius: 0.055 [m]

Aquifer Thickness:

Comments:

Evaluated by: AP/MB

Evaluation Date: 15/07/2010



Douglas Partners

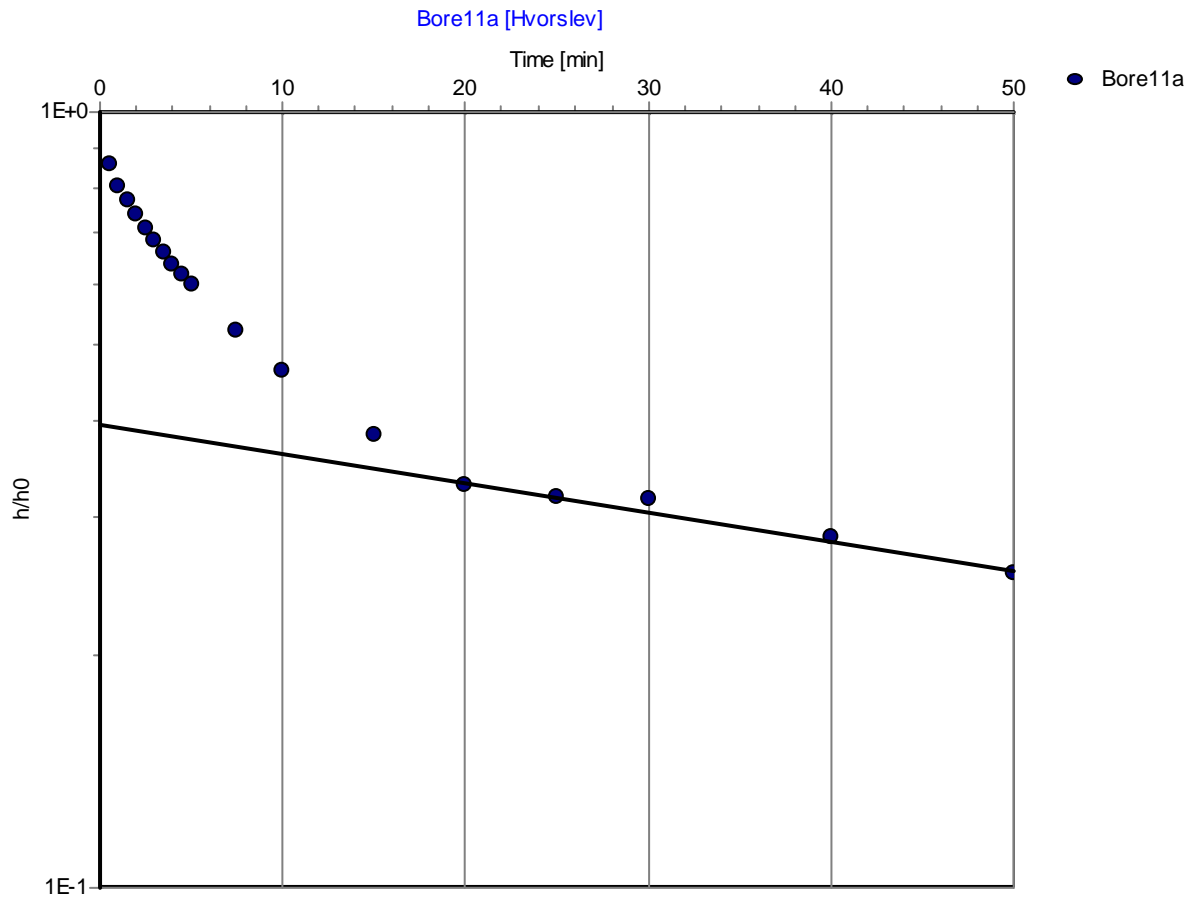
Geotechnics • Environment • Groundwater

Slug Test Analysis Report

Project: Alpha Mine Infrastructure

Number: 74359.00

Client: Hancock Prospecting Pty Ltd



Slug Test: **Bore11a**

Analysis Method: **Hvorslev**

Analysis Results:

Conductivity: 5.11E-3 [m/d]

Test parameters:

Test Well: Bore11a

Casing radius: 0.025 [m]

Screen length: 3.1 [m]

Boring radius: 0.055 [m]

Aquifer Thickness:

Comments:

Evaluated by: AP/MB

Evaluation Date: 15/07/2010



Douglas Partners

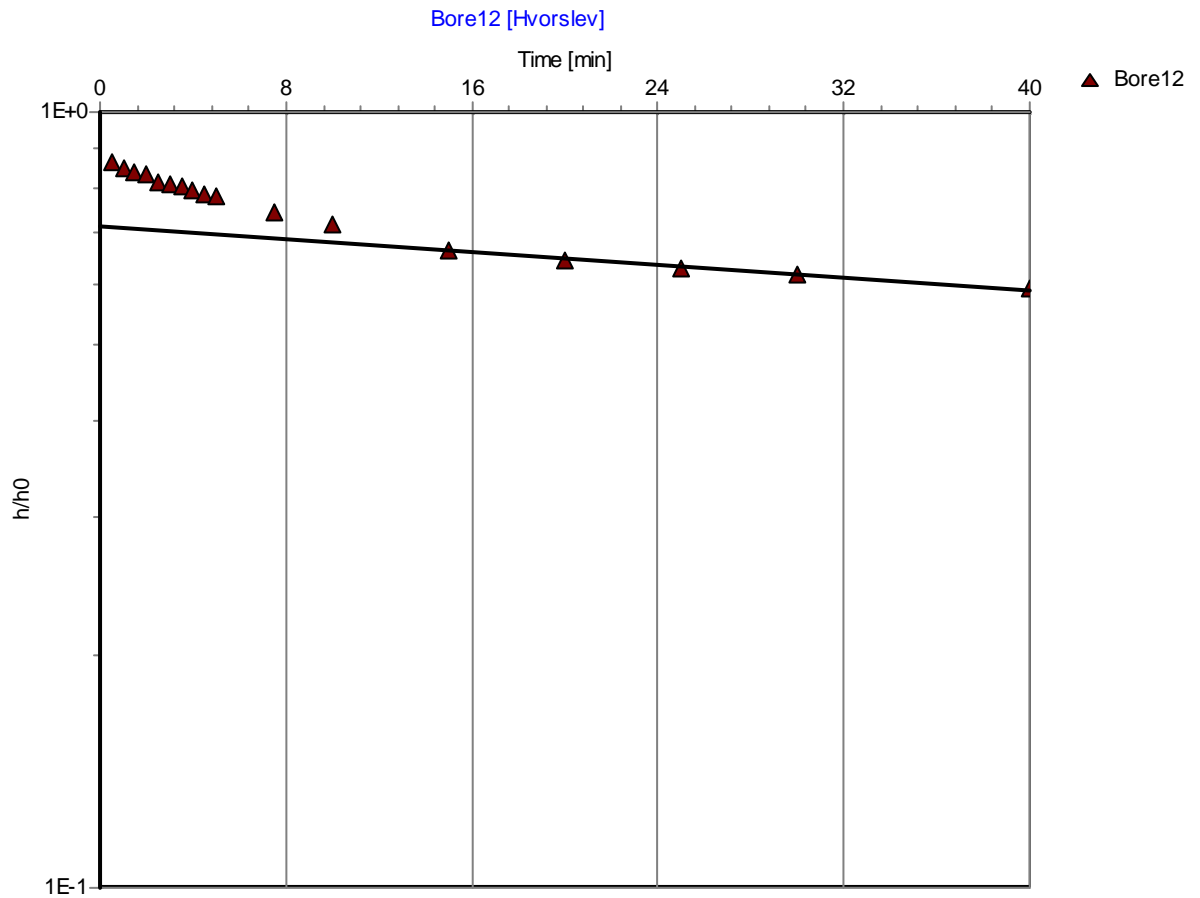
Geotechnics • Environment • Groundwater

Slug Test Analysis Report

Project: Alpha Mine Infrastructure

Number: 74359.00

Client: Hancock Prospecting Pty Ltd



Slug Test: **Bore12**

Analysis Method: **Hvorslev**

Analysis Results:

Conductivity: 2.51E-3 [m/d]

Test parameters:

Test Well: Bore12
Casing radius: 0.025 [m]
Screen length: 3.6 [m]
Boring radius: 0.055 [m]

Aquifer Thickness:

Comments:

Evaluated by: AP/MB

Evaluation Date: 15/07/2010

B.4 Laboratory Test Results



RESULTS OF MOISTURE CONTENT, PLASTICITY AND LINEAR SHRINKAGE TESTS

Client :	Hancock Prospecting Pty Ltd	Project No. :	74359
Project :	Alpha Coal Project	Report No. :	BO10-517
Location :	Alpha	Report Date :	15/07/2010
		Date Sampled :	2-17/06/2010
		Date of Test:	26/06-01/07/2010
		Page:	1 of 1

TEST LOCATION	DEPTH (m)	DESCRIPTION	Code	W _F %	W _L %	W _P %	PI %	*LS %
Bore 1	3.00-3.45m	Sandy silty clay	2, 5	16.4	48	23	25	15.5
Bore 4	0.50-0.95m	Silty clay	2, 5	15.7	48	15	33	12.5
Bore 4	3.00-3.45m	Sandy clay	2, 5	12.1	43	20	23	14.5
Bore 5	0.50-0.95m	Silty clay	2, 5	14.4	31	15	16	11
Bore 5	3.00-3.45m	Clayey silt	2, 5	15.3	30	20	10	8
Pit 1	1.4-1.8m	ELS Sandstone	2, 5	5.6	19	11	8	3
Pit 4	1.8-2.1m	EL-VLS Sandstone	2, 5	7.4	22	12	10	5
Pit 7	0.6-0.9m	Sandy clay	2, 5	8.6	21	9	12	6
Pit 8	0.4-0.8m	Sandy clay	2, 5	10.2	34	13	21	9
Pit 13	1.2-1.4m	ELS Sandstone	2, 5	9.6	25	11	14	5
Pit 18	2.0-2.3m	EL-VLS Sandstone	2, 5	8.8	23	11	12	5.5
Pit 24	1.7-1.9m	ELS Sandstone	2, 5	9.4	27	11	16	4.5
Pit 26	0.1-0.3m	Clayey sand with some gravel	2, 5	8.3	47	18	29	11.5

Legend:

W_F Field Moisture Content
W_L Liquid limit
W_P Plastic limit
PI Plasticity index
LS Linear shrinkage from liquid limit condition.

Test Methods:

Moisture Content: AS 1289.2.1.1 - 2005
Liquid Limit: AS 1289.3.1.2 - 1995
Plastic Limit: AS 1289.3.3.1 - 1995
Plasticity Index: AS 1289.3.2.1 - 1995
Linear Shrinkage: AS 1289.3.4.1 - 1995
Sampling Method(s): AS 1289.1.1 - 2001, AS 1289.1.2.1 - 1998

Code

Sample history for plasticity tests

1 Air dried
2 Low temperature (<50°C) oven dried
3 Oven (105°C) dried
4 Unknown

Method of preparation for plasticity tests

5 Dry sieved
6 Wet sieved
7 Natural

*Specify if sample crumbled CR or curled CU

Remarks



NATA Accredited Laboratory Number 828

This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.

Approved Signatory

Tested	TF/CG
Checked	SG

S. Gibbons
Sue-Ellen Gibbons
Senior Soil Technician

RESULTS OF MOISTURE CONTENT, PLASTICITY AND LINEAR SHRINKAGE TESTS

Client : Hancock Prospecting Pty Ltd		Project No. : 74359	
Project : Proposed Alpha Mine Infrastructure		Report No. : BO11-736	
Location : Via Alpha, Central Qld		Report Date : 18/6/2011	
		Date Sampled : 5-16/3/2011	
		Date of Test: 16/6/2011	
		Page: 1 of 1	

TEST LOCATION	DEPTH (m)	DESCRIPTION	Code	W _F %	W _L %	W _P %	PI %	*LS %
ABH 20	8.90-15.35m	Silty Clay with trace of Sand	2, 5	27.0	68	27	41	16
ABH 16	8.74-13.00m	MS Sandstone	2, 5	6.1	14	13	1	1.5
ATP 82	0.20-0.50m	Slightly Sandy Gravel with some Silt	2, 5	3.3	15	9	6	1.5
ATP 83	0.20-0.30m	Sand and Silt with trace of Gravel	2, 5	4.9	15	8	7	1.5
ATP 84	1.40-1.60m	Silty Sand with some Gravel	2, 5	11.0	18	10	8	2
ATP 85	0.70-0.75m	Slightly Clayey Sandy Gravel	2, 5	5.7	23	17	6	1
ATP 86	0.60-0.80m	Clayey Sand with some Silt	2, 5	8.8	21	8	13	4.5
ATP 87	0.10-0.30m	Gravel with some Sand and Silt	2, 5	2.3	16	15	1	0.5

Legend:

W_F Field Moisture Content
 W_L Liquid limit
 W_P Plastic limit
 PI Plasticity index
 LS Linear shrinkage from liquid limit condition.

Test Methods:

Moisture Content: AS 1289.2.1.1 - 2005
 Liquid Limit: AS 1289.3.1.2 - 1995
 Plastic Limit: AS 1289.3.3.1 - 1995
 Plasticity Index: AS 1289.3.2.1 - 1995
 Linear Shrinkage: AS 1289.3.4.1 - 1995
 Sampling Method(s): AS 1289.1.1 - 2001, AS 1289.1.2.1 - 1998

Code
Sample history for plasticity tests

1 Air dried
 2 Low temperature (<50°C) oven dried
 3 Oven (105°C) dried
 4 Unknown

Method of preparation for plasticity tests

5 Dry sieved
 6 Wet sieved
 7 Natural

*Specify if sample crumbled CR or curled CU

Remarks




NATA Accredited Laboratory Number 828

This document is issued in accordance with NATA's
 accreditation requirements.
 Accredited for compliance with ISO/IEC 17025.

Approved Signatory

Tested	SM
Checked	S..J.

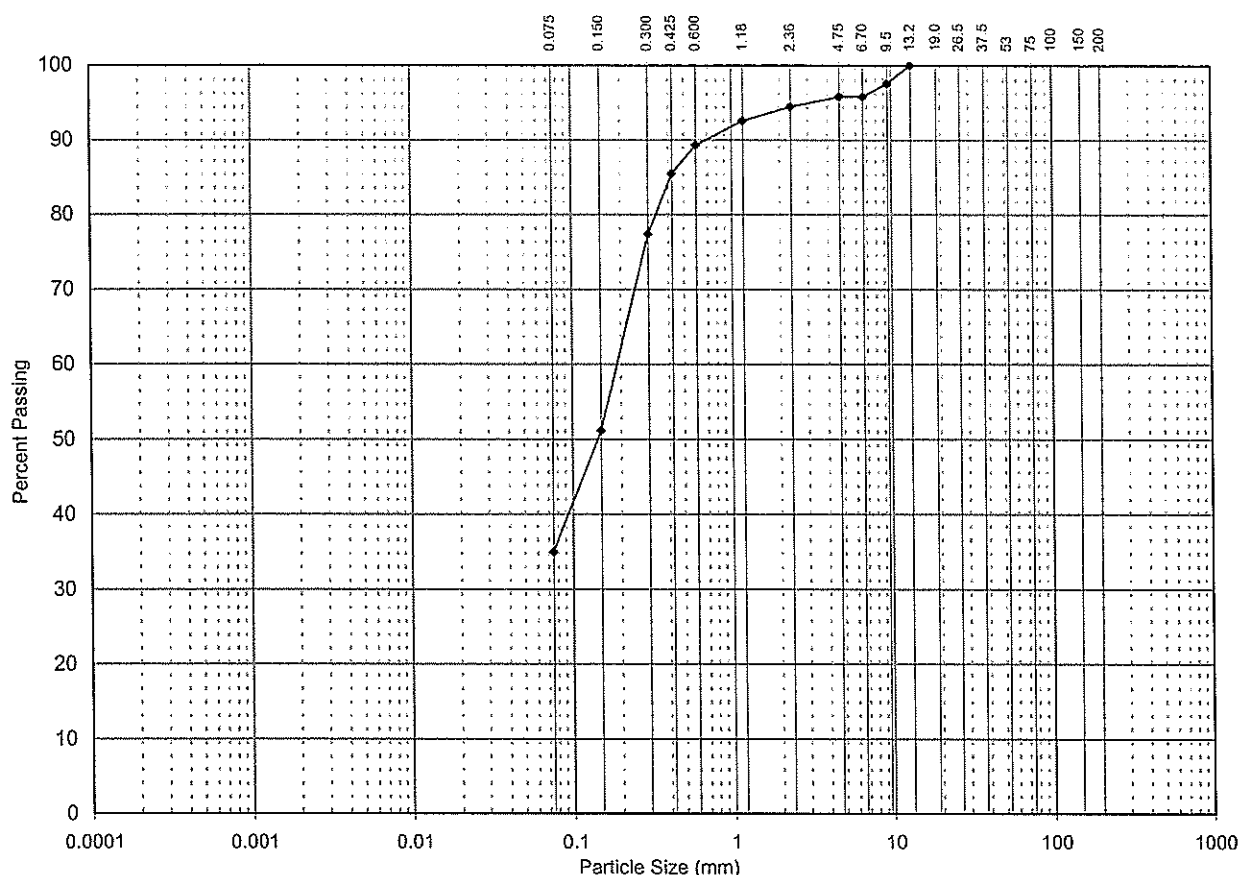

 Srdjan Jajcanin
 Laboratory Co-ordinator



RESULTS OF PARTICLE SIZE DISTRIBUTION

Client :	Hanncock Prospecting Pty Ltd	Project No. :	74359
Project :	Alpha Coal Project	Report No. :	BO10-497
Location :	Alpha	Report Date :	29-Jun-10
Road No:	-	Date Sampled:	2-17/06/2010
Chainage:	-	Date of Test:	28-Jun-10
Sample / Pit No:	Bore 6	Depth / Layer:	0.50-0.95m
Section / Lot No:	-	Test Request No:	-
Page:		1 of 1	

AUSTRALIAN STANDARD SIEVE APERTURES



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	~
13.2	100%
9.5	98%
6.7	96%
4.75	96%
2.36	94%
1.18	93%
0.600	89%
0.425	85%
0.300	77%
0.150	51%
0.075	35%

CLAY FRACTION			SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
			Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
			0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60

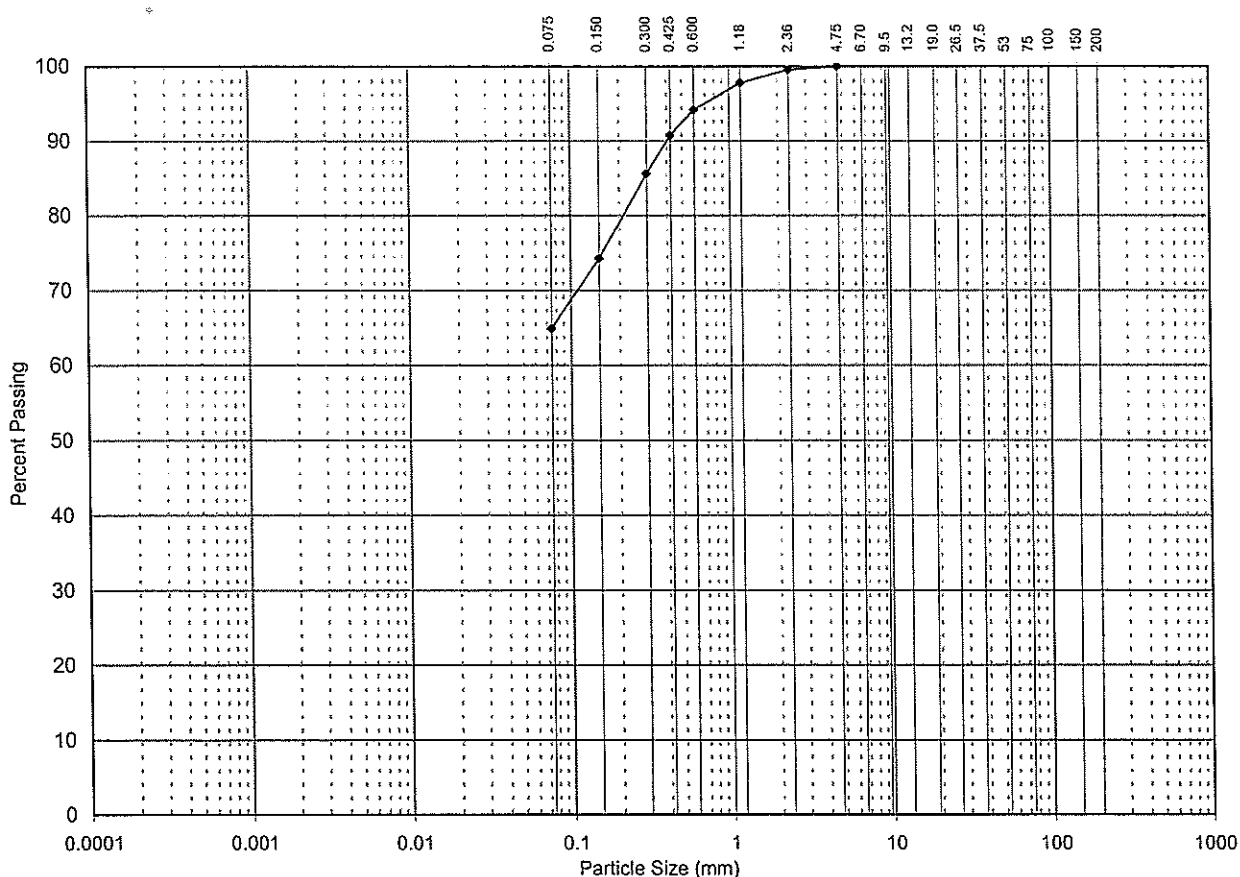
Description: Silty sand with some gravel
 Test Method(s): AS 1289.3.6.1 - 2009, AS 1289.3.6.3 - 2003
 Sampling Method(s): Sampled by DP Engineering
 Remarks: 0



RESULTS OF PARTICLE SIZE DISTRIBUTION

Client :	Hanncock Prospecting Pty Ltd	Project No. :	74359
Project :	Alpha Coal Project	Report No. :	BO10-499
Location :	Alpha	Report Date :	08-Jul-10
Road No:	-	Date Sampled:	2-17/06/2010
Chainage:	-	Date of Test:	06-Jul-10
		Sample / Pit No:	Bore 12
		Depth / Layer:	1.50-1.95m
		Section / Lot No:	-
		Test Request No:	-
		Page:	1 of 1

AUSTRALIAN STANDARD SIEVE APERTURES



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	~
13.2	~
9.5	~
6.7	~
4.75	100%
2.36	100%
1.18	98%
0.600	94%
0.425	91%
0.300	86%
0.150	74%
0.075	65%

CLAY FRACTION			SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
			Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
			0.002	0.006	0.02	0.06	0.2	0.6	2.0	5.0	20	60

Description: Sandy clay
Test Method(s): AS 1289.3.6.1 - 2009, AS 1289.3.6.3 - 2003
Sampling Method(s): Sampled by DP Engineering
Remarks: 0

Approved Signatory:

Tested:	SAG
Checked:	SG

S. Gibbons
Sue-Ellen Gibbons
Senior Soil Technician

Appendix C Exploratory Boreholes

Appendix C

C.1 Exploratory Borehole Logs

Date(s) Drilled: 19/07/11 to 21/07/11	Logged By: RJR/CJH	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7429510 mN 451020 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
322 0									SAND (SP); fine grained, light greyish brown with some light orange stain, with some silt, dry, loose to medium dense, friable (Residual)						Start Augering at 09:22 (19/07/11)
321 1									Sandy CLAY (CL); low plasticity, light greyish brown, sand is fine grained, dry, stiff to very stiff, friable, MC:5.7%, LL:18%, PL:10%, PI:8%, LS:2.0*, 54% Fines	1	10 12 13	25	0.5		
									Sandy SILT (ML); light greyish brown, sand is fine to medium grained, with a trace of clay, dry, stiff to very stiff, friable						
320 2									SAND (SP); fine grained, light brown to light greyish brown with some light orange stain, with some silt and a trace of clay, dry, very dense, friable, becomes silty	2	30 for 120mm	50+	0.1		
319 3	1	1	36		36				becomes light greyish brown, with a trace of silt, slightly cemented in places SANDSTONE; low strength, highly weathered, light greyish brown with light orange stain, fine grained, slightly fractured	3	50 for 80mm	50+	0.1		HW Casing installed to 3.0m. Start NQ3 Coring at 10:57
	2	1	80		80										Polymer added to water
318 4	3	1	100		87				From 4.0m to 4.13m - highly fractured (recovered as fine to coarse grained angular gravel of sandstone) / SAND (SP); fine grained, light grey to light brown, with a trace of silt (Residual)						
317 5	4	1	0		0										NO RECOVERY from 5.0m to 6.4m
	5	1	0		0										

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 19/07/11 to 21/07/11	Logged By: RJR/CJH	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7429510 mN 451020 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
316 6																
	6	1	0		0											
										</						

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 19/07/11 to 21/07/11	Logged By: RJR/CJH	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7429510 mN 451020 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS	
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)		
												Blows per 150mm	N Value Blows/300mm				
310 12																	
									Silty CLAY/Clayey SILT (CL-ML); low to medium plasticity, mottled light orange, red and light grey, with a trace of to some fine to coarse grained sand, moist, very stiff, MC: 12.1%, 59% Fines	10	23 50 50 for 100mm	50+	0.4				Start of days drilling (21/07/11). Overnight water level at 5.15m
309 13																	
									Silty CLAY/Clayey SILT (CL-ML); low plasticity, light grey mottled with some light orange, with some fine to coarse grained sand, moist, very stiff to hard, MC:11.9%, LL:18%, PL:12%, PI:6%, LS:4%, 54% Fines	11	34 50 for 120mm	50+	0.3				
308 14																	
									Sandy CLAY (CH); medium to high plasticity, light grey mottled with some red iron stain, sand is fine to coarse grained, moist, hard, with a few cemented layers (EW Sandstone), MC:12.3%, LL:20%, LS:3.5%	12	50 for 130mm	50+	0.1				
307 15																	
									Silty CLAY/Clayey SILT (CL-ML); low plasticity, light grey with trace light orange, with some fine to medium grained sand, moist, stiff to hard, MC:12%, LL:19%, PL:13%, PI:6%, LS:3.0%, 56% Fines	13	27 49 50 for 60mm	50+	0.4				
306 16																	
									becomes red and light grey with rare yellow, hard	14	50 for 130mm	50+	0.1				
305 17																	
									becomes red mottled light grey, with a trace of fine to medium grained sand, moist, hard	15	50 for 130mm	50+	0.1				
304																	

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

URS Australia Pty Ltd

Phone: (07) 3243 2111 Fax: (07) 3243 2199



Project No.: 42626683
Project Reference: Alpha Coal Project - Out-of-Pit Tailings Storage Facility

Client: Hancock Coal

Sheet 4 of 4

BH01

Date(s) Drilled: 19/07/11 to 21/07/11	Logged By: RJR/CJH	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7429510 mN 451020 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS	
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)		Water Content (%)
												Blows per 150mm	N Value Blows/300mm			
304 18																
	7	1	85		74				SANDSTONE; very low strength, highly to extremely weathered, red with a trace of light grey, no visible bedding, fine to medium grained, fractured (Colinlea Sandstone) 55mm layer of light grey clay	16	40 for 30mm	50+	0.0			Start NQ3 Coring at 11:40
303 19									becomes light grey with some red, occasional laminations of light grey clay (5-20mm thick)							
	8	1	100		84											
302 20									END OF BOREHOLE at 20.0m (Target Depth)							Rlg chatter and rods bouncing at 19.8m Piezometer installed to 20.0m at conclusion of drilling
301 21																
300 22																
299 23																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability



Date(s) Drilled: 22/07/11 to 22/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/70 mm Blade Bit	Total Depth Drilled (m): 10.1
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 329.0 m
Groundwater Depth: Not Encountered	Location: 7429351 mN 452227 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
329 0									Silty SAND (SM); fine to medium grained, brown to light brown, dry, friable, trace rootlets (Alluvium)						Start Augering at 09:20 (22/07/11)	
									SILT (ML); light yellowish brown, with a trace of clay and some fine grained sand, dry, stiff, slightly cemented (Residual)							
328 1									becomes mottled orange, sandy (fine grained)	1	9	21	0.5			
									becomes orange brown, some fine grained sand, dry to moist		11					
											10					
327 2									MC:8.1%, LL:20%, PL:12%, Pl:8%, LS:1.0*%, 31% Fines		7					
									SAND (SP); fine grained, light grey mottled light orange, with a trace of to some clay, moist, medium dense	2	7	17	0.5			
									becomes light orange brown, clayey		10					
326 3									becomes fine to medium grained, light grey, with a trace of clay, moist, slightly cemented	3	17	27	0.5			
									becomes light grey to orange brown, mottled, with a trace of to some clay		15					
											12					
325 4									becomes with some red iron staining, with a trace of fine to coarse sub angular to subrounded gravel (incl. quartz and sandstone), MC:11.5%, LL:21%, LS:1.5%	4	19	20	0.5	Driller notes possible perched groundwater at 3.8m		
									SAND (SW); fine to medium grained, light grey, moist to wet, medium dense, clean becomes clayey		9					
											11					
324 5									becomes medium to coarse grained, light grey speckled white, with some clay and with a trace of fine to coarse grained subrounded gravel of sandstone, slightly cemented, MC:8.1%, LL:25%, PL:13%, Pl:12%, LS:3.0+%, 23% Fines	5	12	28	0.5	HW Casing installed to 4.5m. Start Rotary Wash Drilling		
											13					
											15					

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 22/07/11 to 22/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/70 mm Blade Bit	Total Depth Drilled (m): 10.1
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 329.0 m
Groundwater Depth: Not Encountered	Location: 7429351 mN 452227 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
323 6								becomes light grey to white with rare reddish brown mottles, with a trace of fine grained subrounded gravel, very dense, homogenous	X	6	50 for 140mm	50+	0.1			
322 7								CLAY (CL); low plasticity, light grey with some light orange stain, with some fine grained sand and a trace of silt, very stiff to hard, a few sandy pockets (medium to coarse grained), MC:18.6%, LL:32%, PL:22%, PI:10%, LS:6%, 55% Fines	X	7	42 50 for 70mm	50+	0.2			
321 8								with rare grey to reddish brown pockets, with some silt, very thinly laminated, very slightly cemented, a few light grey silt nodules	X	8	50 for 100mm	50+	0.1			
320 9								becomes with a trace of silt, homogenous, moderately cemented	X	9	50 for 60mm	50+	0.1			
319 10								becomes with some fine grained sand	X	10	50 for 70mm	50+	0.1			
								END OF BOREHOLE at 10.07m (Target Depth)						Piezometer installed to 10.0m at conclusion of drilling		
318 11																
317																






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NOTES: Classification: Soil classification via AS 1726 - 1993
ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 23/07/11 to 23/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 338.0 m
Groundwater Depth: Not Encountered	Location: 7429250 mN 453345 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:


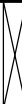

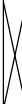




Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS	
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
338 0									SAND (SW); fine to medium grained, light greyish brown, with some silt, dry, friable, trace rootlets (Alluvium) becomes fine to coarse grained							Start Augering at 10:23 (23/07/11)
337 1									SILT (ML); low plasticity, light greyish brown, with some fine grained sand, dry, very stiff, friable (Residual) becomes low to medium plasticity, mottled light orange brown, with a trace of fine grained sand and a trace of clay, slightly cemented	1	9 10 17	27	0.5			
336 2									becomes light brown to light orange brown, with some sand to sandy (fine to medium grained), a few iron stained pockets becomes with a trace of fine grained sand, light grey, slightly to moderately cemented	2	27 43 30 for 100mm	50+	0.4			
335 3									becomes sandy (fine grained), no clay, moist, no cementation becomes with some orange brown mottles, sand is fine to coarse grained becomes with a trace of fine to medium grained subangular to subrounded gravel of quartz and sandstone	3	11 21 30	50+	0.5			
334 4									becomes brown to light greyish brown, speckled black, slightly cemented 100mm silt lense with a trace of fine grained sand and a trace of clay Clayey SAND (SC); fine grained, light orange brown with rare light grey mottles, moist, medium dense to dense becomes with a trace of fine to medium grained subangular to subrounded gravel of quartz and sandstone	4	13 11 26	37	0.5			
333 5									becomes fine to coarse grained, MC:9%, LL:20%, PL:11%, PI:9%, LS:3.0%, 48% Fines CLAY (CL); low plasticity, light orange brown to light grey with occasional orange mottles, with a trace of to some fine grained sand and silt, dry to moist, very stiff, a few fine grained sandy pockets	5	17 17 27	44	0.5			

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Date(s) Drilled: 23/07/11 to 23/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 338.0 m
Groundwater Depth: Not Encountered	Location: 7429250 mN 453345 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
332 6									becomes some fine to medium grained sand, MC:6.6%, LL:45%, LS:7.5% becomes light grey with light orange stain, with a trace of fine grained sand 30mm thick reddish brown iron hard pan		11 19 21	40	0.5			
331 7									Silty CLAY (CH); high plasticity, light brown speckled white and yellow, with a trace of fine grained sand, moist, stiff to very stiff, MC:25.6%, LL:121%, PL:25%, PI:96%, LS:17.0*+%, 90% Fines becomes light grey, crudely very thinly laminated in places, occasional reddish brown iron hard pans		11 17 21	38	0.5			
330 8									SILTSTONE; extremely low strength, residual to completely weathered, tan and light grey, very thinly laminated to laminated (SILT: tan to light grey, with some clay, dry, friable, slightly to moderately cemented)		46 50 for 90mm	50+	0.2			
329 9									SILT (ML); tan to light grey, with some clay, dry, hard, friable, slightly to moderately cemented (Residual Siltstone)		23 50 for 120mm	50+	0.3			
328 10									END OF BOREHOLE at 10.0m (Target Depth)						Piezometer installed to 10.0m at conclusion of drilling	
327 11																
326																

NOTES: Classification: Soil classification via AS 1726 - 1993

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Piezometer installed to 10.0m at conclusion of drilling

Date(s) Drilled: 09/08/11 to 10/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 321.0 m
Groundwater Depth: Not Encountered	Location: 7427970 mN 450695 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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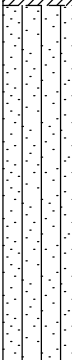


Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
321 0									Silty SAND (SM); fine grained, light grey, dry, friable, a few rootlets (Residual)							Start Augering at 14:48 (09/08/11)
									becomes with some silt, moist, rare slightly cemented silt nodules							
320 1									Sandy CLAY (CL); low plasticity, light greyish brown to light brown with rare light orange stain, with a trace of silt, moist, very stiff, MC:10.2%, LL:31%, PL:13%, PI:18%, LS:8.0+%, 58% Fines	1	12 12 16	28	0.5			
319 2									Clayey SAND (SC); fine grained, light grey with rare light orange stain, moist, friable, dense, homogenous, MC:7.9%, LL:19%, PL:12%, PI:7%, LS:3.0*, 35% Fines	2	17 24 25	49	0.5			
318 3									SILT (ML); with a trace of clay and some fine grained sand, light grey and light orange, moist, very stiff							
									Silty SAND (SM); fine grained, light grey with rare light orange stain, moist, medium dense	3	10 13	23	0.5			HW casing installed to 3.2m. Begin Rotary Wash Drilling at 16:07
317 4																
									Gravelly SAND (SW); fine to medium grained, light grey, gravel is medium to coarse grained and angular to subangular of sandstone, moist, very dense, slightly to moderately cemented (Residual to CW Sandstone)	4	50 for 80mm	50+	0.1			
316 5																
315																

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Date(s) Drilled: 09/08/11 to 10/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 321.0 m
Groundwater Depth: Not Encountered	Location: 7427970 mN 450695 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
315 6									CLAY (CL); low plasticity, light grey, with some fine grained sand and with a trace of silt, moist, very stiff, slightly cemented (Residual), MC:14.6%, LL:30%, PL:20%, PI:10%, LS:5.5%, 59% Fines	5	27 44 50 for 130mm	50+	0.4	Alternating hard and soft bands observed during drilling		
314 7									Silty SAND (SM); fine to medium grained, light grey, moist, very dense, homogenous	6	50 for 80mm	50+	0.1			
313 8									Sandy GRAVEL (GW); gravel is fine to medium grained and angular of sandstone, sand is fine to coarse grained, light pinkish grey, with some silt, very dense, slightly cemented (Residual to CW Sandstone)	7	50 for 50mm	50+	0.1		Alternating hard and soft bands observed during drilling	
312 9									SILT (ML); low plasticity, light grey, with a trace of to some clay and with a trace of fine grained sand, moist, very stiff to hard, homogenous	8	50 for 140mm	50+	0.1	Alternating hard and soft bands observed during drilling		
311 10																
310 11																
309																

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URS Australia Pty Ltd

Phone: (07) 3243 2111 Fax: (07) 3243 2199

Project No.: 42626683
Project Reference: Alpha Coal Project - Out-of-Pit Tailings Storage Facility

Client: Hancock Coal

Sheet 3 of 4

BH04

Date(s) Drilled: 09/08/11 to 10/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 321.0 m
Groundwater Depth: Not Encountered	Location: 7427970 mN 450695 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS	
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)		Water Content (%)
												Blows per 150mm	N Value Blows/300mm			
309 12	1	1	100		100				SANDSTONE; medium strength, moderately to slightly weathered, light grey, light pinkish red and light yellow, laminated at 0° to 20°, well developed, fine to medium grained, slightly fractured, rare soft silt or sand lenses up to 25mm thick (Colinlea Sandstone) UCS: 15.8MPa						Start NQ3 Coring at 12.0m	
308 13									becomes laminated to very thinly bedded						Packer Testing from 13.0m to 16.0m	
307 14	2	1	100		100				becomes low to medium strength, moderately weathered becomes light grey and light pink							
306 15	3	1	100		100				from 15.45m to 16.70m: becomes fine to coarse grained							
305 16									becomes light grey, light orange and light pinkish red, quartz-rich becomes medium to coarse grained, low strength, moderately to highly weathered, slightly pitted in places						Core has abundant mechanically induced fractures	
304 17	4	1/2	100		0				becomes laminated light grey and light pink at 0° to 30°						Piezometer installed to 17.5m at conclusion of drilling	

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Date(s) Drilled: 09/08/11 to 10/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 321.0 m
Groundwater Depth: Not Encountered	Location: 7427970 mN 450695 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
303 18									becomes with a few coarse grained subangular to subrounded gravel of quartz, sandstone and claystone/chert (conglomeratic) CLAYSTONE/CHERT; high strength, moderately to slightly weathered, white, cryptocrystalline to argillaceous CLAY (CL); low plasticity, grey to light grey, with some silt, moist, very stiff, homogenous (Residual Siltstone)	9	25 50 for 120mm	50+	0.3		
302 19	5	2	17		0			MC:16.6%, LL:33%, PL:23%, PI:10%, LS:6.5%, 95% Fines							
								SILTSTONE; extremely low strength, residual to completely weathered, grey to light grey (SILT; low plasticity, grey to light grey, with a trace of to some clay, moist, very stiff, homogenous)							
301 20	6	2	100		0				END OF BOREHOLE at 20.0m (Target Depth)						
300 21															
299 22															
298 23															
297															

NOTES: Classification: Soil classification via AS 1726 - 1993

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Date(s) Drilled: 26/07/11 to 26/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level:329.0 m
Groundwater Depth:Not Encountered	Location: 7427936 mN 451853 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m)	Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
		Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
329	0									Silty SAND (SM); fine to medium grained, brown to light brown, dry, friable, some rootlets (TOPSOIL) / SAND (SW); fine to medium grained, light brown, with some silt and with a trace of fine grained subangular gravel, dry to moist, loose to medium dense, friable (Residual)						Start Augering at 08:59 (26/07/11)
328	1									MC:12.4%, LL:25%, PL:12%, PI:13%, LS:5.5%, 46% Fines CLAY (CL); low plasticity, light grey to light brown mottled orange brown, with some fine grained sand, rare rootlets becomes with a trace of fine grained sand	X 1	2 5 6	11	0.5		
327	2									becomes with a trace of fine grained angular gravel and fine to coarse grained sand GRAVEL (GW); fine to medium grained and angular to subangular of sandstone, reddish brown, with a trace of silt and some fine to coarse grained sand, dry, very dense	X 2	15 50 for 20mm	50+	0.2		
326	3	1	1	100		0				Silty SAND (SM); fine to coarse grained, reddish brown, with a trace of fine to medium grained subangular gravel of sandstone, dry becomes gravelly SANDSTONE; extremely low to very low strength, residual to highly weathered, light grey to reddish brown, fine grained, slightly oxidised (Colinlea Sandstone) becomes low strength						From 2.4m - becomes difficult to auger
		2	1	100		100				becomes highly weathered						
325	4									becomes reddish brown, iron rich, oxidised, silty						
324	5	3	1	98		75				becomes completely to highly weathered, extremely low to very low strength						
323																

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Date(s) Drilled: 26/07/11 to 26/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 329.0 m
Groundwater Depth: Not Encountered	Location: 7427936 mN 451853 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
323 6															

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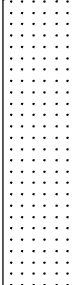
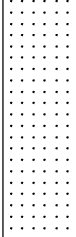
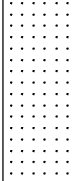


Date(s) Drilled: 24/07/11 to 24/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 12.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 338.0 m
Groundwater Depth: Not Encountered	Location: 7427953 mN 452859 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Drill Cuttings	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
338 0									SILT (ML); brown, with a trace of clay and a trace of fine to medium grained sand, dry, friable, rootlets (TOPSOIL) SILT (ML); light brown to light yellowish brown, with a trace of clay and a trace of fine to medium grained sand, dry, friable (Residual)						Start Augering at 10:17 (24/07/11)	
337 1									SILT (ML); low to medium plasticity, light greyish brown and reddish brown, with some clay and a trace of fine grained sand, dry, very stiff, slightly cemented becomes light reddish brown, with a few medium grained sand-sized silt nodules	1	14 20 19	39	0.5			
336 2									becomes with a trace of clay and some fine to medium grained sand SAND (SP); fine grained, light grey and light reddish brown, with some clay, dry, very dense becomes slightly to moderately cemented becomes fine to medium grained sand, clayey, with a trace of fine to medium grained subangular gravel of predominantly quartz	2	24 31 37	50+	0.5			
335 3									becomes light reddish brown, with some clay, MC:9%, LL:24%, PL:13%, PI:11%, LS:4.0%, 32% Fines CLAY (CL); light reddish brown with rare light grey lenses, with some fine to medium grained sand and with a trace of fine subangular gravel, dry, very stiff	3	11 21 31	50+	0.5			
334 4									Clayey SAND (SC); fine to medium grained, light grey with some light orange brown pockets, with a trace of fine grained angular gravel, dry, very dense, moderately cemented in places, MC:14.8%, LL:25%, PL:14%, PI:11%, LS:4.0% CLAY (CL); low plasticity, light grey, with a trace of fine grained sand and silt, dry, very stiff, slightly cemented, homogenous	4	29 28 34	50+	0.5			
333 5									becomes with rare light orange brown pockets and with some silt, MC:11.1%, LL:24%, PL:17%, PI:7%, LS:3.0%, 48% Fines becomes sandy (fine grained)	5	19 47 50 for 100mm	50+	0.4			

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Date(s) Drilled: 24/07/11 to 24/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 12.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 338.0 m
Groundwater Depth: Not Encountered	Location: 7427953 mN 452859 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Drill Cuttings	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
332 6									becomes moderately cemented	⊗	6	50 for 130mm	50+	0.0		From 7.0m to 7.3m and 7.7m to 8.0m: difficult to auger
331 7									Silty SAND (SM); fine grained, light grey, with a trace of fine grained angular gravel, dry, very dense	⊗	7	50 for 70mm	50+	0.0		
330 8	1	1	96		96				SANDSTONE; low to very low strength, highly weathered, light orange brown to light grey, thinly laminated in places, fine grained (Colinlea Sandstone)						HW Casing installed to 8.0m. Start NQ3 Coring at 14:54. Polymer added	
329 9									From 8.90m to 9.05m: becomes completely weathered, extremely low strength							Packer Test from 9.0 - 12.0m
	2	1	100		100				no discernable bedding							
328 10									becomes low strength, highly to moderately weathered, light greyish white to light orange brown, slightly fractured							
									rare coarse grained subrounded gravel-sized clasts							
327 11	3	1	86		86				From 11.60m to 11.85m: inferred core loss							

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

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Date(s) Drilled: 02/08/11 to 03/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.2
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7425884 mN 450748 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
322 0								SAND (SW); fine grained, light greyish brown, with some silt, dry, friable, a few rootlets (Residual)							Start Augering at 12:38 (02/08/11)	
								becomes fine to medium grained, light brown, slightly cemented in places								
321 1								MC:5.3%, LL:22%, PL:10%, PI:12%, LS:5.5%, 49% Fines		9						
								CLAY (CL); low plasticity, light greyish brown with light orange stain, with a trace of fine grained sand and silt, dry, friable, stiff	1	12	25	0.5				
								becomes some silt		13						
320 2								becomes light grey to light brown, some fine grained sand, trace silt, hard	2	50 for 145mm	50+	0.2				
319 3								becomes with a few light orange and orange brown mottles, rare sandy pockets, very stiff to hard		20					HW casing installed to 3.0. Start Rotary Wash Drilling at 3.0m. Polymer added	
									3	34	50+	0.5				
										38						
318 4																
								becomes light grey with rare light orange stain, sandy (fine grained), moist	4	37	50	0.3				
										50 for 150mm						
317 5																
316																

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Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7425884 mN 450748 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT_GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.	Relative Level (m)	Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS	
			Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	SPT		Recovery (m)	Water Content (%)		
													Blows per 150mm	N Value Blows/300mm				
316	6											5	21 25 28	50+	0.5			
315	7																	
314	8																	Start NQ3 Coring at 7.8m
313	9																	
312	10																	Packer Test from 9.2m to 12.2m

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Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7425884 mN 450748 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
310 12									SANDSTONE; medium to high strength, slightly weathered, medium red to reddish grey, fine to medium grained, unbroken						Start of days drilling (03/08/11). Packer Test from 12.2m to 15.2m	
309 13	3	1/2	100		100				SANDSTONE; medium strength, slightly to moderately weathered, light grey, fine grained, quartz-rich becomes crudely laminated light orange and light grey At 12.0m: 130 mm coarse grained band							
									becomes interlaminated light grey and light orange pink							
									becomes medium to coarse grained							
308 14									SANDSTONE; low to medium strength, moderately to slightly weathered, light grey with light orange and light pinkish grey laminations at 15° to 30°, fine to coarse grained, quartz rich, UCS: 4.8MPa						Packer Test from 15.2m to 18.2m	
	4	2	99		99				SANDSTONE; medium strength, slighty to moderately weathered, light grey with a few light orange to light pink laminations at 30°, crudely very thinly bedded, fine to medium grained							
307 15									UCS: 5.22MPa							
									From 15.4m to 15.6m: becomes fine to coarse grained, laminated to very thinly bedded							
306 16	5	2	97		97				SILTSTONE; very low to low strength, highly to completely weathered, light grey to grey, crudely very thinly to thinly bedded with some "soft" beds							
									From 16.1m: becomes interbedded with fine grained sandstone							
305 17									SANDSTONE; low to medium strength, moderately weathered, light grey, laminated to very thinly bedded, very fine to fine grained, some very thin low strength beds of siltstone							
	6	2	100		98											

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Date(s) Drilled: 02/08/11 to 03/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash & NQ3	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.2
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 322.0 m
Groundwater Depth: Not Encountered	Location: 7425884 mN 450748 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:



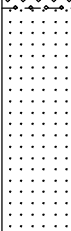
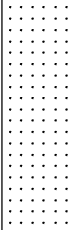
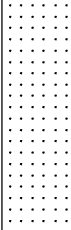
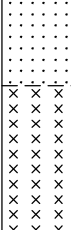
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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
304 18									From 18.0m to 18.4m: becomes very low to low strength, highly weathered At 18.1m: 30mm fractured zone becomes fine to medium grained						Packer Test from 18.2m to 20.2m
303 19	7	2/3	72		70				From 19.45 to 20.0m: likely zone of core loss						
302 20									END OF BOREHOLE at 20.2m (Target Depth)					Piezometer installed to 20.0m at conclusion of drilling	
301 21															
300 22															
299 23															
298															

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 27/07/11 to 28/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 331.0 m
Groundwater Depth: Not Encountered	Location: 7425936 mN 451854 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Drill Cuttings	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
331 0									SILT (ML); light brown with some light orange stain, low to medium plasticity, with some clay and a trace of fine grained sand, dry to moist (Residual) becomes light orange brown, with a trace of clay and some fine to medium grained sand, moist						Start Augering (27/07/11)
330 1									Silty CLAY (CL); low plasticity, light orange brown with a few grey mottles, moist, stiff, MC:10.4%, LL:26%, PL:13%, PI:13%, LS:5.5+%, 51% Fines	1	6	50+	0.4		HW Casing installed to 2.0m. Start NQ3 Coring at 2.1m
									SAND (SW); fine to coarse grained, reddish brown, with a trace of silt and some fine to medium grained angular to subangular gravel of sandstone, very dense becomes with a trace of fine grained gravel, some silt		50 for 130mm				
329 2	1	1	100		100				SANDSTONE; low to very low strength, highly weathered, dark reddish brown with rare grey pockets, fine to medium grained, iron rich, oxidised (Colinlea Sandstone) becomes slightly pitted (washed out sand pockets) From 2.6m to 3.0m: becomes fine to coarse grained (fine grained matrix with coarse grained sand-sized clasts)						
328 3															Core badly disturbed when removing from barrel.
327 4	2	1	73		0				becomes extremely low strength, residual to completely weathered (SAND: fine to coarse grained with some silt and a trace of to some fine to medium grained angular to subangular gravel of sandstone, slightly cemented)						Packer Test from 4.0 - 7.0m
326 5									SILTSTONE; very low to extremely low strength, residual to completely weathered, light reddish brown, fine to medium grained sandy beds, weakly cemented, iron rich, oxidised						
325															

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Date(s) Drilled: 27/07/11 to 28/07/11	Logged By: RJR	Checked By: RJR
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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
325 6							x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x 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NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 25/07/11 to 25/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 338.0 m
Groundwater Depth: Not Encountered	Location: 7426169 mN 452755 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
338 0									SILT (ML); brown, with a trace of fine grained sand, dry, friable, rootlets (TOPSOIL) SILT (ML); low plasticity, light greyish brown, with some clay, dry, a few very stiff silt nodules (Residual)						Start Augering at 13:15 (25/07/11)
337 1									becomes light brown with rare light grey to grey mottles, with a trace of fine grained sand becomes with a trace of clay	1	11 17 21	38	0.5		
336 2									with rare black inclusions	2	30 34 37	50+	0.5		
335 3									becomes with trace light orange stain, slightly cemented in places becomes with a trace of fine grained subangular gravel	3	25 34 32	50+	0.5		
334 4									becomes light greyish brown to light grey with light orange to orange pockets, no gravel, MC:4.3%, LL:23%, PL:15%, PI:8%, 46% Fines	4	29 36 50 for 110mm	50+	0.5		
333 5										5	16 31 47	50+	0.4		
332															

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 25/07/11 to 25/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 338.0 m
Groundwater Depth: Not Encountered	Location: 7426169 mN 452755 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
332 6									becomes fine to medium grained, light grey with no stain, with some silt, homogenous	X	6	15 23 27	50	0.5		
331 7									CLAY (CL); low plasticity, light grey with orange brown pockets, occasionally speckled white, with some fine grained sand and trace silt, dry, very stiff, slightly cemented, MC:7.2%, LL:24%, PL:13%, PI:11%, LS:2.5*%	X	7	17 19 26	45	0.5		
330 8									SAND (SC); fine grained, light grey with orange brown pockets and some light orange lenses, with some clay to clayey, dry, dense, MC:6.7%, LL:22%, PL:11%, PI:11%, LS:2.0*%, 37% Fines	X	8	21 17 18	35	0.5		
329 9										X	9	21 26 30	50+	0.5		
328 10									END OF BOREHOLE at 10.0m (Target Depth)							Piezometer installed to 10.0m at conclusion of drilling
327 11																
326																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 04/08/11 to 09/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 323.0 m
Groundwater Depth: Not Encountered	Location: 7424122 mN 450696 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
317 6									becomes with a trace of fine grained sand, trace to some clay, slightly to moderately cemented	5	29 36 48	50+	0.5	Start of days drilling at 07:58 (09/08/11)		
316 7																
315 8									Clayey SAND (SC); fine grained, light brown to light orange brown, with a trace of fine grained angular gravel, moist, very dense, MC:10.2%, LL:23%, PL:13%, PI:10%, LS:4.5%, 43% Fines	6	30 31 33	50+	0.5			
314 9									becomes fine to medium grained, light greyish brown with light orange brown and reddish brown mottles, with some fine to medium grained angular to subangular gravel	7	21 31 47	50+	0.4			
313 10																
312 11									CLAY (CI); medium plasticity, light grey, with some fine to medium grained sand, a trace of silt and a trace of fine to medium grained angular gravel, stiff to very stiff, MC:21.2%, LL:46%, PL:17%, PI:29%, LS:7.0+%, 51% Fines becomes low to medium plasticity, light grey to light orange brown, with a trace of fine grained sand and a trace of to some silt, no gravel	8	6 9 10	19	0.5			
311																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 04/08/11 to 09/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 323.0 m
Groundwater Depth: Not Encountered	Location: 7424122 mN 450696 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
311 12									becomes light grey with some light orange staining, with a trace of silt and some fine to medium grained sand, rare silt nodules	X 9	11 16 17	33	0.5			
310 13																
									becomes reddish brown to light grey with some yellow mottles, some silt, MC:13.7%, LL:31%, PL:14%, PI:17%, LS:8%	X 10	13 17 25	42	0.5			
309 14																
308 15									becomes with a trace of to some silt	X 11	10 10 11	21	0.4			
307 16																
									Clayey SAND (SC); fine grained, mottled light grey, reddish brown and light yellow, with a trace of silt, moist, dense, slightly cemented in rare lenses, MC: 10.1%, 47% Fines	X 12	12 15 16	31	0.4			
306 17																
305																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 04/08/11 to 09/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 323.0 m
Groundwater Depth: Not Encountered	Location: 7424122 mN 450696 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS	
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)		
												Blows per 150mm	N Value Blows/300mm				
305 18																	
										X	13	14 18 19	37	0.5			
304 19																	
									</								

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 29/07/11 to 30/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 330.0 m
Groundwater Depth: Not Encountered	Location: 7424103 mN 451745 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
330 0									SILT (ML); low plasticity, brown to light greyish brown, with a trace of clay and a trace of fine grained sand, dry, friable, rootlets (Alluvium)						Start Augering at 14:35 (29/07/11)
									SAND (SW); fine to medium grained, light brown, with some silt and a trace of clay, dry, friable, trace rootlets						
329 1									Sandy SILT (ML); light brown to tan with light orange stain, sand is fine to medium grained, with a trace of fine grained subangular gravel, moist, firm MC:10.2%, LL:20%, PL:15%, PI:5%, LS:1.5*%, 16% Fines	1	2	4	0.5		
									SAND (SW); fine to medium grained, light brown to tan with light orange stain, with some clay and some fine to medium grained subangular to subrounded gravel, moist, loose		3				
									Silty SAND (SM); fine to medium grained, light brown, moist to wet, medium dense (Residual)						
328 2									SANDSTONE; extremely low strength, residual to completely weathered, light grey, fine grained (SAND: fine to medium grained, light grey, with some silt and medium grained gravel, dry, moderately cemented) (Colinlea Sandstone)	2	50 for 70mm	50+	0.4		HW Casing installed to 2.2m. Start NQ3 Coring at 15:44
	1	1	100		100				becomes very low to low strength, highly to moderately weathered, crudely laminated, silty						
									SANDSTONE; low strength, moderately weathered, reddish brown mottled/speckled white and yellow, fine to coarse grained (fine grained matrix with medium to coarse grained sand and fine grained subangular gravel-sized clasts), iron rich, oxidised						
327 3									becomes medium strength, fine grained with rare medium to coarse grained sand-sized clasts						
326 4	2	1	100		95				becomes interbedded light grey and reddish brown, rare quartz veins						Packer Test from 4.0 - 7.0m
									becomes low strength, moderately to highly weathered						
325 5															
	3	1	100		100				SANDSTONE; low strength, moderately weathered, light brown to light grey, fine grained with rare medium to coarse grained sand-sized clasts, slightly oxidised, silty						Start of days drilling (30/07/11)

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 29/07/11 to 30/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 330.0 m
Groundwater Depth: Not Encountered	Location: 7424103 mN 451745 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
324 6																
	4	1	75		75											
323 7																
322 8	5	1/2	100		98											
321 9																
	6	2	56		0											
320 10																
319 11																
318																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 28/07/11 to 29/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 339.0 m
Groundwater Depth: Not Encountered	Location: 7423924 mN 452644 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Drill Cuttings	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
339 0									Sandy SILT (ML); low plasticity, brown, sand is fine grained, with a trace of clay, dry, friable, some rootlets (Residual)							Start Augering at 0.0m
338 1									Clayey SAND (SC); fine grained, light brown to light orange brown with orange brown pockets, with a trace of silt, moist, firm to stiff, MC:12.6%, LL:32%, PL:13%, PI:19%, LS:7.0*, 46% Fines becomes light brown, some fine grained sand	1	2 2 2	4	0.5			
337 2																HW Casing installed to 2.0m. Start NQ3 Coring at 12:50. Polymer added
	1	1	100		100				SANDSTONE; low to very low strength, highly weathered, reddish brown with a few light grey and yellow mottles, fine grained, iron rich, oxidised (Colinlea Sandstone)							
336 3									becomes interbedded sandstone and siltstone becomes very low strength, highly to completely weathered							
335 4	2	1	97		0											Packer Test from 4.0 - 7.0m
334 5																
333																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 28/07/11 to 29/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/NQ3	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 339.0 m
Groundwater Depth: Not Encountered	Location: 7423924 mN 452644 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Drill Cuttings	Sampler Type: SPT	Hammer Data:

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Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
333 6																
	3	1	100		0				SANDSTONE: very low to extremely low strength, completely weathered, reddish brown with some light brown to tan lenses and pockets, fine grained, silty, iron rich, oxidised							
332 7																
									from 7.8m to 8.5m: recovered as 200mm of Sandy Gravel with some silt (very weak zone)							
331 8	4	1/2	76		0											
330 9									from 8.9m to 9.2m: very weak zone (recovered as 200mm of Sandy GRAVEL with some silt)							
	5	2	100		0											
329 10									END OF BOREHOLE at 10.0m (Target Depth)							
328 11																
327																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 01/08/11 to 01/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 328.0 m
Groundwater Depth: Not Encountered	Location: 7422312 mN 450717 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS	
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)		
												Blows per 150mm	N Value Blows/300mm				
328 0									SAND (SW); fine to medium grained, brown, with some silt, dry, loose, friable, rootlets (Alluvium)							Start Augering at 08:31 (31/08/11)	
									becomes light brown, with a trace of silt								
327 1									CLAY (Cl); medium plasticity, light brown with rare light grey and light orange stain, with a trace of silt and a trace of fine grained sand, dry to moist, stiff to very stiff (Residual), MC:10%, LL:40%, PL:12%, PI:28%, LS:11%, 51% Fines	1	6 7 8	15	0.5				
									becomes with a trace of to some silt								
326 2									becomes light grey to light greyish brown, with a trace of to some fine grained sand and a trace of silt, very stiff	2	10 23 31	50+	0.5				
325 3									Silty SAND (SM); fine grained, light greyish brown mottled orange and light orange brown, dry, very dense, friable, slightly cemented	3	24 38 33	50+	0.5			HW Casing installed to 3.0m. Start Rotary Wash Drilling at 3.0m	
324 4									becomes find to medium grained sand, with some silt and with a trace of fine to medium grained subangular gravel	4	40 38 50 for 90mm	50+	0.4				
323 5																	
322																	

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 01/08/11 to 01/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 328.0 m
Groundwater Depth: Not Encountered	Location: 7422312 mN 450717 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
322 6									CLAY (CL); low plasticity, light grey to light greyish brown with some light orange mottles, with a trace of silt and some fine to medium grained sand, dry, very stiff, homogenous, MC:10.9%, LL:35%, PL:16%, PI:19%, LS:10%, 55% Fines	5	40 50 for 150mm	50+	0.3		
321 7															
320 8									Silty SAND (SM); fine grained, light grey, with some fine to coarse grained angular gravel, dry, very dense, homogenous, moderately cemented (SANDSTONE: extremely low strength, residual to completely weathered, light grey)	6	50 for 100mm	50+	0.1		
319 9									becomes fine to medium grained, light brown to light grey with rare light orange stain, no gravel	7	50 for 100mm	50+	0.1		
318 10															
317 11									becomes fine grained, light grey	8	50 for 110mm	50+	0.1		
316															

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 01/08/11 to 01/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 328.0 m
Groundwater Depth: Not Encountered	Location: 7422312 mN 450717 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
												Blows per 150mm	N Value Blows/300mm			
316 12									becomes light grey to light greyish brown	X	9	50 for 120mm	50+	0.1		
315 13																
									becomes fine to coarse grained, with some silt and some fine to medium grained angular gravel	X	10	50 for 90mm	50+	0.1		
314 14																
313 15									SILT (ML); low plasticity, light grey with light orange stain, with a trace of clay and a trace of fine to medium grained sand, dry to moist, very stiff, rare limonitic nodules and iron stain (SANDSTONE/SILTSTONE; extremely low strength, residual, light grey)	X	11	42 50 for 125mm	50+	0.3		
312 16																
									becomes grey to light grey, slightly cemented	X	12	28 50 for 135mm	50+	0.3		
311 17																
310																

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 01/08/11 to 01/08/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger/Rotary Wash	Drill Bit Size/Type: 120mm Auger/90 mm Blade Bit	Total Depth Drilled (m): 20.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 328.0 m
Groundwater Depth: Not Encountered	Location: 7422312 mN 450717 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES					REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)	
											Blows per 150mm	N Value Blows/300mm			
310 18									becomes mottled light grey, reddish brown and light orange, with a trace of to some clay	13	27 43 50 for 120mm	50+	0.4		Piezometer installed to 20.0m at conclusion of drilling
309 19									becomes clayey with rare sandy pockets, MC:14.8%, LL:31%, PL:17%, PI:14%, LS:6%, 56% Fines becomes light grey, homogenous	14	35 34 50 for 135mm	50+	0.4		
308 20									END OF BOREHOLE at 20.0m (Target Depth)						
307 21															
306 22															
305 23															
304															

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 31/07/11 to 31/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 340.0 m
Groundwater Depth: Not Encountered	Location: 7421310 mN 452120 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
	Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type Number	SPT		Recovery (m)	Water Content (%)		
											Blows per 150mm	N Value Blows/300mm				
340 0									SAND (SP); fine grained, light brown to light brownish grey, with some silt, dry, loose, friable, rootlets (Residual)							Start Augering at 09:13 (31/07/11)
									becomes fine to medium grained sand							
339 1									becomes moist, medium dense							
									Clayey SILT (ML); low plasticity, light grey with light orange stain, with a trace of clay and some fine grained sand, moist, very stiff, rare sandy pockets	1	5	11	0.3			
									becomes with rare light orange stain, no sandy pockets, homogenous		6					
338 2																
337 3									MC:5.9%, LL:16%, PL:11%, PI:5%, LS:1.0*%, 35% Fines							
									SAND (SW); fine to medium grained, light grey to light orange brown, with some silt to silty and with a trace of fine to medium grained subangular gravel, moist, very dense, friable	3	27	50+	0.5			
											29					
336 4																
335 5									Sandy SILT (ML); light greyish brown, sand is fine grained, with a trace of fine grained angular to subrounded gravel, dry, very stiff to hard, friable	4	50 for 80mm	50+	0.1			

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Date(s) Drilled: 31/07/11 to 31/07/11	Logged By: RJR	Checked By: RJR
Drilling Method: Solid Flight Auger	Drill Bit Size/Type: 120mm Auger	Total Depth Drilled (m): 10.0
Drilling Rig Type: Drillcat Explorer 200	Drilling Contractor: TerraTest	Relative Level: 340.0 m
Groundwater Depth: Not Encountered	Location: 7421310 mN 452120 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Piezometer	Sampler Type: SPT	Hammer Data:

BOREHOLE ALPHA TSF_MB_RJT.GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.	Relative Level (m) Depth (m)	ROCK CORE						In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES						REMARKS
		Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)				Type	Number	SPT		Recovery (m)	Water Content (%)	
													Blows per 150mm	N Value Blows/300mm			
	334	6									X	5	41 50 for 80mm	50+	0.2		
	333	7															
	332	8															
	331	9									X	7	40 50 for 110mm	50+	0.3		
	330	10															
	329	11															
	328																

NOTES: Classification: Soil classification via AS 1726 - 1993

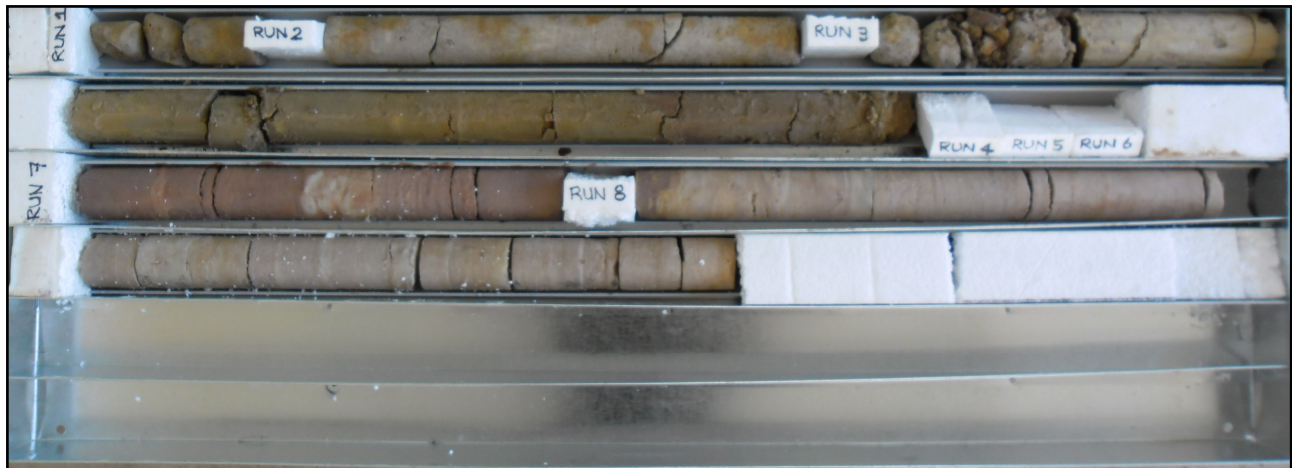
ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

Piezometer installed to 10.0m at conclusion of drilling

NOTES: Classification: Soil classification via AS 1726 - 1993

ABBREVIATIONS: PP: Pocket Penetrometer LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index EC: Emerson Class k: Laboratory Permeability

C.2 Core Photographs



BH01 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	3.08 – 3.50	36	36
	Run 2	3.50 – 4.00	80	80
	Run 3	4.00 – 5.00	100	87
	Run 4	5.00 – 5.50	0 (NR)	0
	Run 5	5.50 – 6.20	0 (NR)	0
	Run 6	6.20 – 6.40	0 (NR)	0
	Run 7	18.53 – 19.0	85	74
	Run 8	19.0 – 20.0	100	84

NR – No Recovery



BH04 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	12.00 – 13.10	100	100
	Run 2	13.10 – 15.20	100	100
	Run 3	15.20 – 16.00	100	100
	Run 4	16.00 – 18.10	100	0



BH04 (Box 2)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 4	12.00 – 13.10	100	100
	Run 5	18.10 – 19.30	100	100
	Run 6	19.30 – 20.00	100	100



BH05 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	2.80 – 3.20	100	0
	Run 2	3.20 – 4.20	100	100
	Run 3	4.20 – 6.20	98	75
	Run 4	6.20 – 9.20	93	0



BH05 (Box 2)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 4	6.20 – 9.20	93	0
	Run 5	9.20 – 10.00	75	0



BH06 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	8.00 – 9.20	96	96
	Run 2	9.20 – 10.20	100	100
	Run 3	10.20 – 12.00	86	86



BH07 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	7.80 – 9.20	96	95
	Run 2	9.20 – 12.20	98	98
	Run 3	12.20 – 13.80	100	100



BH07 (Box 2)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 3	12.20 – 13.80	100	100
	Run 4	13.80 – 15.20	99	99
	Run 5	15.20 – 16.70	97	97
	Run 6	16.70 – 18.20	100	98
	Run 7	18.20 – 20.00	72	70



BH07 (Box 3)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 7	18.20 – 20.00	72	70



BH08 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	2.10 – 3.20	100	100
	Run 2	3.20 – 6.20	73	0
	Run 3	6.20 – 7.00	100	0
	Run 4	7.00 – 8.00	0 (NR)	0
	Run 5	8.00 – 8.50	90	0
	Run 6	8.50 – 9.20	93	0



BH08 (Box 2)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 6	8.50 – 9.20	72	70
	Run 7	9.20 – 10.00	100	0



BH11 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	2.20 – 3.20	100	100
	Run 2	3.20 – 5.20	100	95
	Run 3	5.20 – 6.20	100	100
	Run 4	6.20 – 7.00	75	75
	Run 5	7.00 – 9.20	100	98



BH11 (Box 2)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 5	7.00 – 9.20	100	98
	Run 6	9.20 – 10.00	56	0



BH12 (Box 1)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 1	2.20 – 3.20	100	100
	Run 2	3.20 – 6.20	97	0
	Run 3	6.20 – 7.00	100	0
	Run 4	7.00 – 9.20	76	0



BH12 (Box 2)	Run	Depth (m)	Recovery (%)	RQD (%)
	Run 4	7.00 – 9.20	76	0
	Run 5	9.20 – 10.00	100	0

Appendix D Test Pits

Appendix D

D.1 Test Pit Logs

URS Australia Pty Ltd

TEST PIT LOG TP01

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

21-7-11

Date Finished:

21-7-11

Relative Level: 341 mAHD

Coordinates: 7430598 mN

452197 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
341	Sandy SILT (ML); low plasticity, dark brown, sand is fine grained, moist, organics (TOPSOIL)		0					
	Sandy SILT (ML); low plasticity, reddish brown, sand is fine to medium grained, moist, stiff to very stiff (Residual)							
340	with some rounded gravel, some roots		1				BS @ 1.0m TP01-01	
	Sandy GRAVEL (GW); fine to coarse grained and subrounded to subangular, well graded, light brown with yellow bands, sand is fine to coarse grained, dry, medium dense to dense							
339			2				BS @ 2.0m TP01-02	
	Clayey SAND (SC); fine grained, light grey mottled light orange and brown, with a trace of to some fine to medium grained subangular gravel, moist, medium dense to dense MC:9.3%, LL:31%, PL:18%, PI:13%, LS:5.0%, 23% Fines		3				BS @ 3.0m TP01-03	
338	MC:9.8%, 38% Fines becomes fine to medium grained, light yellowish grey becomes dense						BS @ 3.4m TP01-04	
337	SANDSTONE: low to very low strength, completely weathered, light grey mottled orange, fine grained (Colinlea Sandstone) END OF TEST PIT at 3.9m (Refusal)		4					
336			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP02

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 21-7-11 Date Finished: 21-7-11		Relative Level: 353 mAH Coordinates: 7430596 mN 452947 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
353	Silty SAND (SM); fine to medium grained, reddish brown, moist, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, reddish brown, with a trace of silt, moist, loose (Residual)						BS @ 0.6m TP02-01	
352			1				BS @ 1.1m TP02-02	
	Silty SAND (SM); fine grained, reddish brown, with some medium to coarse grained subrounded gravel, dry, loose							
351			2					
	GRAVEL (GP); medium to coarse grained, reddish brown, dense							
	Silty SAND (SM); fine to medium grained, reddish brown, with some medium to coarse grained subrounded gravel, dry, medium dense							Bucket Ripping
350			3				BS @ 3.0m TP02-02	
	becomes gravelly (fine to coarse grained of sandstone)							
349	SANDSTONE; extremely low strength, completely weathered, reddish dark brown, fine to medium grained (Colinlea Sandstone)		4				BS @ 4.4m TP02-04	Bucket Ripping
	END OF TEST PIT at 4.4m (Refusal)							
348			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP03

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage
Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 322 mAHd



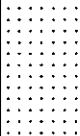
Coordinates: 7429845 mN

450696 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
322	SAND (SW); fine to medium grained, well graded, light brown, with a trace of silt, moist, very loose, rootlets (Alluvium) becomes pale brown, dry		0				BS @ 0.3m TP03-01	
321	Sandy CLAY (Cl); medium plasticity, brown mottled yellow and red, sand is fine to medium grained, with a trace of fine to medium grained gravel, moist, stiff to very stiff (Residual) MC:11.4%, LL:43%, PL:16%, PI:27%, LS:9.5+%, EC:2, MDD:1.8t/m ³ , OMC:14.5%, 55% Fines becomes grey mottled yellow and red, very stiff to hard becomes dry		1				BS @ 1.0m TP03-02 BS @ 1.5m TP03-03	
320	SANDSTONE; very low to low strength, highly to completely weathered, grey mottled reddish brown and yellow, fine to medium grained (Colinlea Sandstone)		2					
319	END OF TEST PIT at 2.5m (Refusal)		3					
318			4					
317			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

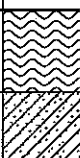


NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP04

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 26-7-11 Date Finished: 26-7-11		Relative Level: 326 mAH Coordinates: 7429846 mN 451447 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
326	Silty SAND (SM); fine to medium grained, well graded, dark brown to black, low plasticity, moist, loose, rootlets (TOPSOIL) MC:8.8%, LL:21%, PL:11%, PI:10%, LS:3.0%, EC:5, MDD:2.05t/m ³ , OMC:9%, 37% Fines, K=8 x 10 ⁻¹⁰ m/s, C=8.8kPa, phi=34.7° Clayey SAND (SC); fine to medium grained, well graded, light brown to orange, low plasticity, moist, loose (Residual)		0				BS @ 0.3m TP4-01	
325	becomes grey mottled brown and yellow, medium dense to dense		1				BS @ 1.1m TP4-02	
324	SANDSTONE: very low to low strength, completely to highly weathered, grey mottled yellow and red, fine to medium grained (Colinlea Sandstone) END OF TEST PIT at 1.8m (Refusal)		2					
323			3					
322			4					
321			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP05

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting			Client: Hancock Coal	
Excavator Type: Hitachi 200 LC	Logged By: CD	Checked By: RJR		
	Date Started: 21-7-11	Date Finished: 21-7-11		
			Relative Level: 340 mAHd Coordinates: 7429846 mN 452945 mE	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
340	Silty SAND (SM); fine to medium grained, dark grey to black, moist, very loose, rootlets (TOPSOIL)		0					
	Silty SAND (SM); fine to medium grained, light yellowish grey, moist, loose to medium dense (Residual) MC:7.8%, LL:15%, PL:12%, PI:3%, LS:0.5%, 36% Fines						BS @ 0.6m TP05-01	
339	Clayey SAND (SC); fine to medium grained, mottled grey and red, low plasticity, moist, loose to medium dense		1		1			
	becomes fine grained, uniform, mottled light grey and red MC:12.2%, LL:29%, PL:13%, PI:16%, LS:6.0%, EC:5, 41% Fines, K=4 x 10 ⁻¹⁰ m/s, C'=12.6kPa, phi'=29.1°		2		2		BS @ 1.7m TP05-02	
338	becomes mottled grey, red and yellow.							
	SANDSTONE; medium strength, moderately weathered, grey mottled yellow, fine to medium grained (Collinlea Sandstone) MC:12.1%, 19% Fines						BS @ 2.8m TP05-03	Bucket Ripping
337	END OF TEST PIT at 2.9m (Refusal)		3					
336			4					
335			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP07

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 321 mAH

Coordinates: 7429095 mN

450695 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
321	SAND (SW); fine to medium grained sand, well graded, dark brown, with a trace of silt, dry to moist, very loose to loose, rootlets (Alluvium) becomes yellowish brown		0				BS @ 0.35m TP7-01	
320	Silty/Clayey SAND (SM-SC); fine to medium grained, well graded, brown mottled yellow, grey and red, low plasticity, moist, medium dense to dense (Residual)		1		2.5 to 3.5		BS @ 1.5m TP7-02	
319	SANDSTONE; low to medium strength, moderately to slightly weathered, grey mottled red and yellow, fine to medium grained, thinly bedded (Colinlea Sandstone) END OF TEST PIT at 1.6m (Refusal)		2					
318			3					
317			4					
316			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP08

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 26-7-11

Date Finished: 26-7-11

Relative Level: 329 mAHD

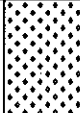

Coordinates: 7429096 mN

451448 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
329	SAND (SW); fine to medium grained, well graded, brown, dry, loose, rootlets (Alluvium) becomes gravelly (fine to medium grained and subrounded to subangular)		0				BS @ 0.4m TP08-01	
328	Sandy GRAVEL (GW); medium to coarse grained, well graded, angular to subrounded, brown, with some silt, dry, dense MC: 11.5%, 9% Fines SANDSTONE; low to medium strength, highly weathered, grey mottled yellowish brown, fine to medium grained (Colinlea Sandstone)		1				BS @ 0.9m TP08-02	
327	END OF TEST PIT at 1.5m (Refusal)		2					
326			3					
325			4					
324			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
+: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP09

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 22-7-11 Date Finished: 22-7-11		Relative Level: 334 mAH Coordinates: 7429097 mN 462195 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
334	SAND (SW); fine to medium grained sand, dark brown, with some silt, moist, loose, rootlets (TOPSOIL) becomes light brown, no silt, dry		0				BS @ 0.2m TP09-01	
	SANDSTONE; very low to low strength, highly to moderately weathered, light brown, yellow and white, fine to medium grained (Colinlea Sandstone) MC: 10.3%, 61% Fines						BS @ 0.7m TP09-02	
333	END OF TEST PIT at 0.9m (Refusal)		1					
332			2					
331			3					
330			4					
329			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP10

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting			Client: Hancock Coal	
Excavator Type: Hitachi 200 LC	Logged By: CD	Checked By: RJR		
	Date Started: 26-7-11	Date Finished: 26-7-11		
			Relative Level: 335 mAHN Coordinates: 7429095 mN 452949 mE	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
335	SAND (SW); fine to medium grained, dark greyish brown, moist, very loose, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, light grey, with a trace of silt, dry, loose, roots, friable (Residual)							
	becomes silty, MC: 4.2%, 35% Fines						BS @ 0.6m TP10-01	
334	SAND (SW); fine to medium grained, dark brown mottled red and yellow, moist, medium dense		1				BS @ 1.0m TP10-02	Bucket Ripping
	SANDSTONE; extremely low strength, completely weathered, dark brown mottled red and yellow, fine to medium grained (Colinlea Sandstone)							
	SANDSTONE; low strength, moderately weathered, grey mottled yellow, fine to medium grained							
333	becomes medium strength, grey		2				BS @ 2.0m TP10-03	
	MC: 11.7%, 10% Fines							
332	SILTSTONE; medium strength, slightly weathered, grey mottled red, thinly bedded		3				BS @ 3.2m TP10-04	
331	END OF TEST PIT at 3.5m (Refusal)		4					
330			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	<input checked="" type="checkbox"/>
Refusal	<input type="checkbox"/>
Flooding	<input type="checkbox"/>
Caving/collapse	<input type="checkbox"/>

SAMPLE TYPE:

Bulk Sample	BS
Tube Sample	TS
Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
+: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP11

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

22-7-11

Date Finished:

22-7-11

Relative Level: 344 mAHd

Coordinates: 7429137 mN
453695 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
344	SAND (SP); fine to medium grained, light brown, moist, loose, rootlets (TOPSOIL)		0				BS @ 0.2m TP11-01	
	SAND (SP); fine to medium grained, poorly graded, light brown, moist, medium dense to dense, a few rootlets (Residual)							
343	SANDSTONE; extremely low strength, completely weathered, grey mottled yellowish brown, fine grained (Colinlea Sandstone)		1				BS @ 1.2m TP11-02	
	becomes medium strength, moderately weathered							
342	SILTSTONE; medium strength, moderately weathered, grey, sandy		2				BS @ 2.0m TP11-03	
	END OF TEST PIT at 2.1m (Refusal)							
341			3					
340			4					
339			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP12

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 321 mAHd

Coordinates: 7428345 mN

450697 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
321	Silty SAND (SM); fine to medium grained sand, dark brown, low plasticity, dry, loose to medium dense (Alluvium)		0				BS @ 0.3m TP12-01	
320	Sandy Clay (CL/SC); light brown mottled yellow and red, low plasticity, sand is fine to medium grained, moist, stiff to very stiff (Residual) MC:11%, LL:23%, PL:12%, PI:11%, LS:6.0+%, EC:1, MDD:1.94t/m ³ , OMC:10.5%, 53% Fines, K=2 x 10 ⁻¹⁰ m/s, C'=3.8kPa, phi'=29.4°		1				BS @ 1.2m TP12-02	
319	SANDSTONE; very low to low strength, residual to completely weathered, grey mottled brown, fine to medium grained (Colinlea Sandstone)		2				BS @ 2.5m TP12-03	
318	END OF TEST PIT at 2.8m (Refusal)		3					
317			4					
316			5					
TEST PIT SECTION							TEST PIT TERMINATED AT:	
							Target Depth	<input type="checkbox"/>
							Refusal	<input checked="" type="checkbox"/>
							Flooding	<input type="checkbox"/>
							Caving/collapse	<input type="checkbox"/>
							SAMPLE TYPE:	
							Bulk Sample	BS
							Tube Sample	TS
							Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP13

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 327 mAHD

Coordinates: 7428343 mN

451449 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
327	SAND (SW); fine to medium grained, dark brown, with a trace of silt, dry, loose, roots (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, light brown, with some silt to silty, dry, medium dense (Alluvium) MC: 3.4%, 29% Fines						BS @ 0.4m TP13-01	
326	SANDSTONE; extremely low to low strength, residual to completely weathered, red mottled yellow brown, fine to medium grained (Colinlea Sandstone)		1					
	SANDSTONE; medium strength, moderately weathered, grey mottled pale red and speckled black, fine to medium grained							
	END OF TEST PIT at 1.6m (Refusal)							
325			2					
324			3					
323			4					
322			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
										SAMPLE TYPE:	
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP14

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting				
Excavator Type: Hitachi 200 LC	Logged By: CD Checked By: RJR Date Started: 26-7-11 Date Finished: 26-7-11	Relative Level: 338 mAH Coordinates: 7428346 mN 452196 mE	Client: Hancock Coal	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
338	SAND (SW); fine to coarse grained, light brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0				BS @ 0.3m TP14-01	
	Silty SAND (SW); fine to medium grained, well graded, subrounded to rounded, reddish brown, dry, loose (Alluvium) M.C. 4.5%, 29% Fines							
	Sandy GRAVEL (GW); fine to coarse grained and subrounded to subangular, brown, sand is fine to medium grained, with a trace of silt, dry, medium dense						BS @ 0.8m TP14-02	
337	SANDSTONE; very low strength, completely weathered, grey mottled yellow red brown, fine to medium grained (Colinlea Sandstone) becomes low to medium strength, highly weathered to moderately weathered		1					
	END OF TEST PIT at 1.3m (Refusal)							
336			2					
335			3					
334			4					
333			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP15

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

22-7-11

Date Finished:

22-7-11

Relative Level: 344 mAHd

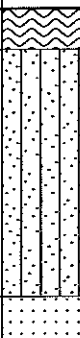
Coordinates: 7428346 mN

452947 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
344	SAND (SW); fine to medium grained, light brown, dry, very loose, rootlets (TOPSOIL)		0					
	Silty SAND (SM); fine to medium grained, yellow to light brown, dry to moist, medium dense to dense, friable (Residual)							
	MC:7.7%, EC:5, MDD:1.91t/m ³ , OMC:11.5%, 50% Fines						BS @ 0.6m TP15-01	
343	becomes pale yellow mottled reddish brown, moist, dense		1					
	SANDSTONE; very low strength, completely weathered, pale yellow to white, fine to medium grained (Colinlea Sandstone)						BS @ 1.6m TP15-02	
342	END OF TEST PIT at 1.7m (Target Depth)		2					
341			3					
340			4					
339			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP16

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

22-7-11

Date Finished:

22-7-11

Relative Level: 347 mAH

Coordinates: 7428345 mN

453697 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
347	SAND (SW); fine to medium grained, dark brown, moist, loose, rootlets (TOPSOIL)		0					Easily excavated from GL to 1.5m
	SAND (SW); fine to medium grained, light brown, moist, loose (Alluvial)							
346	SAND (SP); fine to medium grained, light brown, with some silt, low plasticity, very moist, loose to medium dense (Residual)		1					
	becomes light brown mottled yellow, dense to very dense						BS @ 1.5m TP16-01	Low to moderate resistance from 1.5m to 2.1m
345	SANDSTONE; extremely low strength, completely weathered, grey mottled yellow, red and brown, fine to medium grained (Colinlea Sandstone)		2					
	becomes very low strength, highly weathered, fine to medium grained, silty						BS @ 2.8m TP16-02	Difficult to excavate from 2.7m to 2.9m
344	END OF TEST PIT @ 2.9m (Refusal)		3					
343			4					
342			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP17

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 321 mAHd

Coordinates: 7427597 mN

450697 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
321	SAND (SW); fine to medium grained, dark brown to black, with a trace of silt, moist, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, light brown, with a trace of silt, low plasticity, moist, loose (Alluvium)						BS @ 0.5m TP17-01	
320	Clayey SAND (SC); fine to medium grained, well graded, grey mottled yellow and red, with some silt, moist, medium dense (Residual)		1					
319			2					
	SANDSTONE; very low to medium strength, completely weathered, grey mottled yellow, fine to medium grained, silty (Colinlea Sandstone)							
318	becomes medium to high strength, moderately weathered		3					
	END OF TEST PIT at 3.1m (Refusal)							
317			4					
316			5					
TEST PIT SECTION							TEST PIT TERMINATED AT:	
							Target Depth	<input type="checkbox"/>
							Refusal	<input checked="" type="checkbox"/>
							Flooding	<input type="checkbox"/>
							Caving/collapse	<input type="checkbox"/>
							SAMPLE TYPE:	
							Bulk Sample	BS
							Tube Sample	TS
							Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP18

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 331 mAHd

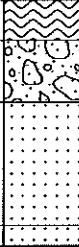
Coordinates: 7427596 mN

451448 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
331	SAND (SW); fine to medium grained, well graded, brown, moist (TOPSOIL)		0					
	Sandy GRAVEL (GP); fine to medium grained gravel, poorly graded, subrounded to subangular, brown, with a trace of silt, moist, medium dense (Alluvium)							
	SANDSTONE; medium strength, residual to completely weathered, brown mottled yellow and red, fine to medium grained (Sandy GRAVEL; fine to medium grained, brown mottled yellow and red, very dense) (Colinlea Sandstone)							
330	SANDSTONE; medium to high strength, highly weathered to moderately weathered, grey mottled yellow and red, fine to medium grained		1					
	END OF TEST PIT at 1.2m (Refusal)							
329			2					
328			3					
327			4					
326			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP19

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

26-7-11

Date Finished:

26-7-11

Relative Level: 335 mAHD



Coordinates: 7427597 mN

452196 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
335	SAND (SP); fine to medium grained, greyish brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0				BS @ 0.4m TP19-01	
334	SANDSTONE; very low to low strength, completely weathered to moderately weathered, grey to white, fine to fine grained (Colinlea Sandstone) becomes medium to high strength, moderately weathered to slightly weathered, MC:7.2%, LL:27%, PL:18%, PI:9%, LS:2.5%, 12% Fines / END OF TEST PIT at 1.0m (Refusal)		1				BS @ 0.9m TP19-02	
333			2					
332			3					
331			4					
330			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP20

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

22-7-11

Date Finished:

22-7-11

Relative Level: 344 mAHD

Coordinates: 7427597 mN

452949 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
344	SAND (SW); fine to coarse grained, light brown, subrounded to rounded, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0					
	SAND (SP); fine grained, dark reddish brown, with a trace of silt, dry, medium dense (Alluvium)						BS @ 0.4m TP20-01	
343	SANDSTONE; medium strength, moderately weathered, grey, fine grained (Colinlea Sandstone)		1					Bucket Ripping
	END OF TEST PIT at 1.1m (Refusal)							
342			2					
341			3					
340			4					
339			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP21

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage
Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

22-7-11

Date Finished:

22-7-11

Relative Level: 356 mAH

Coordinates: 7427596 mN

453694 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
356	Sandy SILT (ML); dark brown, sand is fine grained, moist, firm (TOPSOIL)		0					
355	Sandy SILT (ML); low plasticity, reddish brown, sand is fine grained, moist, stiff (Residual)		1				BS @ 0.6m TP21-01	
	becomes yellow and red, with some clay							
	becomes mottled red and grey, very stiff to hard						BS @ 1.6m TP21-02	
	SILTSTONE; High strength, moderately weathered, red mottled yellow or grey, fine grained sand (Colinlea Sandstone)						BS @ 1.8m TP21-03	Bucket Ripping
354	END OF TEST PIT at 1.9m (Refusal)		2					
353			3					
352			4					
351			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS




NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP22

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 26-7-11 Date Finished: 26-7-11		Relative Level: 318 mAH Coordinates: 7426846 mN 450695 mE		Client: Hancock Coal	
				Permit No.:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
318	SAND (SW); fine to medium grained, brownish grey, with a trace of silt, dry, loose to medium dense (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, brown to grey, with a trace of silt, dry, medium dense to dense (Alluvium)							
	becomes dense to very dense							
317	SANDSTONE; low strength, highly to completely weathered, yellowish grey, fine to medium grained (Collinlea Sandstone)		1				BS @ 0.9m TP22-01	
	becomes medium strength, moderately weathered, grey							
	END OF TEST PIT at 1.4m (Refusal)							
316			2					
315			3					
314			4					
313			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP23

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 23-1-11 Date Finished: 23-1-11		Relative Level: 330 mAHD Coordinates: 7426846 mN 451446 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
330	SAND (SW); fine to medium grained, brown, with a trace of silt, dry, loose (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, light brown, with a trace of silt, dry, loose to medium dense (Alluvium)							
	becomes silty; MC:6.7%, 29% Fines						BS @ 0.5m TP23-01	
329	Clayey SAND (SC); fine to medium grained, well graded, grey mottled brown and yellow, medium plasticity, moist, medium dense to dense (Residual)		1					
	MC:11.3%, LL:39%, PL:12%, PI:27%, LS:7.5+%, 45% Fines						BS @ 1.3m TP23-02	
	SANDSTONE; very low strength, completely weathered, grey mottled yellowish brown, fine to medium grained (Colinlea Sandstone)							
	becomes low to medium strength, completely to highly weathered							
328	END OF TEST PIT at 1.8m (Refusal)		2					
327			3					
326			4					
325			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP24

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

23-7-11

Date Finished:

23-7-11

Relative Level: 352 mAHD

Coordinates: 7426849 mN

452947 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
352	Clayey SAND (SC); dark brown to reddish brown, moist, loose, rootlets (TOPSOIL)		0					
351	Clayey Gravelly SAND (SC); fine to coarse grained, well graded, rounded to subrounded, red to light brown, dry, loose, rootlets (Alluvium) MC:5.0%, LL:24%, PL:13%, PI:11%, LS:3.5%, 28% Fines becomes medium dense		1				BS @ 0.8m TP24-01	
350	SANDSTONE; extremely low strength, residual, yellow to reddish brown, fine to medium grained, with some clay and gravel (Colinlea Sandstone)		2					
349	MC:11.7%, LL:29%, PL:14%, PI:15%, LS:7%, EC:5, MDD:1.86t/m ³ , OMC:14%, 43% Fines, K=3 x 10 ⁻⁹ m/s, C=11.2kPa, phi=32.1°		3				BS @ 2.5m TP24-02	
348	becomes completely weathered		4					
347	END OF TEST PIT at 4.7m (Target Depth)		5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth



Refusal



Flooding



Caving/collapse



SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
+: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP26

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 23-7-11

Date Finished: 23-7-11

Relative Level: 342 mAH

Coordinates: 7426095 mN

452944 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
342	SAND (SW); fine to medium grained, well graded, rounded to subrounded, dark grey, with a trace of clay, dry, loose to medium dense, rootlets (TOPSOIL)		0				BS @ 0.4m TP26-01	
341	Clayey SAND (SC); fine to medium grained, well graded, rounded, dark grey mottled orange and yellow, low plasticity, moist, dense (Residual) becomes pale grey, MC:10%, LL:31%, PL:11%, PI:20%, LS:5.5+%, 55% Fines		1				BS @ 0.9m TP26-02	
340	SILTSTONE; very low strength, completely weathered to highly weathered, grey mottled yellow, fine grained (Colinlea Sandstone) becomes medium strength		2					Bucket Ripping
339	END OF TEST PIT at 2.2m (Refusal)		3					
338			4					
337			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP27

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage
Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 23-7-11

Date Finished: 23-7-11

Relative Level: 352 mAH

Coordinates: 7426098 mN

453694 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
352	Silty SAND (SM); fine to medium grained, dark grey, dry, loose, rootlets (TOPSOIL)		0					
	Silty SAND (SM); fine to medium grained, well graded, dark grey, low plasticity, moist, dense, roots (Alluvium)							
351			1					
	Clayey SAND (SC); fine grained, well graded, grey mottled yellow, with a trace of fine grained subrounded to rounded gravel, low plasticity, moist, medium dense (Residual)							
350	becomes mottled yellow and red		2					
349			3				BS @ 2.9m TP27-01	
348	Silty SAND; fine grained, light brown to yellowish grey, moist, very dense (Residual)		4					
347	END OF TEST PIT at 5.0m (Target Depth)		5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP28

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

25-7-11

Date Finished:

25-7-11

Relative Level: 321 mAH

Coordinates: 7425349 mN

450697 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
321	SAND (SW); fine to medium grained, dark brown, with a trace of silt, dry, loose (TOPSOIL) becomes light brown		0				BS @ 0.3m TP28-01	
320	Clayey Gravelly SAND (SC); fine to medium grained, well graded, grey mottled yellowish brown, gravel is subrounded, moist, dense to very dense (Residual) MC:11.6%, 41% Fines		1				BS @ 1.2m TP28-02	
319	SANDSTONE; low strength, completely weathered, grey mottled yellowish brown, fine to medium grained (Colinlea Sandstone) becomes low to medium strength, highly to moderately weathered		2					
	END OF TEST PIT at 2.3m (Refusal)							
318			3					
317			4					
316			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
										SAMPLE TYPE:	
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP28/2

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 25-7-11

Date Finished: 25-7-11

Relative Level: 328 mAHD

Coordinates: 7426345 mN

451444 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
328	SAND (SW); fine to medium grained, dark brown, with a trace of silt, moist, very loose (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, light brown, with a trace of silt, moist, loose (Alluvium)						BS @ 0.4m TP28/2-01	
327	SANDSTONE; very low to low strength, residual to completely weathered, grey mottled yellow and red, fine to medium grained (Colinlea Sandstone)		1					
	becomes extremely low to very low strength							
326	MC:12.3%, LL:35%, PL:13%, PI:22%, LS:7.5+%, 42% Fines		2				BS @ 2.0m TP28/2-02	
325	becomes medium to high strength, highly to moderately weathered, greyish brown		3					
324	END OF TEST PIT at 3.5m (Refusal)		4					
323			5					

TEST PIT SECTION												TEST PIT TERMINATED AT:			
												Target Depth	<input type="checkbox"/>		
												Refusal	<input checked="" type="checkbox"/>		
												Flooding	<input type="checkbox"/>		
												Caving/collapse	<input type="checkbox"/>		
												SAMPLE TYPE:			
												Bulk Sample	BS		
												Tube Sample	TS		
												Disturbed Sample	DS		

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP29

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

25-7-11

Date Finished:

25-7-11

Relative Level: 338 mAHD

Coordinates: 7425340 mN

452198 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
338	SAND (SW); fine to medium grained, well graded, reddish brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0				BS @ 0.4m TP29-01	
337	Silty SAND; fine to coarse grained, well graded, subrounded, dark reddish brown, low plasticity, moist to wet, loose to medium dense (Alluvium) MC:5.4%, PI: NP, EC:5, MDD:1.97t/m ³ , OMC:8.5%, 25% Fines		1					
336	SAND (SW); fine to medium grained, well graded, light brown mottled grey, with some silt, low plasticity, wet, loose to medium dense (Residual)		2				BS @ 2.0m TP29-02	
335	SANDSTONE; very low to low strength, completely to highly weathered, grey mottled reddish brown and yellow, fine to medium grained (Colinlea Sandstone) becomes medium strength, moderately weathered, grey		3					
334	END OF TEST PIT at 2.9m (Refusal)		4					
333			5					

TEST PIT SECTION												TEST PIT TERMINATED AT:	
												Target Depth	<input type="checkbox"/>
												Refusal	<input checked="" type="checkbox"/>
												Flooding	<input type="checkbox"/>
												Caving/collapse	<input type="checkbox"/>
												SAMPLE TYPE:	
												Bulk Sample	BS
												Tube Sample	TS
												Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

 ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP30

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 23-7-11

Date Finished: 23-7-11

Relative Level: 350 mAHD

Coordinates: 7425346 mN

452946 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
350	Silty SAND (SM); fine to medium grained, well graded, light brown, moist, loose, rootlets (TOPSOIL)		0				BS @ 0.3m TP30-01	
	Silty SAND (SM); fine to medium grained, well graded, reddish brown, low plasticity, moist, loose (Alluvium)							
349	Sandy GRAVEL (GW); fine to medium grained, subrounded to subangular, yellowish brown, sand is fine grained, with some clay, moist, medium dense MC:8%, 13% Fines		1				BS @ 1.2m TP30-02	
348	SANDSTONE; extremely low strength, residual to completely weathered, grey mottled yellow and red, medium to coarse grained (Colinlea Sandstone) becomes medium strength, moderately weathered, fine grained		2					
	END OF TEST PIT at 2.3m (Refusal)							
347			3					
346			4					
345			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
SAMPLE TYPE:											
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP32

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

25-7-11

Date Finished:

25-7-11

Relative Level: 322 mAH

Coordinates: 7424596 mN

450697 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
322	SAND (SW); fine to medium grained, well graded, light brown, dry, very loose, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, yellowish brown, dry, loose, roots (Residual)						BS @ 0.3m TP32-01	
321	SAND (SW); fine to medium grained, well graded, grey mottled yellow and brown, with some silt, low plasticity, dry, dense		1					
	SANDSTONE; extremely low strength, residual, grey mottled yellow and brown, fine to medium grained (SAND: fine to medium grained, grey, moist, dense) (Colinlea Sandstone)		2					
320								
	becomes very low to low strength, completely weathered							
319			3					
	becomes low to medium strength, completely to highly weathered, grey							
318	END OF TEST PIT at 3.8m (Refusal)		4					
317			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP31

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting				
Excavator Type: Hitachi 200 LC	Logged By: CD Checked By: RJR Date Started: 23-7-11 Date Finished: 23-7-11	Relative Level: 364 mAH Coordinates: 7425346 mN 463699 mE	Client: Hancock Coal	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
364	Silty SAND (SM); fine to medium grained, well graded, brown, moist, loose, rootlets (TOPSOIL)		0					
	Silty SAND (SM); fine to medium grained, well graded, reddish brown, low plasticity, moist, loose (Alluvium)						BS @ 0.4m TP31-01	
363			1					
	Silty SAND (SM); fine to medium grained, well graded, brown, with some fine to medium grained and rounded to subrounded gravel, dry to moist, loose (Residual)							
362			2					
	SANDSTONE; extremely low strength, residual, red mottled yellow and brown, fine to medium grained (Gravelly SAND: fine to medium grained, reddish brown, with some silt, moist, dense to very dense) (Colinlea Sandstone)						BS @ 3.2m TP31-02	
361			3					
360			4					
	END OF TEST PIT at 4.7m (Target Depth)							
359			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☒ X
 Refusal ☐
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP33

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting				
Excavator Type: Hitachi 200 LC	Logged By: CD Checked By: RJR Date Started: 25-7-11 Date Finished: 25-7-11	Relative Level: 349 mAH Coordinates: 7424595 mN 452194 mE	Client: Hancock Coal	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
349	SAND (SW); fine to medium grained, well graded, dark brown, with a trace of silt, moist, very loose, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, light yellowish brown, with a trace of silt, moist, loose, rootlets (Alluvium)						BS @ 0.4m TP33-01	
348	Sandy GRAVEL (GW); poorly graded, subrounded to subangular, sand is fine to medium grained, brown, with some silt, moist, medium dense to dense (Residual) MC:9.4%, EC:2, 7% Fines		1					
	SANDSTONE; extremely low strength, residual, yellowish brown mottled grey, fine to medium grained (Colinlea Sandstone)						BS @ 1.2m TP33-02	
347	becomes very low to low strength, completely weathered, grey mottled light yellow		2					
	becomes medium to high strength, highly to completely weathered							
346	END OF TEST PIT at 2.9m (Refusal)		3					
345			4					
344			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP34

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

25-7-11

Date Finished:

25-7-11

Relative Level: 350 mAHD

Coordinates: 7424595 mN

452949 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
350	SAND (SW); fine to medium grained, well graded, brown, with a trace silt, dry, loose, rootlets (TOPSOIL)		0					
349	SAND (SW); fine to medium grained, well graded, reddish brown and grey, with some silt, moist (Alluvium) becomes moist to wet		1				BS @ 0.5m TP34-01 BS @ 1m TP34-02	Groundwater ponding at soil/rock interface
348	SANDSTONE; extremely low strength, residual, grey mottled red and yellow, fine to medium grained, silty (Colinlea Sandstone) MC:10.7%, 22% Fines becomes low to medium strength, highly to moderately weathered		2				BS @ 1.5m TP34-03	
347	END OF TEST PIT at 2.2m (Pit Collapsing)		3					
346			4					
345			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☐Flooding ☐Caving/collapse ☒

SAMPLE TYPE:

Bulk Sample BS

Tube Sample TS

Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP35

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

25-7-11

Date Finished:

25-7-11

Relative Level: 363 mAHD

Coordinates: 7424588 mN

453696 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
363	Silty SAND (SM); fine to coarse grained, well graded, light brown, with a trace of fine to medium grained gravel, dry, loose, rootlets (TOPSOIL) Gravelly SAND (SW); fine to coarse grained, well graded, rounded, gravel is fine to medium grained, with some silt, moist, medium dense (Alluvial)		0				BS @ 0.3m TP35-01	
362	Silty SAND (SM); fine to coarse grained, well graded, rounded, low plasticity, moist, medium dense to dense (Residual) SILTSTONE; medium strength, moderately to slightly weathered, grey stained red and yellow (Colinlea Sandstone)		1				BS @ 1.1m TP35-02	
361	END OF TEST PIT at 1.5m (Refusal)		2					
360			3					
359			4					
358			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
										SAMPLE TYPE:	
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP37

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 25-7-11

Date Finished: 25-7-11

Relative Level: 329 mAH

Coordinates: 7423846 mN

451450 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
329	SAND (SP); fine grained, poorly graded, light brown, with a trace of silt, dry, very loose, rootlets (TOPSOIL)		0				BS @ 0.4m TP37-01	
328	Silty SAND (SM); fine grained, poorly graded, light brown and grey, low plasticity, dry, loose to medium dense (Alluvium) MC:3.1%, 40% Fines		1				BS @ 1.2m TP37-02	
327	SAND (SP); fine grained, poorly graded, dark brown, with a trace of silt, moist, medium dense to dense (Residual)		2					
	becomes dense							
326	SANDSTONE; very low to medium strength, completely to highly weathered, grey mottled yellow, red and brown, fine to medium grained (Colinlea Sandstone)		3					
	END OF TEST PIT at 2.9m (Refusal)							
325			4					
324			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP38

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage
Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

24-7-11

Date Finished:

24-7-11

Relative Level: 335 mAHd

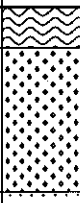
Coordinates: 7423844 mN

452195 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
335	SAND (SW); fine to medium grained, well graded, dark brown, with some silt, moist, loose, rootlets (TOPSOIL) SAND (SW); fine to medium grained, well graded, light brown, with a trace of to some silt, moist, loose to medium dense (Residual)		0				BS @ 0.4m TP38-01	
334	SANDSTONE: medium to high strength, highly to slightly weathered, grey mottled red and yellow, fine to medium grained (Colinlea Sandstone) END OF TEST PIT at 1.0m (Refusal)		1					
333			2					
332			3					
331			4					
330			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
+: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP39

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 25-7-11 Date Finished: 25-7-11		Relative Level: 341 mAH Coordinates: 7423845 mN 452946 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
341	SAND (SP); fine grained, poorly graded, dark grey, with a trace of silt, dry, very loose, rootlets (TOPSOIL)		0					Next to Creek Bed - offset 10m
340	SAND (SP); fine grained, poorly graded, rounded, grey, with a trace of silt, dry, loose to medium dense (Residual)		1				BS @ 0.5m TP39-01	
339	SANDSTONE; extremely low to very low strength, residual to completely weathered, grey mottled yellow, fine to medium grained (Colinlea Sandstone) MC: 8.3%, 45% Fines becomes very low to low strength, completely to highly weathered, grey mottled yellow and red		2				BS @ 1.3m TP39-02	
	becomes medium to high strength, moderately to slightly weathered, grey							Strong Resistance
338	END OF TEST PIT at 2.4m (Refusal)		3					
337			4					
336			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP40

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting				
Excavator Type: Hitachi 200 LC	Logged By: CD Checked By: RJR Date Started: 23-7-11 Date Finished: 23-7-11	Relative Level: 351 mAHD Coordinates: 7423671 mN 453520 mE	Client: Hancock Coal	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
351	SAND (SP); fine to medium grained, poorly graded, light grey, with some silt, dry, loose (Residual)		0					
350	becomes grey mottled yellowish brown, dense to very dense		1				BS @ 0.3m TP40-01	
349	SANDSTONE; extremely low strength, completely weathered, grey mottled yellow and reddish brown, fine to medium grained (Colinlea Sandstone)		2					
	becomes medium strength, highly weathered, thinly laminated							
348	END OF TEST PIT at 2.8m (Refusal)		3					
347			4					
346			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP41

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage
Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 25-7-11

Date Finished: 25-7-11

Relative Level: 323 mAHD




Coordinates: 7423096 mN

450699 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
323	SAND (SW); fine to medium grained, well graded, dark brown, with some silt, moist, loose, rootlets (TOPSOIL) SAND (SW); fine to medium grained, well graded, light brown, with a trace of silt, moist, loose to medium dense (Alluvial)		0				BS @ 0.5m TP41-01	
322	SAND (SW); fine to medium grained, well graded, grey mottled yellow or red, with some silt, moist, dense to very dense (Residual)		1					
321	SANDSTONE; extremely low to very low strength, residual to completely weathered, grey with rare yellow and red mottles, fine to medium grained (Colinlea Sandstone) MC:17.0%, 41% Fines becomes medium to high strength, highly to moderately weathered, grey		2				BS @ 2.2m TP41-02	
320	END OF TEST PIT at 2.8m (Refusal)		3					
319			4					
318			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS

Tube Sample TS

Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
+: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP42

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 25-7-11 Date Finished: 25-7-11		Relative Level: 329 mAHD Coordinates: 7423095 mN 451445 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
329	SAND (SW); fine to medium grained, well graded, dark brown, with some silt, dry, loose to very loose, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, pale brownish grey, with some silt, low plasticity, dry, loose (Alluvium)						BS @ 0.3m TP42-01	
328	SAND (SW); fine to medium grained, well graded, grey mottled yellow or red, with some silt, moist, very dense (Residual)		1					
	SANDSTONE; extremely low to very low strength, residual to completely weathered, greyish brown mottled yellow and red, fine to medium grained (Colinlea Sandstone)							
	becomes low to medium strength, completely to moderately weathered							
327	END OF TEST PIT at 1.9m (Refusal)		2					
326			3					
325			4					
324			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP43

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

24-7-11

Date Finished:

24-7-11

Relative Level: 338 mAHD

Coordinates: 7423094 mN

452195 mE

Permit No:

Client:

Hancock Coal

TESTPIT ALPHA COAL GPJ GEOTECH.GDT 13/10/11 This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
338	SAND (GW); fine to medium grained, well graded, pale brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0					
	Silly SAND (SM); fine to medium grained, well graded, greyish brown mottled yellow and red, with a few cobble-sized fragments of sandstone, dry, dense (Residual) MC:8.2%, 38% Fines						BS @ 0.6m TP43-01	
337	SANDSTONE; medium to high strength, moderately to slightly weathered, reddish brown, fine to medium grained (Colinlea Sandstone) END OF TEST PIT at 1.0m (Refusal)		1					Bucket Ripping
336			2					
335			3					
334			4					
333			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP44

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

24-7-11

Date Finished:

24-7-11

Relative Level: 353 mAHD




Coordinates: 7423095 mN

452947 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
353	Gravelly SAND (SW); fine to medium grained, well graded, light brown, with a trace of silt, dry, loose, a few rootlets (Alluvium)		0					
	Sandy GRAVEL (GP); fine grained, well graded, subrounded to angular, dark brown, sand is fine to medium grained dry, medium dense to dense						BS @ 0.5m TP44-01	Bucket Ripping
352	SANDSTONE; very low to low strength, completely weathered, yellow mottled red and grey, fine grained							
	becomes low strength, completely weathered, grey		1					
	becomes very low to low strength, highly weathered							Bucket Ripping
	END OF TEST PIT at 1.5m (Refusal)							
351			2					
350			3					
349			4					
348			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
										SAMPLE TYPE:	
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP45

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199		Project No.: 42626683		Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility	
Excavator Contractor Hills Mass Contracting							
Excavator Type: Hitachi 200 LC		Logged By: CD Checked By: RJR Date Started: 24-7-11 Date Finished: 24-7-11		Relative Level: 361 mAHD Coordinates: 7423100 mN 453459 mE		Client: Hancock Coal	
				Permit No:			

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
361	Silty SAND (SM); fine to medium grained, well graded, reddish brown, dry, loose (TOPSOIL)		0				BS @ 0.3m TP45-01	
360	Clayey SAND (SC); fine to medium grained, well graded, grey mottled yellow and red, with some silt, low plasticity, dense (Residual)		1				BS @ 1.1m TP45-02	
	becomes very dense							
359	END OF TEST PIT at 1.7m (Refusal - Sandstone)		2					
358			3					
357			4					
356			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP46

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

24-7-11

Date Finished:

24-7-11

Relative Level: 342 mAH

Coordinates: 7422346 mN

452199 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
342	SAND (SW); fine to medium grained, well graded, reddish brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0				BS @ 0.3m TP46-01	
341	SAND (SW); fine to medium grained, well graded, red to reddish brown, with a trace of to some silt, moist, loose to medium dense (Alluvium)		1					
	Clayey SAND (SC); fine to medium grained, well graded, yellowish brown, low plasticity, moist to wet, medium dense (Residual)							
	MC:16.9%, LL:22%, PL:15%, PI:7%, LS:3.0%, 32% Fines						BS @ 1.7m TP46-02	Groundwater ponding at soil/rock interface
340	SANDSTONE: medium to high strength, moderately to slightly weathered, grey mottled yellow and red, fine to medium grained (Colinlea Sandstone)		2					
	END OF TEST PIT at 2.2m (Refusal)							
339			3					
338			4					
337			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP47

URS Australia Pty. Ltd.

Phone: (07) 3243 2111

Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

24-7-11

Date Finished:

24-7-11

Relative Level: 335 mAHD

Coordinates: 7421599 mN

451446 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
335	SAND (SP); fine grained, poorly graded, light brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0					
	SAND (SP); fine to fine grained, poorly graded, light brown, with a trace of silt, dry, medium dense (Residual)						BS @ 0.3m TP47-01	
334	Clayey SAND (SC); fine to medium grained sand, well graded, yellowish brown mottled grey and red, low plasticity, moist, medium dense to dense		1					
	becomes grey, dense							
	MC:12.4%, LL:25%, PL:10%, PI:15%, LS:4.5%, 45% Fines						BS @ 1.6m TP47-02	
333	SANDSTONE; low to medium strength, highly to moderately weathered, grey mottled yellow and red, fine to medium grained (Colinlea Sandstone)		2					
	END OF TEST PIT at 2.3m (Refusal)							
332			3					
331			4					
330			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP48

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage
Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 24-7-11

Date Finished: 24-7-11

Relative Level: 360 mAHd



Coordinates: 7421596 mN

462944 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
350	SAND (SW); fine to medium grained, well graded, dark brown, with some fine to medium grained, subrounded gravel, with a trace of silt, dry, loose (TOPSOIL) Sandy GRAVEL (GW); fine to medium grained, well graded, light brown, with a trace of silt, dry, loose to medium dense (Alluvium)		0				BS @ 0.4m TP48-01	
349	SANDSTONE: low to medium strength, highly to moderately weathered, greyish red, fine to medium grain (Colinlea Sandstone) END OF TEST PIT at 1.0m (Refusal)		1					Bucket Ripping
348			2					
347			3					
346			4					
345			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐Refusal ☒Flooding ☐Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample

BS

Tube Sample

TS

Disturbed Sample

DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP50

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting				
Excavator Type: Hitachi 200 LC	Logged By: CD Checked By: RJR Date Started: 24-7-11 Date Finished: 24-7-11	Relative Level: 336 mAHD Coordinates: 7420845 mN 451445 mE	Client: Hancock Coal	
			Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
336	SAND (SW); fine to medium grained, well graded, dark brown, with a trace of silt, moist, loose, rootlets (TOPSOIL)		0				BS @ 0.4m TP50-01	
	SAND (SW); fine to medium grained, well graded, light yellowish brown, with a trace of silt, moist, loose (Residual)							
	becomes grey mottled yellow and red, with some silt, medium dense							
335			1				BS @ 0.9m TP50-02	
	SANDSTONE; very low to medium strength, completely to moderately weathered, grey mottled yellow and red, fine to medium grained (Colinlea Sandstone)							
	END OF TEST PIT at 1.4m (Refusal)							
334			2					
333			3					
332			4					
331			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth ☐
 Refusal ☒
 Flooding ☐
 Caving/collapse ☐

SAMPLE TYPE:

Bulk Sample BS
 Tube Sample TS
 Disturbed Sample DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP51

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By: CD

Checked By: RJR

Date Started: 24-7-11

Date Finished: 24-7-11

Relative Level: 345 mAHD

Coordinates: 7420847 mN

452197 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
345	SAND (SW); fine to medium grained, well graded, brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0					
	SAND (SW); fine to medium grained, well graded, light brown, with some silt, dry, loose (Alluvium)						BS @ 0.3m TP51-01	
344	SAND (SC); fine to medium grained, well graded, grey mottled yellow and red, with some clay, low plasticity, moist, medium dense to dense (Residual)		1					
	becomes clayey, MC:8.3%, LL:23%, PL:11%, PI:12%, LS:6%, 40% Fines						BS @ 1.3m TP51-02	
343	SANDSTONE; extremely low to very low strength, residual to completely weathered, fine to medium grained, grey mottled yellow and red (Colinlea Sandstone)		2					
	becomes low to medium strength, highly to moderately weathered, grey							Bucket Ripping
342	END OF TEST PIT at 2.7m (Refusal)		3					
341			4					
340			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
										SAMPLE TYPE:	
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP52

URS Australia Pty. Ltd.		Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626683	Project Reference: Alpha Coal Project - Out-Of-Pit Tailings Storage Facility
Excavator Contractor Hills Mass Contracting				
Excavator Type: Hitachi 200 LC	Logged By: CD Checked By: RJR Date Started: 24-7-11 Date Finished: 24-7-11	Relative Level: 349 mAH Coordinates: 7420848 mN 452948 mE Permit No:	Client: Hancock Coal	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
349	Silty SAND (SM); fine to medium grained, poorly graded, dark brown, dry, loose, rootlets (TOPSOIL)		0					
	Silty SAND (SM); fine to medium grained, poorly graded, grey mottled yellowish brown, moist, medium dense (Residual)						BS @ 0.3m TP52-01	
348			1				BS @ 1.0m TP52-02	
	SANDSTONE; extremely low to very low strength, residual to completely weathered, grey mottled yellowish brown, fine to medium grained (Colinlea Sandstone)							Bucket Ripping
347			2				BS @ 2.2m TP52-03	Bucket Ripping
	END OF TEST PIT at 2.4m (Refusal)							
346			3					
345			4					
344			5					

TEST PIT SECTION										TEST PIT TERMINATED AT:	
										Target Depth	<input type="checkbox"/>
										Refusal	<input checked="" type="checkbox"/>
										Flooding	<input type="checkbox"/>
										Caving/collapse	<input type="checkbox"/>
										SAMPLE TYPE:	
										Bulk Sample	BS
										Tube Sample	TS
										Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP54

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility

Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LC

Logged By:

CD

Checked By:

RJR

Date Started:

24-7-11

Date Finished:

24-7-11

Relative Level: 351 mAH

Coordinates: 7420095 mN

452195 mE

Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
351	SAND (SW); fine to medium grained, well graded, brown to light brown, with a trace of silt, dry, loose, rootlets (TOPSOIL)		0				BS @ 0.2m TP54-01	
	Gravelly SAND (SW); fine to medium grained, well graded, light brown, gravel is fine to medium grained and subrounded to subangular, dry, medium dense (Alluvium)						BS @ 0.6m TP54-02	
350	SANDSTONE; extremely low to very low strength, residual to completely weathered, brown mottled yellow and red, fine to medium grained (Colinlea Sandstone)		1				BS @ 1m TP54-03	Bucket Ripping
	becomes low strength, highly to completely weathered							
	SANDSTONE/SILTSTONE; medium strength, moderately weathered, grey mottled light red, fine grained							
	END OF TEST PIT at 1.6m (Refusal)							
349			2					
348			3					
347			4					
346			5					

TEST PIT SECTION												TEST PIT TERMINATED AT:	
												Target Depth	<input type="checkbox"/>
												Refusal	<input checked="" type="checkbox"/>
												Flooding	<input type="checkbox"/>
												Caving/collapse	<input type="checkbox"/>
												SAMPLE TYPE:	
												Bulk Sample	BS
												Tube Sample	TS
												Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

URS Australia Pty Ltd

TEST PIT LOG TP55

URS Australia Pty. Ltd.

Phone: (07) 3243 2111
Fax: (07) 3243 2199

Project No.:

42626683

Project Reference:

Alpha Coal Project - Out-Of-Pit Tailings Storage Facility


Excavator Contractor Hills Mass Contracting

Excavator Type:

Hitachi
200 LCLogged By: CD
Checked By: RJR
Date Started: 24-7-11
Date Finished: 24-7-11Relative Level: 362 mAHD
Coordinates: 7420095 mN
452944 mE
Permit No:

Client:

Hancock Coal

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (kg/cm ²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
362	Silty SAND (SM); fine to medium grained, well graded, light brown, dry, loose, rootlets (TOPSOIL)		0					
	Silty SAND (SM); fine to medium grained, well graded, greyish brown, dry, dense (Alluvium)							BS @ 0.5m TP55-01
361	SANDSTONE; medium strength, moderately to highly weathered, grey mottled yellowish brown, fine to medium grained (Colinlea Sandstone)		1					High resistance
	END OF TEST PIT at 1.2m (Refusal)							
360			2					
359			3					
358			4					
357			5					

TEST PIT SECTION															TEST PIT TERMINATED AT:	
															Target Depth	<input type="checkbox"/>
															Refusal	<input type="checkbox"/>
															Flooding	<input type="checkbox"/>
															Caving/collapse	<input type="checkbox"/>
															SAMPLE TYPE:	
															Bulk Sample	BS
															Tube Sample	TS
															Disturbed Sample	DS

NOTES: Soil classification via AS1726-1993

ABBREVIATIONS: MC: Moisture Content LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index LS: Linear Shrinkage *: Crumbling occurred
 +: Curling occurred EC: Emerson Class MDD: Maximum Dry Density OMC: Optimum Moisture Content k: Laboratory Permeability
 FA: Peak Friction Angle C: Cohesion

D.2 Test Pit Photographs



Test Pit 02



Test Pit 05



Test Pit 07



Test Pit 10



Test Pit 11



Test Pit 13



Test Pit 16



Test Pit 24



Test Pit 19



Test Pit 26



Test Pit 28/2



Test Pit 34



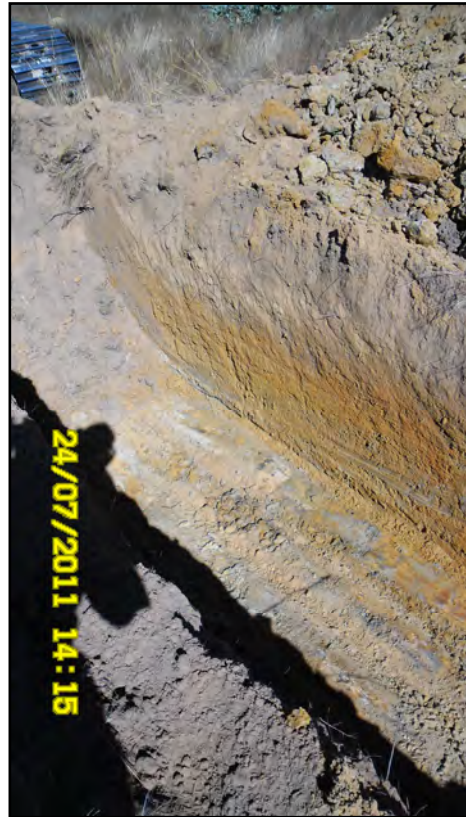
Test Pit 35



Test Pit 44



Test Pit 46



Test Pit 50



Test Pit 48



Test Pit 51

Appendix E In Situ Test Results

Appendix E

E.1 Falling Head Permeability Tests

URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH01A
 Job Number: 42626683
 Date: 22/07/2011

Logged By: CLH
 Coordinates: 451022 mE
 7429511 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 2.7 m

Diameter (ϕ , mm): 120 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.06 m

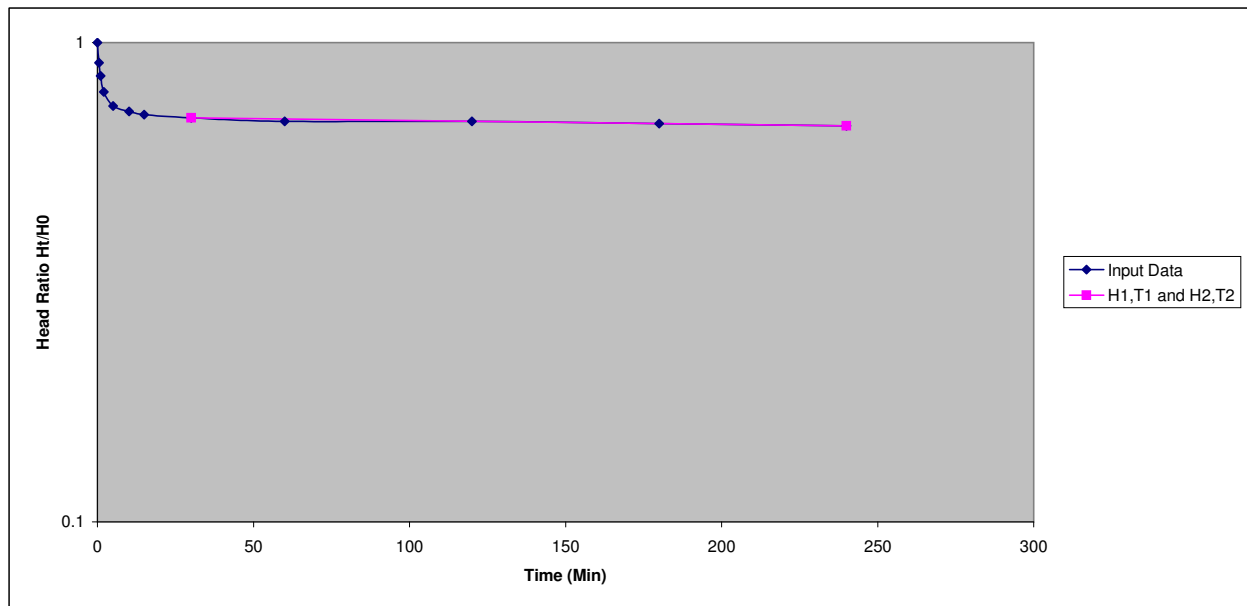
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	2.7	1
0.5	30	0.25	2.45	0.9074074
1	60	0.4	2.3	0.8518519
2	120	0.57	2.13	0.7888889
5	300	0.71	1.99	0.737037
10.2	612	0.76	1.94	0.7185185
15	900	0.79	1.91	0.7074074
30	1800	0.82	1.88	0.6962963
60	3600	0.85	1.85	0.6851852
120	7200	0.85	1.85	0.6851852
180	10800	0.87	1.83	0.6777778
240	14400	0.89	1.81	0.6703704

Select H1,T1 and H2, T2

30	1800	0.82	1.88	0.6962963
240	14400	0.89	1.81	0.6703704

F = 4.456554889

K= 5.57139E-08



URS
FALLING HEAD TEST DATA LOG SHEET

Location: BH02A
Job Number: 42626683
Date: 24/07/2011

Logged By: SHENAL
Coordinates: 452217 mE
7429356 mN

Ground Level RL:
Test Level RL:
Initial Hole Depth (L): 3 m

Diameter (Ø, mm): 110 mm
Depth to test (d): 0 m
Datum Depth below Ground Level (α): 0 m
R: 0.055 m

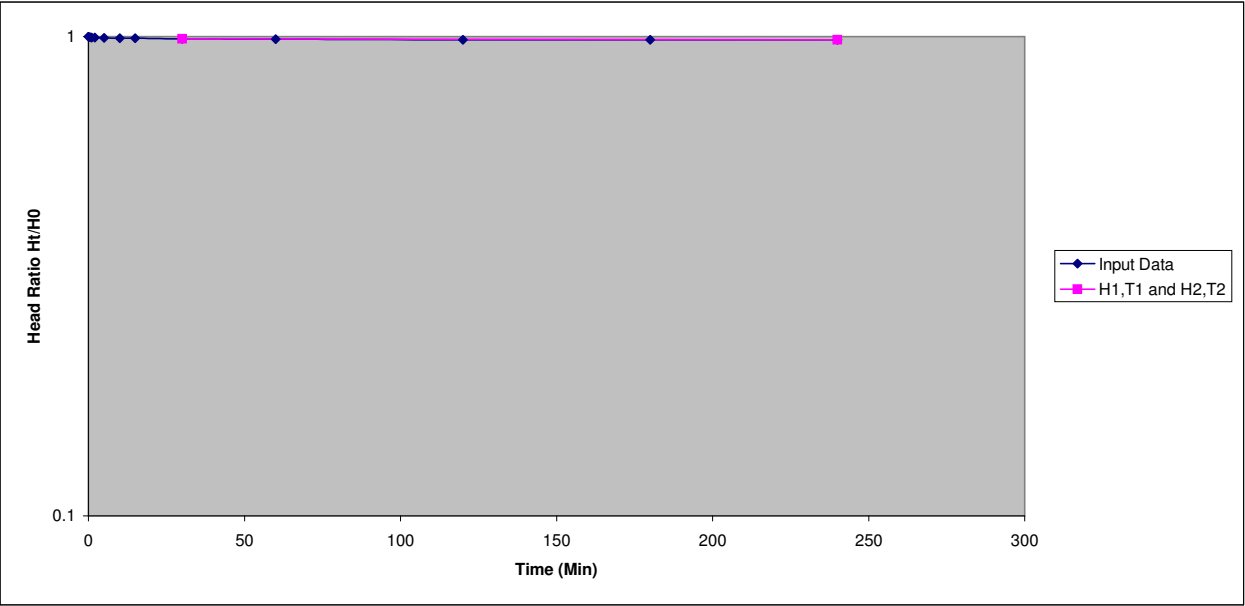
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3	1
0.5	30	0.01	2.99	0.9966667
1	60	0.012	2.988	0.996
2	120	0.015	2.985	0.995
5	300	0.017	2.983	0.9943333
10	600	0.021	2.979	0.993
15	900	0.024	2.976	0.992
30	1800	0.031	2.969	0.9896667
60	3600	0.037	2.963	0.9876667
120	7200	0.044	2.956	0.9853333
180	10800	0.045	2.955	0.985
240	14400	0.046	2.954	0.9846667

Select H1,T1 and H2, T2

30	1800	0.031	2.969	0.9896667
240	14400	0.046	2.954	0.9846667

F = 4.713526846

K= 7.29427E-09



URS
FALLING HEAD TEST DATA LOG SHEET

Location: BH03A
Job Number: 42626683
Date:

Logged By: SHENAL
Coordinates: 453344 mE
7429251 mN

Ground Level RL:
Test Level RL:
Initial Hole Depth (L): 3 m

Diameter (Ø, mm): 110 mm
Depth to test (d): 0 m
Datum Depth below Ground Level (α): 0 m
R: 0.055 m

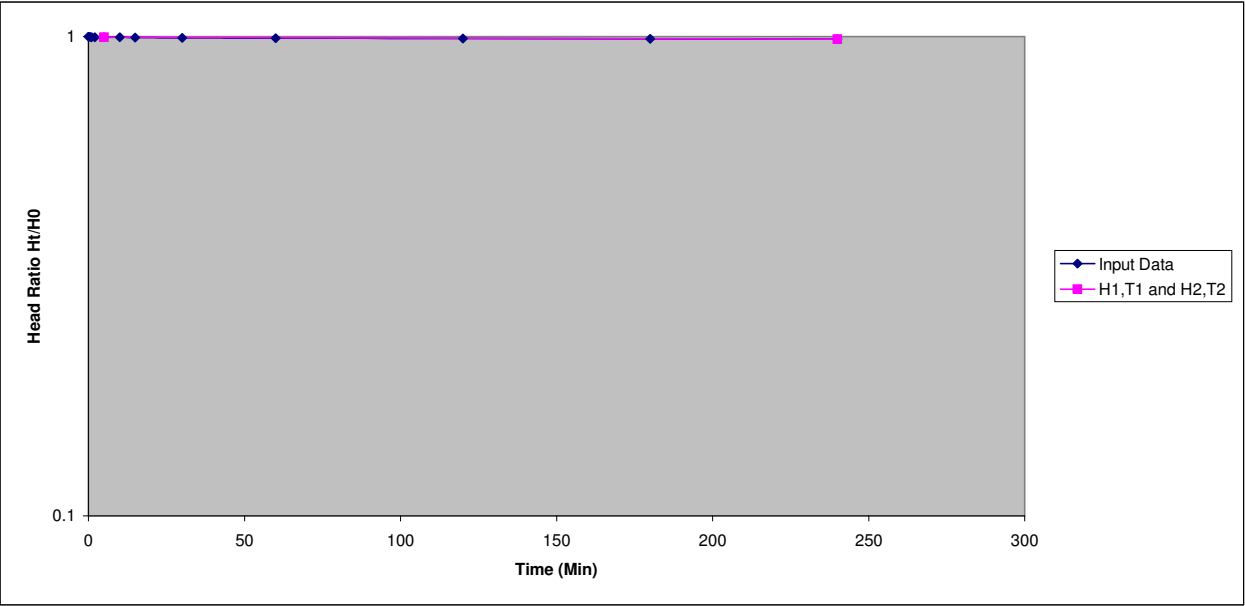
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3	1
0.5	30	0.005	2.995	0.9983333
1	60	0.007	2.993	0.9976667
2	120	0.008	2.992	0.9973333
5	300	0.009	2.991	0.997
10	600	0.011	2.989	0.9963333
15	900	0.013	2.987	0.9956667
30	1800	0.017	2.983	0.9943333
60	3600	0.021	2.979	0.993
120	7200	0.027	2.973	0.991
180	10800	0.031	2.969	0.9896667
240	14400	0.035	2.965	0.9883333

Select H1,T1 and H2, T2

5	300	0.009	2.991	0.997
240	14400	0.035	2.965	0.9883333

F = 4.713526846

K= 1.12358E-08



URS
FALLING HEAD TEST DATA LOG SHEET

Location: BH04A
Job Number: 42626683
Date: 10/08/2011

Logged By: RJR
Coordinates: 450693 mE
7427979 mN

Ground Level RL:
Test Level RL:
Initial Hole Depth (L): 2.9 m

Diameter (Ø, mm): 110 mm
Depth to test (d): 0 m
Datum Depth below Ground Level (α): 0 m
R: 0.055 m

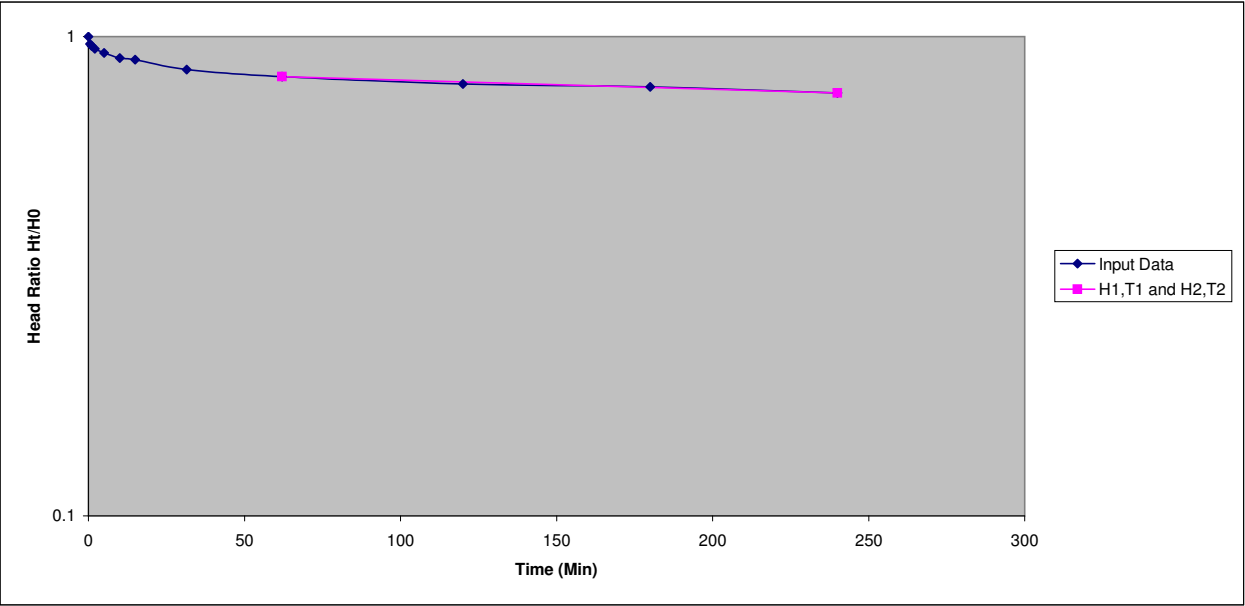
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	2.9	1
0.5	30	0.1	2.8	0.9655172
1	60	0.128	2.772	0.9558621
2	120	0.165	2.735	0.9431034
5	300	0.219	2.681	0.9244828
10	600	0.284	2.616	0.902069
15	900	0.306	2.594	0.8944828
31.5	1890	0.424	2.476	0.8537931
62	3720	0.508	2.392	0.8248276
120	7200	0.59	2.31	0.7965517
180	10800	0.623	2.277	0.7851724
240	14400	0.689	2.211	0.7624138

Select H1,T1 and H2, T2

62	3720	0.508	2.392	0.8248276
240	14400	0.689	2.211	0.7624138

F = 4.5953662

K= 1.28136E-07



URS
FALLING HEAD TEST DATA LOG SHEET

Location: BH05A
Job Number: 42626683
Date: 28/07/2011

Logged By: SHENAL
Coordinates: 451846 mE
7427936 mN

Ground Level RL:
Test Level RL:
Initial Hole Depth (L): 2.3 m

Diameter (Ø, mm): 110 mm
Depth to test (d): 0 m
Datum Depth below Ground Level (α): 0 m
R: 0.055 m

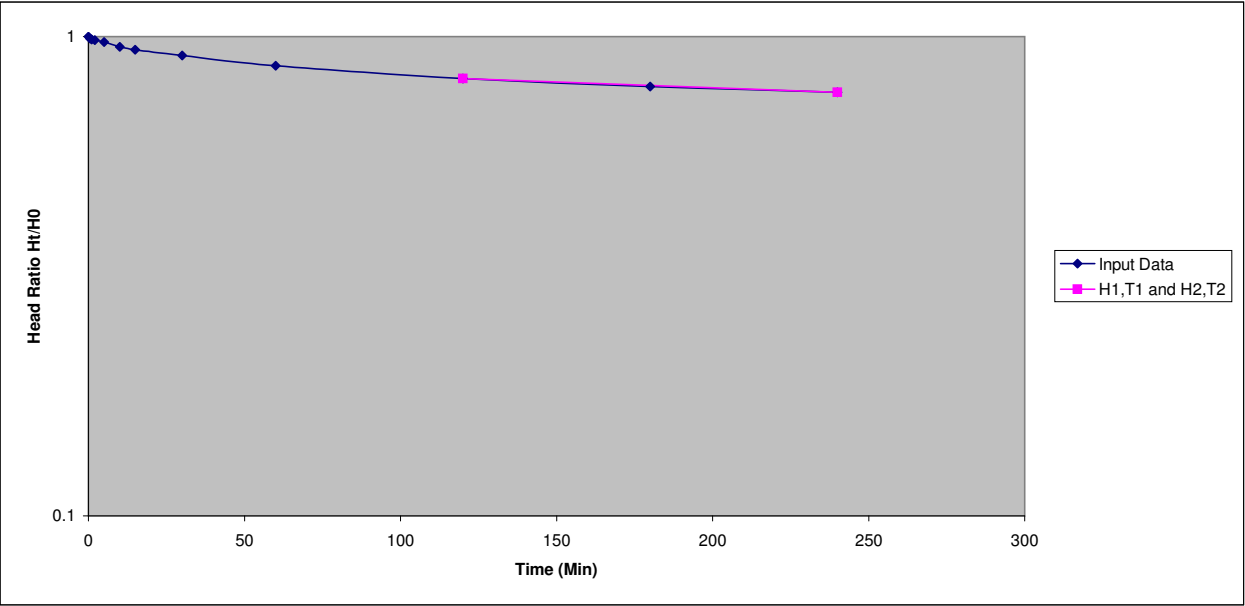
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	2.3	1
0.5	30	0.02	2.28	0.9913043
1	60	0.03	2.27	0.9869565
2	120	0.04	2.26	0.9826087
5	300	0.06	2.24	0.973913
10	600	0.11	2.19	0.9521739
15	900	0.14	2.16	0.9391304
30	1800	0.2	2.1	0.9130435
60	3600	0.3	2	0.8695652
120	7200	0.42	1.88	0.8173913
180	10800	0.49	1.81	0.7869565
240	14400	0.54	1.76	0.7652174

Select H1,T1 and H2, T2

120	7200	0.42	1.88	0.8173913
240	14400	0.54	1.76	0.7652174

F = 3.870893143

K= 1.18975E-07



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH06A
 Job Number: 42626683
 Date: 26/07/2011

Logged By: SHENAL
 Coordinates: 452847 mE
 7427446 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 3 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

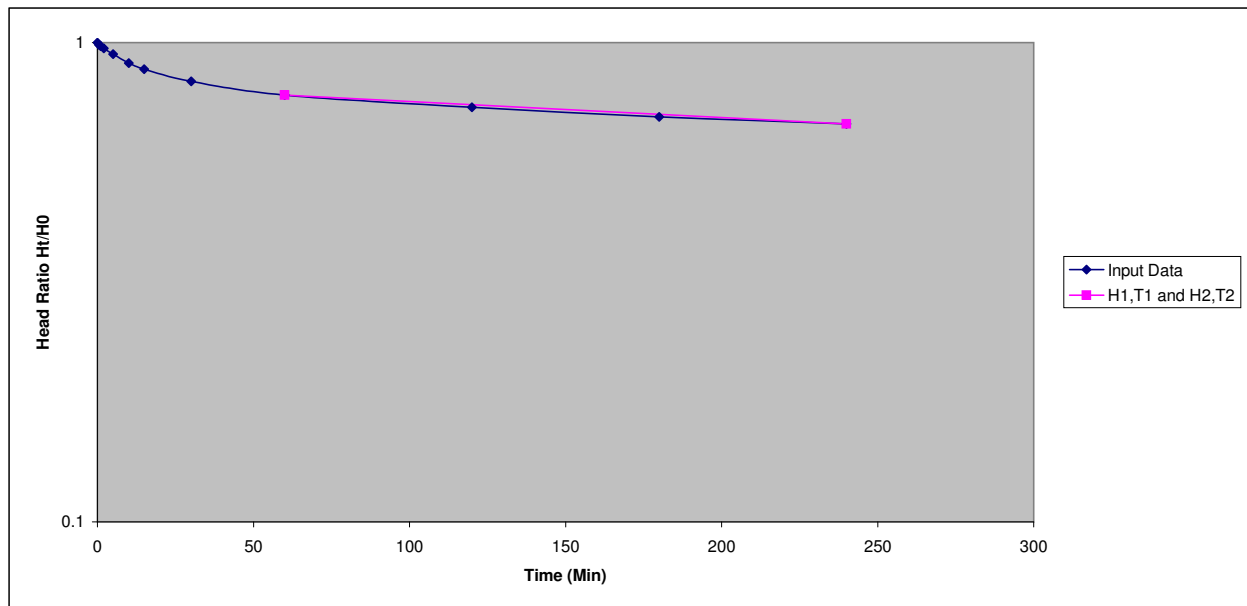
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3	1
0.5	30	0.03	2.97	0.99
1	60	0.05	2.95	0.9833333
2	120	0.08	2.92	0.9733333
5	300	0.16	2.84	0.9466667
10	600	0.28	2.72	0.9066667
15	900	0.36	2.64	0.88
30	1800	0.51	2.49	0.83
60	3600	0.67	2.33	0.7766667
120	7200	0.8	2.2	0.7333333
180	10800	0.9	2.1	0.7
240	14400	0.97	2.03	0.6766667

Select H1,T1 and H2, T2

60	3600	0.67	2.33	0.7766667
240	14400	0.97	2.03	0.6766667

F = 4.713526846

K= 2.31579E-07



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH07A
 Job Number: 42626683
 Date: 4/08/2011

Logged By: RJR
 Coordinates: 450753 mE
 7425886 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 3 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

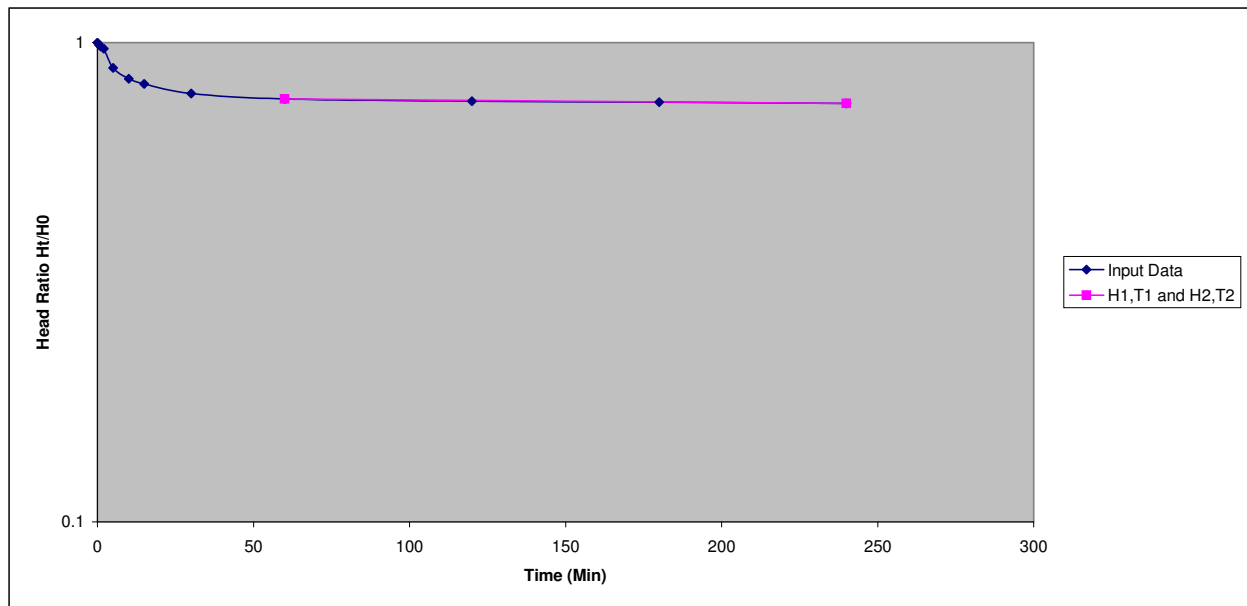
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3	1
0.5	30	0.03	2.97	0.99
1	60	0.055	2.945	0.9816667
2	120	0.085	2.915	0.9716667
5	300	0.345	2.655	0.885
10	600	0.48	2.52	0.84
15	900	0.54	2.46	0.82
30	1800	0.65	2.35	0.7833333
60	3600	0.71	2.29	0.7633333
120	7200	0.735	2.265	0.755
180	10800	0.745	2.255	0.7516667
240	14400	0.76	2.24	0.7466667

Select H1,T1 and H2, T2

60	3600	0.71	2.29	0.7633333
240	14400	0.76	2.24	0.7466667

F = 4.713526846

K= 3.70909E-08



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH08A
 Job Number: 42626683
 Date: 30/07/2011

Logged By: SHENAL
 Coordinates: 451879 mE
 7425941 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 1.5 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

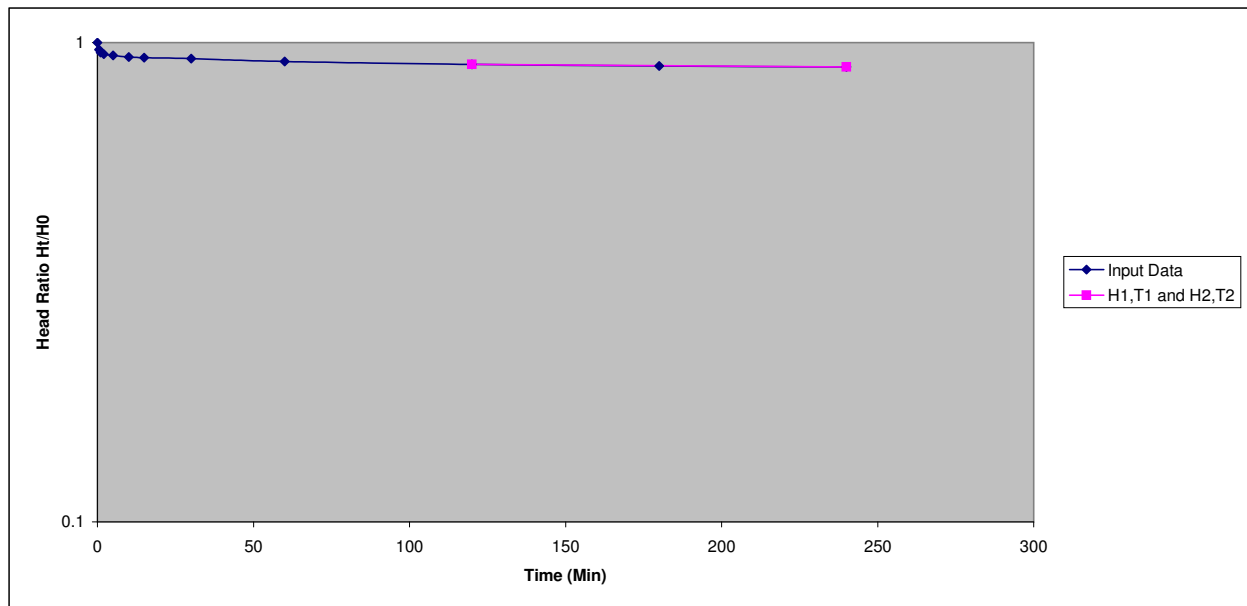
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	1.5	1
0.5	30	0.05	1.45	0.9666667
1	60	0.07	1.43	0.9533333
2	120	0.08	1.42	0.9466667
5	300	0.09	1.41	0.94
10	600	0.1	1.4	0.9333333
15	900	0.105	1.395	0.93
30	1800	0.11	1.39	0.9266667
60	3600	0.13	1.37	0.9133333
120	7200	0.15	1.35	0.9
180	10800	0.16	1.34	0.8933333
240	14400	0.165	1.335	0.89

Select H1,T1 and H2, T2

120	7200	0.15	1.35	0.9
240	14400	0.165	1.335	0.89

F = 2.850907301

K= 1.16392E-08



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH09A
 Job Number: 42626683
 Date: 26/07/2011

Logged By: SHENAL
 Coordinates: 452759 mE
 7426173 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 3 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

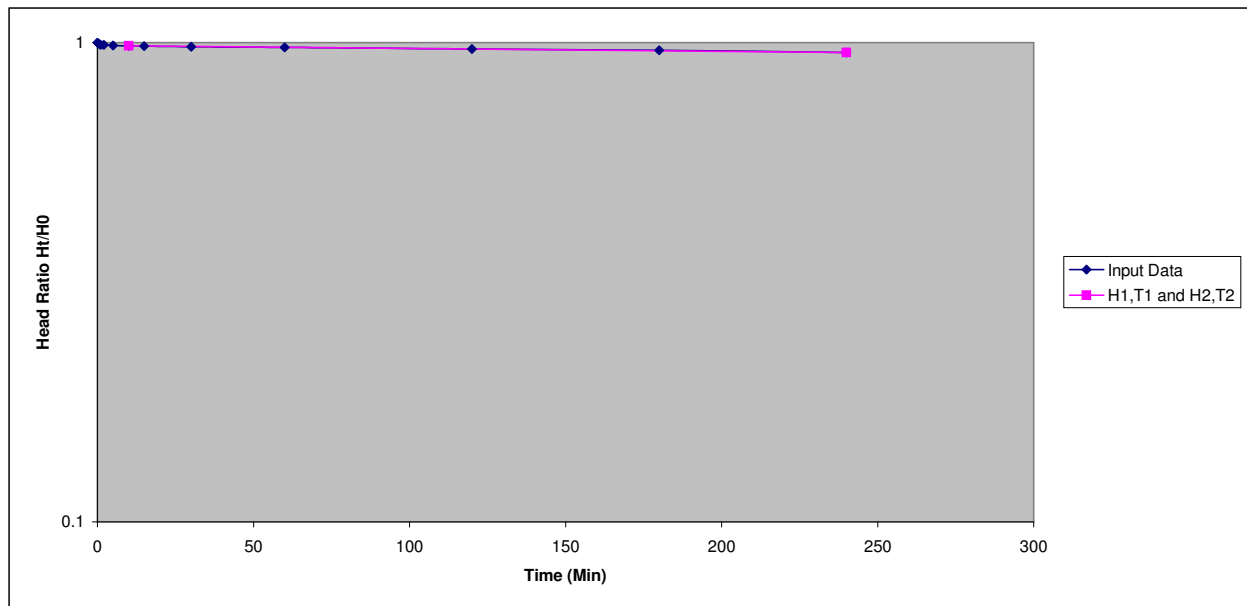
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3	1
0.5	30	0.02	2.98	0.9933333
1	60	0.03	2.97	0.99
2	120	0.03	2.97	0.99
5	300	0.04	2.96	0.9866667
10	600	0.045	2.955	0.985
15	900	0.051	2.949	0.983
30	1800	0.06	2.94	0.98
60	3600	0.07	2.93	0.9766667
120	7200	0.09	2.91	0.97
180	10800	0.11	2.89	0.9633333
240	14400	0.14	2.86	0.9533333

Select H1,T1 and H2, T2

10	600	0.045	2.955	0.985
240	14400	0.14	2.86	0.9533333

F = 4.713526846

K= 4.2967E-08



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH10A
 Job Number: 42626683
 Date: 9/08/2011

Logged By: RJR
 Coordinates: 450690 mE
 7424124 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 2.7 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

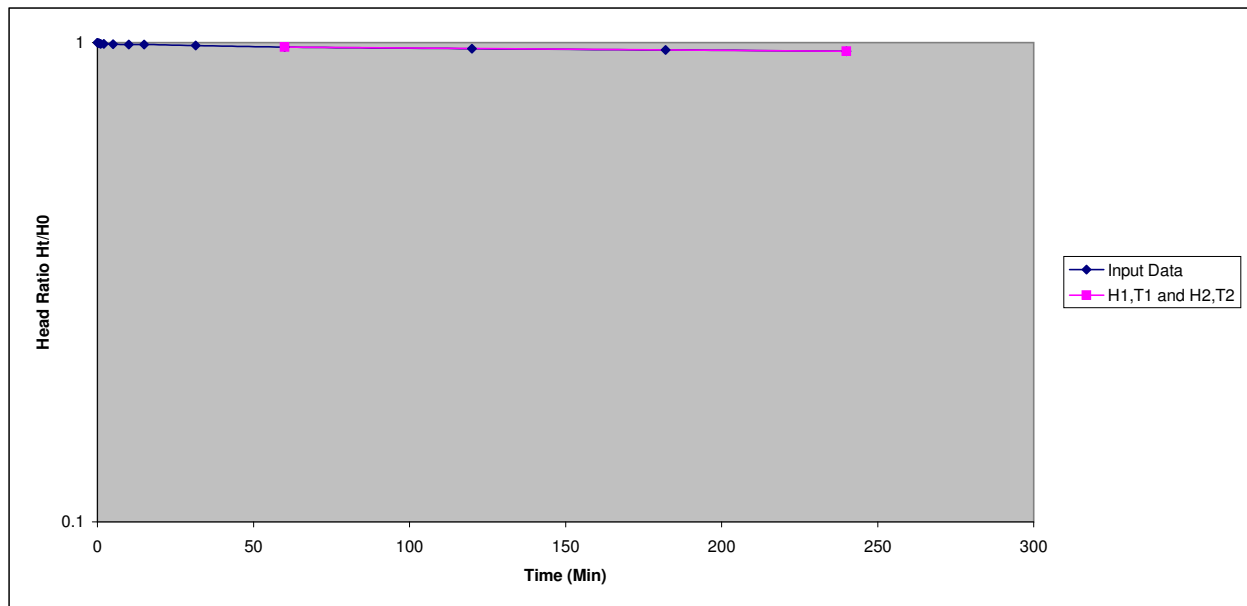
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	2.7	1
0.5	30	0.009	2.691	0.9966667
1	60	0.015	2.685	0.9944444
2	120	0.017	2.683	0.9937037
5	300	0.019	2.681	0.992963
10	600	0.023	2.677	0.9914815
15	900	0.026	2.674	0.9903704
31.5	1890	0.039	2.661	0.9855556
60	3600	0.057	2.643	0.9788889
120	7200	0.078	2.622	0.9711111
182	10920	0.094	2.606	0.9651852
240	14400	0.108	2.592	0.96

Select H1,T1 and H2, T2

60	3600	0.057	2.643	0.9788889
240	14400	0.108	2.592	0.96

F = 4.35696489

K= 2.86875E-08



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH11A
 Job Number: 42626683
 Date: 31/07/2011

Logged By: SHENAL
 Coordinates: 451756 mE
 742104 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 1.5 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

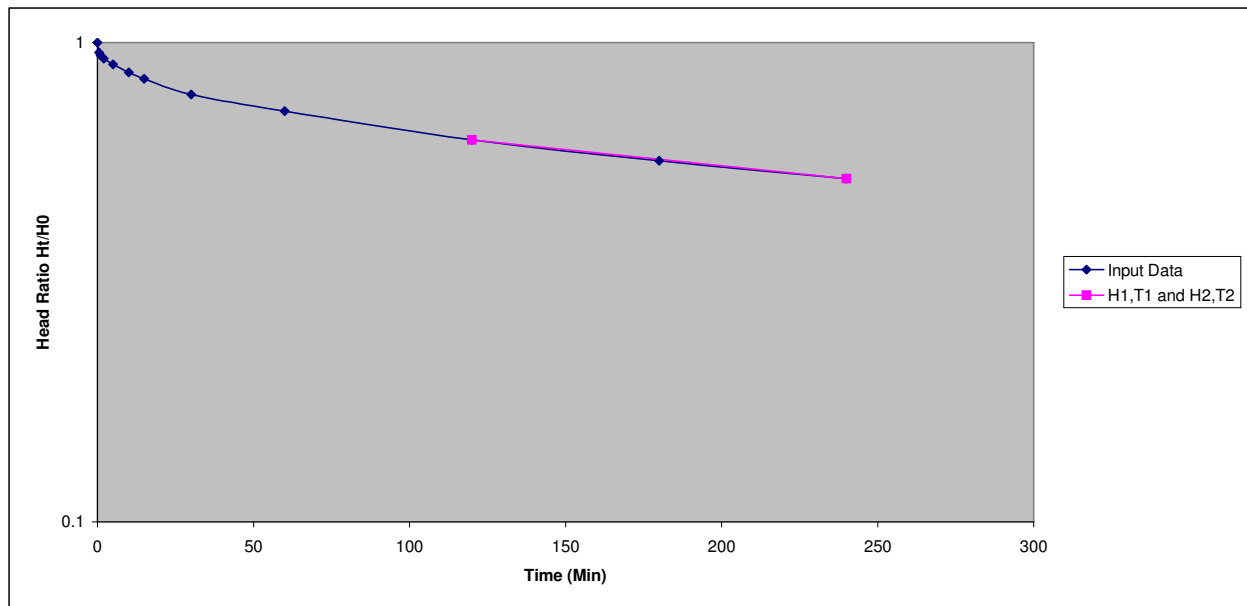
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	1.5	1
0.5	30	0.07	1.43	0.9533333
1	60	0.09	1.41	0.94
2	120	0.11	1.39	0.9266667
5	300	0.15	1.35	0.9
10	600	0.2	1.3	0.8666667
15	900	0.24	1.26	0.84
30	1800	0.33	1.17	0.78
60	3600	0.42	1.08	0.72
120	7200	0.56	0.94	0.6266667
180	10800	0.65	0.85	0.5666667
240	14400	0.72	0.78	0.52

Select H1,T1 and H2, T2

120	7200	0.56	0.94	0.6266667
240	14400	0.72	0.78	0.52

F = 2.850907301

K= 1.94366E-07



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH12A
 Job Number: 42626683
 Date: 30/07/2011

Logged By: SHENAL
 Coordinates: 452646 mE
 7423919 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 1.8 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

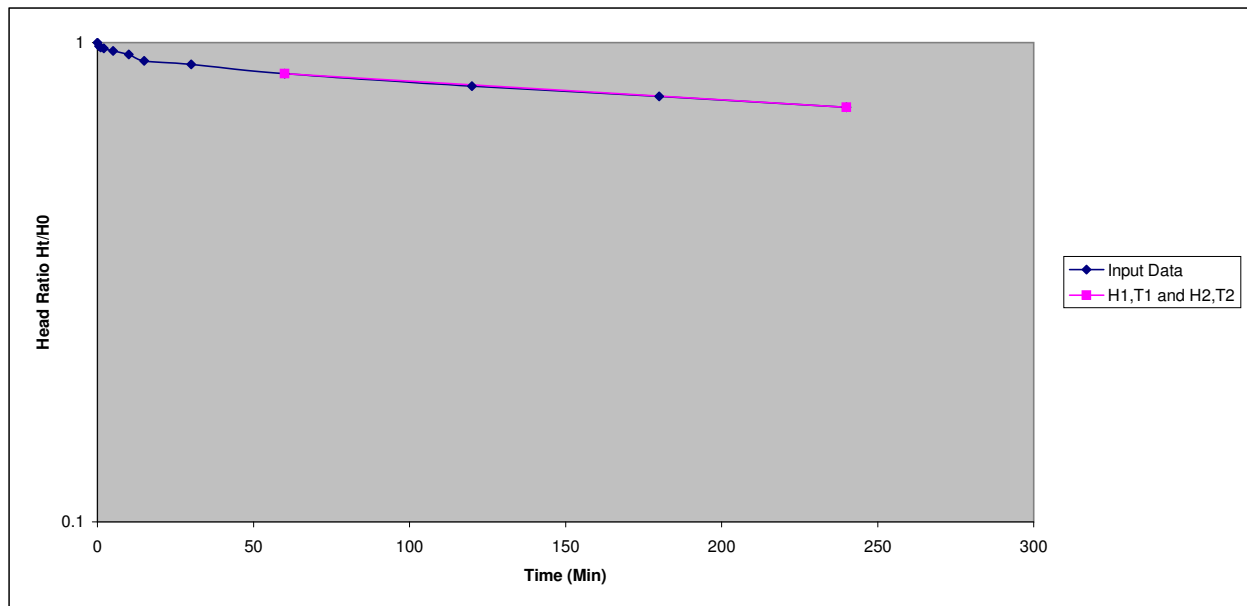
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	1.8	1
0.5	30	0.03	1.77	0.9833333
1	60	0.04	1.76	0.9777778
2	120	0.05	1.75	0.9722222
5	300	0.07	1.73	0.9611111
10	600	0.1	1.7	0.9444444
15	900	0.15	1.65	0.9166667
30	1800	0.18	1.62	0.9
60	3600	0.25	1.55	0.8611111
120	7200	0.34	1.46	0.8111111
180	10800	0.41	1.39	0.7722222
240	14400	0.48	1.32	0.7333333

Select H1,T1 and H2, T2

60	3600	0.25	1.55	0.8611111
240	14400	0.48	1.32	0.7333333

F = 3.24227543

K= 1.41239E-07



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH13A
 Job Number: 42626683
 Date: 3/08/2011

Logged By: Terratest
 Coordinates: 450721 mE
 7422304 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 3.2 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

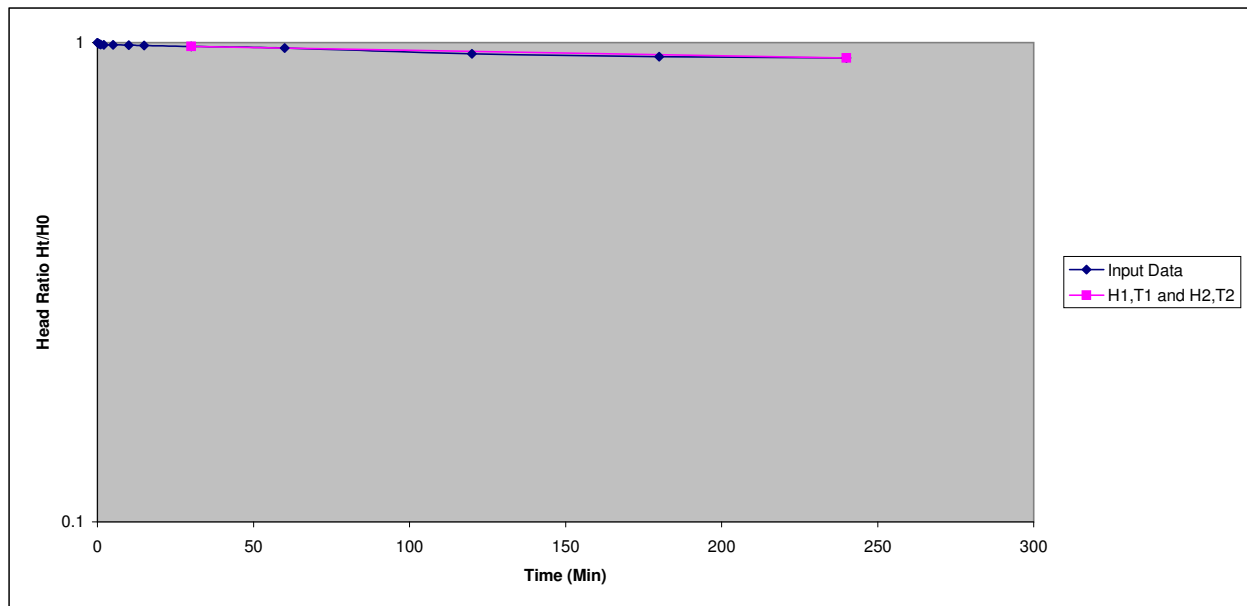
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3.2	1
0.5	30	0.02	3.18	0.99375
1	60	0.03	3.17	0.990625
2	120	0.033	3.167	0.9896875
5	300	0.035	3.165	0.9890625
10	600	0.04	3.16	0.9875
15	900	0.045	3.155	0.9859375
30	1800	0.06	3.14	0.98125
60	3600	0.082	3.118	0.974375
120	7200	0.167	3.033	0.9478125
180	10800	0.211	2.989	0.9340625
240	14400	0.228	2.972	0.92875

Select H1,T1 and H2, T2

30	1800	0.06	3.14	0.98125
240	14400	0.228	2.972	0.92875

F = 4.947909995

K= 8.58318E-08



URS

FALLING HEAD TEST DATA LOG SHEET

Location: BH14A
 Job Number: 42626683
 Date: 1/08/2011

Logged By: Lauren
 Coordinates: 452117 mE
 7421302 mN

Ground Level RL:
 Test Level RL:
 Initial Hole Depth (L): 3.2 m

Diameter (ϕ , mm): 110 mm
 Depth to test (d): 0 m
 Datum Depth below Ground Level (α): 0 m
 R: 0.055 m

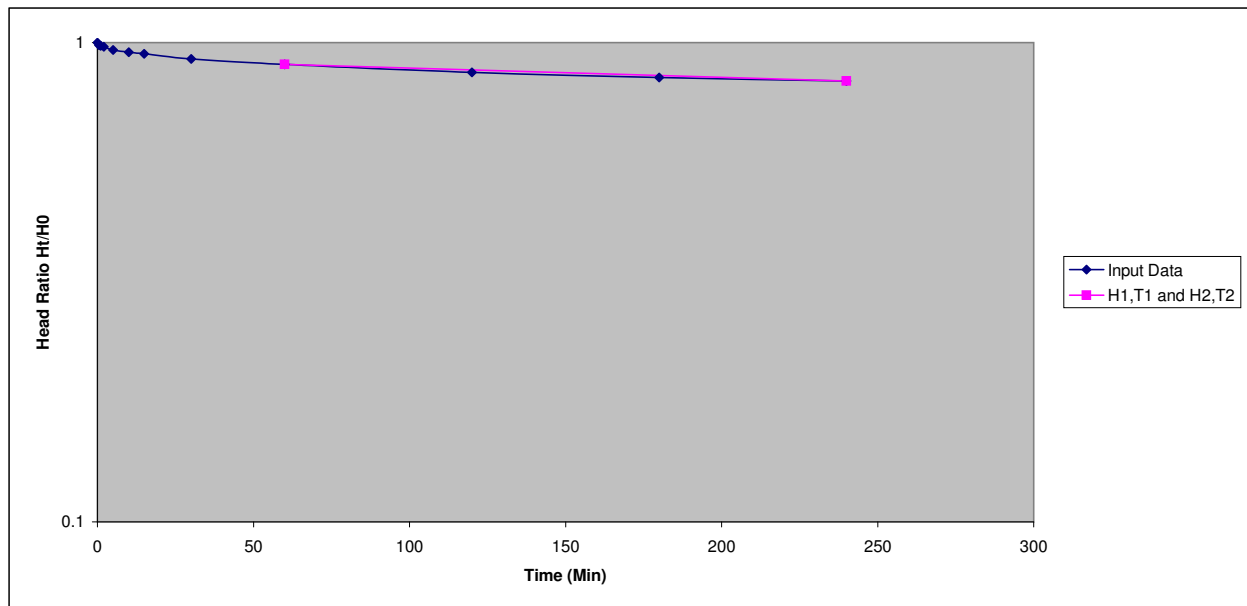
Time (min)	Time (Sec)	L- Ht (m)	Ht (m)	Ht/ Ho (m)
0	0	0	3.2	1
0.5	30	0.04	3.16	0.9875
1	60	0.05	3.15	0.984375
2	120	0.065	3.135	0.9796875
5	300	0.11	3.09	0.965625
10	600	0.145	3.055	0.9546875
15	900	0.17	3.03	0.946875
30	1800	0.24	2.96	0.925
60	3600	0.32	2.88	0.9
120	7200	0.425	2.775	0.8671875
180	10800	0.495	2.705	0.8453125
240	14400	0.54	2.66	0.83125

Select H1,T1 and H2, T2

60	3600	0.32	2.88	0.9
240	14400	0.54	2.66	0.83125

F = 4.947909995

K= 1.44711E-07

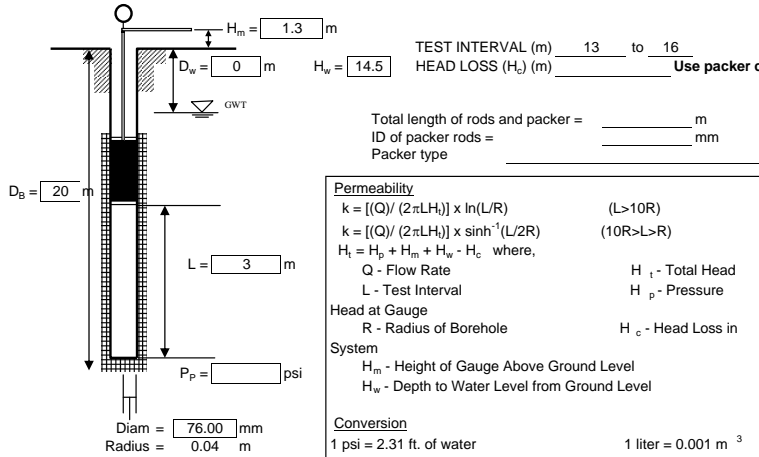


E.2 Packer Tests

PROJECT: Alpha TSF
 LOCATION: 70 km north of Alpha

BORING NO. BH04
 RES. ENG. R Rudd
 DATE 10/08/2011

SHEET 1 OF
 Project No. 42626683
 Cost Code

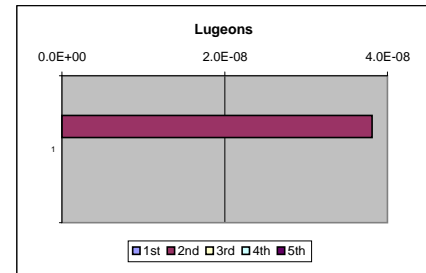
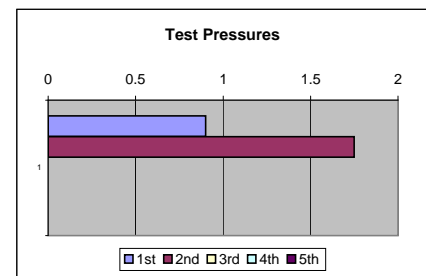


LugeonValue = water taken in test (litres 10 (bars))
 length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.9	0	5	1	0.0E+00
1.75	1E-07	5	2	3.8E-08
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation Not Applicable
 Reportable Lugeon Value 3.8E-08

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAGE FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
90	0	115.2583	0	0.0E+00	0.00E+00	9.20	2.50E+01	0	0.00E+00
	1	115.2583	0						
	2	115.2583	0						
	3	115.2583	0						
	4	115.2583	0						
	5	115.2583	0						
175	0	115.2606	0.0001	2.0E-05	2.00E-05	17.88	3.37E+01	1.38E-07	2.29E-09
	1	115.2607	0						
	2	115.2607	0						
	3	115.2607	0						
	4	115.2607	0						
	5	115.2607	0						
	0								
	1								
	2								
	3								
	4								
	5								
	0								
	1								
	2								
	3								
	4								
	5								
	0								
	1								
	2								
	3								
	4								
	5								

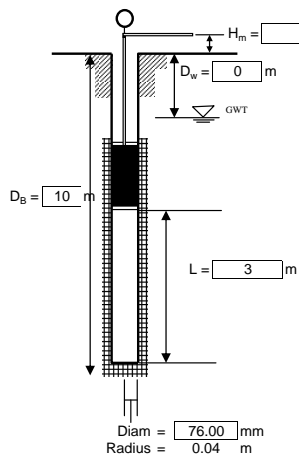


URS **PACKER PERMEABILITY TEST (SINGLE PACKER)**

PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH05
RES. ENG. R Rudd
DATE 26/07/2011

SHEET 1 OF
Project No. 42626683
Cost Code



TEST INTERVAL (m) 7 to 10
HEAD LOSS (H_c) (m) Use packer calibration spreadsheet to estimate.

Total length of rods and packer = m
ID of packer rods = mm
Packer type

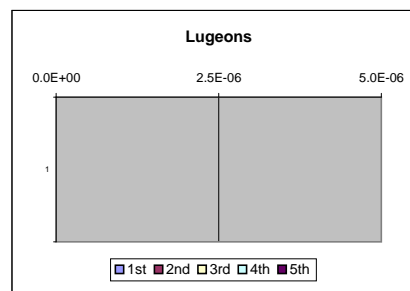
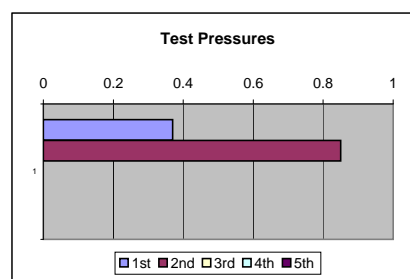
Permeability
 $k = [(Q) / (2\pi L H_c)] \times \ln(L/R)$ ($L > 10R$)
 $k = [(Q) / (2\pi L H_c)] \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_t = H_p + H_m + H_w - H_c$ where,
Q - Flow Rate
L - Test Interval
Head at Gauge
R - Radius of Borehole
System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level
Conversion
1 psi = 2.31 ft. of water 1 liter = 0.001 m³

LugeonValue = water taken in test (litres 10 (bars)
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.37	0	5	1	0.0E+00
0.85	0	7	2	0.0E+00
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation
Reportable Lugeon Value: Not Applicable 0.0E+00

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAG E FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
37	0	115.4	0	0.0E+00	0.00E+00	3.78	1.23E+01	0	0.00E+00
	1	115.4	0						
	2	115.4	0						
	3	115.4	0						
	4	115.4	0						
85	0	115.4041	0	0.0E+00	0.00E+00	8.68	1.72E+01	#####	0.00E+00
	1	115.4038	0						
	2	115.4028	0						
	3	115.4023	0						
	4	115.4021	0						
	5	115.4017	0						
	6	115.401	0						
	7	115.4002	0						

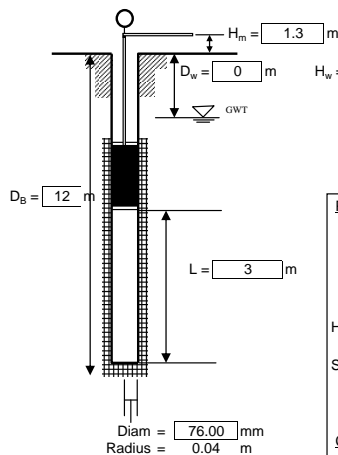


URS **PACKER PERMEABILITY TEST (SINGLE PACKER)**

PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH06
RES. ENG. R Rudd
DATE 25/07/2011

SHEET 1 OF
Project No. 42626683
Cost Code



TEST INTERVAL (m) 9 to 12
HEAD LOSS (H_c) (m) Use packer calibration spreadsheet to estimate.

Total length of rods and packer = m
ID of packer rods = mm
Packer type

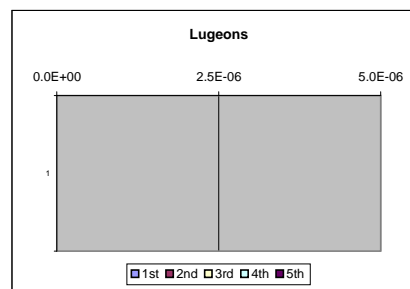
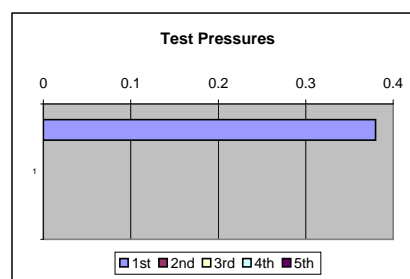
Permeability
 $k = [(Q) / (2\pi L H_c)] \times \ln(L/R)$ (L > 10R)
 $k = [(Q) / (2\pi L H_c)] \times \sinh^{-1}(L/2R)$ (10R > L > R)
 $H_t = H_p + H_m + H_w - H_c$ where,
 Q - Flow Rate
 L - Test Interval
 Head at Gauge
 R - Radius of Borehole
 System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level
 Conversion
 1 psi = 2.31 ft. of water 1 liter = 0.001 m³

LugeonValue = water taken in test (litres 10 (bars)
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.38	0	5	1	0.0E+00
0	0	0	2	
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation Not Applicable
Reportable Lugeon Value

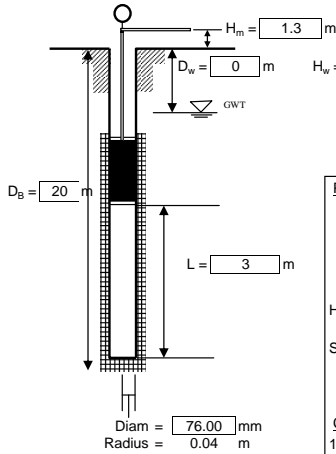
GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAG E FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
38	0	115.4042	0	0.0E+00	0.00E+00	3.88	1.57E+01	#####	0.00E+00
	1	115.4042	0						
	2	115.4042	0						
	3	115.4042	0						
	4	115.4042	0						
	5	115.4042	0						



PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH 07
RES. ENG. R Rudd
DATE 2/08/2011

SHEET 1 OF 5
Project No. 42626683
Cost Code



TEST INTERVAL (m) 9.2 to 12.2
HEAD LOSS (H_c) (m) Use packer calibration spreadsheet to estimate.

Total length of rods and packer = _____ m
ID of packer rods = _____ mm
Packer type _____

Permeability
 $k = [(Q)/(2\pi LH_p)] \times \ln(L/R)$ ($L > 10R$)
 $k = [(Q)/(2\pi LH_p)] \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_t = H_p + H_m + H_w - H_c$ where,
Q - Flow Rate H_t - Total Head
L - Test Interval H_p - Pressure
Head at Gauge
R - Radius of Borehole H_c - Head Loss in System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level

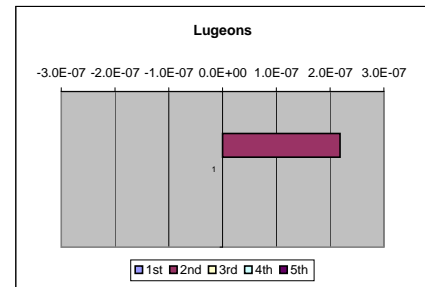
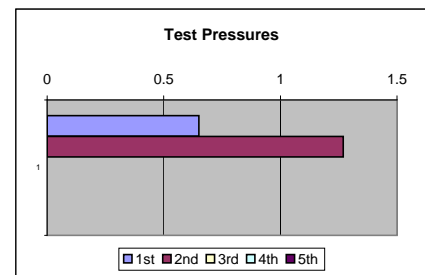
Conversion
1 psi = 2.31 ft. of water 1 liter = 0.001 m³

LugeonValue = water taken in test (litres 10 (bars))
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.65	0	5	1	0.0E+00
1.27	5E-07	6	2	2.2E-07
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation Not Applicable
Reportable Lugeon Value: 2.2E-07

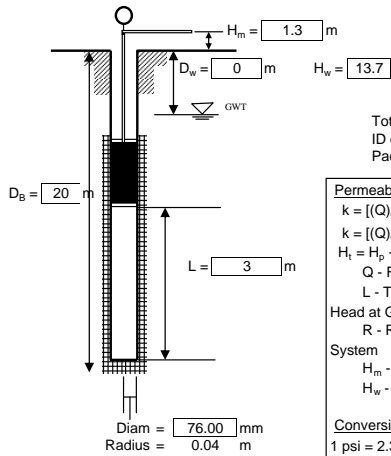
GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAGE FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
65	0	115.205	0	0.0E+00	0.00E+00	6.64	1.86E+01	#####	0.00E+00
	1	115.205	0						
	2	115.205	0						
	3	115.205	0						
	4	115.205	0						
	5	115.205	0						
127	0	115.2064	0.0001	8.3E-05	8.33E-05	12.98	2.50E+01	7.73E-07	1.29E-08
	1	115.2065	0.0001						
	2	115.2066	0.0001						
	3	115.2067	0.0001						
	4	115.2068	0.0001						
	5	115.2069	0.0001						
	6	115.2069	0						
				#DIV/0!	#DIV/0!	0.00	1.20E+01	#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!	0.00	1.20E+01	#DIV/0!	#DIV/0!



PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH-07
RES. ENG. R Rudd
DATE 3/08/2011

SHEET 2 OF 5
Project No. 42626683
Cost Code

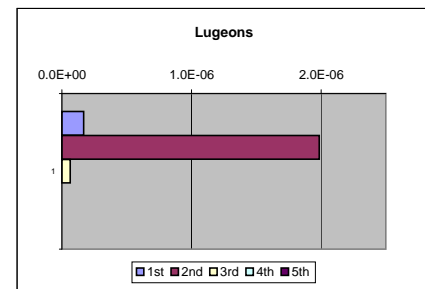
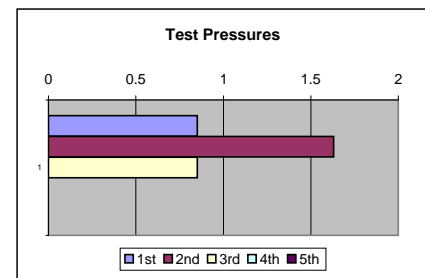


LugeonValue = water taken in test (litrex 10 (bars)
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.85	3E-07	7	1	1.7E-07
1.63	6.8E-06	7	2	2.0E-06
0.85	1E-07	6	3	6.5E-08
0	0	0	4	
0	0	0	5	

Interpretation
Reportable Lugeon Value: 1.7E-07

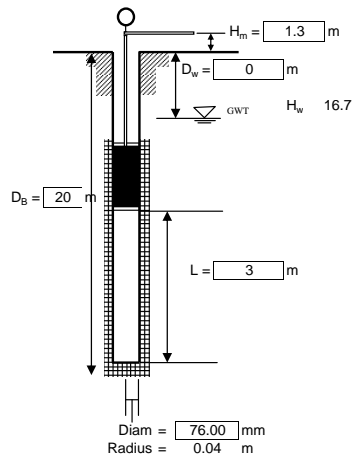
GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAG E FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
85	0	115.2169	0.0001	4.3E-05	4.29E-05	8.68	2.37E+01	4.19E-07	6.99E-09
	1	115.217	0						
	2	115.217	0.0001						
	3	115.2171	0						
	4	115.2171	0.0001						
	5	115.2172	0						
	6	115.2172	0						
	7	115.2172	0						
163	0	115.2191	0.0012	9.7E-04	9.71E-04	16.65	3.17E+01	7.11E-06	1.19E-07
	1	115.2203	0.0011						
	2	115.2214	0.0009						
	3	115.2223	0.001						
	4	115.2233	0.001						
	5	115.2243	0.0009						
	6	115.2252	0.0007						
	7	115.2259	0.0007						
85	0	115.2257	0	1.7E-05	1.67E-05	8.68	2.37E+01	1.63E-07	2.72E-09
	1	115.2257	0						
	2	115.2257	0						
	3	115.2257	0.0001						
	4	115.2258	0						
	5	115.2258	0						
	6	115.2258	0						
	7	115.2258	0						
				#DIV/0!	#DIV/0!	0.00	1.50E+01	#DIV/0!	#DIV/0!



PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH 07
RES. ENG. R Rudd
DATE 3/08/2011

SHEET 3 OF 5
Project No. 42626683
Cost Code



TEST INTERVAL (m) 15.2 to 18.2
HEAD LOSS IN SYSTEM (H_s) (m)
Total length of rods and packer = _____ m
ID of packer rods = _____ mm
Packer type _____

Use packer calibration spreadsheet to estimate.

Permeability
 $k = [(Q)/(2\pi L H_i)] \times \ln(L/R)$ ($L > 10R$)
 $k = [(Q)/(2\pi L H_i)] \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_i = H_p + H_m + H_w - H_c$ where,
Q - Flow Rate
L - Test Interval
R - Radius of Borehole
System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level

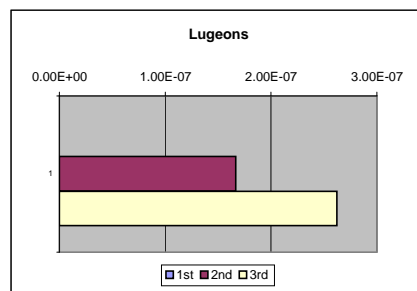
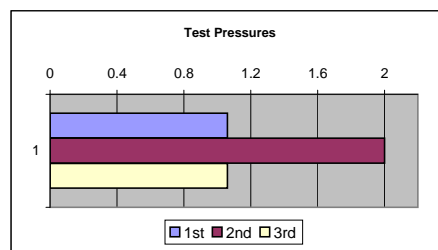
Conversion
1 psi = 2.31 ft. of water
1 liter = 0.001 m³

Lugeon Value = water taken in test (litres) x 10 (bars)
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
1.06	0	6	1	0.00E+00
2	6E-07	6	2	1.67E-07
1.06	5E-07	6	3	2.62E-07

Interpretation
Reportable Lugeon Value Wash Out
2.62E-07

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAGE FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _i (m)	k (m/min)	k (m/sec)
106	0	115.2275	0	0.0E+00	0.00E+00	10.83	2.88E+01	#####	0.00E+00
	1	115.2275	0						
	2	115.2275	0						
	3	115.2275	0						
	4	115.2275	0						
	5	115.2275	0						
	6	115.2275	0						
200	0	115.229	0.0001	1.0E-04	1.00E-04	20.43	3.84E+01	6.03E-07	1.01E-08
	1	115.2291	0.0001						
	2	115.2292	0.0001						
	3	115.2293	0.0001						
	4	115.2294	0.0001						
	5	115.2295	0.0001						
	6	115.2296	0.0001						
106	0	115.2285	0.0001	7.1E-05	7.14E-05	10.83	2.88E+01	5.74E-07	9.57E-09
	1	115.2286	0.0002						
	2	115.2288	0.0001						
	3	115.2289	0.0001						
	4	115.2289	0						
	5	115.229	0.0001						
	6	115.229	0						
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	2								
	3								
	4								
	5								
	6								
	0			#DIV/0!	#DIV/0!	0.00	2.85E+01	#DIV/0!	#DIV/0!
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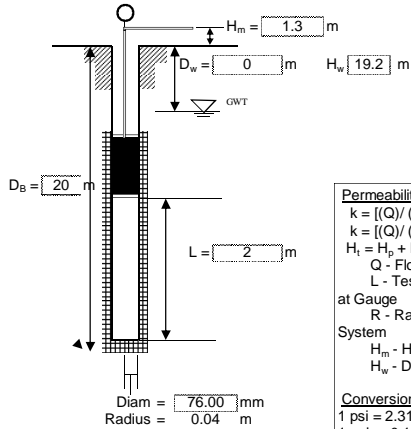
URS

PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH 07
RES. ENG. R Rudd
DATE 3/08/2011

SHEET 4 OF 5
Project No. 42626683
Cost Code



TEST INTERVAL (m) 18.2 TO 20.2
HEAD LOSS IN SYSTEM (H_s) (m) Use packer calibration spreadsheet to estimate.
Total length of rods and packer = m
ID of packer rods = mm
Packer type

Permeability
 $k = [(Q) / (2\pi L H_s)] \times \ln(L/R)$ ($L > 10R$)
 $k = [(Q) / (2\pi L H_s)] \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_t = H_p + H_m + H_w - H_c$ where,
Q - Flow Rate
L - Test Interval
at Gauge
R - Radius of Borehole
System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level
 H_t - Total Head
 H_p - Pressure Head
 H_c - Head Loss in System

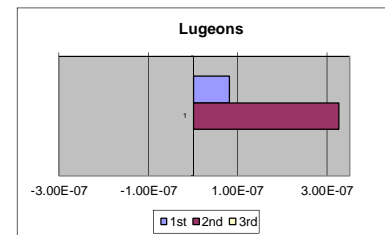
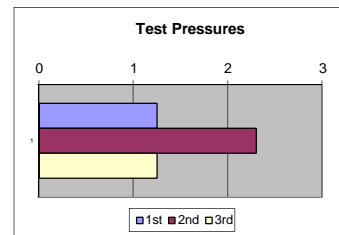
Conversion
1 psi = 2.31 ft. of water
1 gal. = 0.1337 ft³
1 liter = 0.001 m³
1 kPa = 0.10217 m

LugeonValue = water taken in test (litres' x 10 (bars)
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
1.25	1E-07	5	1	8.0E-08
2.3	9E-07	6	2	3.3E-07
1.25	0	4	3	0.0E+00

Interpretation
Reportable Lugeon Value 8.0E-08

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAGE FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
125	0	115.25	0.0001						
	1	115.25	0						
	2	115.25	0						
	3	115.25	0						
	4	115.25	0						
	5	115.25	0						
				2.0E-05	2.00E-05	12.77	3.33E+01	#####	3.16E-09
230	0	115.252	0.0002						
	1	115.252	0.0002						
	2	115.252	0.0001						
	3	115.252	1E-04						
	4	115.252	0.0002						
	5	115.253	0.0001						
	6	115.253	0.0001	1.5E-04	1.50E-04	23.50	4.40E+01	#####	1.79E-08
125	0	115.251	0						
	1	115.251	0						
	2	115.251	0						
	3	115.251	0						
	4	115.251	0						
				0.0E+00	#####	12.77	3.33E+01	#####	0.00E+00
				#DIV/0!	#DIV/0!	0.00	2.05E+01	#DIV/0!	#DIV/0!

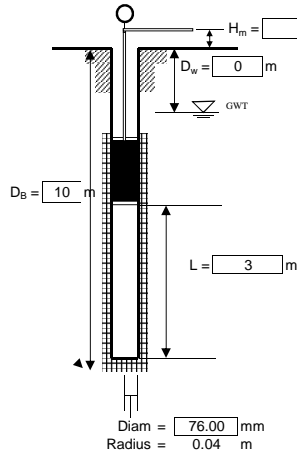


URS PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH08
RES. ENG. R Rudd
DATE 27/07/2011

SHEET 1 OF
Project No. 42626683
Cost Code



TEST INTERVAL (m) 4 to 7
HEAD LOSS (H_c) (m) Use packer calibration spreadsheet to estimate.

Total length of rods and packer = m
ID of packer rods = mm
Packer type

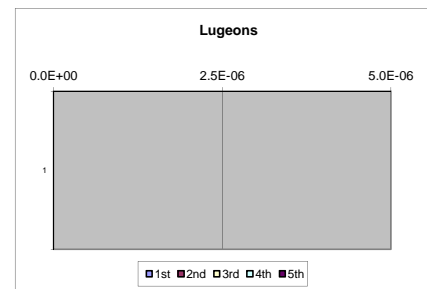
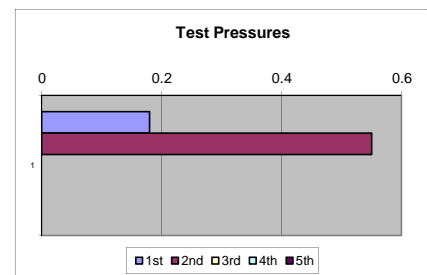
Permeability
 $k = [(Q)/(2\pi LH_f)] \times \ln(L/R)$ (L>10R)
 $k = [(Q)/(2\pi LH_f)] \times \sinh^{-1}(L/2R)$ (10R>L>R)
 $H_t = H_p + H_m + H_w - H_c$ where,
 Q - Flow Rate
 L - Test Interval
 at Gauge
 R - Radius of Borehole
 System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level
 H_c - Head Loss in
 Conversion
 1 psi = 2.31 ft. of water
 1 gal. = 0.1337 ft³ water
 1 liter = 0.001 m³
 1 kPa = 0.10217 m

LugeonValue = water taken in test (litre x 10 (bars))
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.18	0	6	1	0.0E+00
0.55	0	6	2	0.0E+00
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation Not Applicable
Reportable Lugeon Value 0.0E+00

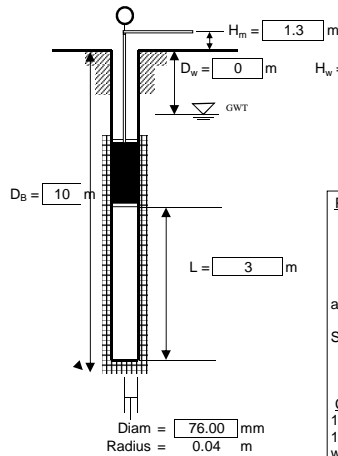
GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAG E FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
18	0	115.31	0	0.0E+00	0.00E+00	1.84	7.34E+00	#####	0.00E+00
	1	115.31	0						
	2	115.31	0						
	3	115.31	0						
	4	115.31	0						
	5	115.31	0						
55	0	115.301	0	0.0E+00	0.00E+00	5.62	1.11E+01	#####	0.00E+00
	1	115.301	0.0000						
	2	115.301	0						
	3	115.301	0						
	4	115.301	0						
	5	115.3	0						
	0	115.3	0						
	1								
	2								
	3								
	4								
	5								
	0								
	1								
	2								
	3								
	4								
	5								
	0								
	1								
	2								
	3								
	4								
	5								



PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH11
RES. ENG. R Rudd
DATE 30/07/2011

SHEET 1 OF
Project No. 42626683
Cost Code



TEST INTERVAL (m) 4 to 7
HEAD LOSS (H_c) (m) _____ Use packer calibration spreadsheet to estimate.

Total length of rods and packer = _____ m
ID of packer rods = _____ mm
Packer type _____

Permeability

$k = \{[(Q)/(2\pi L H_1)] \times \ln(L/R)$	$(L > 10R)$
$k = \{[(Q)/(2\pi L H_1)] \times \sinh^{-1}(L/2R)$	$(10R > L > R)$
$H_1 = H_a + H_p + H_w - H_c$ where,	
Q - Flow Rate	H_1 - Total Head
L - Test Interval	H_p - Pressure Head
at Gauge	
R - Radius of Borehole	H_c - Head Loss in
System	
H_m - Height of Gauge Above Ground Level	
H_w - Depth to Water Level from Ground Level	

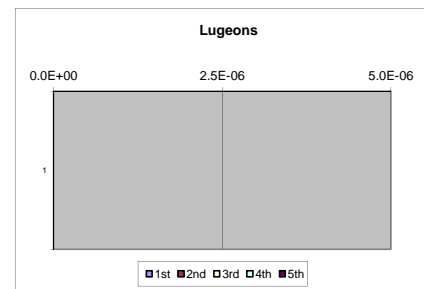
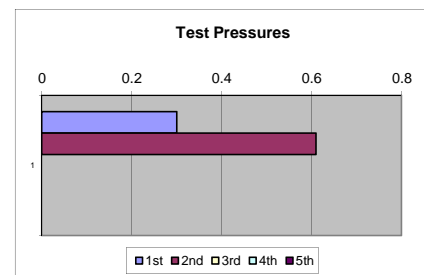
Conversion

Conversion:
 1 psi = 2.31 ft. of water
 1 gal. = 0.1337 ft³
 water
 1 liter = 0.001 m³
 1 kPa = 0.10217 m

$$\text{LugeonValue} = \frac{\text{water taken in test (litre x 10 (bars))}}{\text{length test section (m)} * \text{minutes} * \text{test pressure (bars)}}$$

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.3	0	5	1	0.0E+00
0.61	0	6	2	0.0E+00
0	0	0	3	
0	0	0	4	
0	0	0	5	

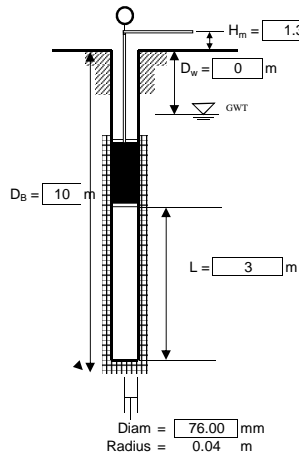
Interpretation	Not Applicable
Reportable Lugeon Value	0.0E+00

[illegible]

PROJECT: Alpha TSF
 LOCATION: 70 km north of Alpha

BORING NO. BH11
 RES. ENG. R Rudd
 DATE 30/07/2011

SHEET 1 OF
 Project No. 42626683
 Cost Code



TEST INTERVAL (m) 7 to 10
 HEAD LOSS (H_c) (m) Use packer calibration spreadsheet to estimate.

Total length of rods and packer = m
 ID of packer rods = mm
 Packer type

Permeability
 $k = [(Q)/(2\pi LH_f)] \times \ln(L/R)$ ($L > 10R$)
 $k = [(Q)/(2\pi LH_f)] \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_t = H_p + H_m + H_w - H_c$ where,
 Q - Flow Rate H_t - Total Head
 L - Test Interval H_p - Pressure Head
 at Gauge
 R - Radius of Borehole H_c - Head Loss in
 System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level

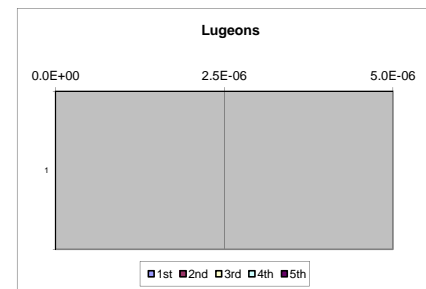
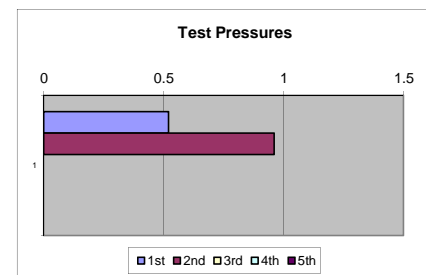
Conversion
 1 psi = 2.31 ft. of water 1 liter = 0.001 m³
 1 gal. = 0.1337 ft³ 1 kPa = 0.10217 m
 water

LugeonValue = water taken in test (litre x 10 (bars))
 length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.52	0	7	1	0.0E+00
0.96	0	7	2	0.0E+00
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation
 Reportable Lugeon Value: Not Applicable 0.0E+00

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAG E FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
52	0	115.203	0	0.0E+00	0.00E+00	5.31	1.51E+01	#####	0.00E+00
	1	115.203	0						
	2	115.203	0						
	3	115.203	0						
	4	115.203	0						
	5	115.203	0						
	6	115.203	0						
	7	115.203	0						
96	0	115.204	0	0.0E+00	0.00E+00	9.81	1.96E+01	#####	0.00E+00
	1	115.204	0						
	2	115.204	0						
	3	115.204	0						
	4	115.204	0						
	5	115.204	0						
	6	115.204	0						
	7	115.204	0						



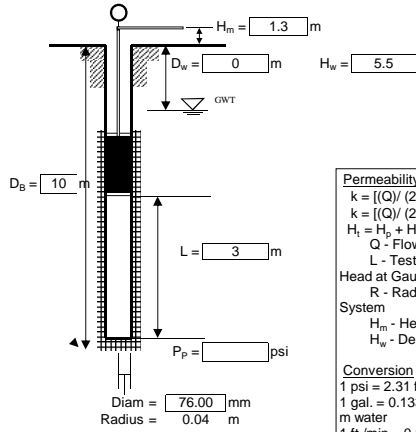
URS

PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH12
RES. ENG. R Rudd
DATE 28/07/2011

SHEET 5 OF 5
Project No. 42626683
Cost Code



TEST INTERVAL (m) 4 to 7
HEAD LOSS IN SYSTEM (H_s) (m) Use packer calibration spreadsheet to estimate.
Total length of rods and packer = m
ID of packer rods = mm
Packer type

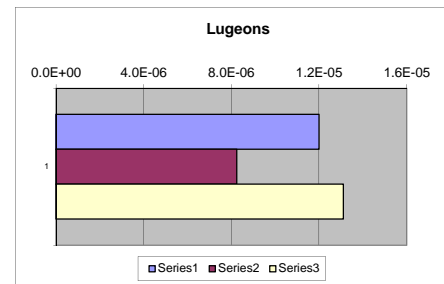
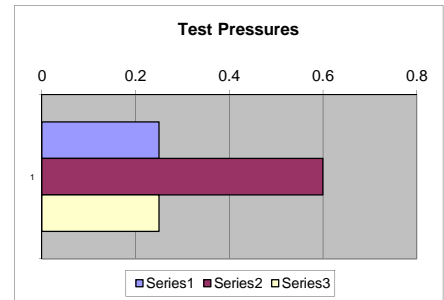
Permeability
 $k = \frac{[Q]}{(2\pi L H_s)} \times \ln(L/R)$ ($L > 10R$)
 $k = \frac{[Q]}{(2\pi L H_s)} \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_s = H_p + H_m + H_w - H_c$ where,
Q - Flow Rate
L - Test Interval
Head at Gauge
R - Radius of Borehole
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level
 H_t - Total Head
 H_p - Pressure
 H_c - Head Loss in System
Conversion
1 psi = 2.31 ft. of water
1 gal. = 0.1337 ft³
m water
1 ft./min = 0.508 cm/sec
1 liter = 0.001 m³
1 kPa = 0.10217

LugeonValue = water taken in test (litx 10 (bars))
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.25	6.3E-06	7	1	1.2E-05
0.6	1.04E-05	7	2	8.3E-06
0.25	5.9E-06	6	3	1.3E-05
0	0	0	4	
0	0	0	5	

Interpretation Turbulent
Reportable Lugeon Value 8.3E-06

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAGE FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
25	0	115.165	0.0005	9.0E-04	9.00E-04	2.55	9.35E+00	2.23E-05	3.72E-07
	1	115.165	0.0008						
	2	115.166	0.001						
	3	115.167	0.001						
	4	115.168	0.001						
	5	115.169	0.001						
	6	115.17	0.001						
60	0	115.173	0.0016	1.7E-03	1.73E-03	6.13	1.29E+01	3.11E-05	5.18E-07
	1	115.175	0.0019						
	2	115.177	0.0015						
	3	115.178	0.0018						
	4	115.18	0.0017						
	5	115.182	0.0019						
	6	115.184							
25	0	115.185	0.0008	9.8E-04	9.83E-04	2.55	9.35E+00	2.44E-05	4.06E-07
	1	115.185	0.0011						
	2	115.187	0.001						
	3	115.188	0.001						
	4	115.189	0.001						
	5	115.19	0.001						
	6	115.191	0.001						
				#DIV/0!	#DIV/0!	0.00	6.80E+00	#DIV/0!	#DIV/0!
				#DIV/0!	#DIV/0!	0.00	2.85E+01	#DIV/0!	#DIV/0!

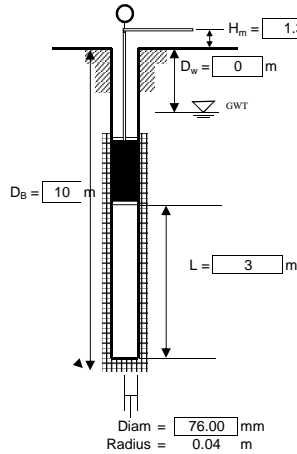


URS PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: Alpha TSF
LOCATION: 70 km north of Alpha

BORING NO. BH12
RES. ENG. R Rudd
DATE 29/07/2011

SHEET 1 OF
Project No. 42626683
Cost Code



TEST INTERVAL (m) 7 to 10
HEAD LOSS (H_c) (m) Use packer calibration spreadsheet to estimate.

Total length of rods and packer = m
ID of packer rods = mm
Packer type

Permeability
 $k = [(Q)/(2\pi LH_f)] \times \ln(L/R)$ ($L > 10R$)
 $k = [(Q)/(2\pi LH_f)] \times \sinh^{-1}(L/2R)$ ($10R > L > R$)
 $H_t = H_p + H_m + H_w - H_c$ where,
Q - Flow Rate
L - Test Interval
at Gauge
R - Radius of Borehole
System
 H_m - Height of Gauge Above Ground Level
 H_w - Depth to Water Level from Ground Level
 H_t - Total Head
 H_p - Pressure Head
 H_c - Head Loss in

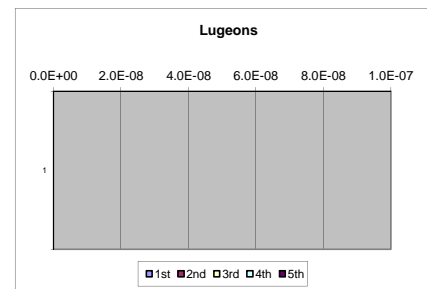
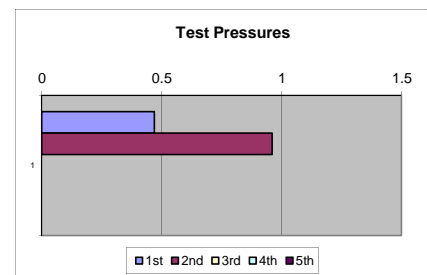
Conversion
1 psi = 2.31 ft. of water
1 gal. = 0.1337 ft³ water
1 liter = 0.001 m³
1 kPa = 0.10217 m

LugeonValue = water taken in test (litre x 10 (bars))
length test section (m) * minutes * test pressure (bars)

Test Pressure (bars)	Water Taken in (l)	Duration (min)	No. Test Run	Lugeon
0.47	0	6	1	0.0E+00
0.96	0	6	2	0.0E+00
0	0	0	3	
0	0	0	4	
0	0	0	5	

Interpretation Not Applicable
Reportable Lugeon Value 0.0E+00

GAUGE PRESSURE (kPa)	ELAPSED TIME (min)	FLOW READING (m ³)	FLOW (m ³ /min)	AVERAG E FLOW (m ³ /min)	Q (m ³ /min)	H _p (m)	H _t (m)	k (m/min)	k (m/sec)
47	0	115.1	0	0.0E+00	0.00E+00	4.80	1.46E+01	#####	0.00E+00
	1	115.1	0						
	2	115.1	0						
	3	115.1	0						
	4	115.1	0						
	5	115.1	0						
96	0	115.103	0	0.0E+00	0.00E+00	9.81	1.96E+01	#####	0.00E+00
	1	115.103	0						
	2	115.103	0						
	3	115.103	0						
	4	115.103	0						
	5	115.103	0						
	0								
	1								
	2								
	3								
	4								
	5								
	0								
	1								
	2								
	3								
	4								
	5								
	0								
	1								
	2								
	3								
	4								
	5								



Appendix F Laboratory Test Results



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11080521-AL
Project	Alpha TSF Geotech	Test Date	24/08-31/08/2011
		Report Date	02/09/2011

Sample No.	11080521	11080523	11080524	11080525	11080526	11080532
Client ID	TP01-03	TP03-02	TP04-01	TP05-01	TP05-02	TP12-02
Depth (m)	3.00	1.00	0.30	0.60	1.70	1.20
Liquid Limit (%)	31	43	21	15	29	23
Plastic Limit (%)	18	16	11	12	13	12
Plasticity Index (%)	13	27	10	3	16	11
Linear Shrinkage (%)	5.0*	9.5+	3.0*	0.5	6.0*	6.0+
Field Moisture Content (%)	9.3	11.4	8.8	7.8	12.2	11.0

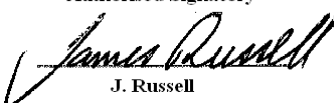
Sample No.	11080537	11080539	11080540	11080541	11080542	11080543
Client ID	TP19-02	TP23-02	TP24-01	TP24-02	TP26-02	TP28/2-02
Depth (m)	0.90	1.30	0.70	2.50	0.90	2.00
Liquid Limit (%)	27	39	24	29	31	35
Plastic Limit (%)	18	12	13	14	11	13
Plasticity Index (%)	9	27	11	15	20	22
Linear Shrinkage (%)	2.5*	7.5+	3.5*	7.0	5.5+	7.5+
Field Moisture Content (%)	7.2	11.3	5.0	11.7	10.0	12.3

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Crumbling occurred + Curling occurred Page 1 of 1 REP00101

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Authorised Signatory


J. Russell



Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated. Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.

Trilab Pty Ltd ABN 25 065 630 506



PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11080521-G
Project	Alpha TSF Geotech	Test Date	18/08-02/09/2011
		Report Date	02/09/2011

Sample No.	11080521	11080522	11080527	11080528	11080529	11080530	11080531
Client ID	TP01-03	TP01-04	TP05-03	TP08-02	TP09-02	TP10-01	TP10-03
Depth (m)	3.00	3.40	2.80	0.90	0.70	0.60	2.00
Moisture (%)	9.3	9.8	10.1	11.5	10.3	4.2	11.7
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							100
37.5			100	100			88
26.5	100		88	98			79
19	98	100	74	92			61
9.5	96	98	57	70			38
4.75	94	97	47	47			25
2.36	91	95	43	29	100	100	21
1.18	70	94	37	27	99	98	18
0.600	57	91	33	23	96	95	16
0.425	51	85	31	20	94	91	15
0.300	44	78	29	17	90	82	14
0.150	32	63	23	12	74	50	12
0.075	23	38	19	9	61	35	10

NOTES/REMARKS: -

Sample/s supplied by the client

Page 1 of 1 REP01101

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Authorised Signatory

James Russell
J. Russell



Laboratory No. 9926

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



EMERSON CLASS NUMBER TEST REPORT

Test Method: AS 1289 3.8.1

Client	URS Australia Pty Ltd	Report No.	11080523-EM
Project	Alpha TSF Geotech	Test Date	18/08-24/08/2011
		Report Date	02/09/2011

Sample No.	11080523	11080524	11080526	11080532	11080536	11080541	11080545
Client ID	TP03-02	TP04-01	TP05-02	TP12-02	TP15-01	TP24-02	TP29-01
Depth (m)	1.00	0.30	1.70	1.20	0.60	2.50	0.40
Description	Sandy Clay - Orange/Brown	Sandy Silt - Brown	Sandy Clay - Red/Brown/Grey	Sandy Clay - Pale Brown	Silty Sand - Brown	Sandy Clay - Orange/Brown	Silty Sand - Red/Brown
Emerson Class Number	2	5	5	1	5	5	5

Sample No.	11080547	-	-	-	-	-	-
Client ID	TP33-02	-	-	-	-	-	-
Depth (m)	1.30	-	-	-	-	-	-
Description	Silty Sandy Gravel - Brown	-	-	-	-	-	-
Emerson Class Number	2	-	-	-	-	-	-

Sample No.	-	-	-	-	-	-	-
Client ID	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-	-
Description	-	-	-	-	-	-	-
Emerson Class Number	-	-	-	-	-	-	-

NOTES/REMARKS: -

Sample/s supplied by the client

Tested with Distilled water at 19°C

Page 1 of 1 REP00401

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Authorised Signatory

James Russell
J. Russell



Laboratory No. 9926

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080523-G

Project Alpha TSF Geotech

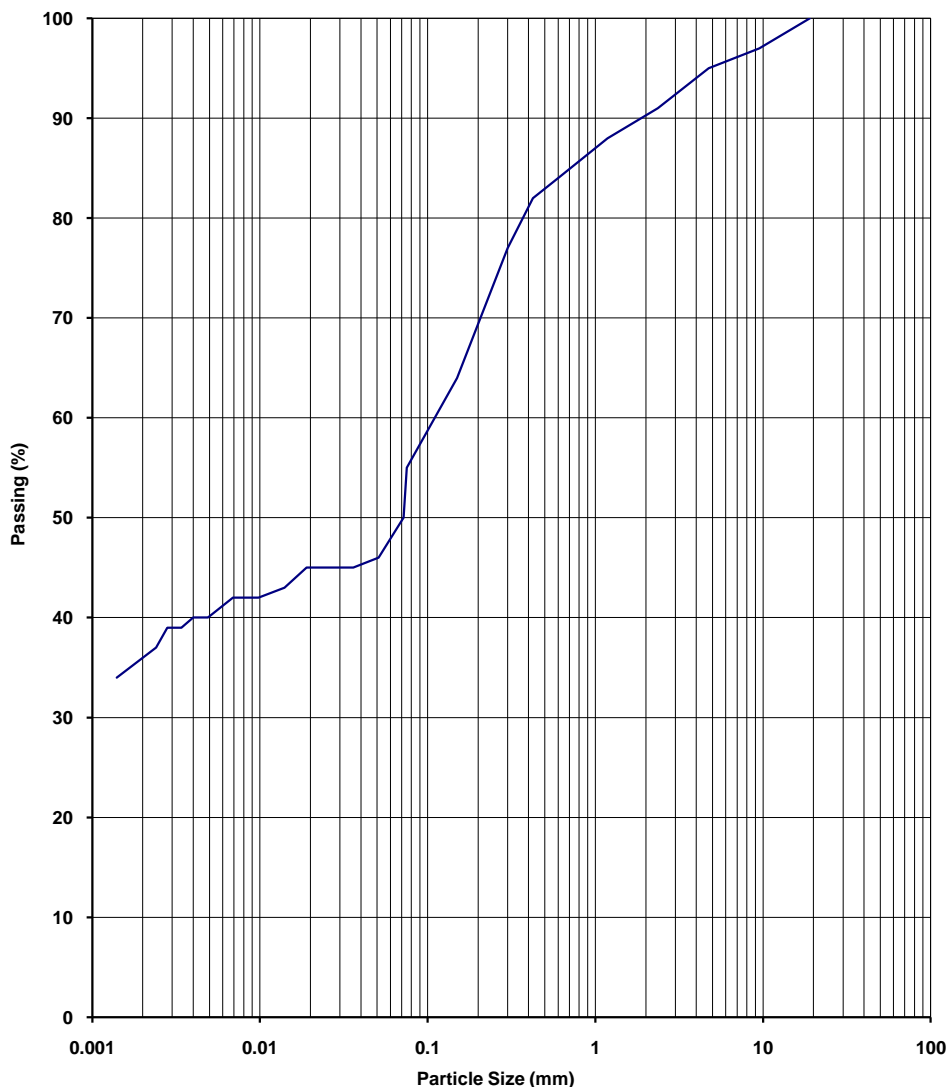
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP03-02

Depth (m) 1.00

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	100
9.5	97
4.75	95
2.36	91
1.18	88
0.600	84
0.425	82
0.300	77
0.150	64
0.075	55
0.072	50
0.051	46
0.036	45
0.026	45
0.019	45
0.014	43
0.0098	42
0.0069	42
0.0049	40
0.004	40
0.0034	39
0.0028	39
0.0024	37
0.0014	34



NOTES/REMARKS:

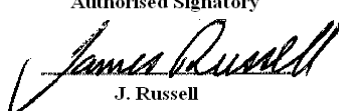
Moisture Content 11.4%

-2.36mm Soil Particle Density(t/m³) 2.63

Sample/s supplied by the client

Page 1 of 1 REP03901

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Authorised Signatory

J. Russell



Laboratory No. 9926

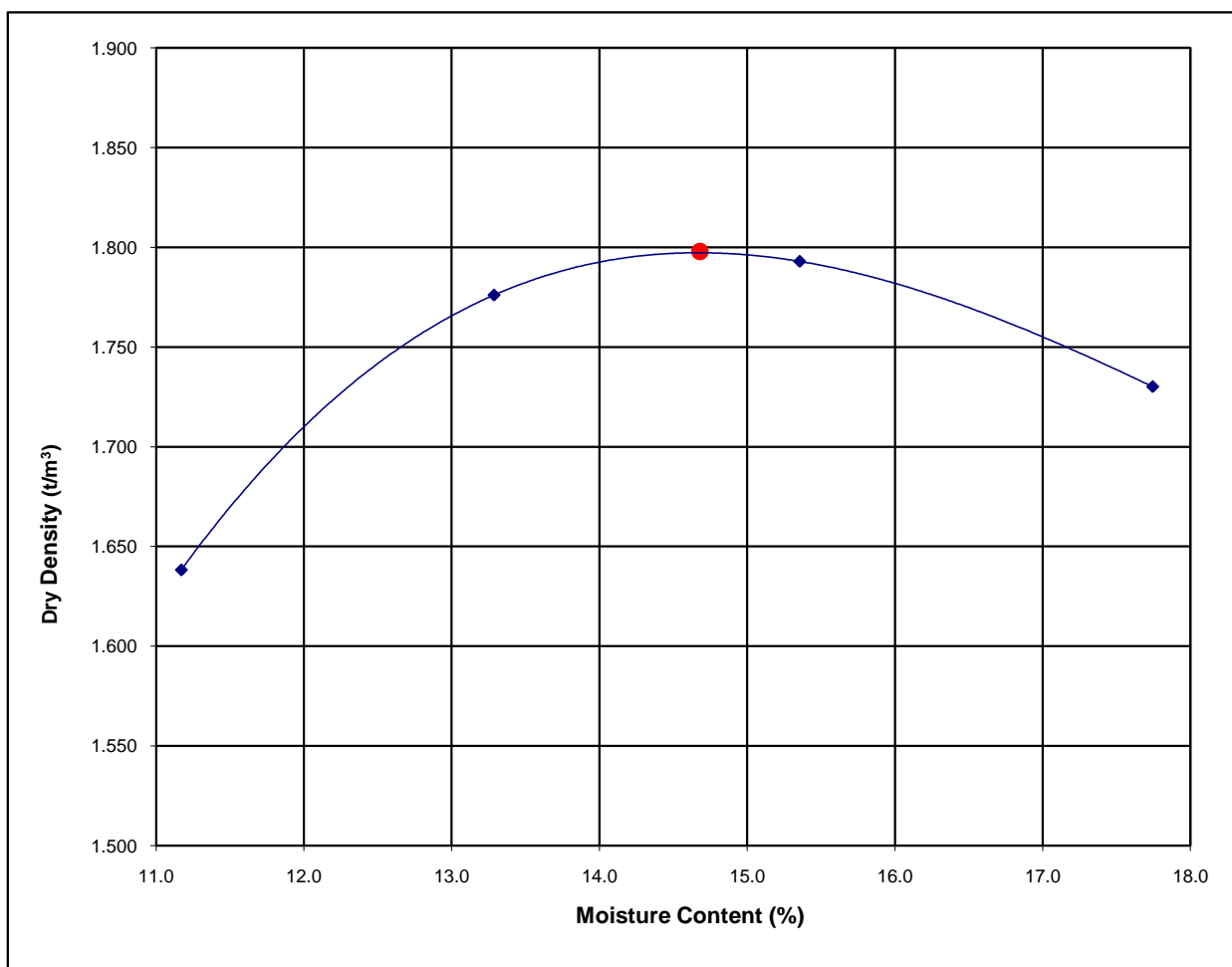
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Trilab Pty Ltd ABN 25 065 630 506

MOISTURE/DENSITY RELATIONSHIP TEST REPORT

Test Method: AS 1289 5.1.1

Client	URS Australia Pty Ltd	Report No.	11080523-MDD
Project	Alpha TSF Geotech	Test Date	20/08/2011
		Report Date	2/09/2011
Client ID	TP03-02	Depth (m)	1.00
Description	Sandy Clay - Brown		



Maximum Dry Density (t/m³)	1.80	Optimum Moisture Content (%)	14.5
Moisture Content (%)	11.4	Percentage of Oversize/Sieve Size (mm)	0/19

NOTES/REMARKS: This is a computer generated plot so estimates may show some minor variations from the results summarised.

Sample/s supplied by the client

Page 1 of 1 REP01301

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Authorised Signatory

James Russell
J. Russell



Laboratory No. 9926

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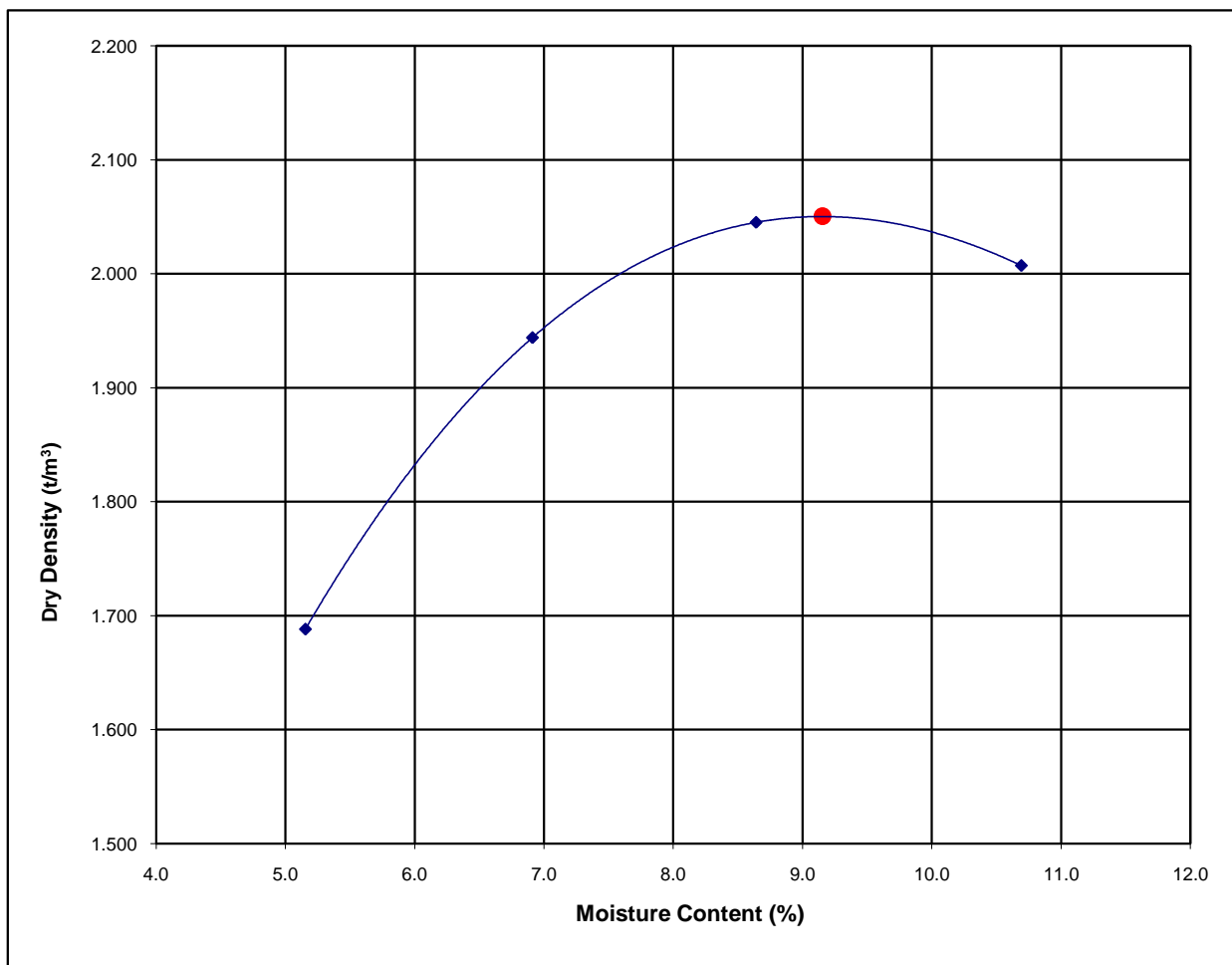
Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

MOISTURE/DENSITY RELATIONSHIP TEST REPORT

Test Method: AS 1289 5.1.1

Client	URS Australia Pty Ltd	Report No.	11080524-MDD
Project	Alpha TSF Geotech	Test Date	20/08/2011
		Report Date	2/09/2011
Client ID	TP04-01	Depth (m)	0.30
Description	Silty Sand - Pale Brown		



Maximum Dry Density (t/m³)	2.05	Optimum Moisture Content (%)	9.0
Moisture Content (%)	8.8	Percentage of Oversize/Sieve Size (mm)	0/19

NOTES/REMARKS: This is a computer generated plot so estimates may show some minor variations from the results summarised.

Sample/s supplied by the client

Page 1 of 1 REP01301

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Authorised Signatory

James Russell
J. Russell



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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



PERMEABILITY BY CONSTANT HEAD TEST REPORT

Test Method AS 1289 6.7.3, 5.1.1 / KH 2 (Based on K H Head (1988) Manual of Laboratory Testing, 10.7)

Client URS Australia Pty Ltd

Report No. 11080524-CHP

Project Alpha TSF Geotech

Test Date 08/09-03/10/2011

Report Date 3/10/2011

Sample No. 11080524

Client ID TP04-01

Depth (m) 0.30

Standard Maximum Dry Density (t/m³) 2.05

Standard Optimum Moisture Content (%) 9.0

Placement Moisture Content (%) 9.0

Placement Wet Density (t/m³) 2.19

Water Used Distilled

Pressure Applied (kPa) 50

Specimen Dimensions

Diameter (mm) 48.0

Length (mm) 56.8

PERMEABILITY

$$K_{20} = 8 \times 10^{-10} \text{ m/s}$$

Notes/Remarks: The above specimen was remoulded to a target of 98% of Standard Dry Density and at Optimum Moisture Content

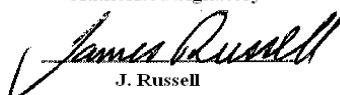
Sample/s supplied by client

Tested as received

Page: 1 of 1 REP01701

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ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080524 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 14/09/2011
Client Id.: TP04-01	Depth (m): 0.30

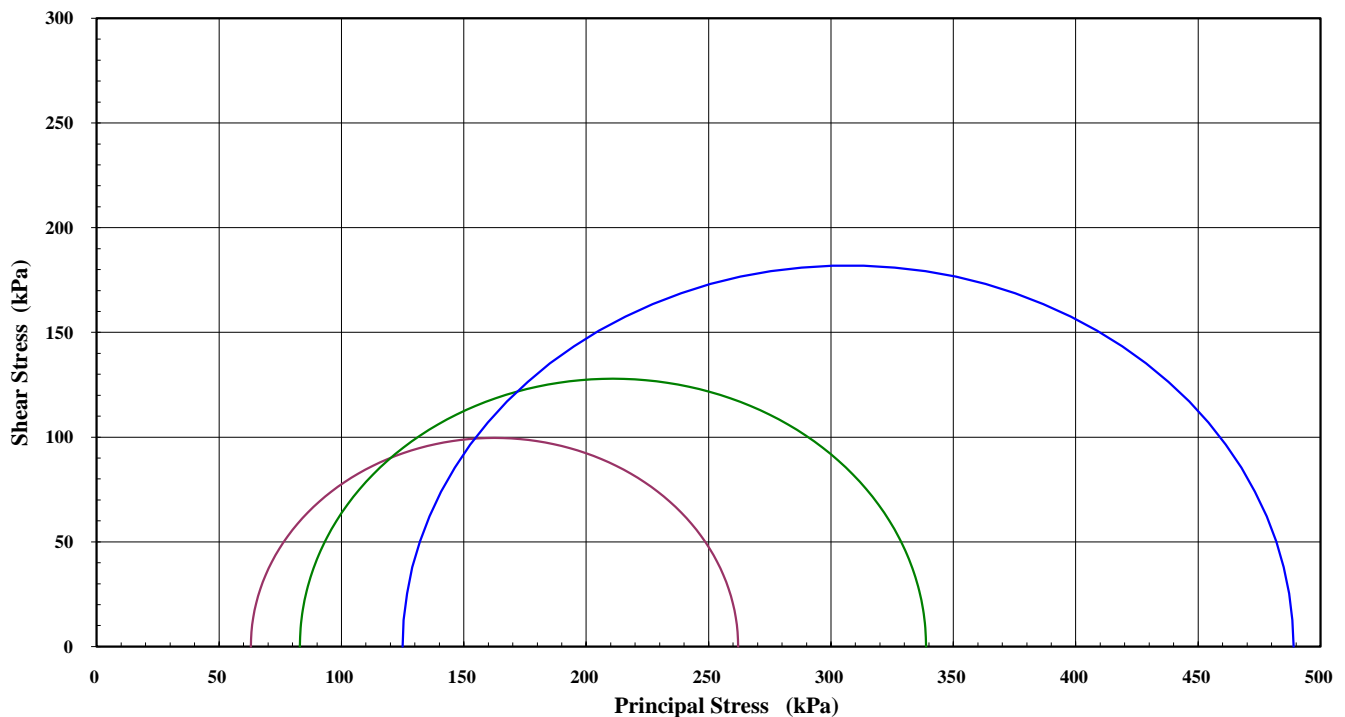
Description: Silty Sand - orange brown

SAMPLE & TEST DETAILS

Initial Height: 95.5 mm	Initial Moisture Content: 8.6 %	Rate of Strain: 0.006 %/min
Initial Diameter: 48.0 mm	Final Moisture Content: 11.1 %	B Response: 97 %
L/D Ratio: 2.0 : 1	Wet Density: 2.18 t/m ³	
	Dry Density: 2.01 t/m ³	

Failure Criteria: Peak Principal Stress Ratio

Mohr Circle Diagram



Interpretation between stages :	1 to 2	2 to 3	1 to 3
Cohesion C' (kPa) :	5.2	11.1	8.8
Angle of Shear Resistance Φ' (Degrees) :	35.9	34.3	34.7

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client Note: Graph not to scale



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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080524 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

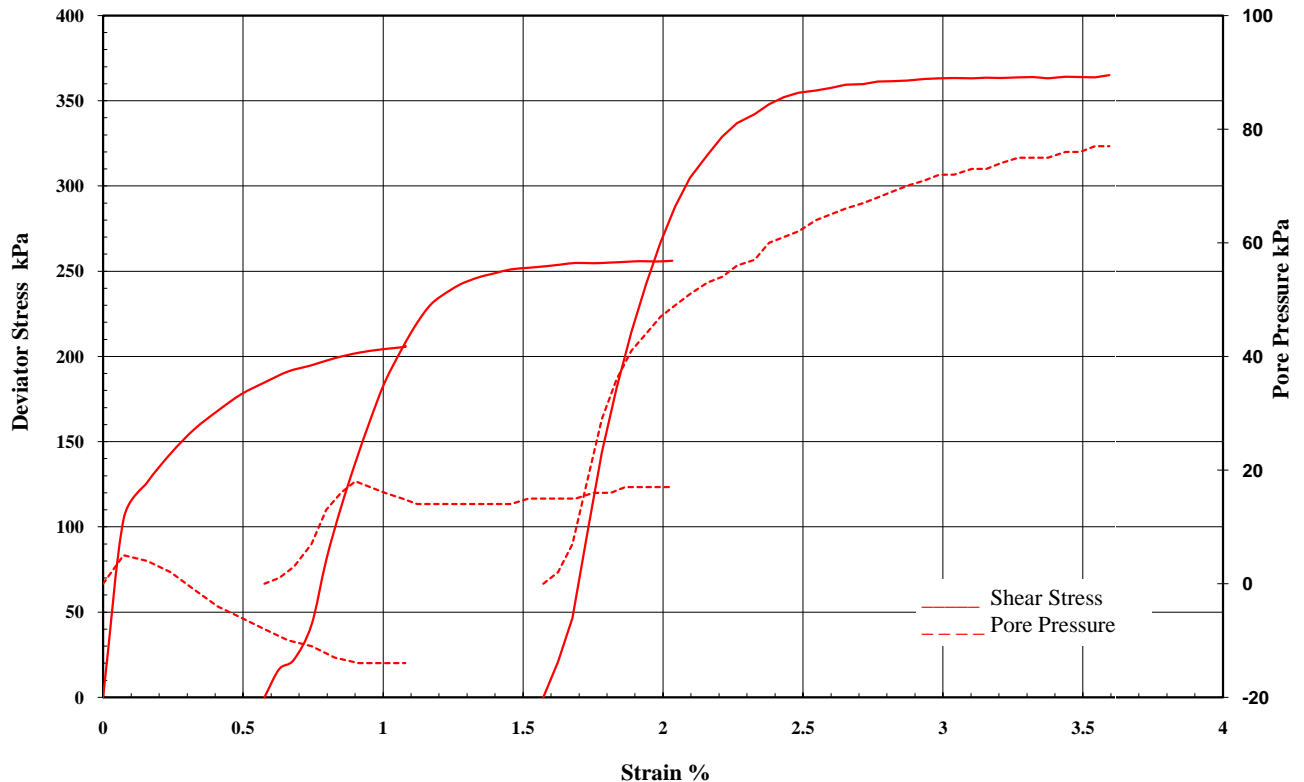
Report Date: 14/09/2011

Client Id.: TP04-01

Depth (m): 0.30

Description: Silty Sand - orange brown

Stress/Strain & Pore Pressure/Strain Diagram



FAILURE DETAILS

Confining Pressure	Back Pressure	Initial Pore	Failure Pore	Principal Effective Stresses			Deviator Stress	Strain
				σ'_1	σ'_3	σ'_1 / σ'_3		
539 kPa	489 kPa	489 kPa	475 kPa	262 kPa	63 kPa	4.160	199 kPa	0.83 %
590 kPa	490 kPa	490 kPa	507 kPa	339 kPa	83 kPa	4.082	256 kPa	1.92 %
690 kPa	490 kPa	490 kPa	567 kPa	489 kPa	125 kPa	3.912	364 kPa	3.32 %

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080524 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

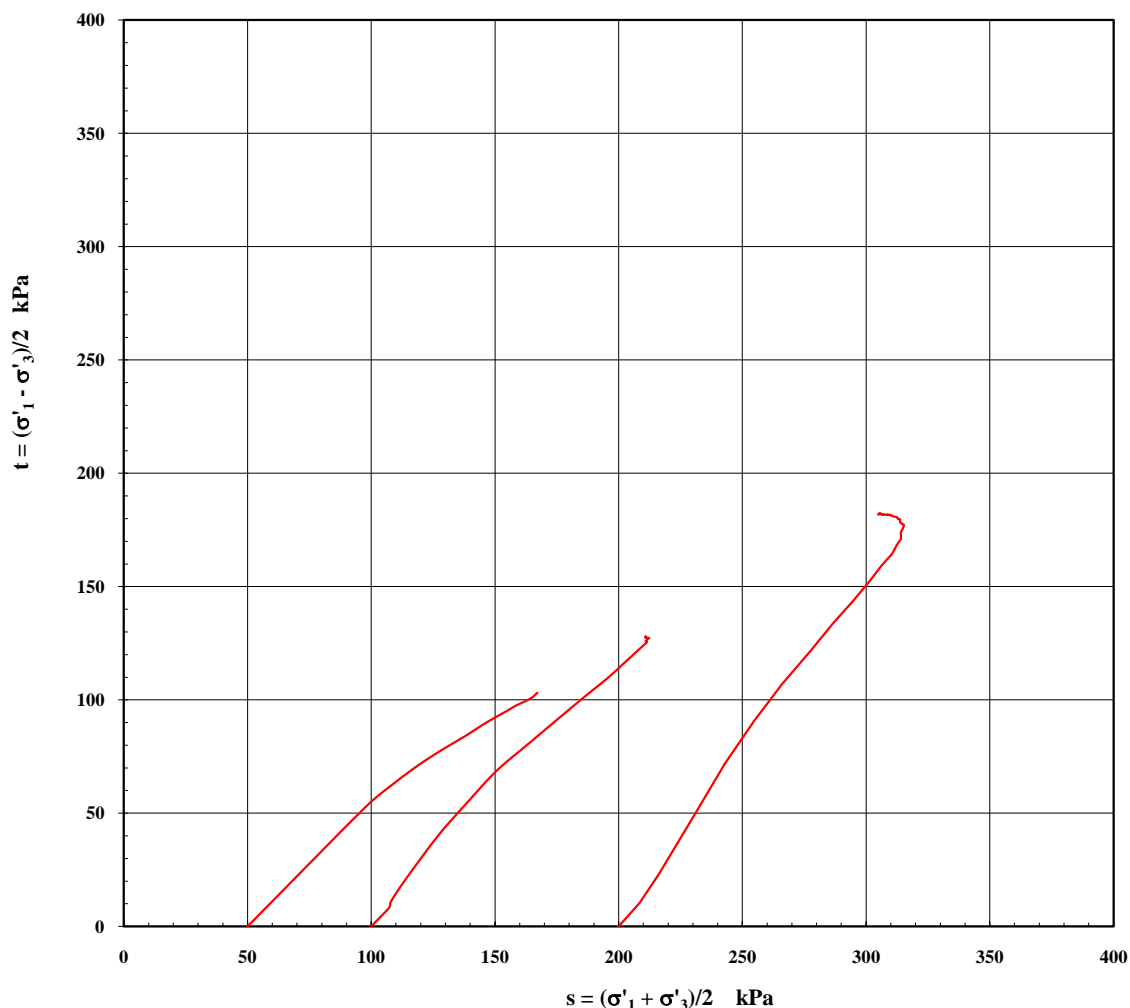
Report Date: 14/09/2011

Client Id.: TP04-01

Depth (m): 0.30

Description: Silty Sand - orange brown

MIT Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080524 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

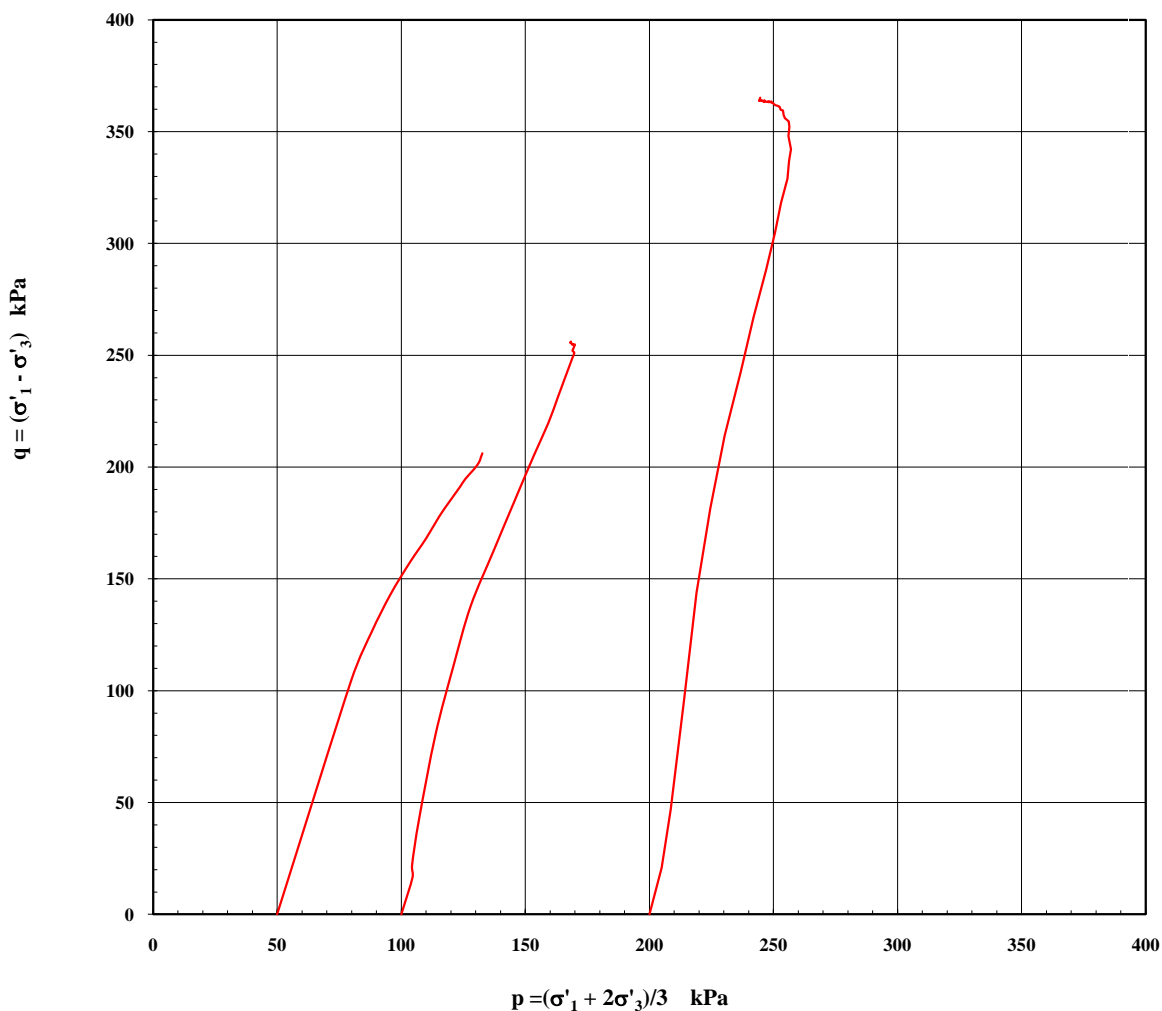
Report Date: 14/09/2011

Client Id.: TP04-01

Depth (m): 0.30

Description: Silty Sand - orange brown

Cambridge Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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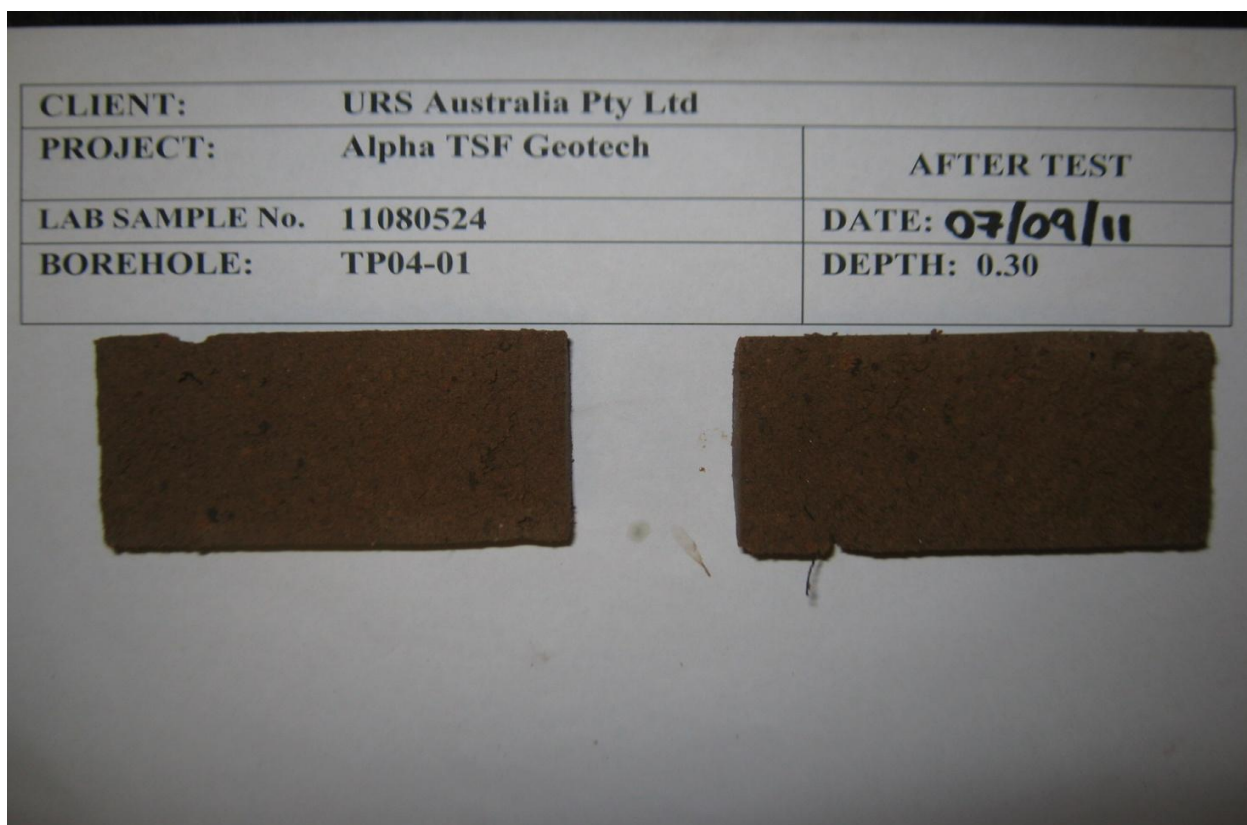
Trilab Pty Ltd
ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080524 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 14/09/2011
Client Id.: TP04-01	Depth (m): 0.30
Description: Silty Sand - orange brown	



Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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ABN 25 065 630 506

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080524-G

Project Alpha TSF Geotech

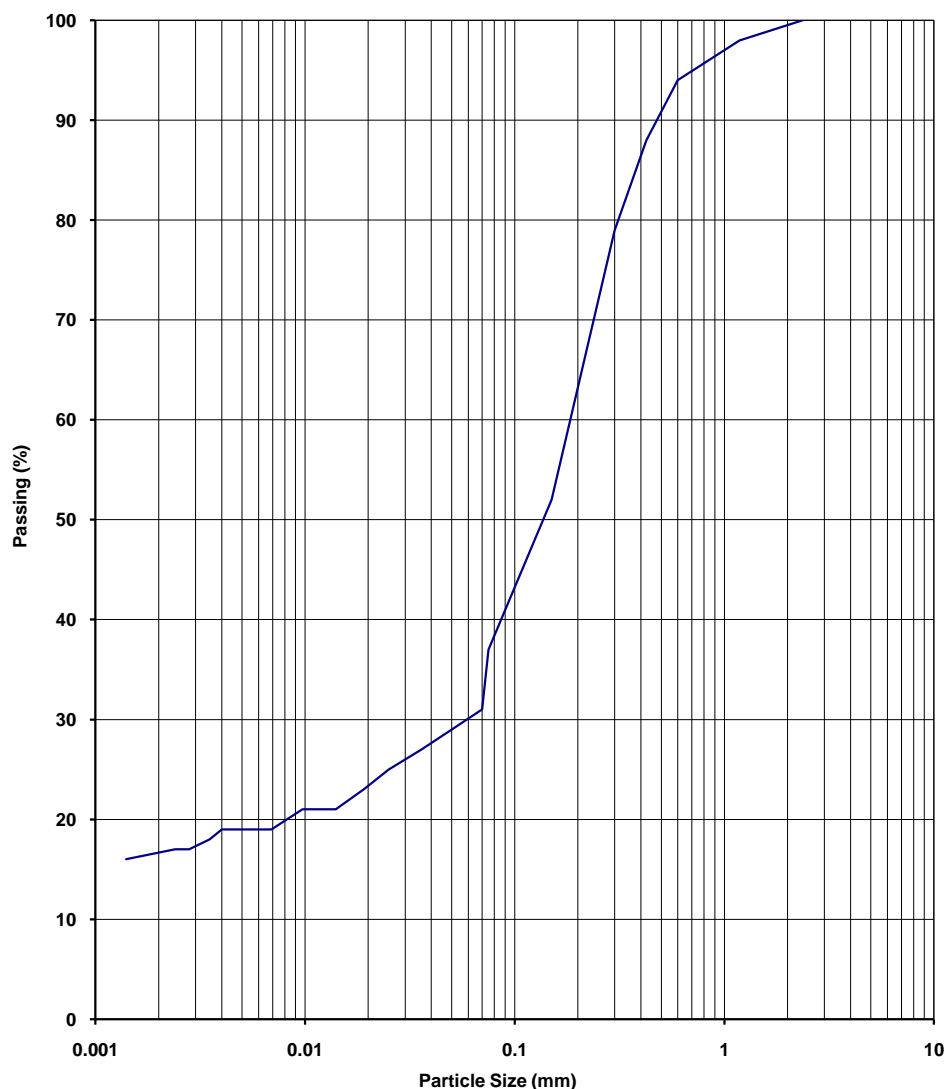
Test Date 19-31/08/2011

Report Date 2/9/2011

Client ID TP04-01

Depth (m) 0.30

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	98
0.600	94
0.425	88
0.300	79
0.150	52
0.075	37
0.07	31
0.05	29
0.036	27
0.025	25
0.019	23
0.014	21
0.0097	21
0.0069	19
0.0049	19
0.004	19
0.0035	18
0.0028	17
0.0024	17
0.0014	16



NOTES/REMARKS:

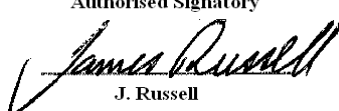
Moisture Content 8.8%

-2.36mm Soil Particle Density(t/m³) 2.65

Sample/s supplied by the client

Page 1 of 1 REP03901

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080525-G

Project Alpha TSF Geotech

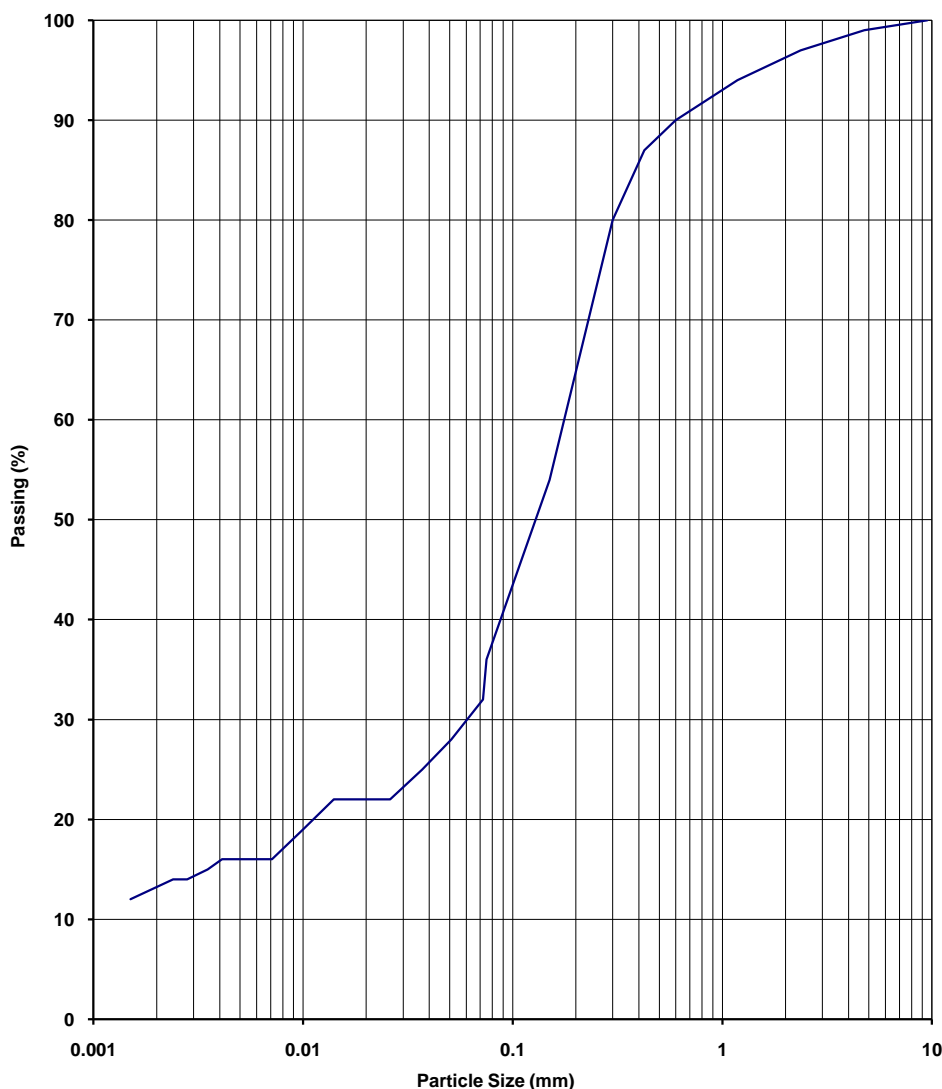
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP05-01

Depth (m) 0.60

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	100
4.75	99
2.36	97
1.18	94
0.600	90
0.425	87
0.300	80
0.150	54
0.075	36
0.072	32
0.051	28
0.037	25
0.026	22
0.019	22
0.014	22
0.01	19
0.0071	16
0.005	16
0.0041	16
0.0035	15
0.0028	14
0.0024	14
0.0015	12



NOTES/REMARKS:

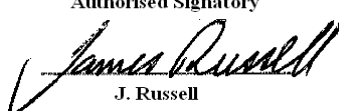
Moisture Content 7.8%

-2.36mm Soil Particle Density(t/m³) 2.66

Sample/s supplied by the client

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PERMEABILITY BY CONSTANT HEAD TEST REPORT

Test Method AS 1289 6.7.3, 5.1.1 / KH 2 (Based on K H Head (1988) Manual of Laboratory Testing, 10.7)

Client URS Australia Pty Ltd

Report No. 11080526-CHP

Project Alpha TSF Geotech

Test Date 18/08-03/10/2011

Report Date 3/10/2011

Sample No. 11080526

Client ID TP05-02

Depth (m) 1.70

Standard Maximum Dry Density (t/m³) 198.00

Standard Optimum Moisture Content (%) 11.0

Placement Moisture Content (%) 1.9

Placement Wet Density (t/m³) 2.07

Water Used Distilled

Pressure Applied (kPa) 50

Specimen Dimensions

Diameter (mm) 48.3

Length (mm) 58.8

PERMEABILITY

$$K_{20} = 4 \times 10^{-10} \text{ m/s}$$

Notes/Remarks: The above specimen was remoulded to a target of 98% of Standard Dry Density and at Optimum Moisture Content

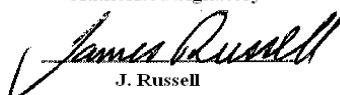
Sample/s supplied by client

Tested as received

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ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080526 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

Report Date: 26/09/2011

Client Id.: TP05-02

Depth (m): 1.7

Description: Sandy Clay - mottled orange grey

SAMPLE & TEST DETAILS

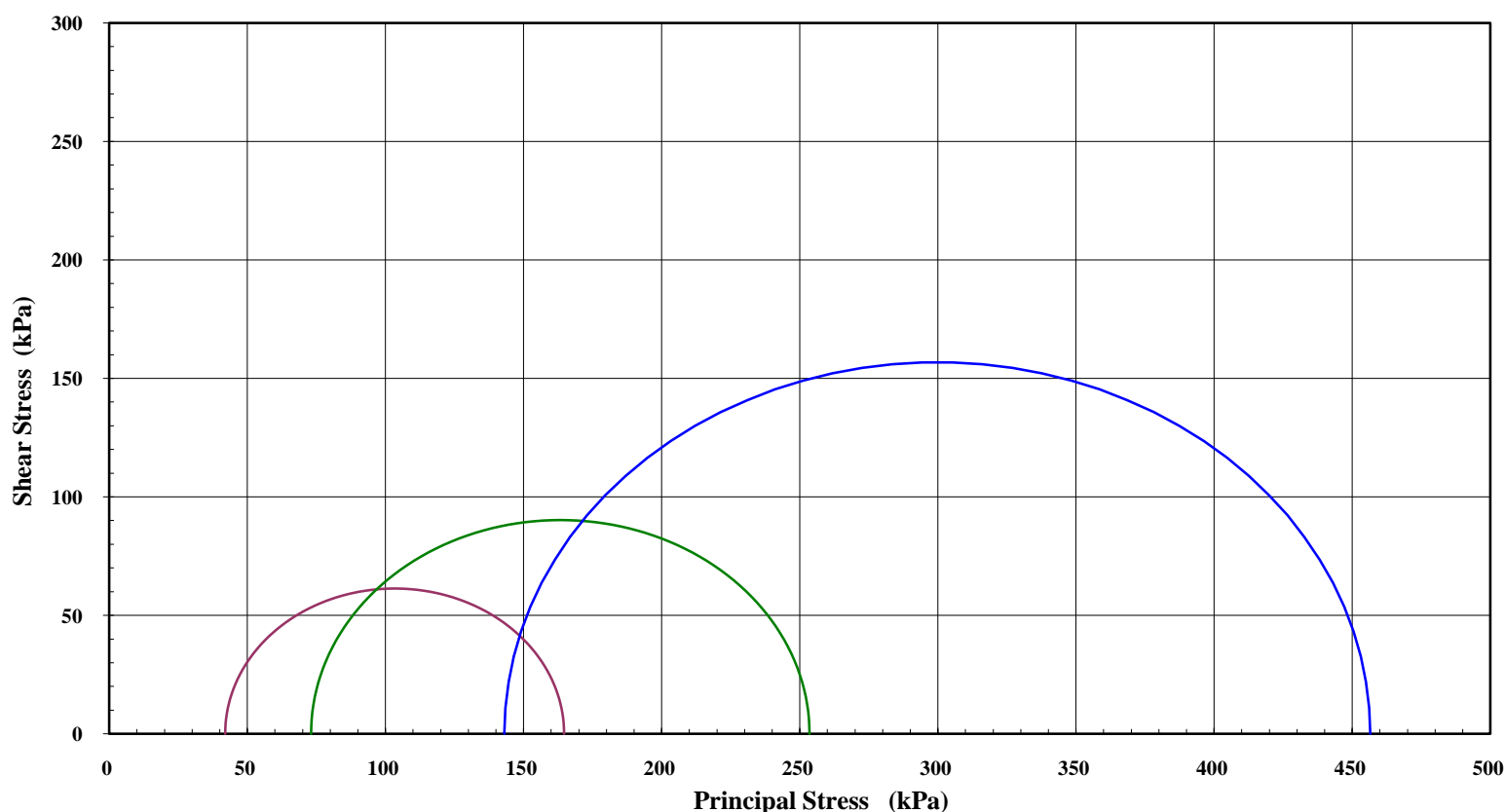
Initial Height: 95.6 mm
Initial Diameter: 48.0 mm
L/D Ratio: 2.0 : 1

Initial Moisture Content: 10.9 %
Final Moisture Content: 12.2 %
Wet Density: 2.15 t/m³
Dry Density: 1.94 t/m³

Rate of Strain: 0.006 %/min
B Response: 97 %

Failure Criteria: Peak Principal Stress Ratio

Mohr Circle Diagram



Interpretation between stages :	1 to 2	2 to 3	1 to 3
Cohesion C' (kPa) :	13.0	12.3	12.6
Angle of Shear Resistance Φ' (Degrees) :	28.9	29.2	29.1

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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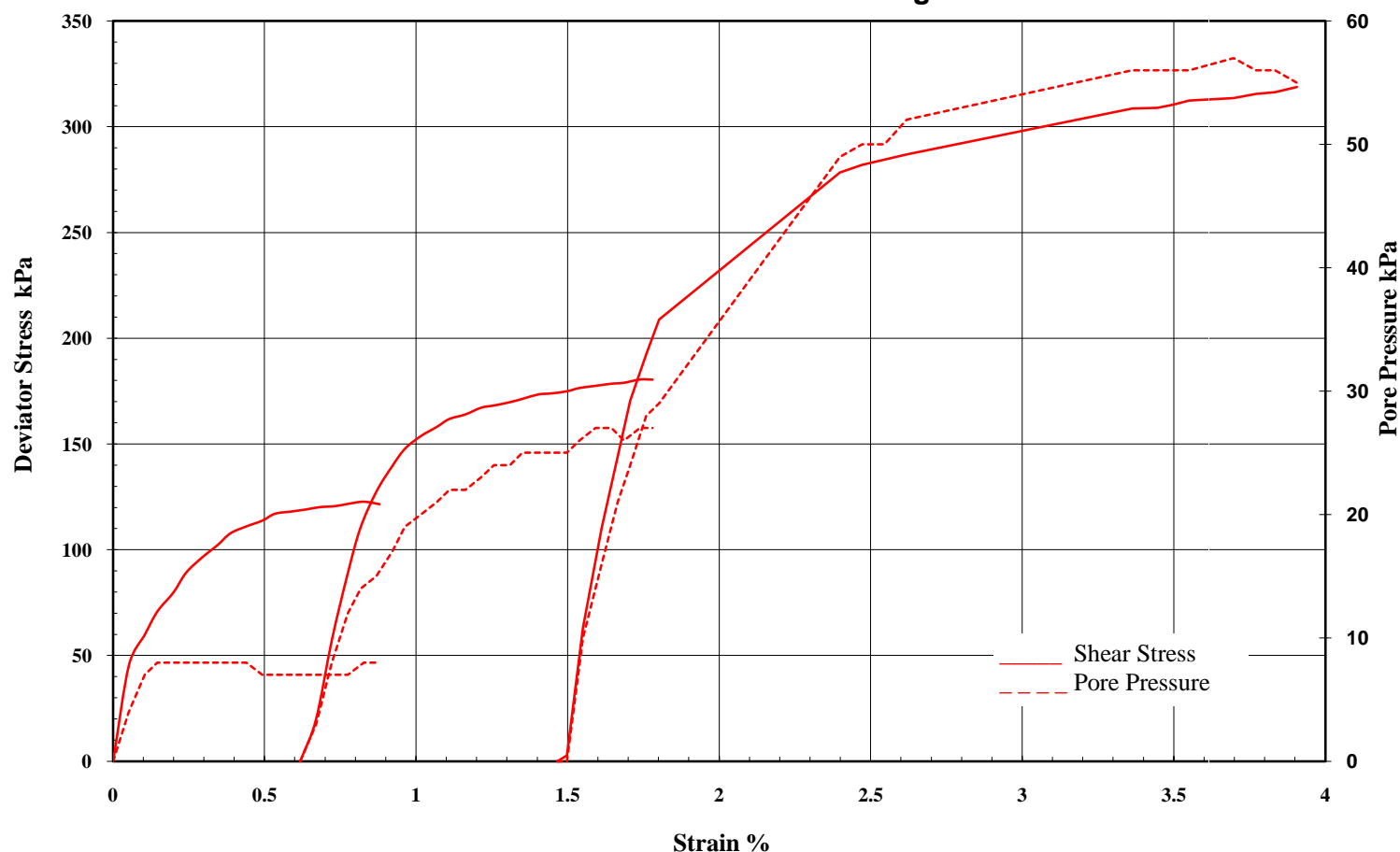
TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080526 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 26/09/2011
Client Id.: TP05-02	Depth (m): 1.7

Description: Sandy Clay - mottled orange grey

Stress/Strain & Pore Pressure/Strain Diagram



FAILURE DETAILS

Confining Pressure	Back Pressure	Initial Pore	Failure Pore	Principal Effective Stresses			Deviator Stress	Strain
				σ'_1	σ'_3	σ'_1 / σ'_3		
543 kPa	493 kPa	493 kPa	501 kPa	165 kPa	42 kPa	3.919	123 kPa	0.83 %
594 kPa	494 kPa	494 kPa	521 kPa	254 kPa	73 kPa	3.473	181 kPa	1.74 %
694 kPa	494 kPa	494 kPa	549 kPa	457 kPa	143 kPa	3.192	314 kPa	3.70 %

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client Note: Graph not to scale



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ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080526 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

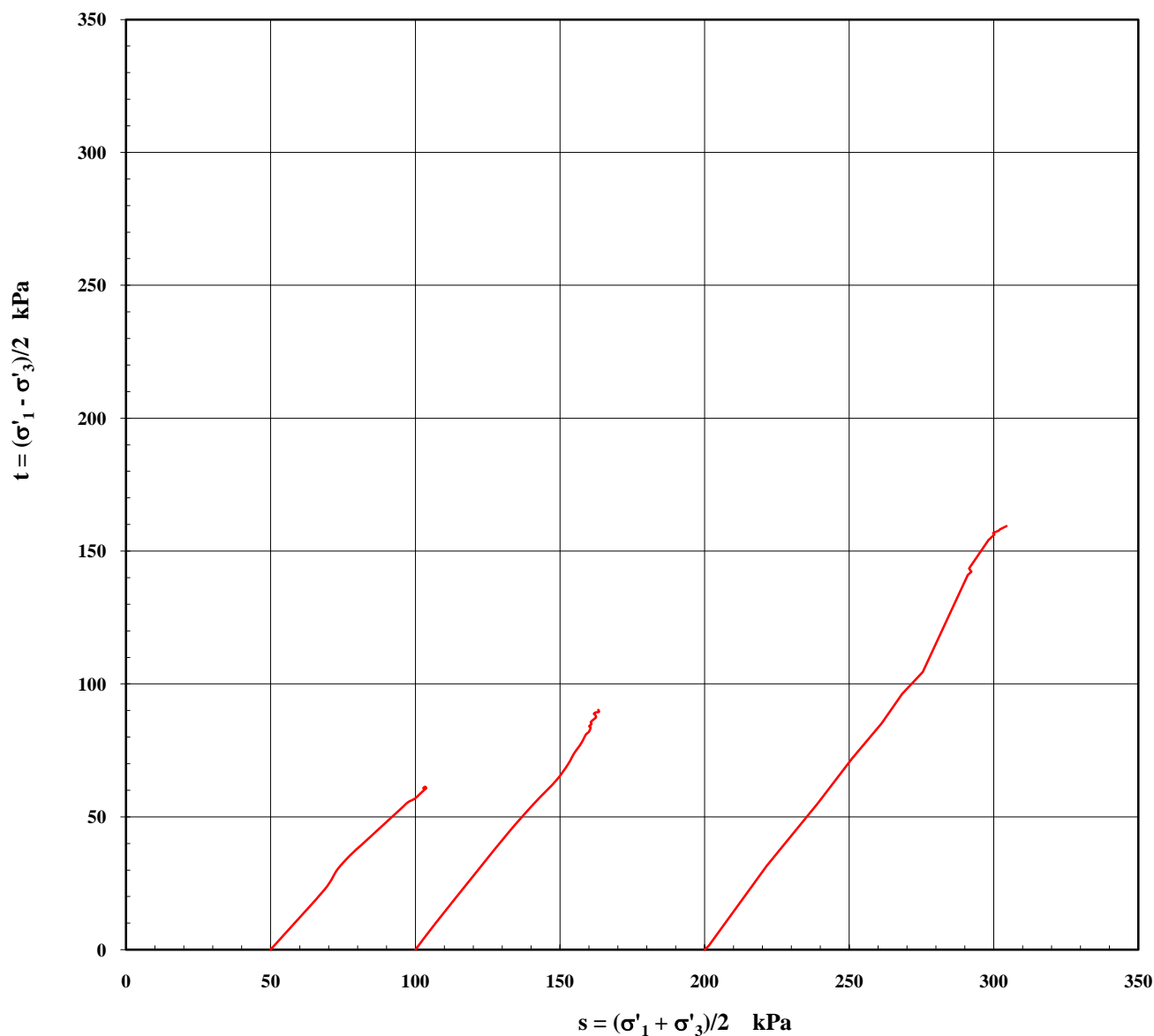
Report Date: 26/09/2011

Client Id.: TP05-02

Depth (m): 1.7

Description: Sandy Clay - mottled orange grey

MIT Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080526 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

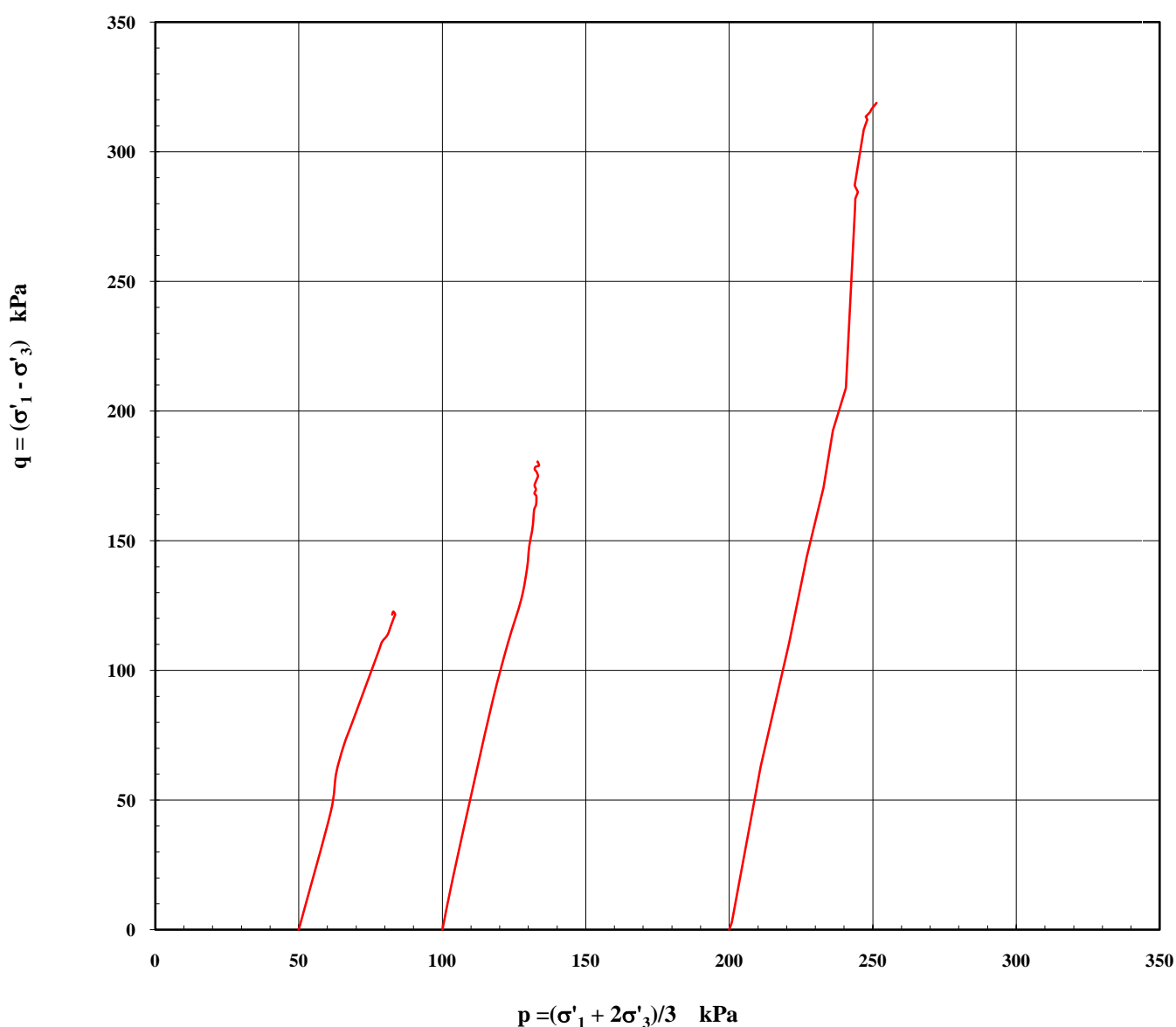
Report Date: 26/09/2011

Client Id.: TP05-02

Depth (m): 1.7

Description: Sandy Clay - mottled orange grey

Cambridge Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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Trilab Pty Ltd
ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080526 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 26/09/2011
Client Id.: TP05-02	Depth (m): 1.7
Description: Sandy Clay - mottled orange grey	



Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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Trilab Pty Ltd
ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080526 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

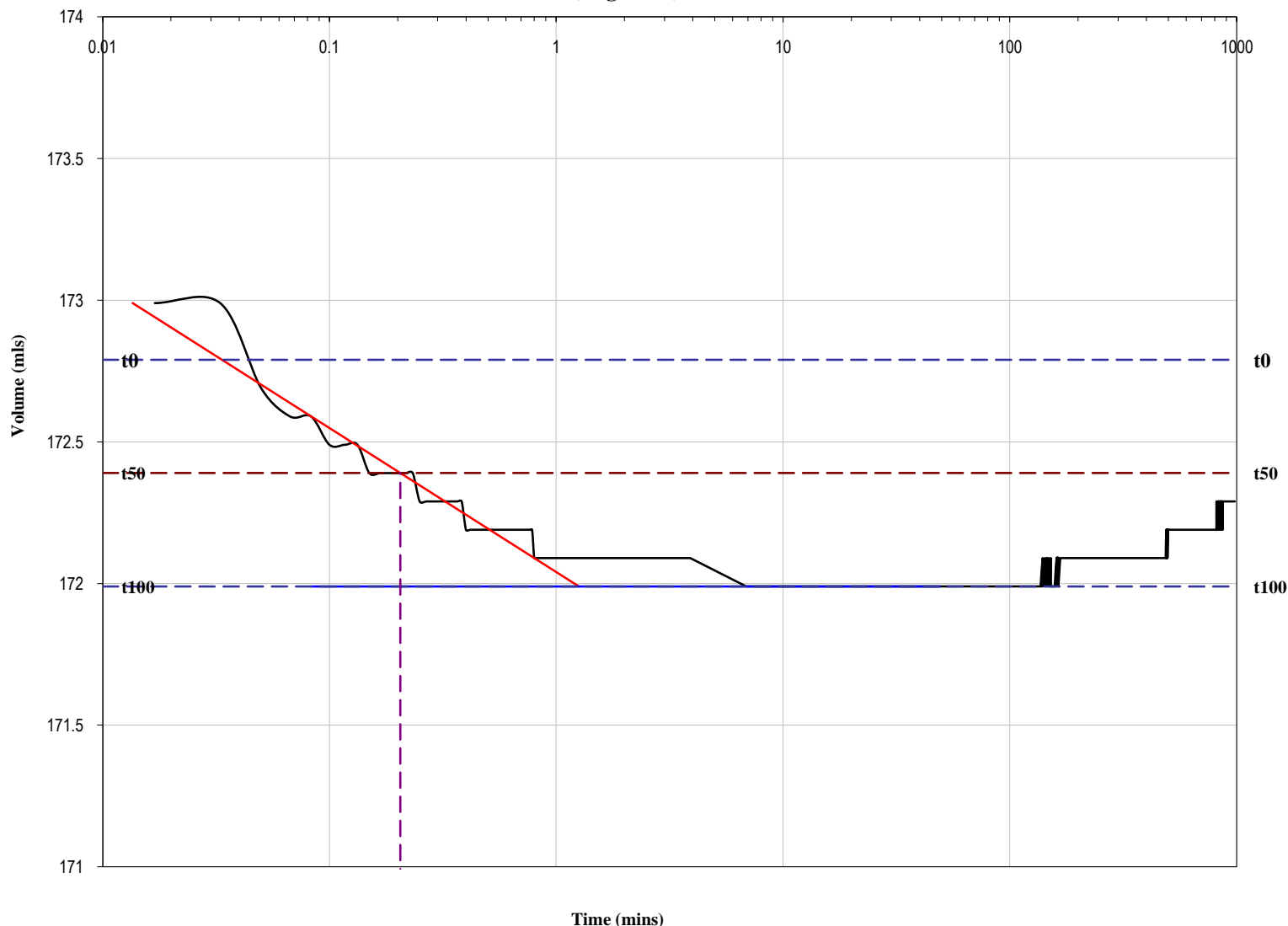
Report Date: 26/09/2011

Client Id.: TP05-02

Depth (m): 1.7

Description: Sandy Clay - mottled orange grey

Volume v's Time (Log Scale)



Cv: 44.82 m²/year
Mv: 0.116 m²/MN
k: 1.61E-09 m/s

Sample Type: Single Individual Specimen remoulded to a target of 97% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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Trilab Pty Ltd
ABN 25 065 630 506

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080526-G

Project Alpha TSF Geotech

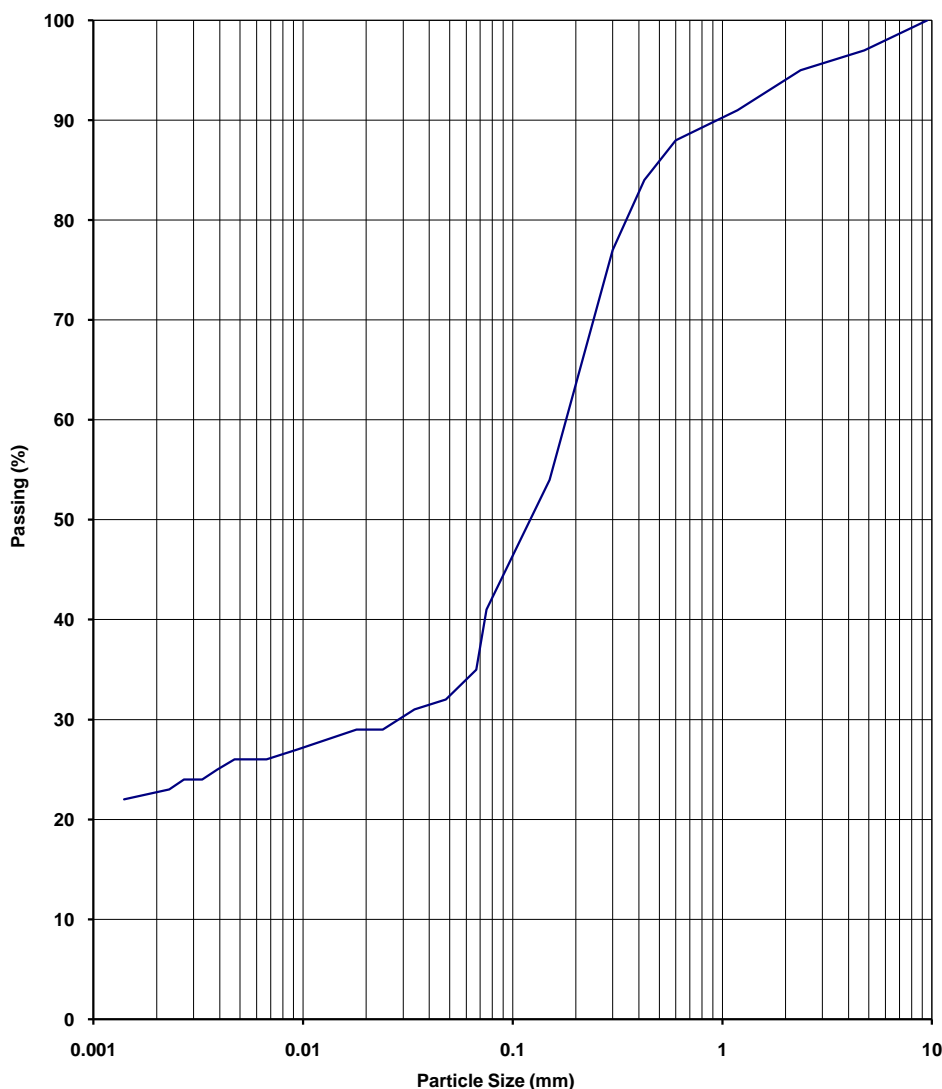
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP05-02

Depth (m) 1.70

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	100
4.75	97
2.36	95
1.18	91
0.600	88
0.425	84
0.300	77
0.150	54
0.075	41
0.067	35
0.048	32
0.034	31
0.024	29
0.018	29
0.013	28
0.0094	27
0.0067	26
0.0047	26
0.0039	25
0.0033	24
0.0027	24
0.0023	23
0.0014	22



NOTES/REMARKS:

Moisture Content 12.2%

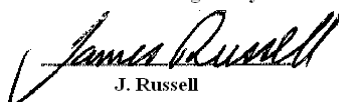
-2.36mm Soil Particle Density(t/m³) 2.67

Sample/s supplied by the client

Page 1 of 1 REP03901

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Authorised Signatory


J. Russell



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PERMEABILITY BY CONSTANT HEAD TEST REPORT

Test Method AS 1289 6.7.3, 5.1.1 / KH 2 (Based on K H Head (1988) Manual of Laboratory Testing, 10.7)

Client URS Australia Pty Ltd

Report No. 11080532-CHP

Project Alpha TSF Geotech

Test Date 10/09-14/09/2011

Report Date 3/10/2011

Sample No. 11080532

Client ID TP12-02

Depth (m) 1.20

Standard Maximum Dry Density (t/m³) 1.94

Standard Optimum Moisture Content (%) 10.5

Placement Moisture Content (%) 10.2

Placement Wet Density (t/m³) 2.10

Water Used Distilled

Pressure Applied (kPa) 50

Specimen Dimensions

Diameter (mm) 48.0

Length (mm) 56.8

PERMEABILITY

$$K_{20} = 2 \times 10^{-10} \text{ m/s}$$

Notes/Remarks: The above specimen was remoulded to a target of 98% of Standard Dry Density and at Optimum Moisture Content

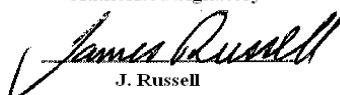
Sample/s supplied by client

Tested as received

Page: 1 of 1 REP01701

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ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080532 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

Report Date: 16/09/2011

Client Id.: TP12-02

Depth (m): 1.20

Description: Clayey Sand - yellow brown

SAMPLE & TEST DETAILS

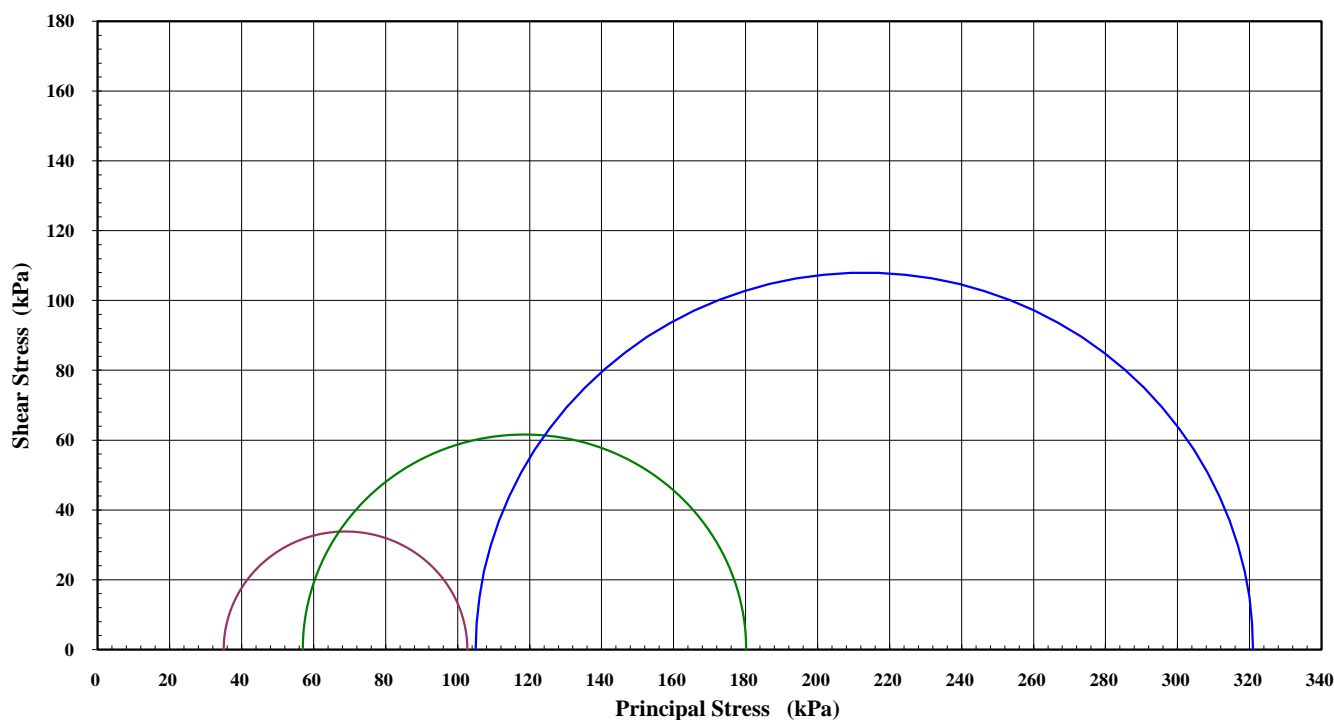
Initial Height: 95.6 mm
Initial Diameter: 48.0 mm
L/D Ratio: 2.0 : 1

Initial Moisture Content: 10.9 %
Final Moisture Content: 13.6 %
Wet Density: 2.11 t/m³
Dry Density: 1.90 t/m³

Rate of Strain: 0.006 %/min
B Response: 98 %

Failure Criteria: Peak Principal Stress Ratio

Mohr Circle Diagram



Interpretation between stages : 2 to 3

Cohesion C' (kPa) : 3.8

Angle of Shear Resistance Φ' (Degrees) : 29.4

Sample Type: Single Individual Specimen remoulded to a target of 98% of Standard Maximum Dry Density

Sample/s supplied by the client Note: Graph not to scale



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Trilab Pty Ltd
ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080532 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

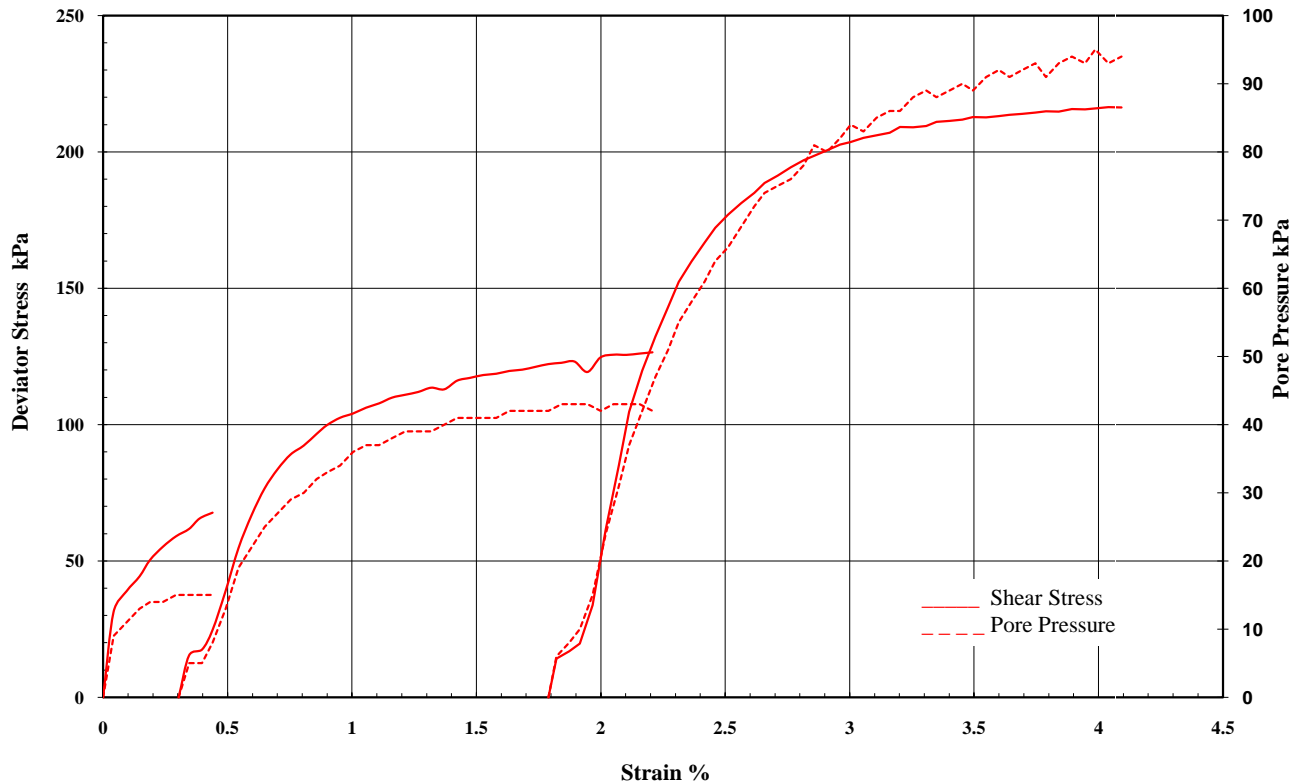
Report Date: 16/09/2011

Client Id.: TP12-02

Depth (m): 1.20

Description: Clayey Sand - yellow brown

Stress/Strain & Pore Pressure/Strain Diagram



FAILURE DETAILS

Confining Pressure	Back Pressure	Initial Pore	Failure Pore	Principal Effective Stresses			Deviator Stress	Strain
				σ'_1	σ'_3	σ'_1 / σ'_3		
542 kPa	492 kPa	492 kPa	507 kPa	103 kPa	35 kPa	2.935	68 kPa	0.44 %
592 kPa	492 kPa	492 kPa	535 kPa	180 kPa	57 kPa	3.161	123 kPa	1.89 %
693 kPa	493 kPa	493 kPa	588 kPa	321 kPa	105 kPa	3.057	216 kPa	3.99 %

Sample Type: Single Individual Specimen remoulded to a target of 98% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080532 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

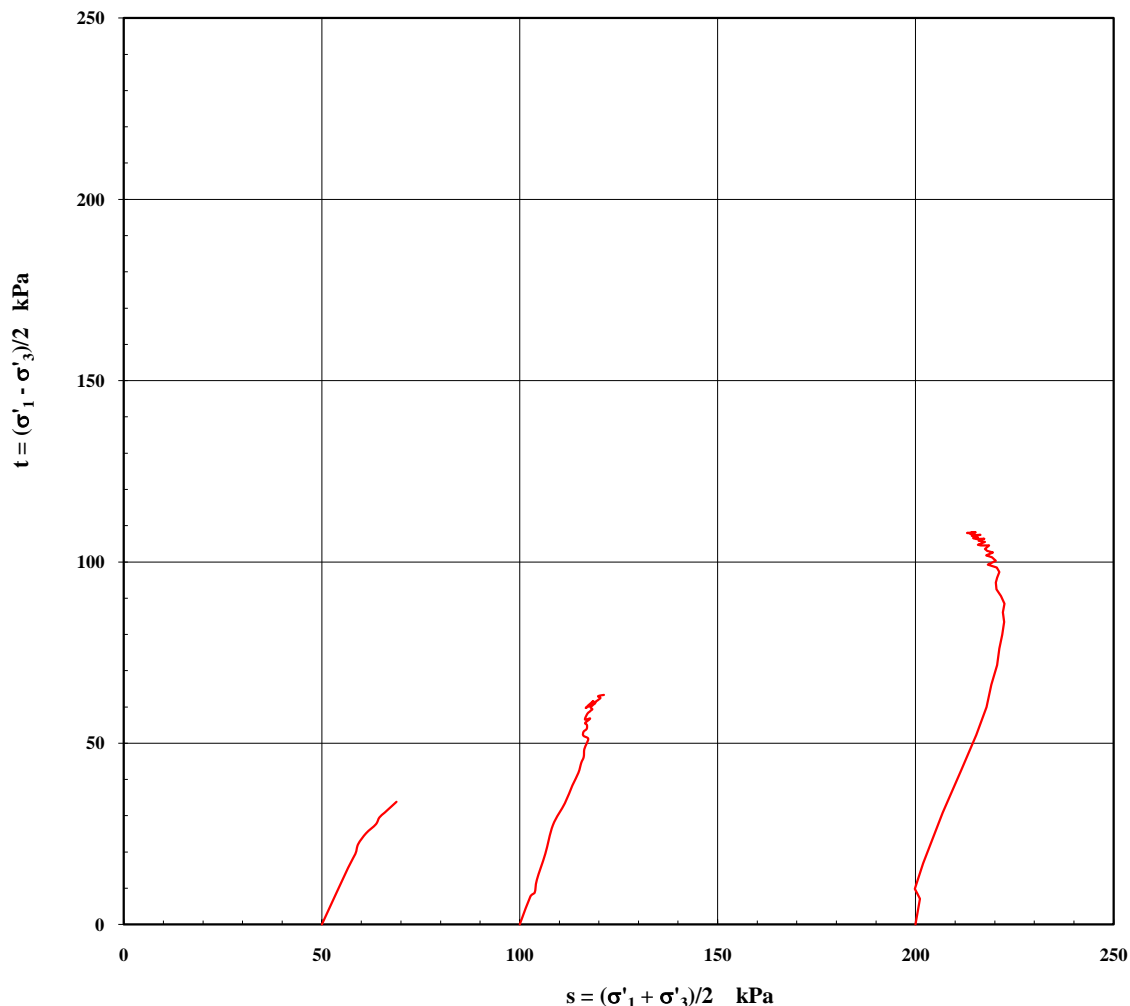
Report Date: 16/09/2011

Client Id.: TP12-02

Depth (m): 1.20

Description: Clayey Sand - yellow brown

MIT Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Specimen remoulded to a target of 98% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080532 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

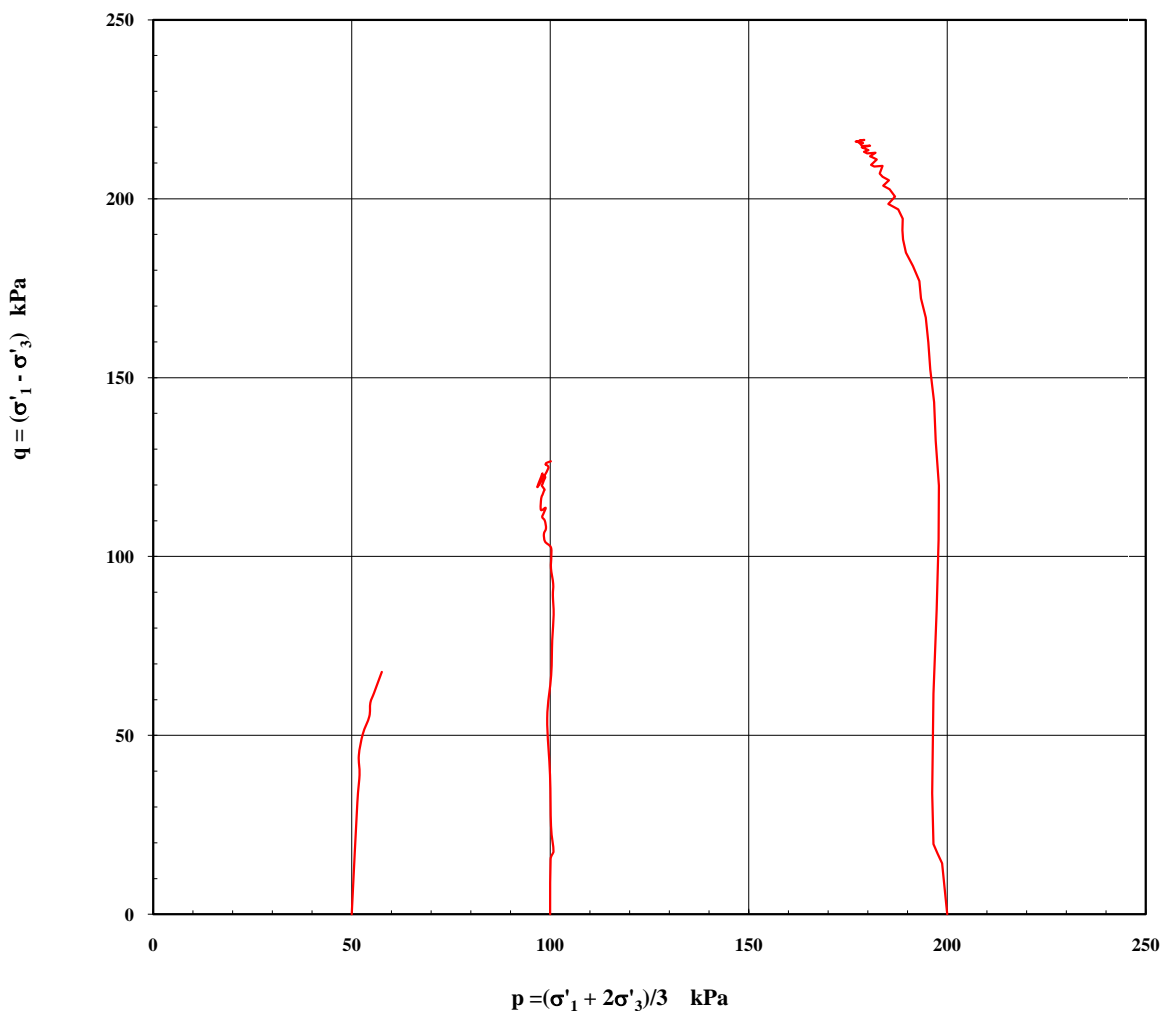
Report Date: 16/09/2011

Client Id.: TP12-02

Depth (m): 1.20

Description: Clayey Sand - yellow brown

Cambridge Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Specimen remoulded to a target of 98% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080532 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 16/09/2011
Client Id.: TP12-02	Depth (m): 1.20
Description: Clayey Sand - yellow brown	



Sample Type: Single Individual Specimen remoulded to a target of 98% of Standard Maximum Dry Density

Sample/s supplied by the client

Note: Graph not to scale



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080532-G

Project Alpha TSF Geotech

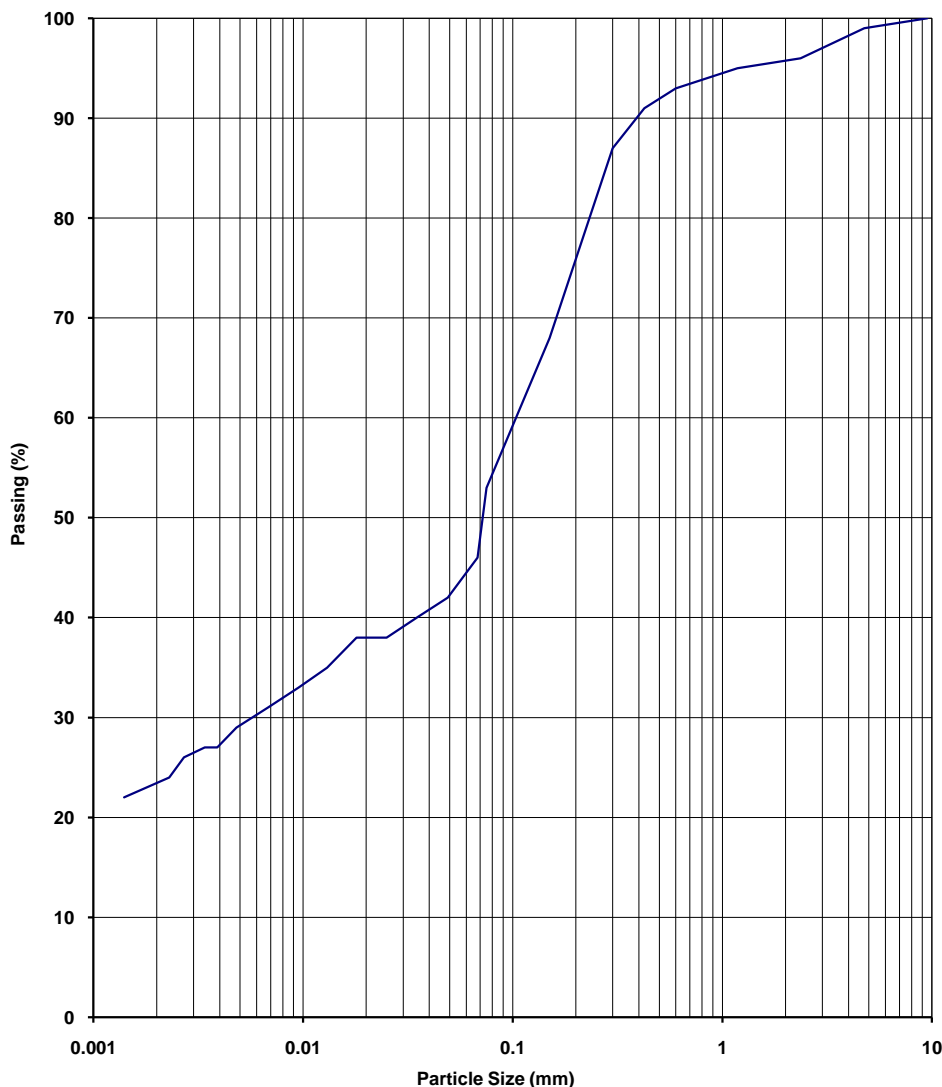
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP12-02

Depth (m) 1.20

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	100
4.75	99
2.36	96
1.18	95
0.600	93
0.425	91
0.300	87
0.150	68
0.075	53
0.068	46
0.049	42
0.035	40
0.025	38
0.018	38
0.013	35
0.0095	33
0.0068	31
0.0048	29
0.0039	27
0.0034	27
0.0027	26
0.0023	24
0.0014	22



NOTES/REMARKS:

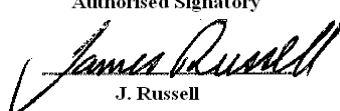
Moisture Content 11.0%

-2.36mm Soil Particle Density(t/m³) 2.67

Sample/s supplied by the client

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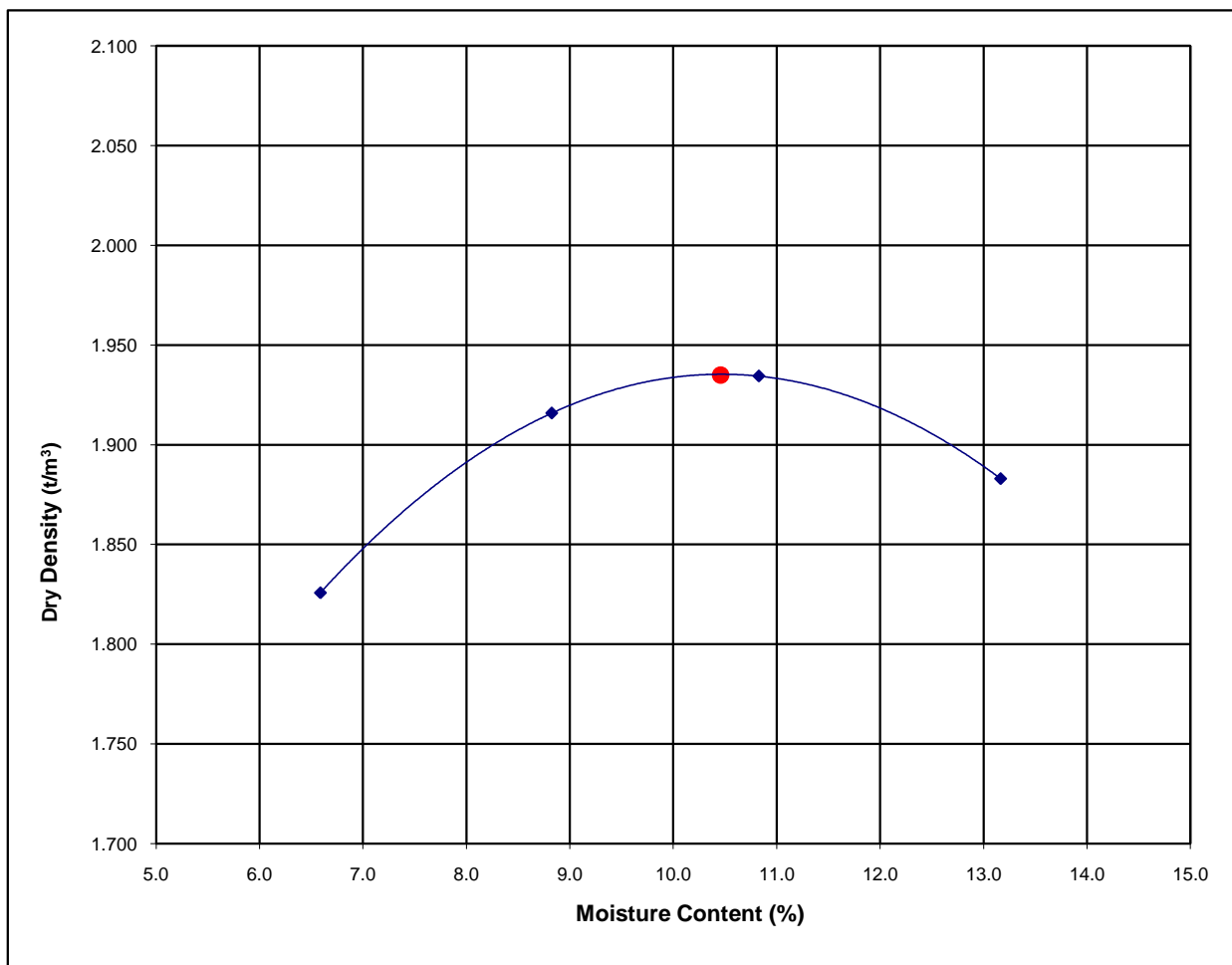
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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

MOISTURE/DENSITY RELATIONSHIP TEST REPORT

Test Method: AS 1289 5.1.1

Client	URS Australia Pty Ltd	Report No.	11080532-MDD
Project	Alpha TSF Geotech	Test Date	20/08/2011
		Report Date	2/09/2011
Client ID	TP12-02	Depth (m)	1.20
Description	Sandy Clay - Brown		



Maximum Dry Density (t/m³)	1.94	Optimum Moisture Content (%)	10.5
Moisture Content (%)	11.0	Percentage of Oversize/Sieve Size (mm)	0/19

NOTES/REMARKS: This is a computer generated plot so estimates may show some minor variations from the results summarised.

Sample/s supplied by the client

Page 1 of 1 REP01301

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

MISSING / NOT TESTABLE SHEET

[illegible]



PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11080534-G
Project	Alpha TSF Geotech	Test Date	18/08-02/09/2011
		Report Date	02/09/2011

Sample No.	11080534	11080535	11080536	11080537	11080538	11080540	11080541
Client ID	TP13-01	TP14-01	TP15-01	TP19-02	TP23-01	TP24-01	TP24-02
Depth (m)	0.40	0.30	0.60	0.90	0.50	0.70	2.50
Moisture (%)	3.8	4.5	7.7	7.2	6.7	5.0	11.7
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75				100			
53				82			
37.5				82			
26.5				68			
19				65			
9.5				53		100	
4.75		100	100	47		91	
2.36	100	96	97	46	100	72	100
1.18	99	90	96	40	97	64	94
0.600	95	86	95	36	91	62	85
0.425	88	82	94	34	83	60	78
0.300	76	74	90	31	70	56	71
0.150	43	47	68	17	43	40	54
0.075	29	29	50	12	29	28	43

NOTES/REMARKS: -

Sample/s supplied by the client

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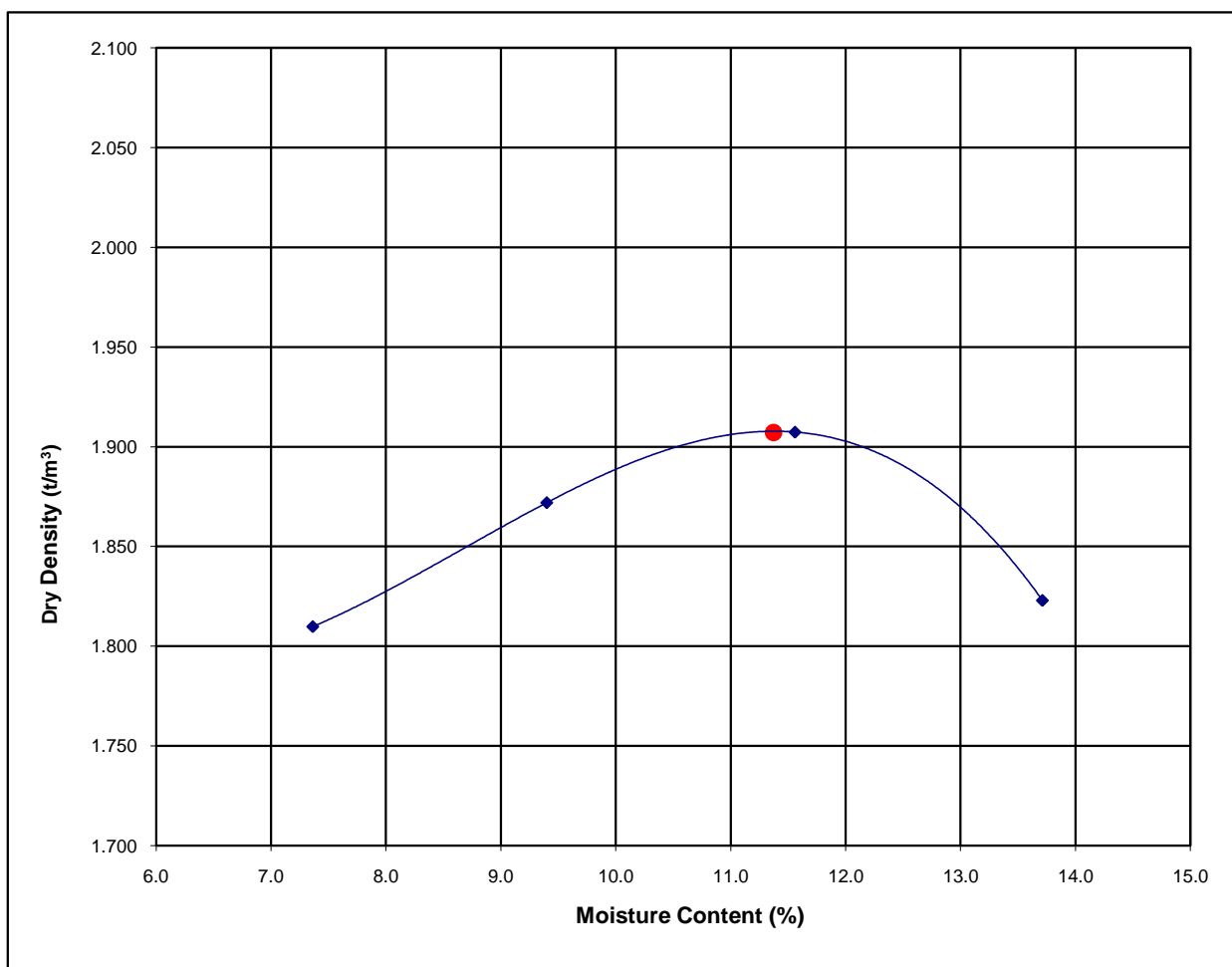
Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

MOISTURE/DENSITY RELATIONSHIP TEST REPORT

Test Method: AS 1289 5.1.1

Client	URS Australia Pty Ltd	Report No.	11080536-MDD
Project	Alpha TSF Geotech	Test Date	20/08/2011
		Report Date	2/09/2011
Client ID	TP15-01	Depth (m)	0.60
Description	Clayey Sand - Pale Grey		



Maximum Dry Density (t/m³)	1.91	Optimum Moisture Content (%)	11.5
Moisture Content (%)	7.7	Percentage of Oversize/Sieve Size (mm)	0/19

NOTES/REMARKS: This is a computer generated plot so estimates may show some minor variations from the results summarised.

Sample/s supplied by the client

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080539-G

Project Alpha TSF Geotech

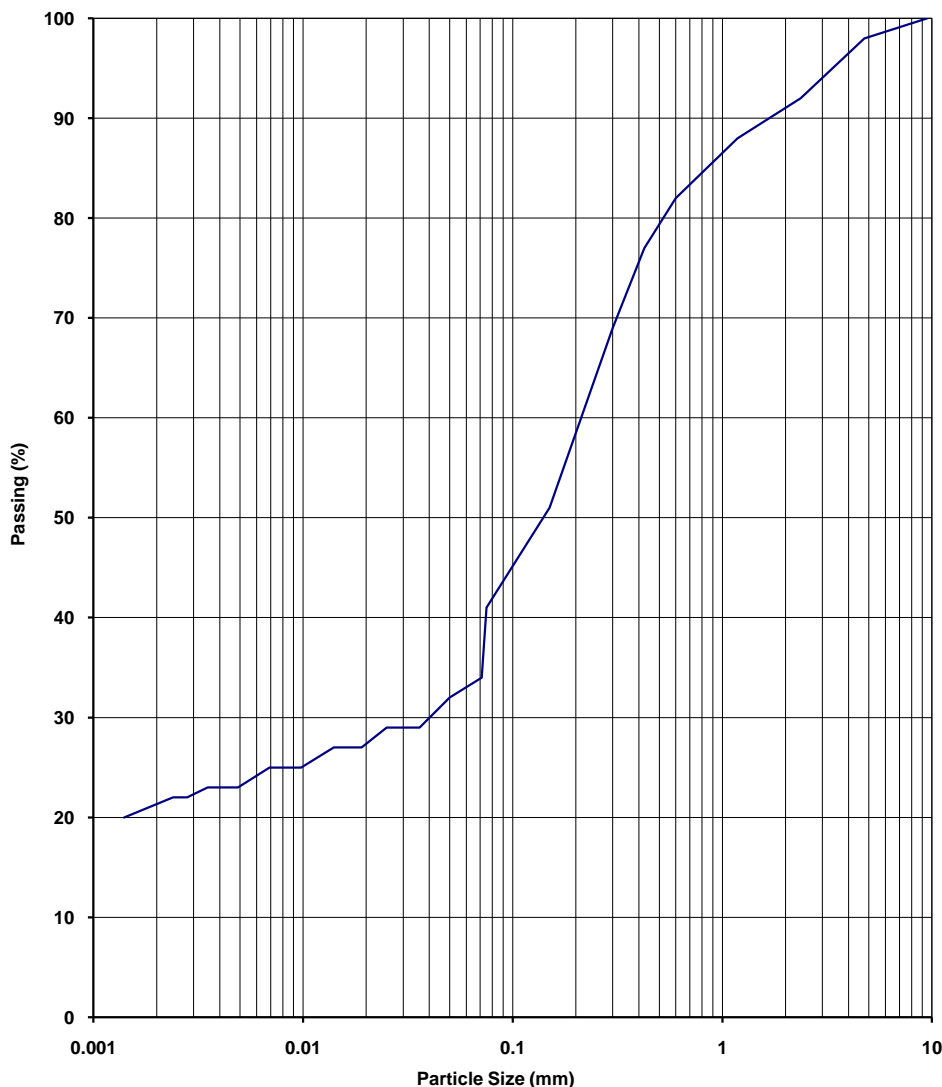
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP23-02

Depth (m) 1.30

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	100
4.75	98
2.36	92
1.18	88
0.600	82
0.425	77
0.300	69
0.150	51
0.075	41
0.071	34
0.05	32
0.036	29
0.025	29
0.019	27
0.014	27
0.0098	25
0.0069	25
0.0049	23
0.004	23
0.0035	23
0.0028	22
0.0024	22
0.0014	20



NOTES/REMARKS:

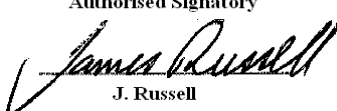
Moisture Content 11.3%

-2.36mm Soil Particle Density(t/m^3) 2.60

Sample/s supplied by the client

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PERMEABILITY BY CONSTANT HEAD TEST REPORT

Test Method AS 1289 6.7.3, 5.1.1 / KH 2 (Based on K H Head (1988) Manual of Laboratory Testing, 10.7)

Client	URS Australia Pty Ltd	Report No.	11080541-CHP
Project	Alpha TSF Geotech	Test Date	18/09-03/10/2011
		Report Date	3/10/2011

Sample No.	11080541
Client ID	TP24-02
Depth (m)	2.50
Standard Maximum Dry Density (t/m³)	1.86
Standard Optimum Moisture Content (%)	14.0
Placement Moisture Content (%)	15.0
Placement Wet Density (t/m³)	2.08
Water Used	Distilled
Pressure Applied (kPa)	50
<u>Specimen Dimensions</u>	
Diameter (mm)	48.6
Length (mm)	55.9

PERMEABILITY

$$K_{20} = 3 \times 10^{-9} \text{ m/s}$$

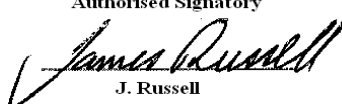
Notes/Remarks: The above specimen was remoulded to a target of 98% of Standard Dry Density and at Optimum Moisture Content

Sample/s supplied by client

Tested as received

Page: 1 of 1 REP01701

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TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080541 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

Report Date: 16/09/2011

Client Id.: TP24-02

Depth (m): 2.50

Description: Clay - orange brown

SAMPLE & TEST DETAILS

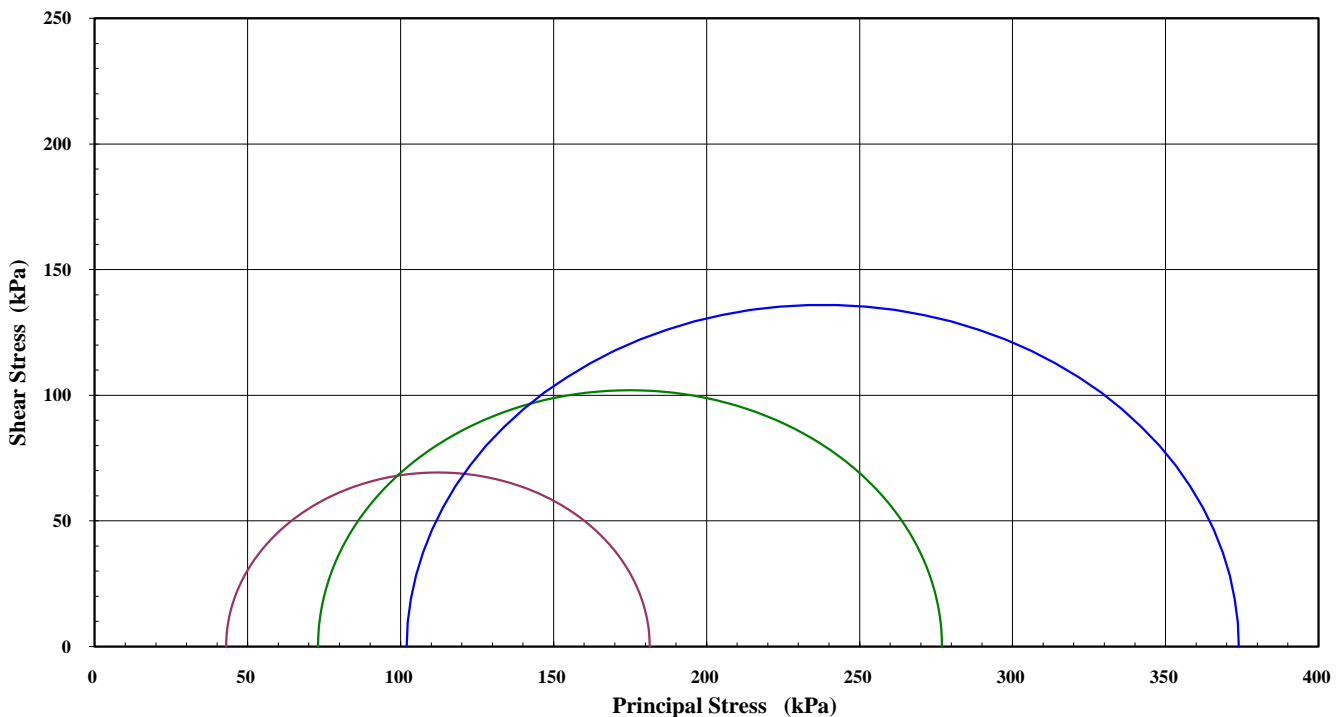
Initial Height: 95.7 mm
Initial Diameter: 48.0 mm
L/D Ratio: 2.0 : 1

Initial Moisture Content: 13.7 %
Final Moisture Content: 10.2 %
Wet Density: 2.07 t/m³
Dry Density: 1.82 t/m³

Rate of Strain: 0.006 %/min
B Response: 97 %

Failure Criteria: Peak Principal Stress Ratio

Mohr Circle Diagram



Interpretation between stages :	1 to 2	2 to 3	1 to 3
Cohesion C' (kPa) :	12.4	9.0	11.2
Angle of Shear Resistance Φ' (Degrees) :	31.5	32.7	32.1

Sample Type: Single Individual Undisturbed Specimen

Remarks: Tested as Received

Sample/s supplied by the client

Note: Graph not to scale



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ABN 25 065 630 506

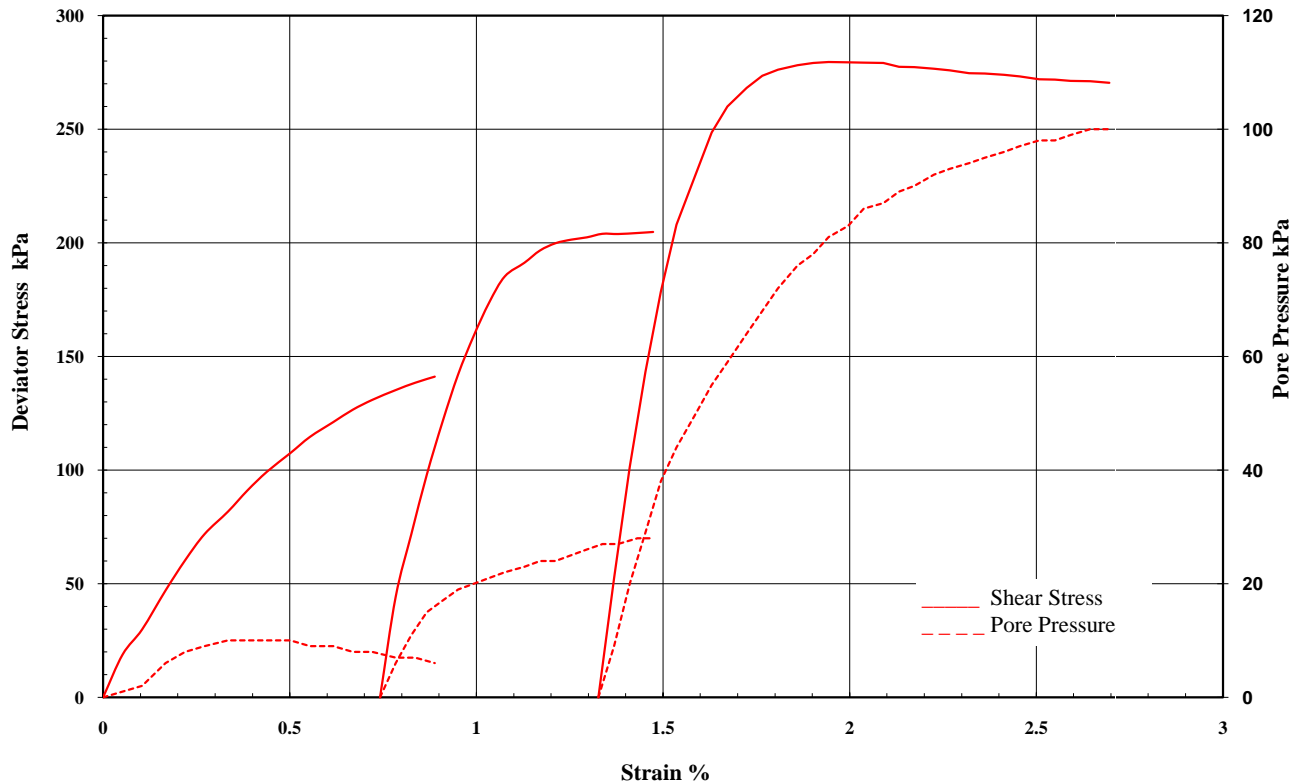


TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080541 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 16/09/2011
Client Id.: TP24-02	Depth (m): 2.50
Description: Clay - orange brown	

Stress/Strain & Pore Pressure/Strain Diagram



FAILURE DETAILS

Confining Pressure	Back Pressure	Initial Pore	Failure Pore	Principal Effective Stresses			Deviator Stress	Strain
				σ'_1	σ'_3	σ'_1 / σ'_3		
542 kPa	492 kPa	492 kPa	499 kPa	181 kPa	43 kPa	4.219	138 kPa	0.84 %
592 kPa	492 kPa	492 kPa	520 kPa	277 kPa	73 kPa	3.794	204 kPa	1.34 %
694 kPa	494 kPa	494 kPa	594 kPa	374 kPa	102 kPa	3.666	272 kPa	2.51 %

Sample Type: Single Individual Undisturbed Specimen

Remarks: Tested as Received

Sample/s supplied by the client

Note: Graph not to scale



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ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080541 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

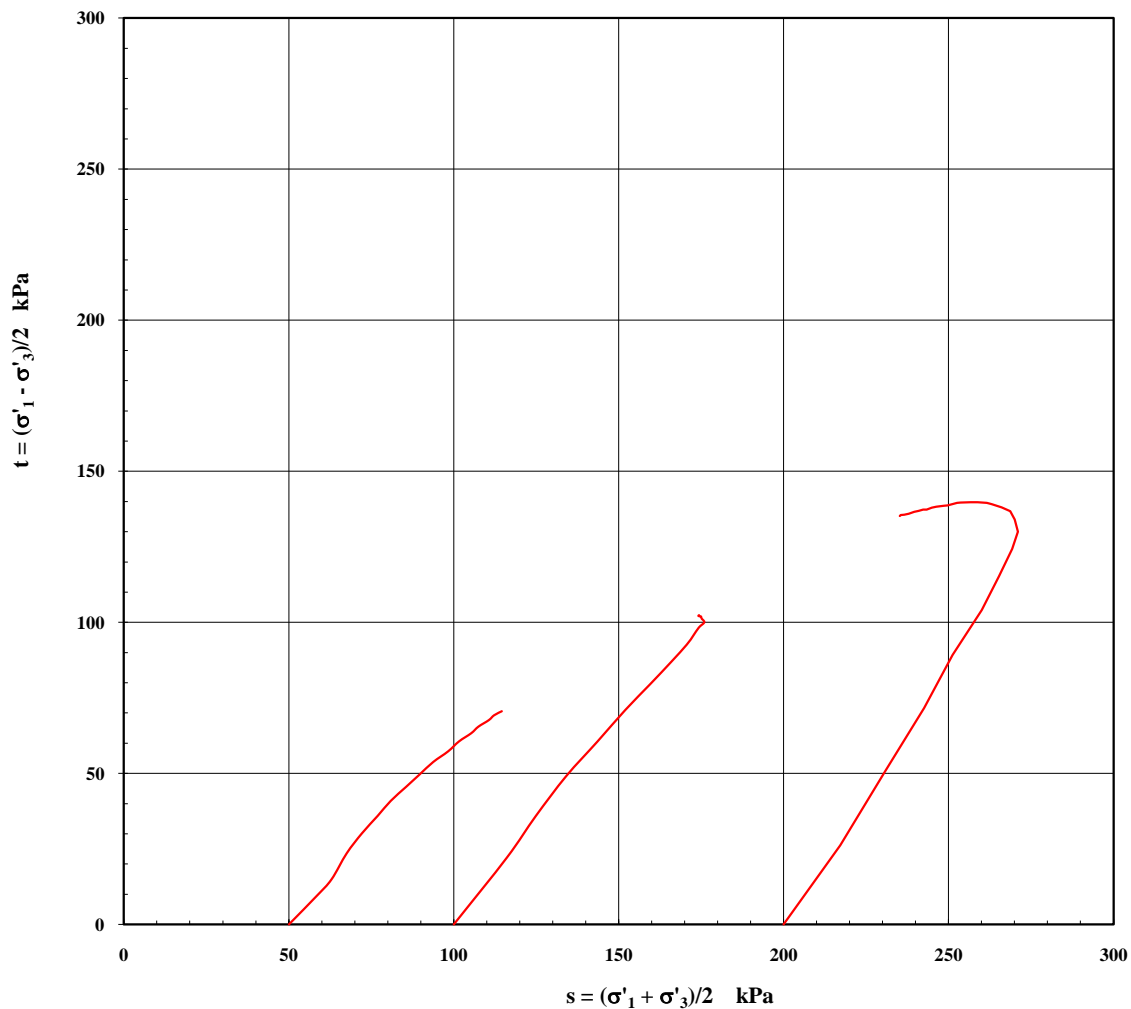
Report Date: 16/09/2011

Client Id.: TP24-02

Depth (m): 2.50

Description: Clay - orange brown

MIT Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Undisturbed Specimen

Remarks: Tested as Received

Sample/s supplied by the client

Note: Graph not to scale



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Authorised Signatory

James Russell
J. Russell

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Doc. Id.: REP03001

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Trilab Pty Ltd
ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080541 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

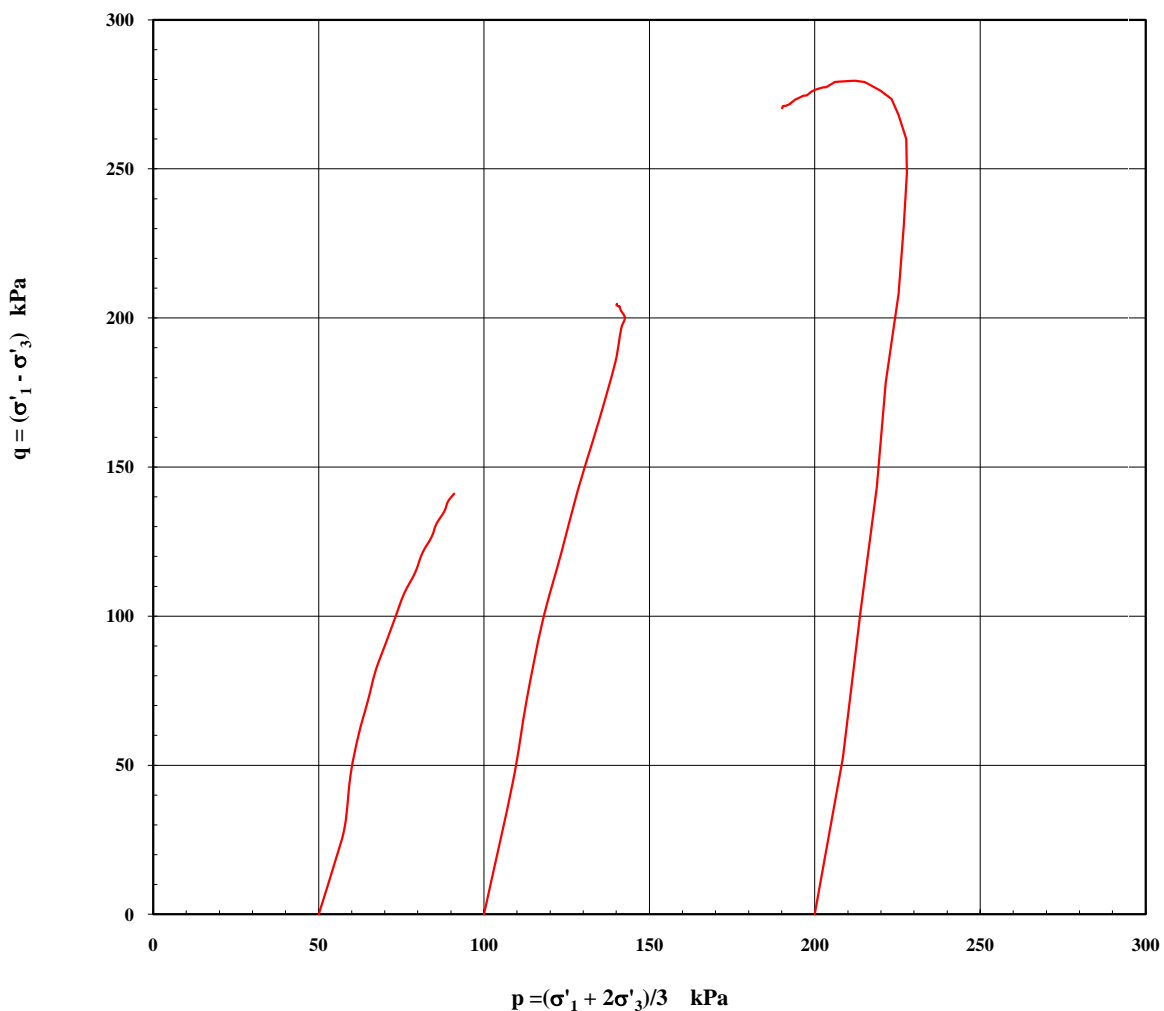
Report Date: 16/09/2011

Client Id.: TP24-02

Depth (m): 2.50

Description: Clay - orange brown

Cambridge Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Undisturbed Specimen

Remarks: Tested as Received

Sample/s supplied by the client

Note: Graph not to scale



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Trilab Pty Ltd
ABN 25 065 630 506



TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd	Report No.: 11080541 - CU
Project: Alpha TSF Geotech	Test Date: 25/08/2011 Report Date: 16/09/2011
Client Id.: TP24-02	Depth (m): 2.50
Description: Clay - orange brown	



Sample Type: Single Individual Undisturbed Specimen	Remarks: Tested as Received
Sample/s supplied by the client	Note: Graph not to scale



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Trilab Pty Ltd
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TRIAxIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: URS Australia Pty Ltd

Report No.: 11080541 - CU

Project: Alpha TSF Geotech

Test Date: 25/08/2011

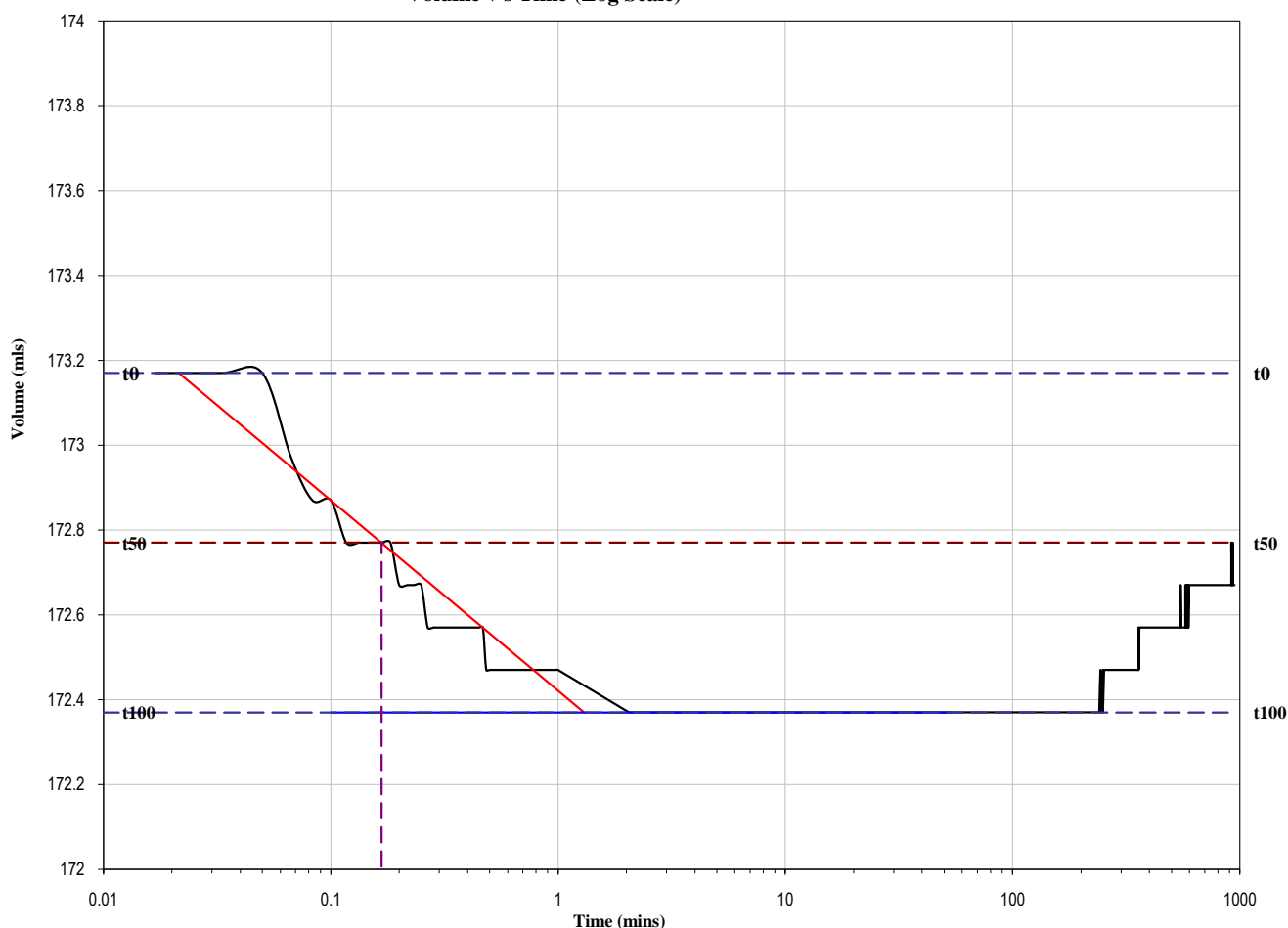
Report Date: 16/09/2011

Client Id.: TP24-02

Depth (m): 2.50

Description: Clay - orange brown

Volume v's Time (Log Scale)



Cv: 43.15 m²/year
Mv: 0.093 m²/MN
k: 1.24E-09 m/s

Sample Type: Single Individual Undisturbed Specimen

Remarks: Tested as Received

Sample/s supplied by the client

Note: Graph not to scale



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Doc. Id.: REP03001

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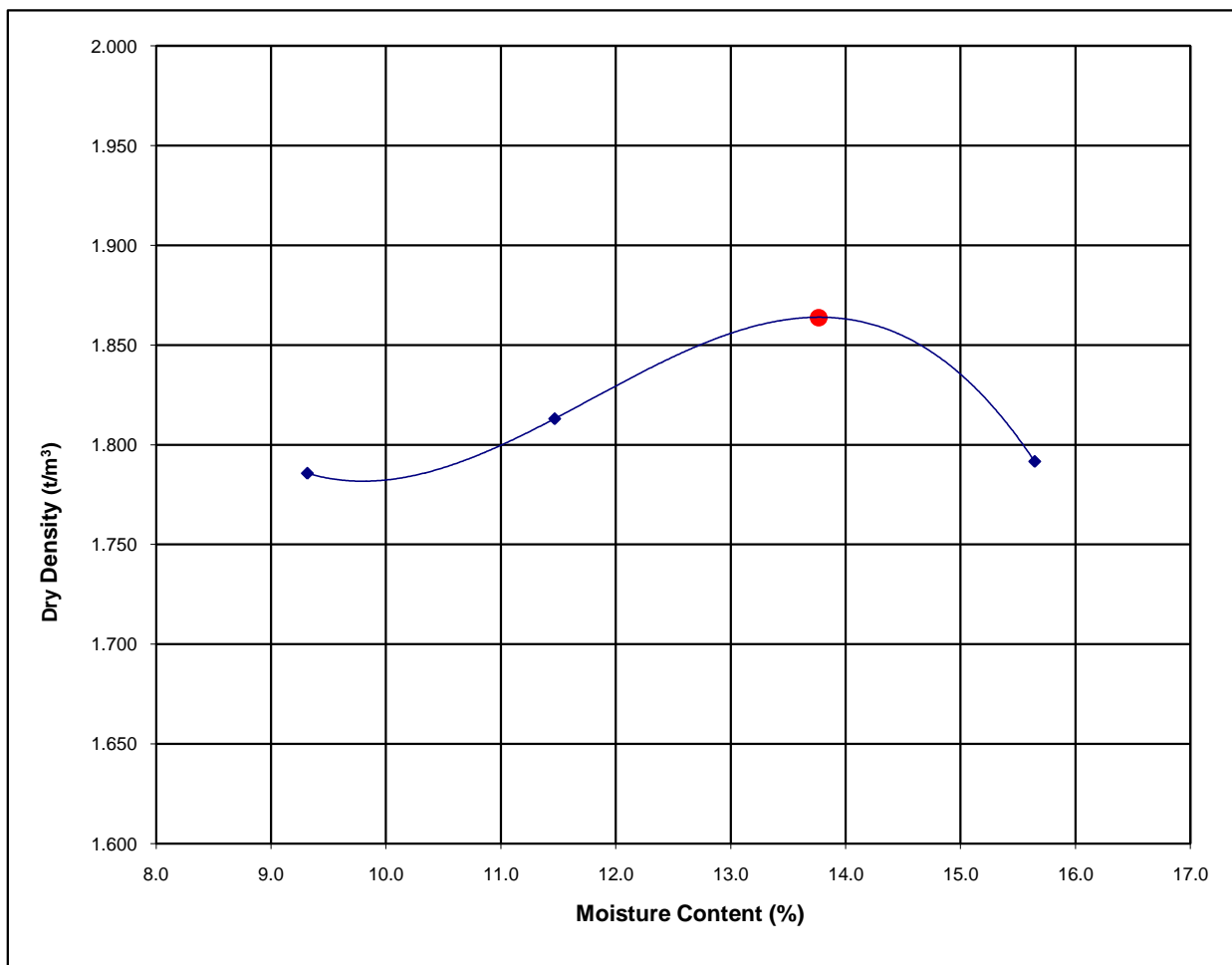
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 ABN 25 065 630 506



MOISTURE/DENSITY RELATIONSHIP TEST REPORT

Test Method: AS 1289 5.1.1

Client	URS Australia Pty Ltd	Report No.	11080541-MDD
Project	Alpha TSF Geotech	Test Date	20/08/2011
		Report Date	2/09/2011
Client ID	TP24-02	Depth (m)	2.50
Description	Sandy Clay - Red/Grey		



Maximum Dry Density (t/m³)	1.86	Optimum Moisture Content (%)	14.0
Moisture Content (%)	11.7	Percentage of Oversize/Sieve Size (mm)	0/19

NOTES/REMARKS: This is a computer generated plot so estimates may show some minor variations from the results summarised.

Sample/s supplied by the client

Page 1 of 1 REP01301

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080542-G

Project Alpha TSF Geotech

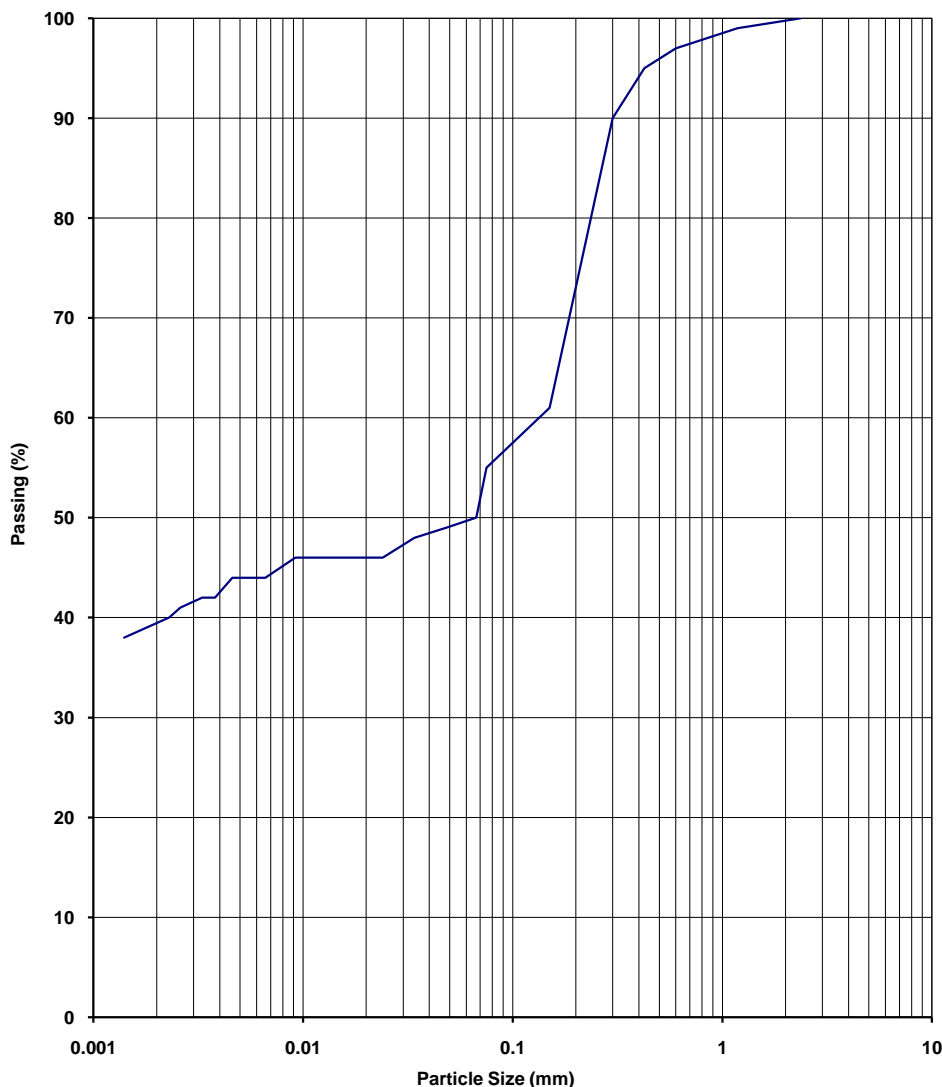
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP26-02

Depth (m) 0.90

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	99
0.600	97
0.425	95
0.300	90
0.150	61
0.075	55
0.067	50
0.048	49
0.034	48
0.024	46
0.018	46
0.013	46
0.0092	46
0.0066	44
0.0046	44
0.0038	42
0.0033	42
0.0026	41
0.0023	40
0.0014	38



NOTES/REMARKS:

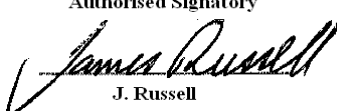
Moisture Content 10.0%

-2.36mm Soil Particle Density(t/m³) 2.62

Sample/s supplied by the client

Page 1 of 1 REP03901

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080543-G

Project Alpha TSF Geotech

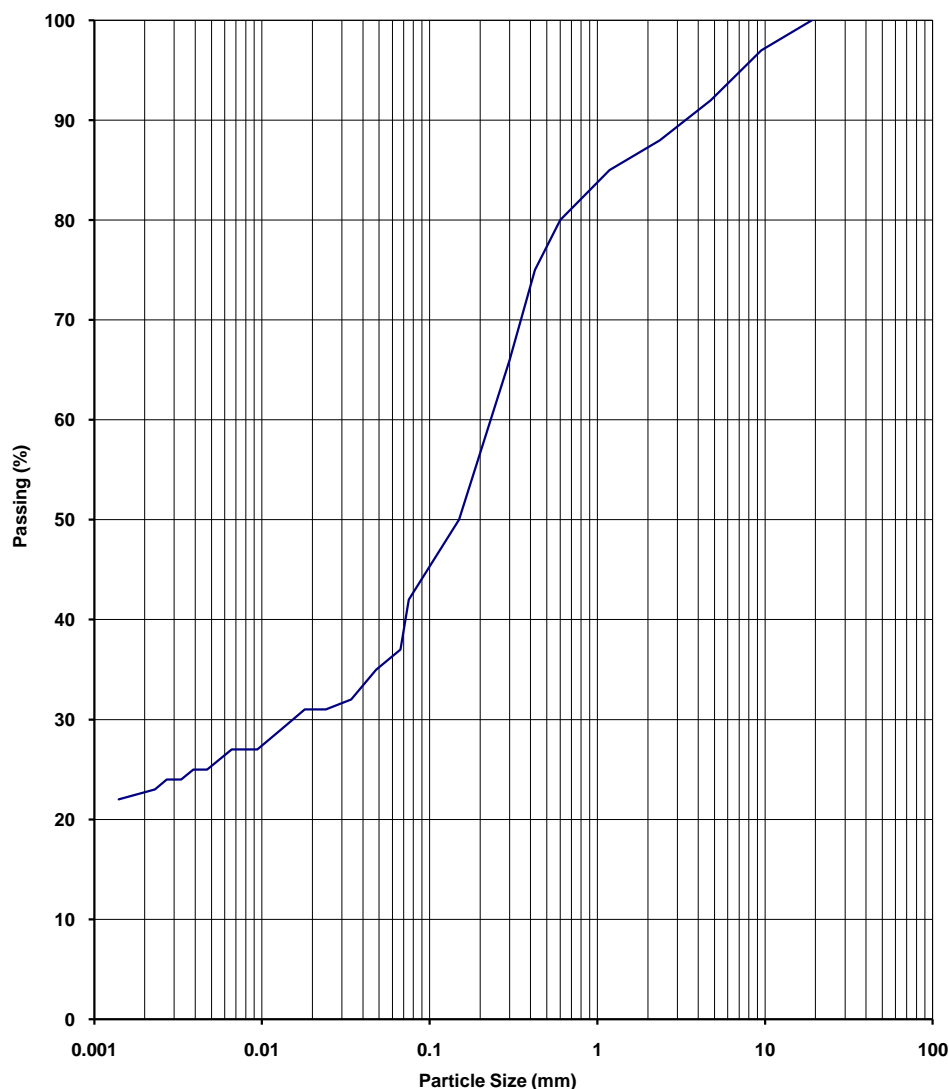
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP28/2-02

Depth (m) 2.00

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	100
9.5	97
4.75	92
2.36	88
1.18	85
0.600	80
0.425	75
0.300	66
0.150	50
0.075	42
0.067	37
0.048	35
0.034	32
0.024	31
0.018	31
0.013	29
0.0094	27
0.0066	27
0.0047	25
0.0039	25
0.0033	24
0.0027	24
0.0023	23
0.0014	22



NOTES/REMARKS:

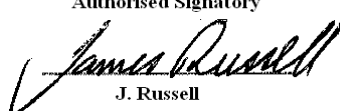
Moisture Content 12.3%

-2.36mm Soil Particle Density(t/m³) 2.62

Sample/s supplied by the client

Page 1 of 1 REP03901

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Trilab Pty Ltd ABN 25 065 630 506



PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11080544-G
Project	Alpha TSF Geotech	Test Date	18/08-02/09/2011
		Report Date	02/09/2011

Sample No.	11080544	11080545	11080546	11080547	11080548	11080549	11080550
Client ID	TP28-02	TP29-01	TP30-02	TP33-02	TP34-03	TP37-01	TP39-02
Depth (m)	1.20	0.40	1.20	1.30	1.50	0.40	1.30
Moisture (%)	11.6	5.4	8.0	9.4	10.7	3.1	8.3
AS SIEVE SIZE (mm)							
150							
75							
53							
37.5			100	100			
26.5			95	93			
19	100		93	73	100		
9.5	95		68	33	80		100
4.75	85		42	23	65		98
2.36	78	100	34	22	61	100	95
1.18	75	98	32	22	59	99	91
0.600	72	91	31	21	57	97	87
0.425	69	83	29	19	53	93	82
0.300	63	70	26	17	48	86	75
0.150	49	40	17	10	33	60	55
0.075	41	25	13	7	22	40	45

NOTES/REMARKS: -

Sample/s supplied by the client

Page 1 of 1 REP01101

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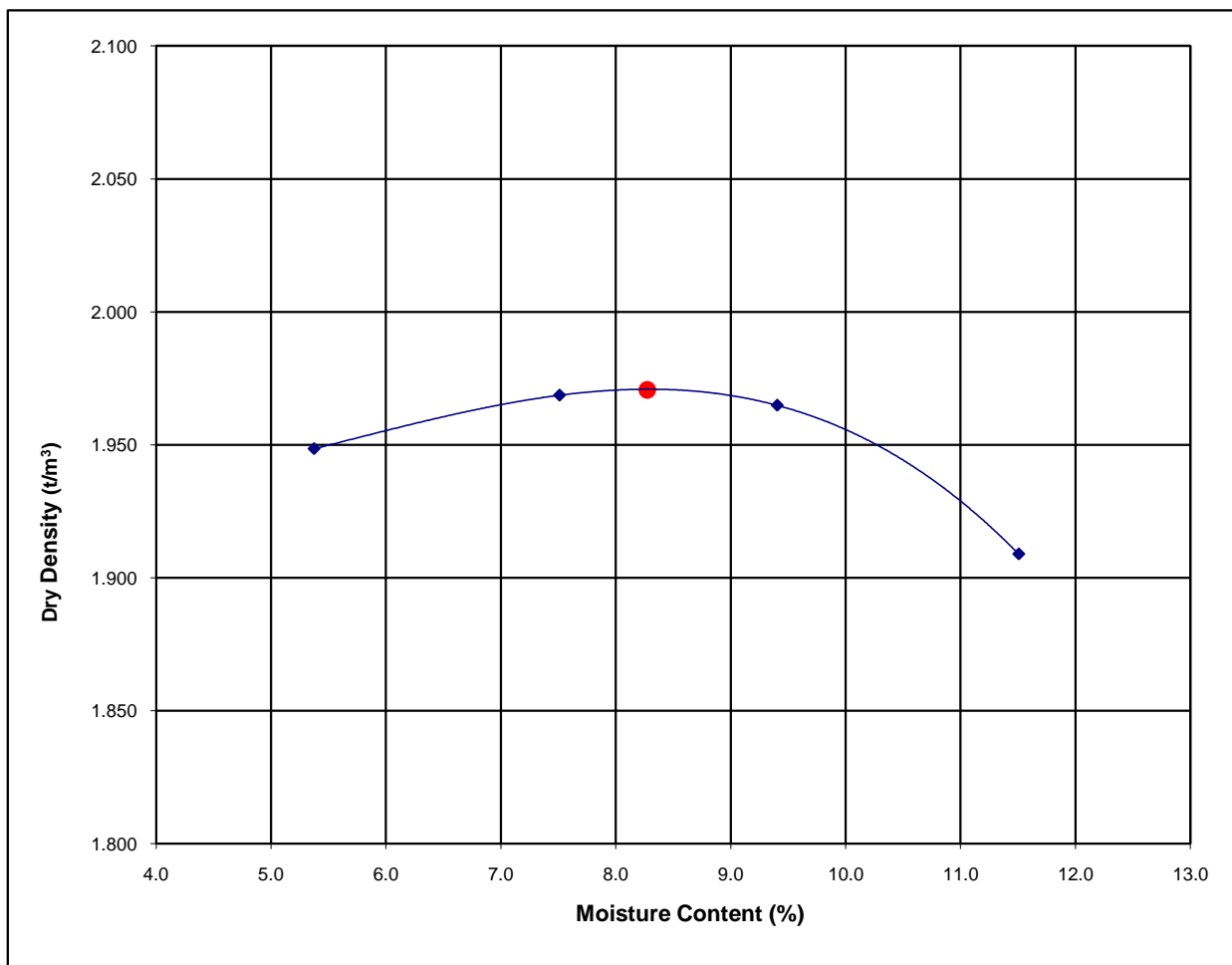
Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

MOISTURE/DENSITY RELATIONSHIP TEST REPORT

Test Method: AS 1289 5.1.1

Client	URS Australia Pty Ltd	Report No.	11080545-MDD
Project	Alpha TSF Geotech	Test Date	20/08/2011
		Report Date	2/09/2011
Client ID	TP29-01	Depth (m)	0.40
Description	Silty Sand - Red/Brown		



Maximum Dry Density (t/m³)	1.97	Optimum Moisture Content (%)	8.5
Moisture Content (%)	5.4	Percentage of Oversize/Sieve Size (mm)	0/19

NOTES/REMARKS: This is a computer generated plot so estimates may show some minor variations from the results summarised.

Sample/s supplied by the client

Page 1 of 1 REP01301

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11080545-AL
Project	Alpha TSF Geotech	Test Date	24/08-31/08/2011
		Report Date	02/09/2011

Sample No.	11080545	11080553	11080554	11080555	-	-
Client ID	TP29-01	TP46-02	TP47-02	TP51-02	-	-
Depth (m)	0.40	1.70	1.60	1.30	-	-
Liquid Limit (%)	Not Obtainable	22	25	23	-	-
Plastic Limit (%)	Not Obtainable	15	10	11	-	-
Plasticity Index (%)	Non Plastic	7	15	12	-	-
Linear Shrinkage (%)	Not Obtainable	3.0*	4.5	6.0	-	-
Field Moisture Content (%)	5.4	16.9	12.4	8.3	-	-

Sample No.	-	-	-	-	-	-
Client ID	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-
Liquid Limit (%)	-	-	-	-	-	-
Plastic Limit (%)	-	-	-	-	-	-
Plasticity Index (%)	-	-	-	-	-	-
Linear Shrinkage (%)	-	-	-	-	-	-
Field Moisture Content (%)	-	-	-	-	-	-

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Crumbling occurred + Curling occurred Page 1 of 1 REP00101

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11080551-G
Project	Alpha TSF Geotech	Test Date	18/08-02/09/2011
		Report Date	02/09/2011

Sample No.	11080551	11080552	-	-	-	-	-
Client ID	TP41-02	TP43-01	-	-	-	-	-
Depth (m)	2.20	0.60	-	-	-	-	-
Moisture (%)	17.0	8.2	-	-	-	-	-
AS SIEVE SIZE (mm)	PERCENT PASSING						
150			-	-	-	-	-
75			-	-	-	-	-
53			-	-	-	-	-
37.5			-	-	-	-	-
26.5			-	-	-	-	-
19		100	-	-	-	-	-
9.5		94	-	-	-	-	-
4.75		90	-	-	-	-	-
2.36	100	82	-	-	-	-	-
1.18	95	78	-	-	-	-	-
0.600	88	74	-	-	-	-	-
0.425	82	71	-	-	-	-	-
0.300	74	66	-	-	-	-	-
0.150	55	50	-	-	-	-	-
0.075	41	38	-	-	-	-	-

NOTES/REMARKS: -

Sample/s supplied by the client

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080553-G

Project Alpha TSF Geotech

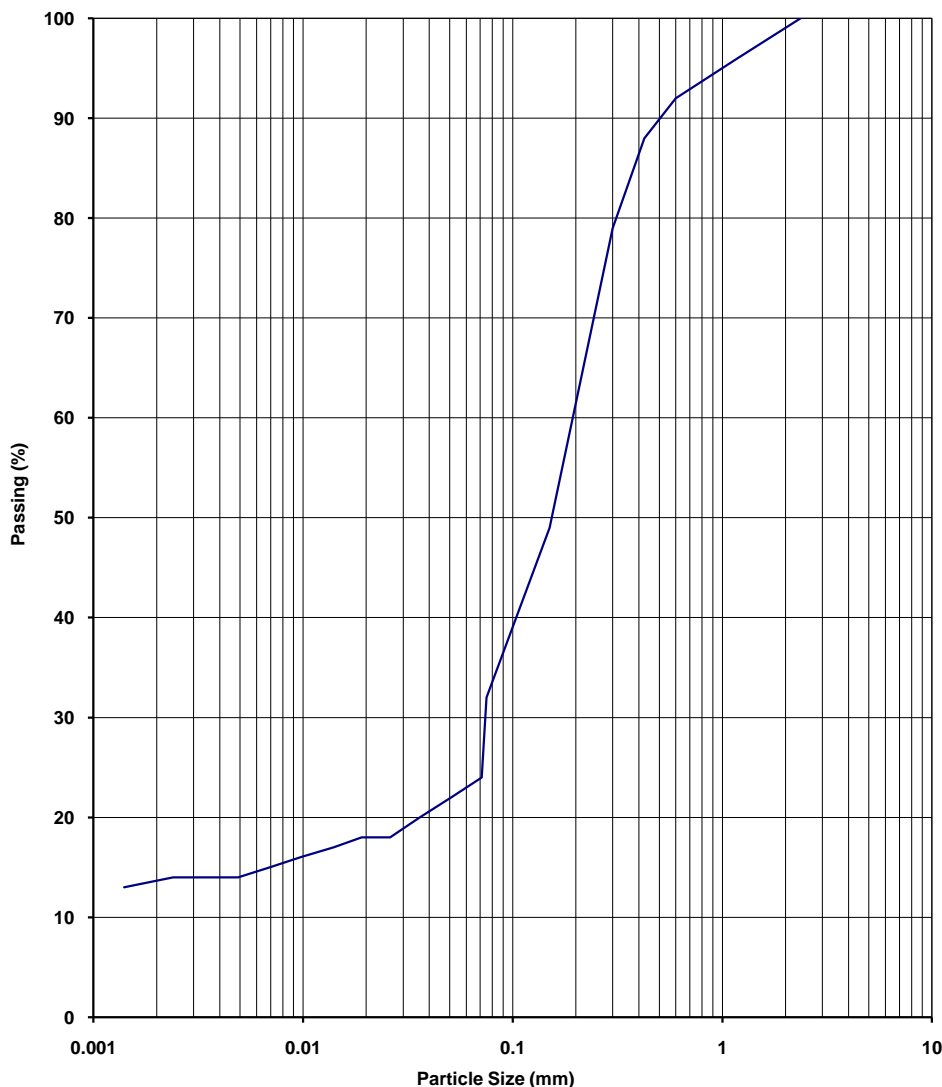
Test Date 18-31/08/2011

Report Date 2/9/2011

Client ID TP46-02

Depth (m) 1.70

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	96
0.600	92
0.425	88
0.300	79
0.150	49
0.075	32
0.071	24
0.051	22
0.036	20
0.026	18
0.019	18
0.014	17
0.0097	16
0.0069	15
0.0049	14
0.004	14
0.0035	14
0.0028	14
0.0024	14
0.0014	13



NOTES/REMARKS:

Moisture Content 16.9%

-2.36mm Soil Particle Density(t/m³) 2.68

Sample/s supplied by the client

Page 1 of 1 REP03901

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080554-G

Project Alpha TSF Geotech

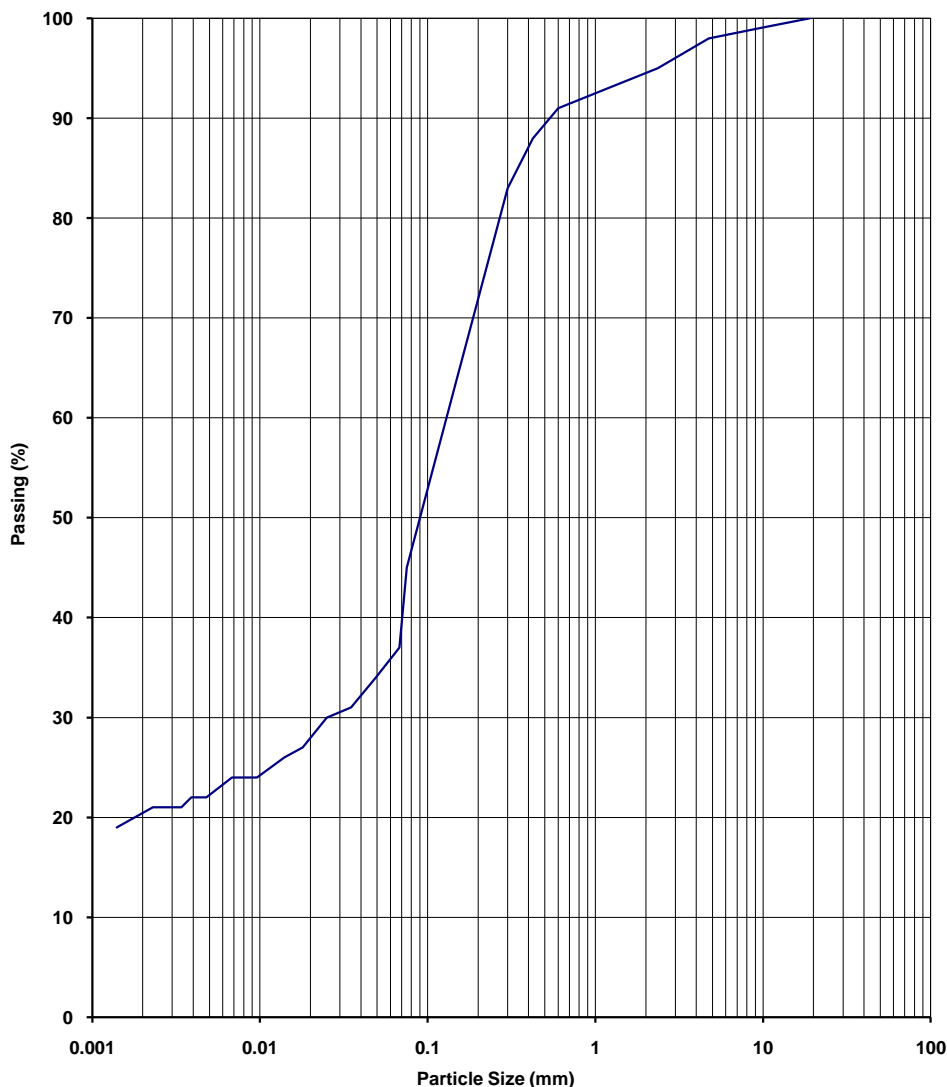
Test Date 22-24/08/2011

Report Date 2/9/2011

Client ID TP47-02

Depth (m) 1.60

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	100
9.5	99
4.75	98
2.36	95
1.18	93
0.600	91
0.425	88
0.300	83
0.150	64
0.075	45
0.068	37
0.049	34
0.035	31
0.025	30
0.018	27
0.014	26
0.0096	24
0.0068	24
0.0048	22
0.0039	22
0.0034	21
0.0027	21
0.0023	21
0.0014	19



NOTES/REMARKS:

Moisture Content 12.4%

-2.36mm Soil Particle Density(t/m^3) 2.65

Sample/s supplied by the client

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11080555-G

Project Alpha TSF Geotech

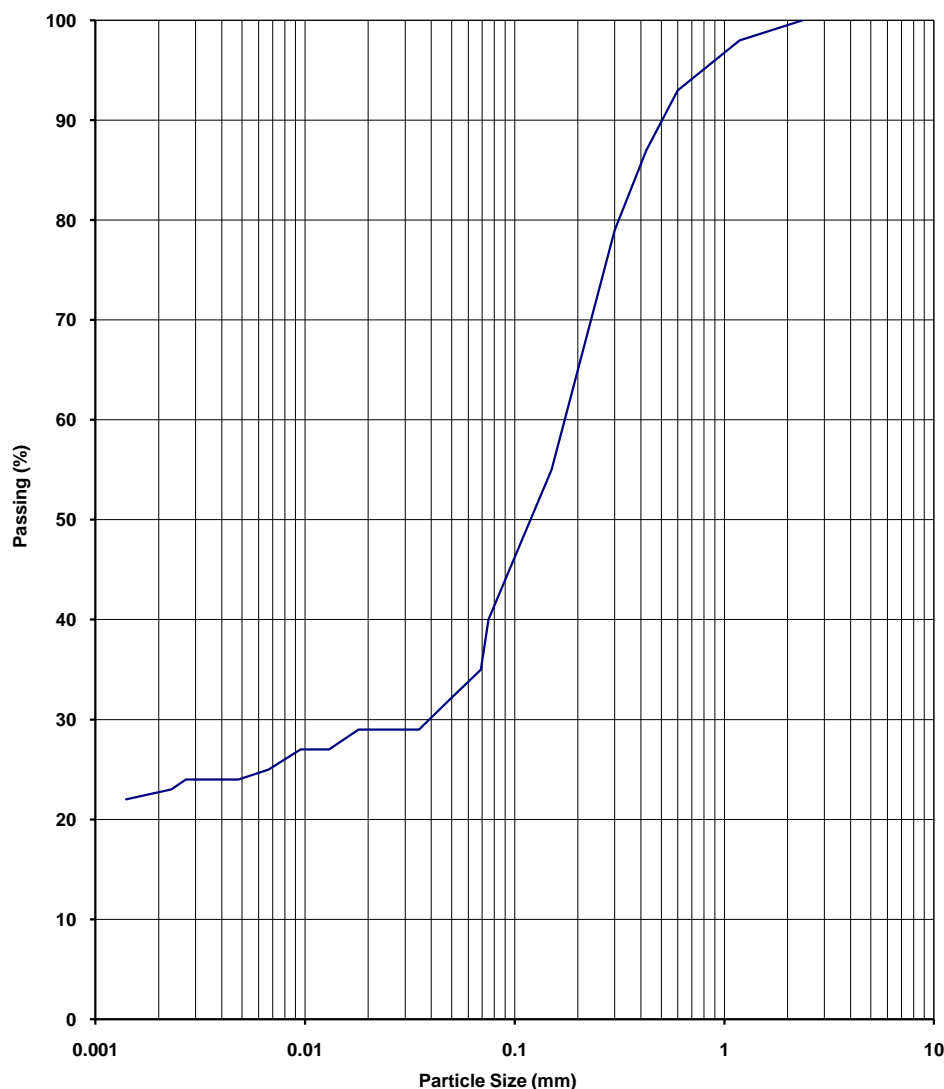
Test Date 19-31/08/2011

Report Date 2/9/2011

Client ID TP51-02

Depth (m) 1.30

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	98
0.600	93
0.425	87
0.300	79
0.150	55
0.075	40
0.069	35
0.049	32
0.035	29
0.025	29
0.018	29
0.013	27
0.0095	27
0.0067	25
0.0048	24
0.0039	24
0.0034	24
0.0027	24
0.0023	23
0.0014	22



NOTES/REMARKS:

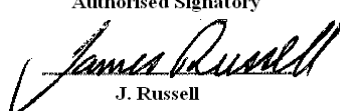
Moisture Content 8.3%

-2.36mm Soil Particle Density(t/m^3) 2.67

Sample/s supplied by the client

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11090045-AL
Project	42626683	Test Date	01/10-06/10/2011
		Report Date	07/10/2011

Sample No.	11090045	11090046	11090047	11090048	11090050	11090051
Client ID	BH01-01	BH01-04	BH01-06	BH01-08	BH01-11	BH01-12
Depth (m)	1.00	6.40	8.50	10.50	13.50	14.50
Liquid Limit (%)	18	90	17	20	18	20
Plastic Limit (%)	10	20	10	13	12	-
Plasticity Index (%)	8	70	7	7	6	-
Linear Shrinkage (%)	2.0*	12.5*+	2.5*	2.5*	4.0	3.5
Field Moisture Content (%)	5.7	23.8	10.4	10.6	11.9	12.3

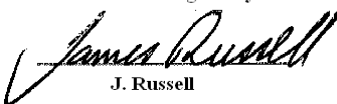
Sample No.	11090052	11090053	11090054	11090055	11090056	11090057
Client ID	BH01-13	BH02-02	BH02-04	BH02-05	BH02-07	BH03-05
Depth (m)	15.50	2.00	4.00	5.00	7.00	5.00
Liquid Limit (%)	19	20	21	25	32	20
Plastic Limit (%)	13	12	-	13	22	11
Plasticity Index (%)	6	8	-	12	10	9
Linear Shrinkage (%)	3.0*	1.0*	1.5	3.0+	6.0	3.0*
Field Moisture Content (%)	12.0	8.1	11.5	8.1	18.6	9.0

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Crumbling occurred + Curling occurred Page 1 of 1 REP00101

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Trilab Pty Ltd ABN 25 065 630 506



PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11090045-G
Project	42626683	Test Date	27/09-06/10/2011
		Report Date	07/10/2011

Sample No.	11090045	11090046	11090047	11090048	11090050	11090052	11090053
Client ID	BH01-01	BH01-04	BH01-06	BH01-08	BH01-11	BH01-13	BH02-02
Depth (m)	1.00	6.40	8.50	10.50	13.50	15.50	2.00
Moisture (%)	5.7	23.8	10.4	10.6	11.9	12.0	8.1
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5		100					
26.5		87					
19		87					
9.5		87					
4.75		87	100	100			
2.36	100	85	97	99	100	100	100
1.18	99	83	91	95	96	98	99
0.600	98	82	86	91	92	96	96
0.425	96	81	83	88	89	95	91
0.300	93	79	78	82	84	92	78
0.150	73	70	64	69	73	80	42
0.075	54	60	42	52	54	56	31

NOTES/REMARKS: -

Sample/s supplied by the client

Page 1 of 1 REP01101

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Authorised Signatory

James Russell
J. Russell



Laboratory No. 9926

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11090049-G

Project 42626683

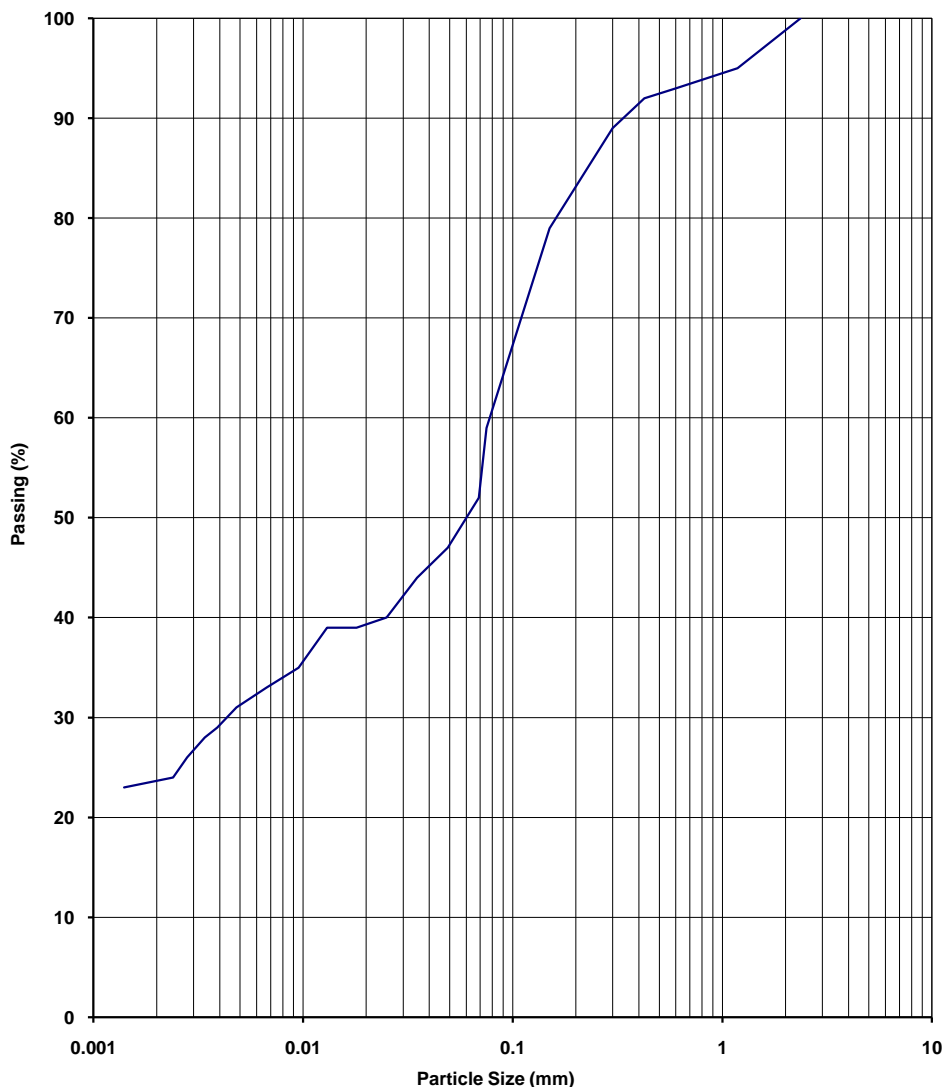
Test Date 7/10/2011

Report Date 10/10/2011

Client ID BH01-10

Depth (m) 12.50

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	95
0.600	93
0.425	92
0.300	89
0.150	79
0.075	59
0.069	52
0.049	47
0.035	44
0.025	40
0.018	39
0.013	39
0.0095	35
0.0067	33
0.0048	31
0.0039	29
0.0034	28
0.0028	26
0.0024	24
0.0014	23



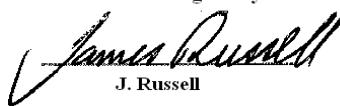
NOTES/REMARKS:

-
Moisture Content 12.1% -2.36mm Soil Particle Density(t/m³) 2.70
Sample/s supplied by the client

Page 1 of 1 REP03901

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11090055-G
Project	42626683	Test Date	27/09-05/10-2011
		Report Date	07/10/2011

Sample No.	11090055	11090056	11090057	11090059	11090060	11090061	11090062
Client ID	BH02-05	BH02-07	BH03-05	BH03-07	BH04-01	BH04-02	BH04-05
Depth (m)	5.00	7.00	5.00	7.00	1.00	2.00	6.00
Moisture (%)	8.1	18.6	9.0	25.6	10.2	7.9	14.6
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5							
26.5	100						
19	93						
9.5	93	100					
4.75	92	99	100				
2.36	89	99	99			100	100
1.18	79	95	99	100	100	99	96
0.600	58	90	98	98	98	96	93
0.425	47	87	97	97	96	94	91
0.300	39	83	91	96	91	85	88
0.150	27	72	64	92	72	55	79
0.075	23	55	48	90	58	35	59

NOTES/REMARKS: -

Sample/s supplied by the client

Page 1 of 1 REP01101

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11090058-AL
Project	42626683	Test Date	28/09-06/10/2011
		Report Date	07/10/2011

Sample No.	11090058	11090059	11090060	11090061	11090062	11090063
Client ID	BH03-06	BH03-07	BH04-01	BH04-02	BH04-05	BH04-09
Depth (m)	6.00	7.00	1.00	2.00	6.00	19.00
Liquid Limit (%)	45	121	31	19	30	33
Plastic Limit (%)	-	25	13	12	20	23
Plasticity Index (%)	-	96	18	7	10	10
Linear Shrinkage (%)	7.5	17.0*+	8.0+	3.0*	5.5	6.5
Field Moisture Content (%)	6.6	25.6	10.2	7.9	14.6	16.6

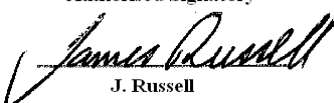
Sample No.	11090064	11090065	11090066	11090067	11090070	11090080
Client ID	BH05-01	BH06-03	BH06-04	BH06-05	BH08-01	BH11-01
Depth (m)	1.00	3.00	4.00	5.00	1.00	1.00
Liquid Limit (%)	25	24	25	24	26	20
Plastic Limit (%)	12	13	14	17	13	15
Plasticity Index (%)	13	11	11	7	13	5
Linear Shrinkage (%)	5.5	4.0*	4.0*	3.0*	5.5+	1.5*
Field Moisture Content (%)	12.4	9.0	14.8	11.1	10.4	10.2

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Crumbling occurred + Curling occurred Page 1 of 1 REP00101

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11090063-G
Project	42626683	Test Date	27/09-06/10/2011
		Report Date	07/10/2011

Sample No.	11090063	11090064	11090065	11090067	11090070	11090080
Client ID	BH04-09	BH05-01	BH06-03	BH06-05	BH08-01	BH11-01
Depth (m)	19.00	1.00	3.00	5.00	1.00	1.00
Moisture (%)	16.6	12.4	9.0	11.1	10.4	10.2
AS SIEVE SIZE (mm)						
150						
75						
53						
37.5						100
26.5						94
19				100		92
9.5			100	99		89
4.75		100	97	97	100	83
2.36		99	95	91	99	72
1.18		97	89	85	96	68
0.600		94	82	81	93	62
0.425		91	77	79	89	57
0.300	100	86	71	77	83	48
0.150	99	66	47	65	65	26
0.075	95	46	32	48	51	16

NOTES/REMARKS:

Page 1 of 1 REP01101

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11090068-AL
Project	42626683	Test Date	12/09/2011
		Report Date	13/09/2011

Sample No.	11090068	11090069	11090071	11090072	11090073	11090074
Client ID	BH07-01	BH07-05	BH09-04	BH09-07	BH09-08	BH10-01
Depth (m)	1.00	6.00	4.00	7.00	8.00	1.00
Liquid Limit (%)	22	31	23	24	22	43
Plastic Limit (%)	10	13	15	13	11	16
Plasticity Index (%)	12	18	8	11	11	27
Linear Shrinkage (%)	5.5	8.0	Insufficient Sample	2.5*	2.0*	11.5+
Field Moisture Content (%)	5.3	8.4	4.3	7.2	6.7	13.5

Sample No.	11090075	11090076	11090077	11090079	11090082	11090083
Client ID	BH10-06	BH10-08	BH10-10	BH10-14	BH13-01	BH13-05
Depth (m)	7.50	10.50	13.50	19.50	1.00	6.00
Liquid Limit (%)	23	46	31	22	40	35
Plastic Limit (%)	13	17	14	12	12	16
Plasticity Index (%)	10	29	17	10	28	19
Linear Shrinkage (%)	4.5	7.0+	8.0	3.5*	11.0	10.0
Field Moisture Content (%)	10.2	21.2	13.7	14.6	10.0	10.9

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client

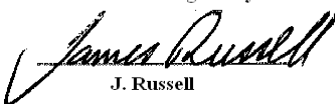
* Crumbling occurred

+ Curling occurred

Page 1 of 1 REP00101

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Trilab Pty Ltd ABN 25 065 630 506



PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11090068-G
Project	42626683	Test Date	08/09-12/09/2011
		Report Date	13/09/2011

Sample No.	11090068	11090069	11090071	11090073	11090074	11090075	11090076
Client ID	BH07-01	BH07-05	BH09-04	BH09-08	BH10-01	BH10-06	BH10-08
Depth (m)	1.00	6.00	4.00	8.00	1.00	7.50	10.50
Moisture (%)	5.3	8.4	4.3	6.7	13.5	10.2	21.2
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5							
26.5							
19							
9.5							
4.75			100	100			
2.36	100	100	98	99	100	100	100
1.18	98	98	96	97	98	98	98
0.600	93	92	95	94	96	95	94
0.425	88	84	94	91	94	91	89
0.300	81	69	92	84	89	85	81
0.150	62	35	73	52	74	62	61
0.075	49	26	46	37	63	43	51

NOTES/REMARKS: -

Sample/s supplied by the client

Page 1 of 1 REP01101

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client URS Australia Pty Ltd

Report No. 11090078-G

Project 42626683

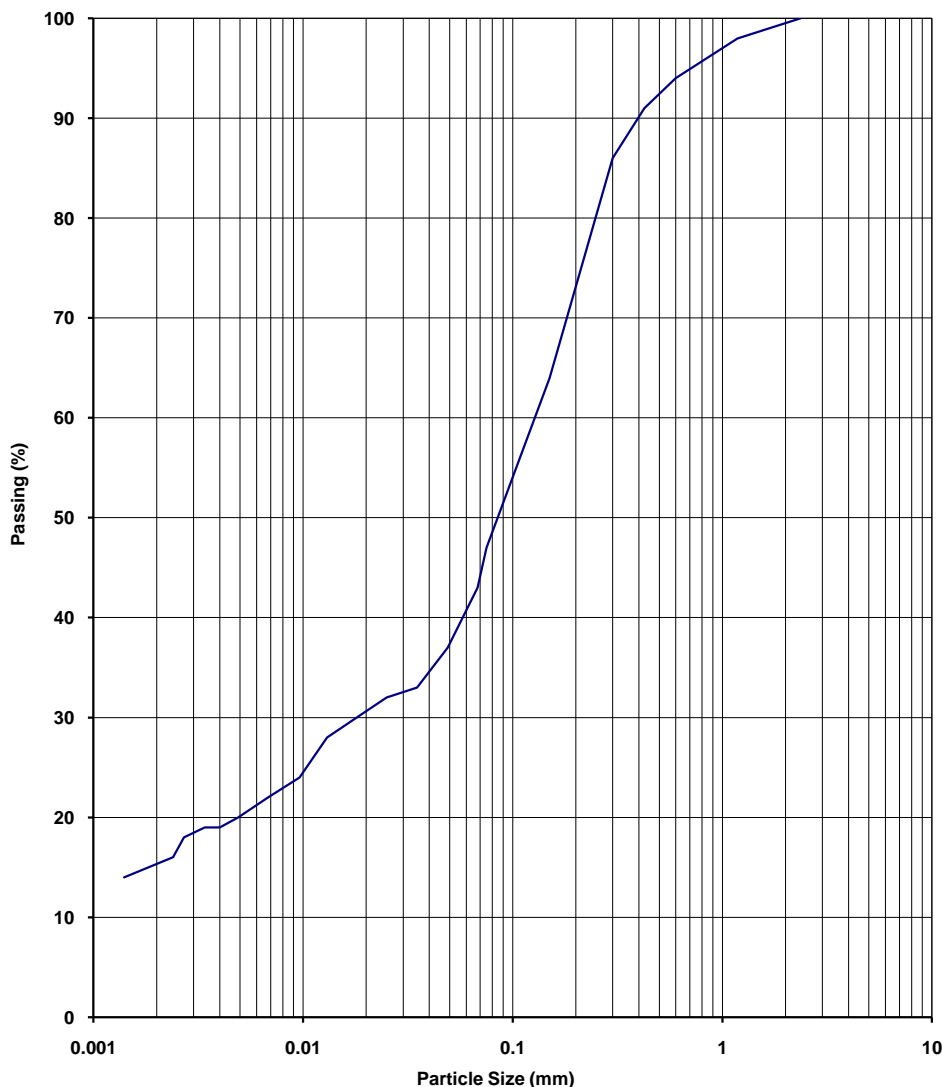
Test Date 05/09-13/09/2011

Report Date 13/9/2011

Client ID BH10-12

Depth (m) 16.50

Sieve Size (mm)	Passing %
150.0	
75.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	98
0.600	94
0.425	91
0.300	86
0.150	64
0.075	47
0.068	43
0.049	37
0.035	33
0.025	32
0.018	30
0.013	28
0.0096	24
0.0068	22
0.0049	20
0.004	19
0.0034	19
0.0027	18
0.0024	16
0.0014	14

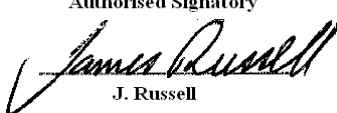


NOTES/REMARKS:

-
Moisture Content 10.1% -2.36mm Soil Particle Density(t/m³) 2.65
Sample/s supplied by the client

Page 1 of 1 REP03901

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11090079-G
Project	42626683	Test Date	08/09-12/09/2011
		Report Date	13/09/2011

Sample No.	11090079	11090082	11090083	11090084	-	-	-
Client ID	BH10-14	BH13-01	BH13-05	BH13-14	-	-	-
Depth (m)	19.50	1.00	6.00	19.50	-	-	-
Moisture (%)	14.6	10.0	10.9	14.8	-	-	-
AS SIEVE SIZE (mm)	PERCENT PASSING						
150					-	-	-
75					-	-	-
53					-	-	-
37.5					-	-	-
26.5					-	-	-
19					-	-	-
9.5					-	-	-
4.75				100	-	-	-
2.36	100	100	100	99	-	-	-
1.18	94	99	99	94	-	-	-
0.600	87	97	96	90	-	-	-
0.425	82	93	93	87	-	-	-
0.300	74	87	87	82	-	-	-
0.150	50	66	69	69	-	-	-
0.075	33	51	55	56	-	-	-

NOTES/REMARKS: -

Sample/s supplied by the client

Page 1 of 1 REP01101

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11090081-AL
Project	42626683	Test Date	29/09-06/10/2011
		Report Date	07/10/2011

Sample No.	11090081	11090085	11090086	11090087	-	-
Client ID	BH12-01	BH14-03	BH14-05	BH14-07	-	-
Depth (m)	1.00	3.00	6.00	9.00	-	-
Liquid Limit (%)	32	16	15	16	-	-
Plastic Limit (%)	13	11	-	12	-	-
Plasticity Index (%)	19	5	-	4	-	-
Linear Shrinkage (%)	7.0*	1.0*	1.5	1.5	-	-
Field Moisture Content (%)	12.6	5.9	22.3	7.9	-	-

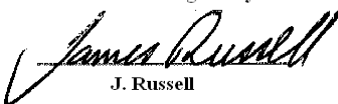
Sample No.	-	-	-	-	-	-
Client ID	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-
Liquid Limit (%)	-	-	-	-	-	-
Plastic Limit (%)	-	-	-	-	-	-
Plasticity Index (%)	-	-	-	-	-	-
Linear Shrinkage (%)	-	-	-	-	-	-
Field Moisture Content (%)	-	-	-	-	-	-

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Crumbling occurred + Curling occurred Page 1 of 1 REP00101

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	URS Australia Pty Ltd	Report No.	11090081-G
Project	42626683	Test Date	27/09-06/10/2011
		Report Date	07/10/2011

Sample No.	11090081	11090085	11090087	-	-	-	-
Client ID	BH12-01	BH14-03	BH14-07	-	-	-	-
Depth (m)	1.00	3.00	9.00	-	-	-	-
Moisture (%)	12.6	5.9	7.9	-	-	-	-
AS SIEVE SIZE (mm)	PERCENT PASSING						
150				-	-	-	-
75				-	-	-	-
53				-	-	-	-
37.5				-	-	-	-
26.5				-	-	-	-
19				-	-	-	-
9.5				-	-	-	-
4.75	100	100		-	-	-	-
2.36	99	98	100	-	-	-	-
1.18	96	97	97	-	-	-	-
0.600	92	95	85	-	-	-	-
0.425	89	93	73	-	-	-	-
0.300	81	87	61	-	-	-	-
0.150	59	54	43	-	-	-	-
0.075	46	35	34	-	-	-	-

NOTES/REMARKS:

Sample/s supplied by the client

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	URS Australia Pty Ltd	Report No.	11090084-AL
Project	42626683	Test Date	12/09/2011
		Report Date	13/09/2011

Sample No.	11090084	-	-	-	-	-
Client ID	BH13-14	-	-	-	-	-
Depth (m)	19.50	-	-	-	-	-
Liquid Limit (%)	31	-	-	-	-	-
Plastic Limit (%)	17	-	-	-	-	-
Plasticity Index (%)	14	-	-	-	-	-
Linear Shrinkage (%)	6.0	-	-	-	-	-
Field Moisture Content (%)	14.8	-	-	-	-	-

Sample No.	-	-	-	-	-	-
Client ID	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-
Liquid Limit (%)	-	-	-	-	-	-
Plastic Limit (%)	-	-	-	-	-	-
Plasticity Index (%)	-	-	-	-	-	-
Linear Shrinkage (%)	-	-	-	-	-	-
Field Moisture Content (%)	-	-	-	-	-	-

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Crumbling occurred + Curling occurred Page 1 of 1 REP00101

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Trilab Pty Ltd ABN 25 065 630 506

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS1289 4133.4.2.1


Client URS Australia Pty Ltd

Report No. 11090088-UCS

Project 42626683

Test Date 5/10/2011

Report Date 6/10/2011

Sample No.	11090088
Client ID	BH04-Run01
Depth (m)	12.25-12.40
Description	-
Wet Density (t/m ³)	2.08
Moisture Content (%)	1.9
Specimen Length (mm)	119.6
Specimen Diameter (mm)	44.4
Mode of Failure	Shear
Test Duration (Min:Sec)	6:32
	
UCS (MPa)	15.8

NOTES/REMARKS: -

Stored and tested as received

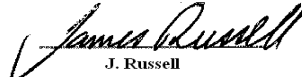
Sample/s supplied by the client

Test Apparatus - ZheJiang Tugong 100 kN Compression Machine

Photo not to scale

Page: 1 of 1 REP02701

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Authorised Signatory

J. Russell



Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.

Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.

Trilab Pty Ltd

ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS1289 4133.4.2.1


Client URS Australia Pty Ltd

Report No. 11090089-UCS

Project 42626683

Test Date 5/10/2011

Report Date 6/10/2011

Sample No.	11090089
Client ID	BH07-Run04
Depth (m)	13.90-14.04
Description	-
Wet Density (t/m ³)	2.07
Moisture Content (%)	3.0
Specimen Length (mm)	122.8
Specimen Diameter (mm)	44.0
Mode of Failure	End Failure
Test Duration (Min:Sec)	2:57
	
UCS (MPa)	4.80

NOTES/REMARKS: -

Stored and tested as received


Sample/s supplied by the client

Test Apparatus - ZheJiang Tugong 100 kN Compression Machine

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS1289 4133.4.2.1

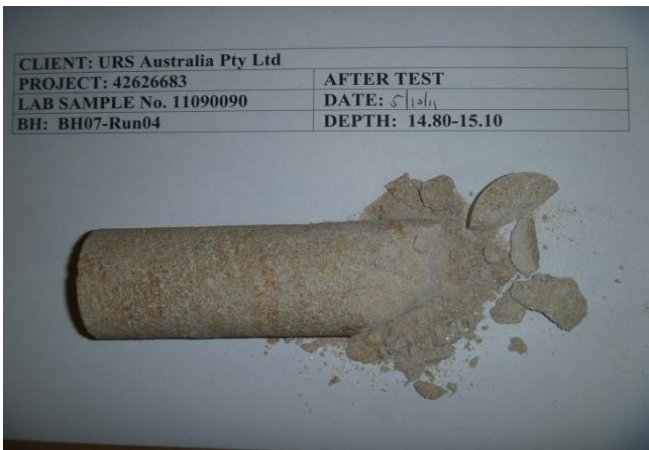
Client URS Australia Pty Ltd

Report No. 11090090-UCS

Project 42626683

Test Date 5/10/2011

Report Date 6/10/2011

Sample No.	11090090
Client ID	BH07-Run04
Depth (m)	14.90-15.05
Description	-
Wet Density (t/m ³)	2.09
Moisture Content (%)	5.2
Specimen Length (mm)	129.2
Specimen Diameter (mm)	43.6
Mode of Failure	End Failure
Test Duration (Min:Sec)	4:34
	
UCS (MPa)	5.22

NOTES/REMARKS: -

Stored and tested as received


Sample/s supplied by the client

Test Apparatus - ZheJiang Tugong 100 kN Compression Machine

Photo not to scale

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING



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