HANCOCK GALILEE PTY LTD

Kevin's Corner Project Environmental Impact Statement

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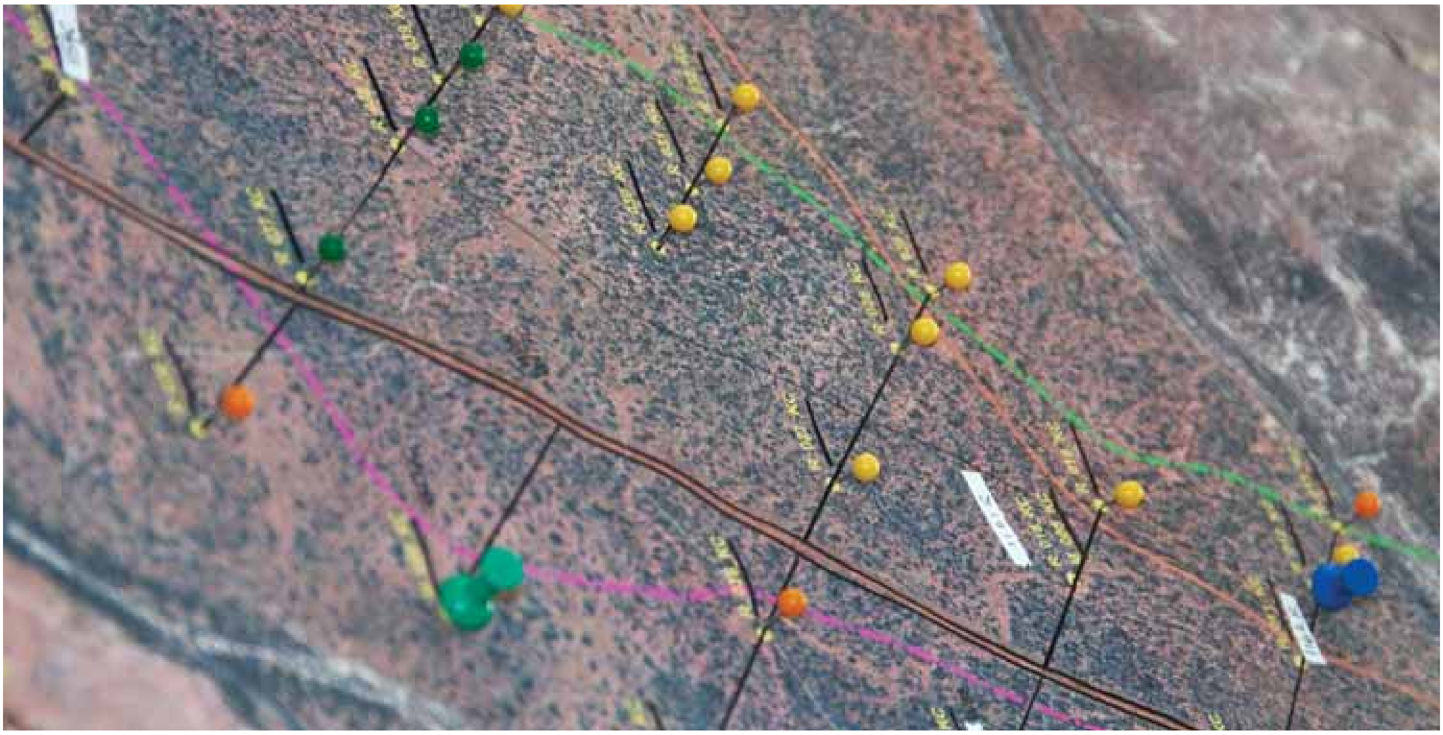

Q1 Geochemical Report

Q2 Tailings Storage Facility Report

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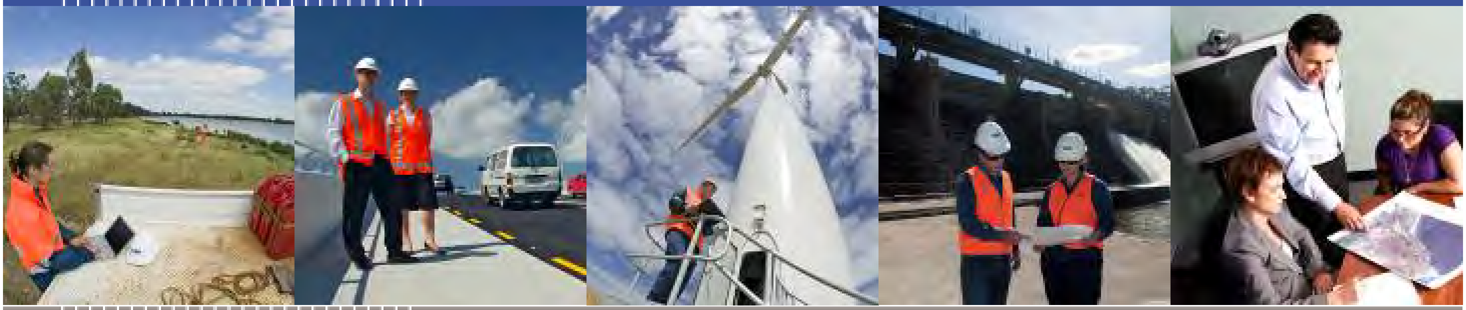

Report

Kevin's Corner Tailings Storage Facility - Concept Design Report

4 APRIL 2011

Prepared for

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Abbreviations

Abbreviation	Description
EPTSF	Ex-Pit Tailings Storage Facility
IPTSF	In-Pit Tailings Storage Facility
EIS	Environmental Impact Statement

Introduction

1.1 Overview of the Project

Hancock Galilee Pty Ltd (HGPL), the Proponent, proposes to establish a new 30 million tonnes per annum (Mtpa) capacity combined open-cut and underground coal mine in the Galilee basin, Central Queensland. The Kevin’s Corner Coal Mine Project (the Project) will primarily serve international export energy markets for thermal coal. The project site is located approximately 65 km north of the township of Alpha; 110 km south-west of the township of Clermont and approximately 340 km south-west of Mackay.

1.2 Purpose of This Document

This concept design report for the proposed tailings management strategy at the Project site has been prepared as part of the documentation for the Kevin’s Corner Environmental Impact Statement (EIS). The scope of this document is to demonstrate the concept design philosophy behind the preferred tailings management strategy. In accordance with the EIS requirements, the document describes associated risks and how they will be controlled or mitigated. This report is not a detailed design document. Further work will be carried out in subsequent phases of the project to further develop the solutions proposed.

Tailings Schedule and Characterisation

2.1 Schedule

Preliminary design information[1] shows that for every 100 tonnes (t) of run-of-mine (ROM) coal, the coal handling and preparation plant (CHPP) will on average produce approximately 75 t of product coal, 17 t of coarse rejects and 8 t of tailings. At 35 Mtpa of ROM feed this equates to approximately 2.8 Mtpa of tailings. However current planning shows that mining operations will be ramped up over the initial 5 years of the mine life with a total ROM feed of the order of 152.4 million tonnes[2] (Mt) over the initial 7 year period. This equates to 12.2 Mt of tailings over the first 7 years of mine operation. Assuming a dry density of tailings solids of 0.8 tonnes per cubic meter (t/m^3) (which could be considered at the lower end for coal tailings) the volume of tailings stored in the TSF over the initial seven year period will be approximately 16 million cubic meters (m^3). This is presented in the calculation below:

<u>Calculation</u>

ROM Feed (total for 7 years)	=	152.4 Mt	(Table 2-2 of Section 2.5.1. of EIS)
Percentage of Tailings	=	8%	(Table 16-6, Section 16.13.1 of EIS)
Solids tonnage to TSF	=	12.2 Mt	[0.08 x 152.4 = 12.2]
Dry density of solids	=	0.8 tonnes/m^3	[assumed by URS]
Volume to TSF for 7 years	=	15.3 million m^3	[12.2/0.8 = 15.3]
Goal for 7 years	**=**	**16 million m^3**	[approximate, rounded]

2.2 Characterisation

2.2.1 Physical

Detailed physical characterisation of tailings samples (particularly particle size) is currently being carried out by the proponent. The laboratory testing program consists of the following:

- Particle Size Distribution (AS 1289 3.6.3/ 3.5.1)
- Atterberg Limits (AS 1289 2.1.1/ 3.1.1/ 3.1.2/ 3.2.1/ 3.3.1/ 3.4.1)
- Moisture Content (AS 1289 5.1.1)
- Emerson Dispersion (AS 1289 3.8.1)

Based on the results of one sample tested (see table below), the tailings are classified as Silty Sand (SM) under the Unified Soil Classification System (USCS). It is anticipated that the physical characteristics of the tailings will vary over the life of the mine depending on the quality of the coal extracted from the mine. However, it is expected that tailings will typically consist of varying proportions of fine sand, silt and clay particles.

[1] Section 16.13.1 of Kevin's Corner EIS
[2] Table 2-2, Section 2.5.1 of Kevin's Corner EIS

Table 2-1 Kevin's Corner Tailings Physical Characterisation Tests Results[3]

Sample ID	Sample #	% Fines	LL	PL	PI	Emerson Class	Description	USCS Class
D Seam DH 1492L	11020808	34	Not Obtainable	Not Obtainable	Non Plastic	4	Silty Sand	SM

2.2.2 Geochemical

Detailed chemical characterisation of tailings samples is currently underway. Geochemical test results[4] available at the time of writing indicate that some tailings may have a low capacity to generate acid. Additional samples are being tested to confirm the acid production potential of the tailings. Detailed results of the geochemical test program for the Project's tailings materials are provided in the pertinent technical report[5].

Two tailings samples from three drill holes have been tested in the static and kinetic geochemical test program, with a further three in preparation at the coal quality laboratory. The two samples are sourced from the D coal seam, which comprises approximately 93% of the total coal produced from both open pit and underground operations (and therefore most of the tailings produced) over the life of mine. These geochemical results were supplemented by existing data from the Alpha Coal Project where 17 tailings samples from 10 drill holes (derived from the C and D coal seams) were subjected to geochemical tests. It is to be noted that the chemical characteristics of the tailings will also depend on possible variations in raw coal, processing methods and potential reactions upon exposure to water and/or air.

Table 2-2 Kevin's Corner Geochemical Characterisation Tests Results[6]

Sample ID	ANC as H_2SO_4 (kg H_2SO_4 equiv./t)	ANC as $CaCO_3$ (% $CaCO_3$)	Net Acid Production Potential (kg H_2SO_4/t)
EB1023365	6.2	0.6	11.8
EB1103269	4.9	0.5	8.07

[3] Additional samples were being tested at the time of this writing
[4] Sample ID EB1023365, EB1103269
[5] Volume 2, Appendix Q1
[6] Additional samples were being tested at the time of this writing

Tailings Management

3.1 Proposed Approach

In the short-term tailings from the Coal Handling and Processing Plant (CHPP) will report to a purpose-built TSF while the Northern Open Cut pit is being operated. Once mining operations cease within this pit (expected duration of between five and seven years) mining operations will be limited to the Central Openpit and Underground operations only, while the Northern Open Cut pit void will be available to store tailings for the remaining life of the project. Further engineering assessment of both the TSF and in-pit tailings disposal will be undertaken. The Proponent has identified a number of above ground TSF sites that could be used as potential back up tailings disposal areas, should they be required. Design concepts for the initial surface TSF structure and subsequent in-pit TSF have been developed and discussed in subsequent sections of this report.

3.2 Options Considered

In developing the preferred tailings management strategy for the Project, several options were considered based on the project scale, mine footprint, local geological, environmental and meteorological conditions and advantages and disadvantages associated with each option. The use of a conventional tailings dam for an initial five to seven year period followed by disposal to the Northern Open Cut Pit was selected after consideration of the options described below.

- Conventional thickener/tailings dam;
- Co-disposal;
- Thickened tailings disposal, including super flocculation and paste disposal;
- Dry tailings; and
- In-pit disposal.

3.2.1 Conventional Thickener/Tailings Storage Facility

It is proposed to pump the tailings slurry to the tailings storage facility (TSF) at approximately 30% solids. Solids will settle and the tailings water will be decanted for reuse at the CHPP. Advantages and disadvantages of this methodology are given below.

Advantages:

1. Proven outcome methodology;
2. Ease of operation;
3. Recycling of decant water; and
4. Comparatively lower capital and operating costs.

Disadvantages:

1. Lower recycle water potential when compared to other options;
2. Potential for dam seepage is greater than other options with higher percentage solids disposal; and
3. Potential for delayed rehabilitation due to extended dewatering time. However, this is to be managed through the use of perimeter spigotted tailings beaching and a central decant pond to promote early rehabilitation.

3.2.2 Co-disposal

This method involves pumping a mixture of tailings and coarse reject to a co-disposal dam at about 40 to 45% solids. The discard is spigotted into the dam at variable locations, with water being decanted into a downstream dam for subsequent recycling at the CHPP. The main disadvantages are:

1. Larger storage size to cater for the volumes of both coarse reject and tailings;
2. Co-disposal emplacements need to be close to the CHPP due to pumping limitations;
3. Dust issues on the large impoundment areas; and
4. High electrical power consumption.

The co-disposal option generally requires large storage volume, highest for pumping and increase in dust. The lack of available space near the CHPP also makes co-disposal relatively less sustainable when compared to the proven strategies of a conventional TSF.

3.2.3 Thickened Tailings Disposal

This process involves the further thickening of tailings up to about 45% to 60% solids. This can potentially be achieved by thickening cones and/or super flocculation. The main disadvantages are:

Paste thickening

1. The paste is verging on thixotropic, requiring positive displacement pumps working at pressure;
2. Rehabilitation is more difficult as the paste is difficult to further dewater; this poses problems for the final rehabilitation of the proposed mine; and
3. Paste thickening of coal tailings is difficult because of the comparatively low specific gravity of the tailings material. Applications are normally utilising higher specific gravity tailings, e.g. bauxite or iron ore. Paste thickening of coal tailings is therefore uncommon. However, paste thickening will be explored as a potential disposal option (possibly underground voids) if deemed feasible in future.

Super flocculation

1. Rehabilitation is more difficult as the thickened tailings is difficult to further dewater;
2. Effectiveness is tailings specific and dependent on material type, therefore unproven without significant testing of the tailings in the future; and
3. A very high flocculent consumption that requires transporting to site by road, increasing the impact on the surrounding environment.

3.2.4 Dry tailings

This method involves the drying of the tailings (approximately 35% moisture) using filters (belt press, plate and frame or similar). The dry tailings are then mixed (on a conveyor) with coarse reject and the resultant mixture is conveyed to a pad outside the CHPP. The reject is then conveyed or trucked to a disposal site. The main disadvantages are:

1. Loading and trucking of the combined dry reject can be operationally difficult (with significant spillage) due to poor (high moisture) performance of the filters;
2. Higher than planned moisture contents have the potential to cause handling problems (including slumping) at the disposal site;
3. Dams have to be constructed to handle runoff/seepage at the disposal site, increasing the project disturbance area; and.

3.2.5 In-pit disposal

This method uses a combination of a conventional tailings storage facility to cater for tailings produced early in the mine life, with a shift to disposal in exhausted mine pit voids once the mining schedule permits.

Advantages:

1. A smaller requirement for tailings to be stored above ground in dam structures, leading to possible capital expenditure savings;
2. Better surface area to volume ratio;
3. Increased depth of TSF will help to extract the water particularly from tailings stored at depth;
4. Due to the smaller dam size - less long term environmental legacy risks concerning the longevity of the rehabilitated storage structure;
5. Less land taken and disturbed for the TSF footprint;
6. Availability of cap material from adjacent overburden emplacement areas;
7. All other advantages of ‘conventional thickener/tailings dam’.

Disadvantages:

1. Mine plan and schedule needs to accommodate accordingly; and
2. All other disadvantages per the ‘conventional thickener/tailings dam’ point.

3.3 Key Risks

Based on existing knowledge and discussions with stakeholders, the following key risks associated with ex-pit tailings storage have been identified and considered as part of the EPTSF concept design.

1. **Seepage:** Risk of tailings liquor seeping into groundwater and potentially impacting local water resources. Risk of formation of a groundwater mound under the tailings storage facility.
2. **Instability:** Risk of failure of embankment resulting in release of tailings and/or tailings liquor into the surrounding environment.

3. **Overtopping:** Risk of release of tailings liquor into the local environmental due to insufficient capacity of the pond resulting in overtopping.
4. **Erosion:** Risk of erosion of slopes of the embankment and/or final cover due to surface water runoff and wind effects. Changes to local soil and/or water quality and/or exposure of tailings to atmosphere due to erosion.
5. **Dust:** Effect of dust generated from tailings on local air quality.
6. **Fauna:** Risk of local fauna mortality due to potentially acidic water stored in open pond.
7. **Final Landform**: Risk to the integrity of final landform and/or final cover resulting in exposure of tailings to atmosphere.

Ex-pit Tailings Storage Facility Siting Study

4.1 Possible Ex-Pit TSF Sites

URS engineers visited the Project site on 11 November, 2010. During the site visit, URS personnel visited two potential sites for ex-pit tailings storage facility (EPTSF). Salva Resources Pty Ltd (Salva) facilitated the visit by providing an escort to the URS personnel while on site. The main purpose of the visit was to assess the general site conditions. The first potential EPTSF site visited by URS personnel (Site 1 in Figure 4-1) can be described as relatively flat, sparsely vegetated and with sandy clay surface soils. The second potential EPTSF site (Site 2 in Figure 4-1) can be described as gently rolling hills, thickly vegetated, with surface sandy soils within the creek bed with intermittent weathered sandstone bedrock outcrops and sandy to clayey top soils outside the creek. In identifying the possible EPTSF sites, URS considered several site constraints such as property boundary, topography, flood plain, mine infrastructure, mining schedule and aquifer to the east of Lagoon Creek. Based on the information available at the time of this study, URS identified nine (9) possible EPTSF sites (see Figure 4-1) for further evaluation. Site 4 was removed from the list due to its location (portions outside MLA).

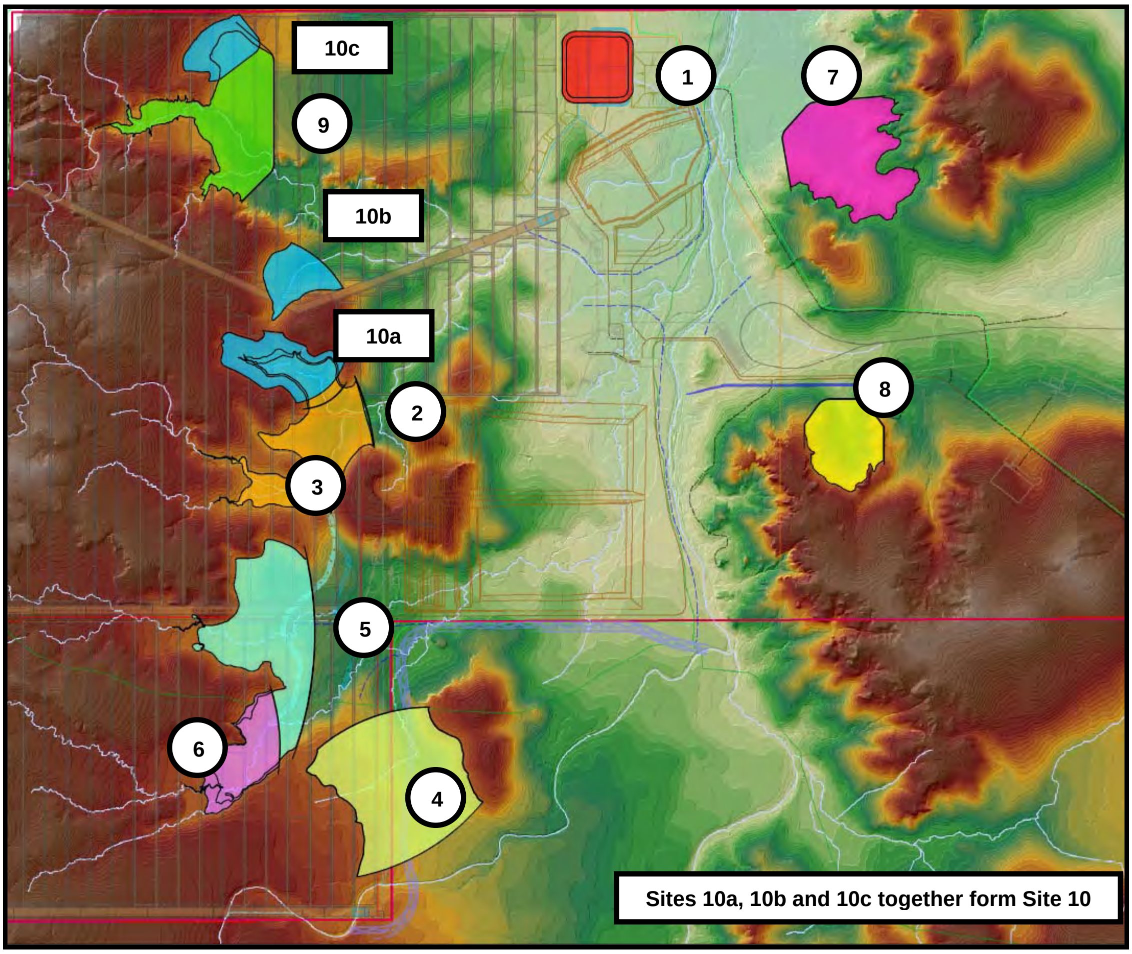


Figure 4-1 Locations of Possible TSF Sites Considered During Siting Study

4.2 Embankment Section

For the purpose of the siting study, URS developed a simple embankment cross section (see Figure 4-2). The objective was to apply the embankment cross section to all nine (9) selected EPTSF sites and calculate available storage at each site. For the purpose of preliminary calculations, URS assumed a relatively flat (1%) beach slope for tailings and a tailings storage level 2m below the embankment crest level as a nominal provision for the design storage allowance and spillway design flows.

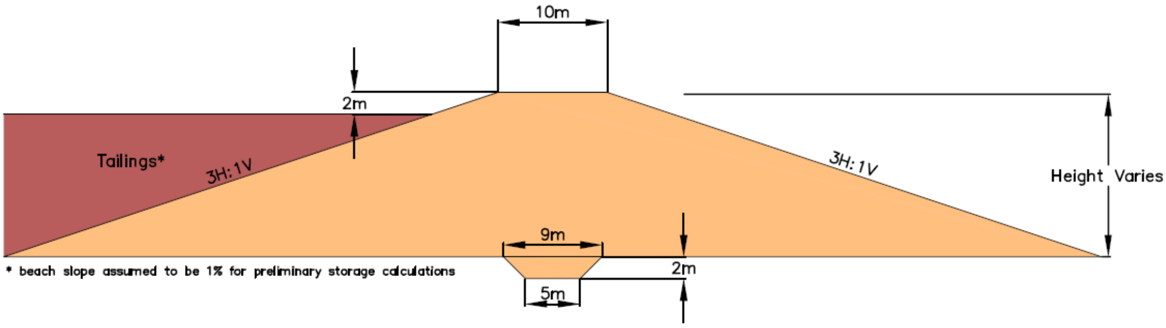


Figure 4-2 Embankment Cross Section Assumed for Siting Study

4.3 Initial Screening

Upon screening the possible EPTSF sites against various criteria, Site 1 and Site 10 (consisting of Sites 10a, 10b and 10c) were chosen as preferred sites for the Kevin's Corner EPTSF. The results of the screening are presented in the table below.

Table 4-1 Results of Initial Screening of Possible TSF Sites

Site #	Meets Minimum Storage Volume	Within Property Boundary	Outside PMF Floodplain	Exclude/Include the Site in Further Studies	Reasoning
1	Yes	Yes	Yes	Include	Original PFS TSF site. Include in Phase 2 for further evaluation.
2	No	Yes	Yes	Exclude	Does not meet minimum storage requirement
3	Yes	Yes	Yes	Exclude	Water diversion interferes with property boundary
4	Yes	No	Yes	Exclude	Footprint interferes with Kevin's Corner property boundary
5	Yes	Yes	Yes	Exclude	Relatively vast footprint, high embankment volume.
6	No	Yes	Yes	Exclude	Does not meet minimum storage requirement
7	Yes	Yes	No	Exclude	Possible interference with the Lagoon creek flood plain
8	Yes	Yes	Yes	Exclude	High embankment volume
9	Yes	Yes	Yes	Exclude	Clean water diversion interferes with the footprint. Large catchment areas.
10a 10b 10c	Yes	Yes	Yes	Include	Three sites together offer potential significant storage volume. Further evaluation warranted.

4.4 Field Investigation

The subsurface conditions within the EPTSF impoundment were investigated by excavating test pits and drilling boreholes into the foundation. The locations of the test pits and boreholes are presented in Drawing 001, Appendix A. These preliminary investigations were performed to assess geotechnical conditions and identify potential borrow materials.

Table 4-2 Number of Test Pits and Boreholes for TSF Siting Study

Site	# of Test Pits	# of Boreholes
1	6	3
10a	5	0
10b	5	0
10c	6	0

4.5 Test Pit Excavations

The test pits were excavated using a CAT 325CL excavator, and logged and photographed by a URS field engineer. Test pits were excavated to the near refusal limit with an average depth of 2.6 m. Bulk samples of native soils were collected from a select set of test pits. The test pit logs are presented in Appendix B. A summary of test pit locations and terminated depths is presented in the Table 4.3.

Table 4-3 Summary of Test Pits Excavated At Possible TSF Sites

Site	Test Pit ID	Total Depth (m)
1	1101	4.7*
	1102	3.0*
	1103	5.2*
	1104	3.3*
	1105	3.1*
	1106	2.1*
10a	A101	2.5*
	A102	2.4*
	A103	2.3*
	A104	3.6*
	A105	3.0*
10b	B101	2.1*
	B102	1.2*
	B103	3.0*
	B105	2.9*
	B106	2.2
10c	C101	2.9
	C102	2.7
	C103	2.7*
	C104	1.7
	C105	4.3
	C106	1.9

*- indicates excavator refusal

4.6 Borehole Drilling

The boreholes were excavated using a Hydropower Scout drill rig, and logged and photographed by a URS field engineer. Boreholes were drilled to an average depth of 14 m below ground surface. Standard Penetration Test (SPT) samples and bedrock core samples were obtained from the boreholes. The borehole logs are presented in Appendix B. A summary of the borehole locations and termination depths is presented in the Table 4-4.

Table 4-4 Summary of Boreholes Drilled at TSF Site 1

Site	Borehole ID	Total Depth (m)
1	1101	15.0
	1102	15.2
	1103	11.2

4.7 In-Situ Permeability Testing

Packer tests were conducted in boreholes 1101 and 1103 to measure in situ permeability. The results of permeability testing are presented in Appendix C. List of permeability tests and test intervals are presented in the table below.

Table 4-5 Summary of In-Situ Permeability Tests Performed at TSF Site 1

Site	Borehole ID	Test Interval (m)
1	1101	12.9 to 15.0
	1103	7.2 to 11.2

4.8 Preferred EPTSF Site

Following the geotechnical exploration, Site 1 (located north of the Northern Open cut pit) was chosen as the preferred EPTSF location (see Figure 4-6). Site 10 (consisting of three separate sites – 10a, 10b and 10c) was chosen as a backup option for future above ground tailings storage (if required). Advantages of Site 1 include:

- Not located above the Colinlea Sandstone Aquifer.
- Located above the PMF level.
- Underlain by naturally occurring low permeability clays that provide a base for the EPTSF to minimise seepage and are suitable to construct the perimeter TSF embankment.
- Close proximity to the CHPP and with minimal impact on other mine infrastructure.
-

4 Ex-pit Tailings Storage Facility Siting Study

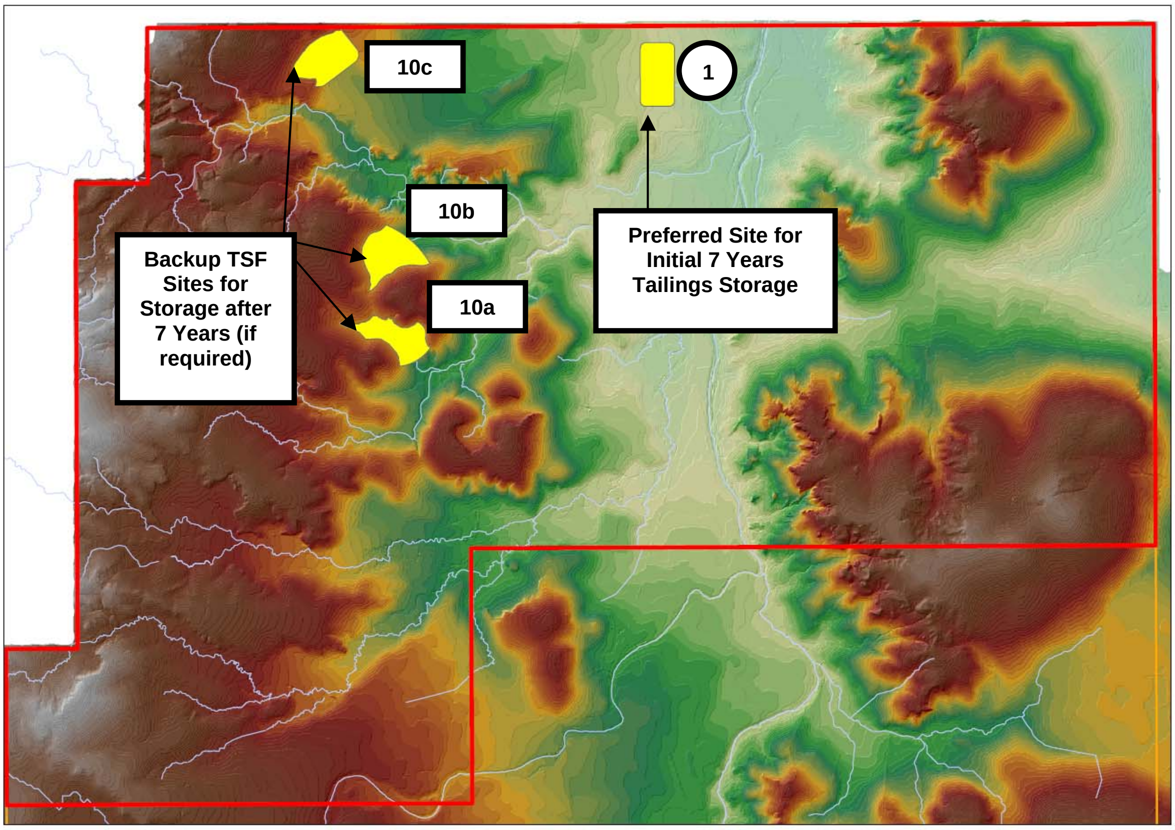


Figure 4-6 Kevin's Corner Preferred TSF Site

Ex-Pit TSF Concept Design

5.1 Site 1 Characterisation

Site 1 is a relatively flat area with sparse vegetation (see Figure 5-1). The subsurface exploration at Site 1 consisted of three (3) boreholes and six (6) test pits (see figure below).

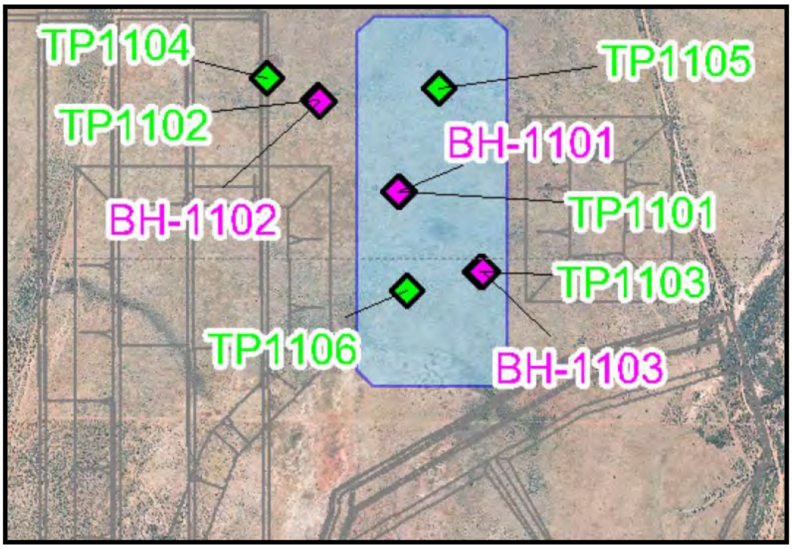


Figure 5-1 EPTSF Site 1 Boreholes and Test Pit Locations

Based on the preliminary geotechnical investigation carried out in February 2011, the subsurface conditions at Site 1 generally consist of stiff to very stiff clayey soils with intermittent sand layers. A thin layer of sandy soil (ranging in thickness from 0.6m to 1.7m) was encountered in all of the test pits and boreholes except BH1102 and TP1102 (located outside the proposed footprint of EPTSF) where the thickness of the top sand layer was considerably higher (9.1m and 3m respectively). List of sand layer thicknesses found at EPTSF Site 1 is presented below.

Location	Top Sand Layer Thickness
BH1101	1.7m
BH1102	9.5m
BH1103	0.8m
TP1101	1.4m
TP1102	3.0m
TP1103	0.8m
TP1104	0.6m
TP1105	0.6m
TP1106	0.9m

Based on the information available from the subsurface exploration, it is anticipated that the considerably high sand layer thickness encountered in BH1102 and TP1102 is a localised subsurface condition. However, additional drilling and/or test pits will be required during final design stages to verify its thickness within the footprint of the dam. Within the footprint of the dam, the top sand layer average thickness was 1m. If the current estimates hold, the sand layer will be stripped away within the footprint of the dam prior to construction to provide low permeability clays as foundation materials.

Residual soils were in general 6 to 11 m in thickness (inside the proposed EPTSF footprint) underlain by sandstone, mudstone and saprolite conglomerates. The location of the proposed EPTSF is interpreted to be on Cainozoic saprolite and laterite, approximately 30 m above the C-D sandstone subcrop. The mean elevation of the ground surface at the site is RL 295 m. Based on the available information[7], the pre-mining ground water table is estimated to be at approximately 280 m RL (approximately 15 meters below ground surface).

Figure 5-2 Photo of TSF Site 1 (Taken on 11-11-2010)

5.2 Ex-Pit TSF Embankment Design Concept

The proposed EPTSF will comprise a perimeter earthfill embankment constructed as a "Turkey's Nest" structure with a rectangular shape and 3H:1V side slopes. Based on the preliminary tailings schedule and a target storage life of seven years, the embankment is expected to be approximately 17 m in height with a footprint of approximately 164 hectares (ha). The full capacity of the EPTSF is estimated to be approximately 16,000 ML. For the purpose of the EIS, the EPTSF is assumed to be constructed as a single stage earthfill embankment constructed to full height (seven year capacity for tailings storage). Staged construction of the storage will be considered during subsequent design development. This could comprise an initial starter embankment with a life of the order of two years with subsequent raises of the embankment to provide additional storage.

[7] Groundwater Investigations Report, Kevin's Corner Project, Prepared by JBT Consulting, May, 2010

5.3 Hazard Classification

Under the *Manual for Assessing Hazardous Categories and Hydraulic Performance of Dams Version 1.1*: (DERM 18 June 2009, Draft) (Manual for Dams v1.1), the hazard category of a dam can be based on a number of factors, including height, contaminant concentration, and the potential for environmental harm caused as a result of failure to contain and dam break. These factors are applied to the proposed Kevin's Corner EPTSF in the following sections.

5.3.1 Hazard Category Based on Height

A dam is considered to be regulated if it incorporates a man-made embankment and the height of that embankment is greater than 8 meters as measured between the crest and the lowest point of the downstream embankment toe. The proposed Kevins Corner TSF embankment will have a constructed maximum embankment height of 17 meters. Hence, the dam will be assessed as a **significant** hazard regulated dam based on height.

5.3.2 Hazard Category Based on Contaminant Concentrations and Minimum Volume

A dam is considered to be a regulated dam if it is likely to contain contaminants outside set concentrations or pH limits at any time when the volume contained within the dam is greater than 50 percent of the dam crest volume, and the dam has a crest volume greater than a certain amount (see Table 3 of the Manual for Dams v1.1, 18 June 2009).

No site specific water quality data is available from the Kevin's Corner site. However limited geochemical testing has been undertaken on sample tailings. The geochemical testing results generally indicate that the contaminant characteristics:

1. Have an average pH of 6.4 which is within the acceptable range of pH 5 to 9.
2. Have a maximum estimated conductivity (salinity) of 356µs/cm, which is less than the acceptable limit of 4,000 µs/cm.

These test results have been for tailings material only, and do not necessarily reflect the likely liquor contaminant concentrations in the EPTSF dam. It is expected that conductivity and contaminant concentration levels will increase and overall water quality will decrease after processing and water reuse.

Given the current lack of site specific data and unknown water quality, the Kevin's Corner EPTSF is assumed as **significant** hazard based on contaminant concentration due to the likelihood of increased water quality degradation over time. This hazard assessment may need revision at a future stage when more detail is known.

5.3.3 Hazard Category Based on Failure to Contain

The following assessment provides a description of the categories that require consideration for the failure to contain hazard classification. These are summarised as likely harm to the general environment, humans, stock and economy, as a result of failure to contain (undertaken in accordance with the definitions of harm provided in Table 1 of the Manual for Dams v1.1, 18 June 2009).

The following Categories have been assumed based on the initial level of analysis for the TSF:

- General Environment –Rating = High.
- Loss or harm to humans –Rating = Significant.
- Loss of stock – Rating = Low.
- General economic loss –Rating = Low.

These categories will require further confirmation in the next phase of the EPTSF design, however based on failure to contain it is assumed the EPTSF has a high hazard category.

5.3.4 Hazard Category Based on Dam Break

The proposed location for the Kevin's Corner EPTSF Dam (Site 1) is in the north central portion of the mine lease area (MLA70425). The local terrain is flat to undulating and consists of open grassed and sparsely wooded plains used for cattle grazing. Sandy Creek runs south to north approximately 1.5km to the east of the proposed TSF dam near the unsealed Jericho-Degulla road. The nearest dwelling is the Forrester Homestead located approximately 6km to the north.

The Kevin's Corner EPTSF Dam is considered a regulated dam based on contaminant concentrations and embankment height. The dam has an operational reservoir volume of approximately 16000 ML. A detailed dam break analysis of the TSF will be required during the detailed assessment and design of the EPTSF, however at this time it has not been analysed in significant detail.

Due to the nature of the turkey's nest structure, a potential dam break could occur along any of the four embankments as follows:

1. A failure of the north embankment would likely pose the greatest threat to the general environment. Under such a scenario, a dam breach outflow could potentially impact the Sandy Creek watercourse with significant to high impacts anticipated.
2. A failure to the south embankment would spill to the proposed 'Northern Open Cut Pit". This would have a High consequence due to the possibility of loss or harm to humans and a significant economic loss if the pit was being actively mined.
3. The east and west embankments are adjacent to large overburden stockpiles, so failure of these embankments would likely have similar consequences as (1) or (2) as the stockpiles would likely force the flow north towards Sandy creek or south into the Open pit. Hence this failure is also likely to be a High impact.

Based on this information, Hazard Category levels were assumed for the EPTSF for the dam break failure scenario:

- General Environment – Rating = High.
- Loss or harm to humans – Rating = High.
- Loss of stock – Rating = Low.
- General economic loss – Rating = Significant.

These categories will require further confirmation with a detailed dam break assessment in the next phase of the design of the project.

5.3.5 Summary Hazard Classification

In accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (version 1.1), the overall hazard category for the Kevin's Corner EPTSF Dam is **High Hazard**, based on the embankment height, the risks assessed from a failure to contain and the dam break failure scenarios.

5.4 Hydraulic Design

5.4.1 Design Context

Kevin's Corner EPTSF has been categorised as a high hazard dam based on the Queensland DERM draft guidelines: *'Manual for Assessing Hazard Categories and Hydraulic Performance of Dams Version 1.1, 18 June 2009'*. Criteria in this guideline require a high hazard category dam with a service life of less than 10 years to be designed to:

1. Safely pass a design flood event of 0.0001 Annual Exceedance Probability (AEP) (1 in 10,000 years);
2. Have a Design Storage Allowance (DSA) volume to accommodate AEP 0.01 wet season rainfall (1 in 100 years critical wet season) when determined using the deciles method; and,
3. Have a Mandatory Reporting Level (MRL) that corresponds to the storage required to contain a 72-hour rainfall event with an AEP of 0.01.

The contributing catchment to the dam is representative of the internal dam area of 164ha. The spillway will be located through the southern embankment of the storage dam, with a rock chute designed to pass flood flows resulting from an AEP 0.0001 event with minimum 0.5 m of freeboard. The spillway will direct overflows to the open pit south of the dam for collection and storage of overflows in large storm events. This is preferable to spilling to north towards Sandy creek and risking a mine water discharge into the water course.

The potential impact from flooding of nearby watercourses on the dam has also been assessed up to the 0.0005 AEP event. As a result of the assessment, it is anticipated that surrounding creek flood extents will not impact the EPTSF Dam up to the 0.0005 AEP. Overland runoff from the southeast will be diverted to the northeast by drainage channels situated around of the embankment such that external overland flows from the AEP 0.001 event (1 in 1000) will not pose a safety risk to the dam.

5.4.2 Flood Assessment of Nearby Watercourses

A flood assessment is currently being undertaken for surrounding watercourses, namely Well Creek to the south and Sandy Creek to the east. Initial results show that the flood extents for the 0.0005 AEP (1 in 2000) flood will not encroach on the footprint of the EPTSF, therefore, the need for additional flood protection, resulting from local watercourse flooding in the vicinity of the EPTSF, is not anticipated. The potential need for additional flood protection should be further assessed upon finalisation of flood modelling works.

5.4.3 Surface Water Flow Assessment for local runoff diversion around dam

The local catchment near the EPTSF generally flows from the southeast to the northwest toward Sandy creek. This catchment is relatively small because Well creek to the south of the TSF drains most of the area to the south and west of the EPTSF away from the EPTSF to Sandy creek. Some localised drains will be required to divert local catchment flows around the EPTSF. These drains will be earthen unlined channels with a 0.01 AEP flow capacity

5.4.4 Dam Spillway Assessment

The spillway rating is dependent on both the hazard category and the service life of the dam. From discussions with Hancock Coal the service life of Kevin's Corner EPTSF Dam is approximately 5-7 years, therefore, it falls within the category of less than 10 years. Since the dam is classified as high hazard, the new spillway should have sufficient capacity to safely convey a design event AEP of 0.0001 (i.e. 1 in 10,000 years). As the dam is designed as a Turkeys Nest, the effective catchment of the dam is the internal area (164 ha).

At this stage a spillway has not been sized for the EPTSF. It is anticipated that the requirements for a spillway to pass a 0.0001 AEP flood in the EPTSF can adequately met during subsequent design stages given the limited catchment of the turkeys nest dam.

5.4.5 Design Storage Allowance

The Design Storage Allowance (DSA) for a High Hazard dam must be sufficient to contain a design event volume AEP of 0.01 (equivalent to an Annual Recurrence Interval (ARI) of 100 years). The dam is considered compliant provided the owner ensures provision of the DSA volume at 1 November each year. In the case of the Kevin's Corner TSF, the method of deciles has been undertaken using a 100-year record of historical rainfall. Details of the DSA are provided in below.

Long-term rainfall data for the Kevin's Corner site was obtained from the Department of Natural Resources and Water (NRW) Silo Data Drill system (SDD).

The Kevin's Corner EPTSF is located in west central Queensland, therefore, the critical wet period of 3 months (December through February) was applied for the deciles method. The annual total rainfall for each wet season was estimated and a probability analysis conducted. The probability analysis indicated that a total rainfall depth, over the three month period for a 1 in 20 year wet season, (i.e. the 99^{th} percentile), would be approximately 623 mm, which equates to a **DSA volume of 1025 ML** (623mm wet season rainfall depth x 164 Ha catchment area contributing to the dam) for the Kevin's Corner EPTSF Dam, assuming no losses.

The Owner shall ensure the DSA volume is available in the storage at 1 November each year to allow for wet season rainfall.

5.4.6 Mandatory Reporting Level

The holder of the environmental authority must notify DERM immediately when the level in the regulated dam reaches the Mandatory Reporting Level (MRL) to minimise actual or potential environmental harm. For a High Hazard dam, the MRL is the lowest of either the 72-hour duration storm, AEP 0.01 (ARI of 1 in 100 years) or a wave allowance freeboard at the same AEP. As the dam is filled with mostly tailings, it is expected that the depth of water will not be sufficient to allow for significant wave generation. Also the dam will have a tailings beach around the perimeter of the dam, limiting the fetch of the dam for wave generation. Hence the MRL has been adopted based on the 72 hour, 0.01 AEP storm.

The volume of the 1 in 100 year, 72-hour rainfall event, was calculated based on 288 mm (100-year 72-hour storm depth) x 164 ha catchment area contributing to the dam (i.e. assuming no losses). The volume of this flood event for Kevin's Corner EPTSF Dam is 473 ML. No level has been set for the MRL at this stage, as this will be done during the dam and spillway design.

5.5 Embankment Design

Foundation

The subsurface conditions encountered during ground investigation indicate the presence of a top sand layer (average thickness 1m) within the footprint of the site. This layer will be stripped within the footprint of the dam to provide suitable residual clays as foundation material. Final bearing surface will be free of organic material, debris and rock fragments. A smooth bearing surface will be provided for construction of seepage control measures.

Embankment

Embankment will be constructed using low permeability clays. The source for embankment material will be identified during subsequent design stages. It is anticipated that stripped surface sand materials may be suitable for use in underdrainage and filter zones if required. However, additional assessment of sands will be required during subsequent design stages to confirm their suitability.

Ex-Pit TSF Seepage Control

Seepage of TSF water into local groundwater and/or surface expression is a key risk to the environment and further engineering design development will be undertaken to better define the controls that will be provided. The objectives for seepage performance of the EPTSF is to control seepage of decant and tailings water into the natural ground and through the EPTSF embankment to limit migration of contaminants to the Environment.

While there is potential for seepage from the TSF to migrate vertically downward it is recognised that dewatering activities at the site both at the open cut pits and the underground workings should temporarily change the local groundwater regime and therefore minimise the risk of groundwater impacts to the surrounding environment. In addition to this the limited operating life of the EPTSF provides an opportunity to decommission and rehabilitate the EPTSF relatively early in the mine operating life while pit dewatering activities will be ongoing. The Proponent will undertake more detailed groundwater modelling to assess the likely performance of the Northern Pit dewatering and the EPTSF 1 site to establish suitable criteria for the design of the proposed seepage controls.

In order to mitigate the risk of seepage to groundwater, seepage management techniques and controls will be implemented at the TSF. Design measures currently being assessed in order to limit the potential for offsite seepage migration include:

- Good tailings and surface water management as described above;
- Providing a compacted low permeability clay liner across the floor of the EPTSF;
- Providing a seepage cut-off trench around the perimeter of the EPTSF to intercept potential seepage flows;
- Limiting the operating life of the out of pit EPTSF to five years and rehabilitating the EPTSF, including providing a surface cover; and
- Providing drainage and/or seepage collection systems.

The Proponent is concurrently undertaking additional groundwater modelling and engineering design as part of the TSF design to develop details of the seepage controls measures required.

5 Ex-Pit TSF Concept Design

Stability of Ex-Pit TSF

Stability of the embankment is a key risk to the environment. The objective for stability performance of the EPTSF is to control slope failure and embankment deformation. In order to mitigate the risk of instability, several techniques and controls will be implemented at the EPTSF including:

- Batter slopes not steeper 3H:1V;
- Foundation preparation;
- Use of engineered earthfill for construction;

Piping Risk

Piping risk assessment will be carried out during detailed design phase once the materials are characterised. It is to be noted that the risk will vary depending upon beach profile established.

Crest Geometry

The crest of EPTSF is 10 meters in width to allow for construction of safety bunds and safe passage of single lane vehicular traffic.

Erosion Control for Ex-Pit TSF

Erosion of external slopes of the EPTSF embankment is another key risk that will be mitigated through design and construction of erosion control measures. The final landform if unprotected will be prone to soil erosion and sediment runoff. Off-site effects potentially include, but are not limited to, ecological impacts on surrounding creek systems and reservoirs. Soil erosion after construction can also lead to recurring maintenance issues of the final landform. In is anticipated, that to mitigate the risk of erosion the final landform surface will be covered with topsoil and grass seeding and surface water controls may be provided. Work is being carried out to refine the erosion control features proposed for Kevin's Corner EPTSF. Temporary erosion protection features such as silt fences shall be maintained during construction until vegetation is established. Vegetative cover over the final landform will mitigate the risk of soil erosion and sediment runoff after construction. Monitoring the effectiveness of vegetative cover is an essential part of responsible site management by the Proponent. As such, the following performance criteria will be adopted:

1. Perform periodic inspections of the vegetative cover (as a minimum – once a year) to evaluate its effectiveness.
2. Undertake regular maintenance programmes to address of vegetative cover that are performing poorly.

Monitoring and Surveillance for Ex-Pit TSF

Annual inspections will be undertaken to monitor the performance of the EPTSF structure. Rainfall events during construction and operation of the EPTSF can cause erosion and transport of sediments from the site. The sediment will be controlled and contained through the use of silt fences, check dams or other appropriate means to minimise sediment transport to nearby watercourses. Annual inspections and reassessment of the hazard category will be performed by a suitably qualified person prior to the wet season (November 1). Interim inspection will be performed by the Proponent after a major rainfall event.

Rehabilitation and Closure of Ex-Pit TSF

The target design life of the EPTSF is seven years. After seven years of use, the structure will be decommissioned as per applicable regulatory guidelines. A closure strategy will be developed in consultation with the State regulators. Key objectives of the closure strategy will include:

- Providing a stable landform;
- Providing a landform surface that is resistant to erosion;
- Providing a surface cover that minimises the risk of infiltration, promotes shedding of surface water and promotes growth of vegetation; and
- Minimises the risk of environmental harm from seepage.

The following design measures will be further considered to achieve the rehabilitation objectives described above:

1. The final tailings surface will be profiled to shed water and limit ponding. This could be achieved by either selective tailings disposal towards the end of the life of the facility or by bulk earthworks once the tailings surface is trafficable.
2. Construction of a surface cover that will be designed to minimise the risk of infiltration, promote surface runoff and limit the risk of ponding. The final surface cover will be revegetated with grasses.
3. Management of surface water across the surface of the cover to minimise the risk of erosion. Temporary sediment control ponds will be incorporated into the surface drainage controls while vegetation is established.

In-Pit Tailings Storage Facility

6.1 Proposed Approach

The Proponent has developed the mine plan to fast track the Northern Open Cut with a view to making this void available for in pit tailings disposal within the initial five years of mine operations. While an EPTSF will be used to store tailings within the initial seven year period as the Northern Open Cut is developed, mine voids within the Northern Open Cut will be the long term tailings disposal strategy for the Project.

The Northern Open cut will be developed using a truck-excavator operation that operates in strips of the order of 70 m wide. Overburden will initially be placed in an out of pit emplacement area. However, once sufficient mine void has been excavated overburden will be placed within the pit to backfill mined areas as the highwall progresses down dip. Towards the end of the Northern Open Cut life mine voids will be available for tailings disposal and overburden will again be placed to out of pit emplacement areas.

6.2 Overview of Pit Geology

Resource drilling investigations show that the pit geology generally comprises an upper Tertiary material comprising interbedded sequences of sand and clay soils overlying Permian material that comprises sequences of siltstone, sandstone and claystone. The tertiary materials are variably weathered and extend to depths ranging from 10 m to 30 m below the existing ground surface. The Permian materials are weathered to depths of up to 30 m below the existing ground surface. The Northern Open Cut has a maximum depth of the order of 85 m below the existing ground surface, with a significant portion of the pit of the order of 30 m to 40 m below the existing ground surface. Further investigation of the pit wall geology will be undertaken during subsequent design phases, specifically to identify the potential extent of more permeable sand materials within the pit walls.

6.3 In Pit Tailings Management Strategy

The in pit tailings disposal strategy generally comprises the construction of a number of tailings disposal cells within the mine void, working from the base of the pit once final coal recovery is completed and mining operations have advanced a safe distance beyond the proposed tailings cell area. This will be achieved by progressively constructing perimeter embankments against the highwall and low wall areas, typically in five metre lift heights, depending upon the size of the cells. These embankments will allow:

1. Access for vehicles around the perimeter of the tailings cell.
2. A corridor for tailings delivery lines and decant water return lines.
3. An opportunity to place engineering controls against the high and low walls to manage seepage from the in pit tailings cell. These controls could include compacted low permeability layers or other seepage controls against the pit walls.
4. A corridor for safety bunds at the toe of the pit slopes and potentially localised dewatering.
5. Diversion of surface water flows into the tailings cells for recycling to the CHPP.
6. Water to be kept away from the toe of the pit walls, thereby minimising the potential impacts on stability of these slopes.

Tailings will be placed within each in-pit cell using either full or partial perimeter spigotted discharge, similar to that proposed for the surface TSF. The objective of this tailings discharge method is to place sequential thin layers of tailings to form beaches of tailings adjacent to the perimeter embankments. This methodology should allow:

- Drying of the tailings beach to increase the density and strength of the tailings.
- Collection of decant water.
- Future rehabilitation of the mine void surface.

Tailings placement will be managed to form decant ponds adjacent to the main pit access ramp for recycling to the CHPP. These decant ponds will be managed to maximise the reclaim and reuse of decant water and also the exposed area of the tailings beaches to promote drying and increase the density of the tailings.

A number of in pit tailings cells will be developed to:

1. Accommodate potential mining operations within the pit such that in pit disposal can commence as soon as reasonably practical.
2. Facilitate rotations of tailings disposal so that works such as raising the perimeter embankments can be carried out to a cell while tailings is deposited into another cell.
3. Reduce the rate of rise of the tailings surface within each cell to promote drying of the tailings and maximise the density of the tailings.

6.4 Final Mine Rehabilitation

Mining within the Northern Open Cut will be completed within the initial five years of the Project and some areas that have been backfilled with overburden could be available for rehabilitation at this time. However, the mine voids proposed for in pit tailings disposal would not be available for rehabilitation until the end of mining. As for the surface TSF a closure strategy will be developed in consultation with the State regulators. Key objectives of the closure strategy will include:

- Providing a stable landform;
- Providing a landform surface that is resistant to erosion;
- Providing a surface cover that minimises the risk of infiltration, promotes shedding of surface water and promotes growth of vegetation; and
- Minimises the risk of environmental harm from seepage.

The rehabilitation strategy for the open pits at the site generally comprises backfilling the surface of the pit with overburden to create an elevated landform potentially up to 30 m above the original ground surface level. The deep deposits of tailings within the Northern Open Cut that could be up to a maximum of 85 m deep will present challenges in terms of:

1. Having sufficient strength to support the overburden material.
2. Ongoing settlement under the weight of the overburden materials.

The operational performance of the in pit tailings and decant water management will have a significant influence on the final strength and consolidation properties of the in pit tailings materials. Strategies that will be further considered during development of rehabilitation plans for the in pit disposal area to address these issues will include:

6 In-Pit Tailings Storage Facility

1. Progressive placement of overburden in horizontal lifts at the completion of tailings disposal to allow pore pressures to dissipate with time and to minimise the risk of instability of the final landform. However, this is likely to significantly extend the post mining attendance that would be required to achieve successful rehabilitation of the landform.
2. Installation of wick drains or similar measures to promote drainage of the tailings under the overburden materials and therefore speed up the initial primary settlement within the tailings. Drainage control measures within the tailings would aim to reduce the period required to achieve successful rehabilitation of the landform.
3. On going monitoring and maintenance of the final landform to assess the rate of ongoing settlement and to maintain the surface integrity of the landform surface.
4. Design the landform surface to promote sheet flow of surface water to eliminate the need for engineered drainage structures across the final landform surface. This requirement will likely limit the maximum final height of the landform above the original ground surface level. However it will also limit the impact of ongoing surface settlement on the drainage and integrity of the final landform.

Limitations

7.1 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 HGPL 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 2/11/2010.

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 November, 2010 and April, 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.

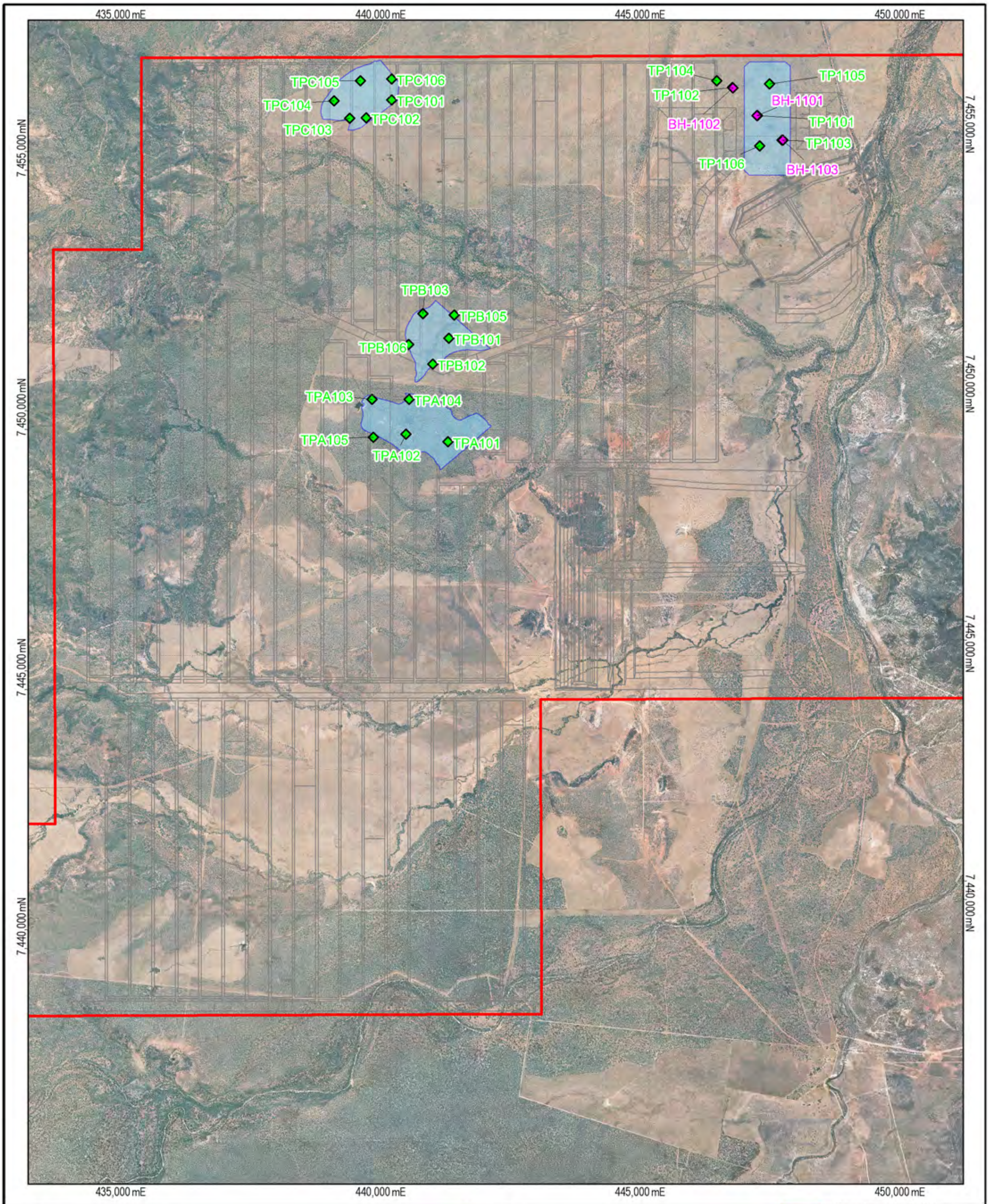
This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

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 Location Map of Test Pits and Boreholes



0 1 2km
Scale: 1:100,000 (A4)

Datum: GDA94, MGA Zone55

TPC132 Test Pit

BH-1102 Bore Hole

Mining Lease Application (MLA70425) Boundary

Potential Tailings Storage Facility Locations

N W E S

I HANCOCK GALILEE PTY LTD

Kevin's Corner Project Environmental Impact Statement

LOCATION MAP OF TEST PITS AND BOREHOLES

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TAILINGS STORAGE FACILITY - CONCEPT DESIGN REPORT Figure: **A-1**

File No: **42626660-g-2115.wor** Drawn: **RG** Approved: **CP** Date: **15-04-2011** Rev. **A** A4

Appendix B Test Pits and Borehole Logs

URS Australia Pty Ltd

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

Project No.:	42626718
Project Reference:	Kevin's Corner Tailings Dam
Client:	Hancock Coal
Borehole	**BH-1101**

Date(s) Drilled:	20/02/11 to 21/10/10	Logged By:	CLH	Checked By:	
Drilling Method:	Solid Stem Auger	Drill Bit Size/Type:	120 mm	Total Depth Drilled (m):	15.0
Drilling Rig Type:	Hydropower Scout	Drilling Contractor:	Drillsearch	Relative Level:	m
Groundwater Depth:	Not Encountered	Location:	7455406 mN 447080 mE	Inclination from Horizontal/Bearing:	-90 deg
Borehole Backfill:	Bentonite and Cuttings	Sampler Type:	SPT NMLC Double Core Barrel	Hammer Data:	Automatic 63.5kg, 760mm

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type Number	SPT: Blows per 150mm	SPT: N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	0									Topsoil						
										(SM) Silty fine to medium SAND, proorly graded, brown, dry, loose. (Loam)	S1	1 / 375mm 1 / 75mm	< 1	0.5		SPT every 0.5 m for top 5 m.
	1									becoming trace clay, coarse sand, moist.	S2	1 1 1	2	0.4		
										(SC) Clayey fine to coarse SAND, brown mottled with red, with some small to large gravel, moist, medium dense to soft.	S3	WH 1 / 300mm	< 1	0.4		
	2									(CH) Sandy CLAY, high plasticity, with fine to medium sand, mottled red, yellow & light grey, moist. (Residual Sandstone)	S4	4 5 6	11			
										(CH) CLAY, high plasticity, with trace fine to medium sand, mottled light grey, red & yellow, and a pocket (80 mm) of black coally shale, moist to dry, hard. (Residual Mudstone)	S5	3 11 24	35	0.5		
	3									(CH) CLAY, high plasticity, with trace fine to coarse sand, mottled light grey, red & yellow, moist, hard. (Residual Sandstone)	S6	15 20 28	48	0.5		PP > 4.5
										(CH) CLAY, high plasticity, with trace fine sand, brown mottled with trace light grey, moist, hard. (Residual Sandstone)	S7	10 12 23	35	0.5		
	4									Same as above	S8	8 18 21	39	0.4		
										becoming trace fine to coarse sand	S9	11 19 30	49	0.5		
	5									(CH) CLAY, high plasticity, with trace fine sand, mottled brown and light grey, dry, hard.	S10	7 11 19	30			

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

BH-1101

Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**	Client: **Hancock Coal**
Date(s) Drilled: **20/02/11 to 21/10/10**	Logged By: **CLH**	Checked By:
Drilling Method: **Solid Stem Auger**	Drill Bit Size/Type: **120 mm**	Total Depth Drilled (m): **15.0**
Drilling Rig Type: **Hydropower Scout**	Drilling Contractor: **Drillsearch**	Relative Level: **m**
Groundwater Depth: **Not Encountered**	Location: **7455406 mN 447080 mE**	Inclination from Horizontal/Bearing: **-90 deg**
Borehole Backfill: **Bentonite and Cuttings**	Sampler Type: **SPT NMLC Double Core Barrel**	Hammer Data: **Automatic 63.5kg, 760mm**

ROCK CORE: Run No., Box No., Recovery (%), Drilling Fluid Loss, R Q D (%), Drill Rate (m/min); In-situ Testing; Lithology

SOIL SAMPLES: Type Number; SPT: Blows per 150mm, N Value Blows/300mm; Recovery (m); Water Content (%)

Depth (m)	MATERIAL DESCRIPTION	Type Number	Blows per 150mm	N Value Blows/300mm	Recovery (m)	REMARKS
6.0–7.25	(SP-SC) Fine to coarse SAND grading to coarse to fine SAND, with trace clay, red brown, with occasional pocket (~10 mm) of light grey fine sand, some clay, moist, very dense. (Residual Sandstone)	S11	28 50 / 150 mm >50		0.3	Borehole collapsed at approx. 4.5 m depth when lowered augers into hole.
7.25–11.4	(CH) CLAY, high plasticity, with some fine to coarse sand, trace small to medium gravel, light grey mottled with some yellow, moist, hard. (Residual Sandstone)	S12	9 17 32	49	0.5	Borehole collapsed at approx. 2 m depth when augers lowered into borehole.
	(CH) CLAY, high plasticity, with trace fine to coarse sand, mottled grey & red brown, and with trace black coaly shale, moist, hard. (Residual Mudstone/Sandstone)	S13	10 21 34	55		Borehole collapsed at 2 m depth again when augers lowered into borehole.
	(CH) Sandy CLAY, high plasticity, with fine sand, light grey mottled with trace yellow, with trace small gravel, dry, hard. (Residual Sandstone)	S14	18 20 41	61	0.5	
11.4–	Top 85 mm: Wash Mid 800 mm: (CL) Sandy CLAY, medium plasticity, with fine to medium sand, and trace coarse sand, small gravel, light grey mottled with some yellow, moist, hard. (Residual Sandstone)					Spun casing to 11.4 m for coring. PP > 4.5

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

BH-1101

Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam	Client: **Hancock Coal**
Date(s) Drilled: **20/02/11 to 21/10/10**	Logged By: **CLH**	Checked By:
Drilling Method: **Solid Stem Auger**	Drill Bit Size/Type: **120 mm**	Total Depth Drilled (m): **15.0**
Drilling Rig Type: **Hydropower Scout**	Drilling Contractor: **Drillsearch**	Relative Level: **m**
Groundwater Depth: **Not Encountered**	Location: **7455406 mN 447080 mE**	Inclination from Horizontal/Bearing: **-90 deg**
Borehole Backfill: **Bentonite and Cuttings**	Sampler Type: **SPT NMLC Double Core Barrel**	Hammer Data: **Automatic 63.5kg, 760mm**

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type	Number	SPT: Blows per 150mm	N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	12																
										Mid 320 mm: (SC) Fine to coarse SAND, with some clay, light grey mottled with some yellow, moist. (Residual Sandstone)							
										Mid 900 mm: (CH) CLAY, high plasticity, with trace fine to medium sand, roots, light grey, moist, hard. (Residual Sandstone)							
	13	R1	1	74													
	14									Bot 200 mm: (SC) Coarse to fine SAND, with some to trace clay, grey mottled with yellow & red, moist. (Residual Sandstone)							
		R2	1	80						(CH) CLAY, high plasticity, with some fine to medium sand, and one layer (80 mm) of (CH) gravelly CLAY, with small to large gravel, some coarse to fine sand, moist. (Residual Sandstone)							
	15									End of borehole at 15.0 m.							
	16																
	17																

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.: 42626718	Project Reference: Kevin's Corner Tailings Dam	Client: **Hancock Coal**	Sheet 1 of 3 **BH-1102**

Date(s) Drilled: **23/02/11 to 24/02/11**	Logged By: **CLH**	Checked By:
Drilling Method: **Solid Stem Auger**	Drill Bit Size/Type: **120 mm**	Total Depth Drilled (m): **15.2**
Drilling Rig Type: **Hydropower Scout**	Drilling Contractor: **Drillsearch**	Relative Level: **m**
Groundwater Depth: **1.9m**	Location: **7455930 mN 446594 mE**	Inclination from Horizontal/Bearing: **-90 deg**
Borehole Backfill: **Bentonite and Cuttings**	Sampler Type: **SPT NMLC Double Core Barrel**	Hammer Data: **Automatic, 63.5kg, 760mm**

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type Number	SPT Blows per 150mm	SPT N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	0									Topsoil						
										(SM) Silty fine to medium SAND, poorly graded, brown, moist, loose. (Loam)	S1	1 1 1	2	0.3		Overnight groundwater level in uncased auger hole measured at 1.9m depth.
										becoming trace clay, coarse sand	S2	1 / 250mm 2 / 200mm	1	0.4		
	1									(SC) Fine to medium SAND, poorly graded, with some clay, brown, moist, loose.	S3	1 1 / 550mm	< 1	0.2		On 2nd blow, sampler fell to 1.7m depth. Drilled to 2.0m. Tip of auger wet.
	2									(SC) Clayey fine to medium SAND, poorly graded, with trace small gravel, brown, wet, loose.	S4	WH / 40mm 1 / 200mm 1 / 200mm	< 1	0.2		WH = weight of hammer. Sampler fell to 3m depth on final blow.
	3									(SP-SM) Fine to coarse SAND, with some to trace silt, light brown, wet, loose.	S5	WH / 200mm 1 / 400mm	< 1	0.1		Sampler fell to 3.6m depth on 1st blow.
	4									Top 220 mm: (SM) Silty fine to coarse SAND, yellow brown, moist, medium dense. Bot 200 mm: (SM) Fine to medium SAND, poorly graded, some silt, light grey mottled with some yellow brown, moist, very dense. (Residual Sandstone)	S6	29 43 50 / 120mm	> 90	0.4		Loose, wet soils encountered from approx. 1.9 m to 3.8 m depth.
	5									Top 120 mm: (SP-SM) Coarse to fine SAND, some to trace silt, trace small gravel, brown, moist to wet, dense. Bot 180 mm: (SP-SC) Fine to coarse SAND, with some to trace clay, light grey mottled with some brown, moist, very dense (Residual Sandstone)	S7	36 64	> 60	0.3		Top of sample at 5 m was wet.

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.: 42626718	Project Reference: Kevin's Corner Tailings Dam	Client: Hancock Coal	**BH-1102**

Date(s) Drilled: **23/02/11 to 24/02/11**	Logged By: **CLH**	Checked By:
Drilling Method: **Solid Stem Auger**	Drill Bit Size/Type: **120 mm**	Total Depth Drilled (m): **15.2**
Drilling Rig Type: **Hydropower Scout**	Drilling Contractor: **Drillsearch**	Relative Level: **m**
Groundwater Depth: **1.9m**	Location: **7455930 mN 446594 mE**	Inclination from Horizontal/Bearing: **-90 deg**
Borehole Backfill: **Bentonite and Cuttings**	Sampler Type: **SPT NMLC Double Core Barrel**	Hammer Data: **Automatic, 63.5kg, 760mm**

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type Number	SPT: Blows per 150mm	N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	6									(SC) Coarse to fine SAND, some to trace clay, yellow brown to light grey, moist, very dense. (Residual Sandstone)	S8	38 56	> 50	0.3		
	7									(SC) Fine to medium SAND, poorly graded, with some clay, trace coarse sand, light grey, moist, very dense. (Residual Sandstone)	S9	29 46 47	93	0.5		
	8									Top 120 mm: (SP-SC) Coarse to fine SAND, some to trace clay, light grey, wet, very dense. (Residual Sandstone)	S10	39 41 / 65mm	> 50	0.2		Borehole collapsed at 6m when sending down spoon. Switched to mud rotary drilling and cased borehole to 8.2 m.
										Bot 80 mm: (SM) Silty fine to coarse SAND, trace clay, red, moist, very dense. (Residual Sandstone)						
	9									SPT Refusal - possible cobble	S11	20 / 10mm	> 50			Rods bouncing when struck by hammer.
										Top 370 mm: (SM) Silty coarse to fine SAND, trace clay, red, wet (Residual Sandstone)						Silty sand at top of Run 1 core sample were wet. PP > 4.5
										Bot 2.5 m: (CH) CLAY, high plasticity, with trace fine to coarse sand and occasional fragment of highly weathered sandstone, light grey mottled with red & brown, moist, very hard.						
	10	R1	1	95												
	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

URS Australia Pty Ltd Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626718 Project Reference: Kevin's Corner Tailings Dam	Client: Hancock Coal	BH-1102

Date(s) Drilled: **23/02/11 to 24/02/11**	Logged By: **CLH**	Checked By:
Drilling Method: **Solid Stem Auger**	Drill Bit Size/Type: **120 mm**	Total Depth Drilled (m): **15.2**
Drilling Rig Type: **Hydropower Scout**	Drilling Contractor: **Drillsearch**	Relative Level: **m**
Groundwater Depth: **1.9m**	Location: **7455930 mN 446594 mE**	Inclination from Horizontal/Bearing: **-90 deg**
Borehole Backfill: **Bentonite and Cuttings**	Sampler Type: **SPT NMLC Double Core Barrel**	Hammer Data: **Automatic, 63.5kg, 760mm**

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type	Number	SPT: Blows per 150mm	N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	12									(CH) CLAY, high plasticity, with some to trace fine to coarse sand and occasional seams (< 10 mm) of coal, mottled light grey & brown with trace dark grey, moist, very hard. (Residual Sandstone)							PP > 4.5
	13	R2	1 & 2	100													
	14																
	15									End iof borehole at 15.16 m.							
	16																
	17																

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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

URS Australia Pty Ltd Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626718 Project Reference: Kevin's Corner Tailings Dam	Client: Hancock Coal	Sheet 1 of 2 **BH-1103**

Date(s) Drilled: 22/02/11 to 23/02/11	Logged By: CLH	Checked By:
Drilling Method: Solid Stem Auger	Drill Bit Size/Type: 120 mm	Total Depth Drilled (m): 11.2
Drilling Rig Type: Hydropower Scout	Drilling Contractor: Drillsearch	Relative Level: m
Groundwater Depth: Not Encountered	Location: 7454913 mN 447566 mE	Inclination from Horizontal/Bearing: -90 deg
Borehole Backfill: Bentonite and Cuttings	Sampler Type: SPT NMLC Double Core Barrel	Hammer Data: Automatic, 63.5kg, 760mm

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type Number	SPT: Blows per 150mm	N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	0									Topsoil						
										(SM) Silty fine to medium SAND, poorly graded, brown, dry, loose. (Loam)	S1	WH / 200mm 2 / 300mm	< 1			
										Top 300 mm: Same as above, becoming moist	S2	1 1 2	3			
										Bot 100 mm: (CL) Sandy CLAY, medium plasticity, with fine to coarse sand, some small to large gravel, brown mottled with some red, moist, soft (Residual Sandstone)						
	1									(CH) CLAY, high plasticity, grey mottled with red, with trace coally shale in top 150 mm, roots, moist, firm. (Residual Sandstone)	S3	5 7 9	13			PP = 2.5 to 2.75
										Same as above, no shale	S4	4 7 8	15			Coally shale "wash" falling into borehole all following samples.
	2									(CH) CLAY, high plasticity, grey mottled with red, with trace roots, moist, firm. (Residual Mudstone)	S5	6 7 11	18			
										(CH) Sandy CLAY, high plasticity, with fine to coarse sand, mottled brown & red, moist, firm. (Residual Sandstone)	S6	4 6 9	15			PP = 1.75 to 2.5
	3									(SC) Fine to coarse SAND, some clay, trace fine gravel, red mottled with some grey brown, moist, medium dense. (Residual Sandstone)	S7	5 9 14	23			
										(CL) CLAY, medium plasticity, some fine to medium & silt, red mottled with some light brown, dry, firm (Residual Sandstone)	S8	12 20 28	48			
	4									Top 100 mm: Same as above Bot 300 mm: (SP-SM) Fine to coarse SAND, some to trace silt, moist, medium dense.	S9	5 7 6	13			Did not bag top 100mm of sample S9.
										Top 100 mm: (SP-SM) Coarse to fine SAND w/ some large gravel, wet. Mid 80 mm: (SC) Clayey fine to coarse SAND, moist. Bot 120 mm: (SM) Silty fine to coarse SAND, trace large gravel, brown mottled w/ some light grey, moist.	S10	7 18 27	45			Top 100mm of sample S10 was wet. All of sample S10 in one bag.
	5									(SP-SC) Fine to medium SAND w/ trace clay, lt grey mottled w/ some yellow & red, moist, very dense.	S11	17 29 50	79			
										(SP-SC) Fine to medium SAND, poorly graded, trace clay, top 120 mm red, bot 230 mm lt grey, moist, very dense.	S12	26 40 20 / 20mm	> 60			

NOTES: Classification: Soil classification via AS 1726 - 1993
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URS Australia Pty Ltd

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

Project No.: 42626718 Project Reference: Kevin's Corner Tailings Dam	Client: **Hancock Coal**	**BH-1103**	
Date(s) Drilled: **22/02/11 to 23/02/11**	Logged By: **CLH**	Checked By:	
Drilling Method: **Solid Stem Auger**	Drill Bit Size/Type: **120 mm**	Total Depth Drilled (m): **11.2**	
Drilling Rig Type: **Hydropower Scout**	Drilling Contractor: **Drillsearch**	Relative Level: **m**	
Groundwater Depth: **Not Encountered**	Location: **7454913 mN 447566 mE**	Inclination from Horizontal/Bearing: **-90 deg**	
Borehole Backfill: **Bentonite and Cuttings**	Sampler Type: **SPT NMLC Double Core Barrel**	Hammer Data: **Automatic, 63.5kg, 760mm**	

Relative Level (m)	Depth (m)	ROCK CORE: Run No.	Box No.	Recovery (%)	Drilling Fluid Loss	R Q D (%)	Drill Rate (m/min)	In-situ Testing	Lithology	MATERIAL DESCRIPTION	SOIL SAMPLES: Type	Number	SPT: Blows per 150mm	N Value Blows/300mm	Recovery (m)	Water Content (%)	REMARKS
	6									SPT Refusal		S13					
										Top 230 mm: (CH) Sandy clay, high plasticity, w/ fine to coarse sand, some rock fragments, red, moist. (Completely Weathered Mudstone)							Rig chatter & roack fragments in spoil at 5.9m depth. Rods bouncing when hit with hammer. Conducted packer test from 7.2m to 11.2m.
										Bot 1.355 m: MUDSTONE, high strength, slightly weathered, red to light grey, fractured with some ehaled fractures.							
	7	R1	1	100		75											
	8									MUDSTONE, high strength, slightly weathered with some low strength, completely weathered zones (<= 80 mm) of gravel, light grey mottled with trace red, slightly fractured.							
	9	R2	1	100		72											
	10																
	11									End of borehole at 11.2 m.							

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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

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TEST PIT LOG TP 1101

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **23-2-11** Date Finished: **23-2-11**	Relative Level: **mAHD** Coordinates: **7455399 mN** **447083 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine SAND, poorly graded, red brown, dry loose. (Loam)		0					
	Same as above							
	becoming fine to coarse sand, moist		1					
	(CL) Sandy CLAY, medium plasticity, with fine to medium sand, some silt, brown with trace red clay, moist.							▽
	(SC) Clayey fine to medium SAND, poorly graded, brown, wet.		2					
	(CH) Sandy CLAY, high plasticity, with fine to coarse sand, brown mottled w/ light grey & red, moist.							
	(CH) CLAY, high plasticity, some fine to coarse sand, brown mottled with light grey & trace red, moist. (Residual Sandstone)		3					
	(CL) CLAY, lowplasticity, with trace fine to coarse sand, brown mottled w/ light grey, moist. (Residual Sandstone)		4					
	(CH) CLAY, high plasticity, brown mottled w/ light gray, moist. (Residual Sandstone)							
	becoming w/ trace red		5					Excavator refusal at 4.7 m.

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP 1102

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **23-2-11** Date Finished: **23-2-11**	Relative Level: **mAHD** Coordinates: **7455905 mN** **446591 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
	(SM) Silty fine to medium SAND, poorly graded, brown, moist, loose. (loam) becoming with trace coarse sand. Same as above		0 – 1.5					
	(CH) Sandy CLAY, high plasticity, with fine to medium sand, brown, wet, soft.		1.5 – 1.9					∇ 1.7m wet
	(SC) Clayey fine to medium SAND, brown, wet, loose.		1.9 – 3.0					Flowing seepage at 2.1m
			3					End of Test pit at 3.0 m. Walls of TP caving in from 2m to 3m.

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	
Refusal	
Flooding	
Caving/collapse	X

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 TP 1103

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **23-2-11** Date Finished: **23-2-11**	Relative Level: **mAHD** Coordinates: **7454922 mN** **447550 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
	(SM) Silty fine to medium SAND, poorly graded, brown, moist, loose. (Loam) Same as above		0					
	(CL) CLAY, low plasticity, some fine sand, brown, moist, soft.		1					
	(CH) CLAY, high plasticity, red brown, moist.							
	(CH) CLAY, high plasticity, with trace fine to coarse sand & small gravel, brown mottled with red & light grey, moist. (Residual Sandstone)							
	(CH) CLAY, high plasticity brown mottled with red & light grey, moist. (Residual Sandstone)		2					
	becoming medium plasticity							
	Same as above		3					
	becoming some fine to medium sand							
	(SM) Fine to coarse sand, some silt, brown, moist.		4					
	(SP-SM) Fine to coarse sand, trace silt, brown, wet.		5					∇
	(SM) Fine to coarse sand, some silt, brown, moist.							Excavator refusal at 5.2m

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 TP 1104

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **23-2-11** Date Finished: **23-2-11**	Relative Level: **mAHD** Coordinates: **7456071 mN** **446294 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to medium SAND, poorly graded, brown, dry, loose. (Loam)		0					
	(CH) CLAY, high plasticity, with some fine to medium sand, red, moist.		1					
	Same as above							
	(CH) CLAY, high plasticity, with some coarse to fine sand & small to medium gravel, light brown mottled w/ red & light grey, moist. (Residual Sandstone)							
	(CH) CLAY, high plasticity, light grey mottled with yellow & red, moist. (Residual Sandstone)							
	Same as above, no red		2					
	Same as above							
	(CH) CLAY, high plasticity, light grey mottled with yellow, moist. (Residual Sandstone)		3					
	becoming with trace fine to medium sand							Excavator refusal at 3.3 m.
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP 1105

URS Australia Pty. Ltd.
Phone: (07) 3243 2111
Fax: (07) 3243 2199

Excavator Contractor: **Simon Contractors**	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**	
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH**	Relative Level: **mAHD**	Client: **Hancock Coal**
	Checked By:	Coordinates: **7456021 mN** **447328 mE**	
	Date Started: **23-2-11**		
	Date Finished: **23-2-11**	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
	(SM) Silty fine to medium sand, poorly graded, red moist, loose. (Loam)		0					
	(CL) Silty CLAY, medium plasticity, with some fine to medium sand, red, moist. (Loam)							
	(CH) CLAY, high plasticity, with some fine to coarse sand, silt, red, moist.		1					
	(CH) Sandy CLAY, high plasticity, with fine to coarse sand, light brown mottled with light grey, moist. (Residual Sandstone)							
	(CH) CLAY, high plasticity, with some fine to coarse sand, light mottled with trace light grey, moist. (Residual Sandstone)		2					
	Same as above							
			3					
	(CL) CLAY, low plasticty, with trace fine to coarse sand, light brown mottled with light grey, moist. (Residual Sandstone)							Excavator refusal at 3.1m
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP 1106

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **24-2-11** Date Finished: **24-2-11**	Relative Level: **mAHD** Coordinates: **7454818 mN** **447120 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
	(SM) Silty fine to medium sand, poorly graded, brown, moist, loose. (Loam)		0					
	becoming trace small gravel, clay							
	(SC) Clayey fine to coarse sand with small to medium gravel, brown, wet, loose.		1					∇ Groundwater at approx. 1 m.
	(CL) Sandy CLAY, medium plasticity, with fine to coarse sand, some small gravel, mottled brown, red & light grey, moist, firm. (Residual Sandstone)							
	SANDSTONE, medium strength, moderately weathered, light grey with some red & yellow, fine to medium grained.		2					
								Excavator refusal at 2.1 m.
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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

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TEST PIT LOG TP A101

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **16-2-11** Date Finished: **16-2-11**	Relative Level: **mAHD** Coordinates: **7449113 mN** **441150 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(CH) Silty CLAY, high plasticity, trace to some sand, brown, moist, soft. (Loam) (CH) CLAY, high plasticity, some silt, trace sand, brown mottled with light brown, wet, soft. (CH) CLAY, high plasticity, some small to medium gravel, tracesand, light brown, wet.		0					∇ Water seeping from stratum from 0.55 m to 0.85 m depth. Excavation wall collapsing .
	(CH) Silty CLAY, high plasticity, some fine to medium sand, mottled brown with some yellow & red, moist, firm. (Residual Sandstone)		1					
	(CL) CLAY, medium to high plasticity, light grey mottled with red, moist, firm. (Residual Sandstone)		2		2.5			
	Same as above							
			3					End of test pit at 2.5 m. Force required to dig subsoil causing excavator tracks to sink.
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	☐
Flooding	☐
Caving/collapse	X

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 TP A102

URS Australia Pty. Ltd.
Phone: (07) 3243 2111
Fax: (07) 3243 2199

Excavator Contractor: **Simon Contractors**		Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH**	Relative Level: **mAHD**	Client: **Hancock Coal**
	Checked By:	Coordinates: **7449261 mN** **440303 mE**	
	Date Started: **16-2-11**		
	Date Finished: **16-2-11**	Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Sandy SILT, dark brown, top 100mm moist, wet below, soft. (Loam)		0					∇ If pressed on test pit subgrade water seeped up, but no free seepage.
	(CL) CLAY, medium plasticity, brown mottled with yellow, moist, soft to firm. (Residual Sandstone) becoming with trace sand		1					
	(CL) CLAY, medium plasticity, with trace smal to large gravel, sand, brown mottled with yellow & red, moist, firm. (Residual Sandstone)		2					
	(SC) Fine to medium SAND, poorly graded, with some weathered sandstone fragemnts, trace to some clay, brown mottled with yellow & red, moist, firm. (Residual Sandstone)							
	SANDSTONE, highly to moderately weathered							Excavator refusal.
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP A103

URS Australia Pty. Ltd. Phone: (07) 3243 2111 Fax: (07) 3243 2199

Excavator Contractor: Simon Contractors	Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam	
Excavator Type: 20 ton Komat'su PC 200	Logged By: CLH	Relative Level: mAHD	Client: Hancock Coal
	Checked By:	Coordinates: 7449927 mN 439649 mE	
	Date Started: 17-2-11		
	Date Finished: 17-2-11	Permit No:	

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) silty fine to medium SAND, trace clay, dark brown, moist, loose. (Loam)		0					
	(SC) Clayey SAND / sandy CLAY, some to small to large gravel, grey brown, wet, soft to firm.				0.75 to 1.5			∇ Seepage from layer.
	(CL) CLAY, medium plasticity, trace fine to medium sand, brown mottled with yellow & red, moist, hard. (Residual Sandstone)		1		> 4.5			
	becoming trace fine sand							
			2					
	(SC) Sandy CLAY, low plasticity, with caorse to fine sand, some gravel & fragments of weathered sandstone & mudstone, light grey mottled with red & yellow, moist. (Extremely Weathered Sandstone)							Excavator refusal at 2.3 m.
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

- Target Depth [ ]
- Refusal [X]
- 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 TP A104

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **17-2-11** Date Finished: **17-2-11**	Relative Level: **mAHD** Coordinates: **7449923 mN** **440385 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to medium SAND, dark brown, moist, loose. (Loam)		0		0.5 to 0.75			
	(SC) Clayey fine to coarse SAND, some silt, trace small gravel, red brown, moist.							
	(CL) CLAY, medium plasticity, trace fine to medium sand, red brown, moist.		1		2.5			
	(CL) CLAY, medium plasticity, some small to large gravel, trace fien to coarse sand, brown mottled with yellow & red, moist, hard. (Residual Sandstone)		2		> 4.5			
	(SC) Clayey fien to coarse sand, some small to large gravel & fragments of weathered sandstone, brown mottled with yellow & red, moist, very dense. (Residual Sandstone)		3					
	(CH) CLAY, high plasticity, some fine to coarse sand, some small to medium gravel, red brown,moist, hard. (Residual Sandstone)							Excavator refusal at 3.6 m.
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP A105

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **16-2-11** Date Finished: **16-2-11**	Relative Level: **mAHD** Coordinates: **7449203 mN** **439679 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
	(CL) Silty CLAY, medium plasticity, some medium to fine sand, red brown, moist, firm.		0		1.0 to 2.25			
	Same as above				1.5 to 2.25			
	(CH) CLAY, high plasticity, trace fien sand, red brown mottled with yellow & red, moist firm.		1		1.25 to 2.25			
	Same as above							
	(CL) CLAY, medium plasticity, light grey mottled with yellow & red, moist, firm to hard.		2					
	Same as above		3					Excavator refusal at 3.0 m.
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP B101

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **18-2-11** Date Finished: **18-2-11**	Relative Level: **mAHD** Coordinates: **7451110 mN** **441132 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
	(SM) Silty fine to medium sand, poorly graded, dark brown, moist, loose. (Loam)		0					▽ Wet layer with seepage from 0.4 m to 0.8 m. ▼
	(SM) Silty fine to coarse sand, brown, wet, very loose.							
	(CH) CLAY, highly plastic, grey & brown mottled with red, moist, stiff. (Residual Mudstone)		1		2.5			
	(GC) Clayey small to large GRAVEL with some fine to coarse sand, brown, moist, very dense. (Residual Sandstone)							
	(CH) CLAY, highly plastic, some coarse to fine sand & small to medium gravel, brown, moist, hard.							
	Highly weathered SANDSTONE with some clayey sand, brown, moist.		2					Excavator refusal at 2.1 m.
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP B102

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **18-2-11** Date Finished: **18-2-11**	Relative Level: **mAHD** Coordinates: **7450615 mN** **440825 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to medium SAND, poorly graded, some small to medium gravel, dark brown, moist. (Loam)		0		0.5 to 1.25			
	(CH) Gravelly CLAY, high plasticity, with some small to medium cobbles and fine to coarse sand, grey mottled with red & yellow, moist, stiff. (Residual Sandstone)				1.25 to 2.25			
	becoming hard		1		> 4.5			
	SANDSTONE, low strength, highly weatheres, grey, fine grained with coarse sand & small gravel sized inclusions.							Excavator refusal at 1.2 m in highly weathered sandstone
			2					
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	
Refusal	X
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 TP B103

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **18-2-11** Date Finished: **18-2-11**	Relative Level: **mAHD** Coordinates: **7451570 mN** **440637 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to medium SAND, poorly graded, brown, moist, very soft. (Loam)				0.25			
	(CH) Sandy CLAY, with fine to coarse sand, brown, moist, firm.				1.75			
	(CH) CLAY, high plasticity, some fine to coarse sand with pockets of extremely weathered sandstone, brown, moist, soft.		1		0.75			
	(SM) Silty fine to coarse SAND, with trace clay, brown, moist, medium dense.		2					
	(SC) Clayey fine to coarse SAND, with some small cobbles and small to large gravel, yellow brown, moist, dense.		3					Excavator refusal at 3.0 m.
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP B105

URS Australia Pty. Ltd. Phone: (07) 3243 2111 Fax: (07) 3243 2199

Excavator Contractor: Simon Contractors		Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam
Excavator Type: 20 ton Komat'su PC 200	Logged By: CLH Checked By: Date Started: 18-2-11 Date Finished: 18-2-11	Relative Level: mAHD Coordinates: 7451543 mN, 441246 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
	(CH) Silty CLAY, high plasticity, some fine to coarse SAND, brown, moist, soft. (Loam)		0					
	(CL) Silty CLAY, low plasticity, trace fine to coarse SAND, brown, moist, firm to hard.				1.75 to 4.5			
	(SC) Coarse to fine SAND, some clay, brown, moist, dense. (Residual Sandstone)		1					
	(SC) Gravelly coarse to fine SAND, with small to large gravel and some highly weathered sandstone fragments and clay, brown mottled with yellow & red, moist, dense. (Extremely Weathered Sandstone)							
	(CH) CLAY, high plasticity, light grey mottled with red & yellow, moist, firm. (Extremely Weathered Sandstone)		2					
	(CH) CLAY, high plasticity, mottled light grey, red & yellow, moist, firm to hard. (Extremely Weathered Sandstone)							Excavator refusal at 2.9 m.
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	
Refusal	X
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 TP B106

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: 42626718	Project Reference: Kevin's Corner Tailings Dam
Excavator Contractor: **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **18-2-11** Date Finished: **18-2-11**	Relative Level: **mAHD** Coordinates: **7450995 mN** **440380 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
	(CH) Fine sandy CLAY, high plasticity, trace coarse sand & small gravel, brown, moist, soft.		0					
	(CH) CLAY, high plasticity, trace fine to coarse sand, grey brown mottled with yellow & red, moist, soft.				0.5			
	Same as above		1		1.5			
	(CH) CLAY, high plasticity, grey mottled with red & yellow, moist, stiff. (Residual Mudstone)		2					
	SANDSTONE & MUDSTONE fragments, highly weathered, with some (CL) CLAY, medium plasticity, trace fine to coarse sand, grey brown, moist.							
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP C101

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **24-2-11** Date Finished: **24-2-11**	Relative Level: **mAHD** Coordinates: **7455713 mN** **440050 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to medium SAND, poorly graded, dark brown, moist, loose. (Loam)		0					
	(SC) Clayey fine to medium SAND, poorly graded, brown, wet, loose.							▽ Wet soils from 0.8 m to approx. 1.6 m. Test pit walls caved in at 1.1 m. ▼
	Same as above		1					
	(CH) Sandy CLAY, high plasticity, with fine to coarse sand & some small to medium gravel, light grey mottled with yellow & red, moist, firm. (Residual Sandstone)		2					
	Same as above.							
	Same as above.		3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	
Refusal	
Flooding	
Caving/collapse	X

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 TP C102

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **25-2-11** Date Finished: **25-2-11**	Relative Level: **mAHD** Coordinates: **7455348 mN** **439554 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to coarse SAND, trace clay, brown, moist, soft. (Loam)		0		0.25 to 0.5			Soil pumping from excavator vibration. Relocated TP 5.0 m from road and fence.
	(SC) Clayey fine to medium SAND, light brown, wet, very soft.							Wet from 0.5 m to 0.9 m.
	(CH) CLAY, high plasticity, with some small cobbles, fine to coarse sand, grey mottled with yellow brown, moist, firm. (Residual Sandstone)		1		0.75			
	(CH) CLAY, high plasticity, with some small to medium cobbles, coarse to fine sand & trace small gravel, mottled grey & brown, moist, firm. (Residual Sandstone)							
	Same as above		2					
	Same as above							
	Same as above		3					End of test pit at 2.7 m due to side wall collapsing from ground surface to 0.9 m depth.
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

- Target Depth [ ]
- Refusal [ ]
- Flooding [ ]
- Caving/collapse [X]

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 TP C103

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **25-2-11** Date Finished: **25-2-11**	Relative Level: **mAHD** Coordinates: **7455350 mN** **439224 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
	(SM) Silty fine to coarse sand, with some clay, red brown, moist, soft. (Loam)		0		0.25 to 0.5			
	(CH) Silty CLAY, high plasticity, with some fine to coarse sand, trace small to medium gravel, red brown, moist, soft.				0.5			
	becoming wet		1					∇ Wall of TP collapsing from near surface to ~2.3m - top of dense SC. ▼
	(SC) Clayey fine to coarse sand, trace small gravel, red brown, wet, loose. (Residual Sandstone)							
	(SC) Fine to coarse SAND, some clay & highly weathered sandstone fragments, red brown, moist, loose to medium dense. (Residual Sandstone)		2		0.75			
	(SC) Coarse to fine SAND, some clay, with trace small gravel, light grey, mottled with light red brown, moist, dense. (Residual Sandstone)							Excavator refusal at 2.7 m.
	(SC) becoming with fragments of highly weathered mudstone		3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	☐
Flooding	☐
Caving/collapse	X

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 TP C104

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **25-2-11** Date Finished: **25-2-11**	Relative Level: **mAHD** Coordinates: **7455681 mN** **438923 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(SM) Silty fine to coarse SAND, brown, wet, loose. (Loam)		0		< 0.25			Ground in vicinity of orig TP location (438923 mE, 7455672 mN) so wet excav sinking as tracked across site.
	(SM/SC) Silty fine to coarse SAND, trace to some clay, light brown, wet, soft.							∇ Water seeping up from bottom TP.
	(CH) CLAY, high plasticity, some fine to coarse sand, mottled light brown & grey, wet to moist, soft. (Residual Sandstone)		1		0.5			▼ Wall collapsing from ground surface to 1.0m depth.
	(SC) Clayey coarse to fine SAND, with some large gravel, moist, firm.		2					Walls retained vertical cut from 1.0m - 1.7m.
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	☐
Flooding	☐
Caving/collapse	X

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 TP C105

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **25-2-11** Date Finished: **25-2-11**	Relative Level: **mAHD** Coordinates: **7456072 mN** **439415 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
			0					
	(CH) Sandy CLAY, high plasticity, with fine to medium sand, brown, moist, soft.				0.25			
	(CH) Sandy CLAY, high plasticity, with fine to medium sand, light grey mottled with brown, wet, soft.		1					∇ Wet & collapsing from 0.8m to 1.1m. ▼
	(CH) Sandy CLAY, high plasticity, with fine to coarse sand, light grey mottled with yellow brown, moist, firm.				1.25 to 2.5			
	(CH) CLAY, high plasticity, with some fine to coarse sand, trace small gravel, brown, moist, firm.							
	(CL) CLAY, medium plasticity, with some fine to medium sand, brown, moist, firm.		2					
	(CH) CLAY, high plasticity, with some fine to coarse sand, trace small gravel, brown mottled with trace dark grey & yellow, moist, hard. (Residual Sandstone)				> 4.5			
	Same as above		3					
	(SC) fine to coarse SAND, some clay, trace small gravel, yellow brown, moist, dense. (Residual Sandstone)							
	Same as above		4					
	(CH) CLAY, high plasticity, with some fine to medium sand, highly weathered sandstone fragments, light yellow brown, moist, hard.							
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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 TP C106

URS Australia Pty. Ltd.	Phone: (07) 3243 2111 Fax: (07) 3243 2199	Project No.: **42626718**	Project Reference: **Kevin's Corner Tailings Dam**
Excavator Contractor **Simon Contractors**			
Excavator Type: **20 ton Komat'su PC 200**	Logged By: **CLH** Checked By: Date Started: **25-2-11** Date Finished: **25-2-11**	Relative Level: **mAHD** Coordinates: **7456115 mN** **440028 mE** Permit No:	Client: **Hancock Coal**

REDUCED LEVEL (m RL)	DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	SHEAR VANE STRENGTH (kPa)	POCKET PENETROMETER (KG/CM²)	DCPT (Blows/100mm)	SAMPLING AND OTHER TESTING	COMMENTS
	(CH) Sandy CLAY, high plasticity, with fine to medium sand, brown,moist, soft. (Loam)		0		0.5			
	(CH) Gravelly CLAY, high plasticity, with subrounded small to medium gravel & some fine to medium sand, brown mottled with light grey, wet, soft.		1		< 0.25			Wet gravelly clay layer ~0.8m to 1.1m.
	(CH) CLAY, , high plasticity, with some fine to medium sand, trace coal, brown mottled with grey & black, moist, firm. (Residual Sandstone)							
	(CH) CLAY, high plasticity, mottled light grey & brown, moist, firm.				1.5			
	MUDSTONE, extremely low strength, highly weathered, light grey mottled with red & brown.		2					
			3					
			4					
			5					

TEST PIT SECTION

TEST PIT TERMINATED AT:

Target Depth	☐
Refusal	X
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

Appendix C Results of Insitu Permeability Testing in Boreholes

Wed core & packer BH1103 TP in Site 1
Thurs BH1102 TP in Site 1 ?
Fri TP in Site 10c

SHEET 1 OF 3
JOB ~~FILE~~ NO. 42626718
SUBCODE 6000

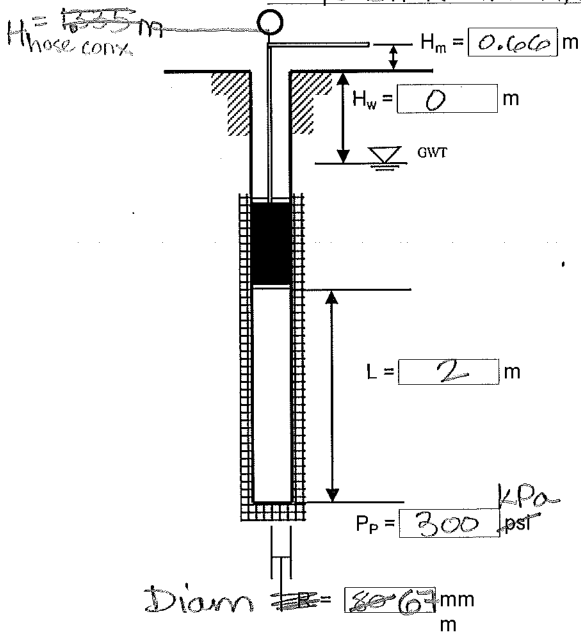
PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: KEVINS CORNER
LOCATION: 70 km N ALPHA, QLD

BORING NO. BH 1101
RES. ENG. CLH
DATE 22/02/11
TEST INTERVAL (m) 12.9 to 15
HEAD LOSS IN SYSTEM (H_c) (m)
Use packe

Total length of rods and packer 14.335 m + 1.420 stick up to hose
OD Diameter of packer rods = ~~60~~ 67 mm , ID = 32mm
Packer type

~~Tank Diameter = m~~



Permeability

$k = [(Q)/(2\pi L H_t)] \times \ln(L/R)$ (L>10R)

$k = [(Q)/(2\pi L H_t)] \times \sinh^{-1}(L/2R)$ (10R>L>R)

$H_t = H_p + H_m + H_w - H_c$ where,

- Q - Flow Rate
- L - Test Interval
- 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 Head at Gauge
- Hc - Head Loss in System

Conversion

1 psi = 2.31 ft. of water = 0.7034 m of water

1 gal. = 0.1337 ft^3 = 3.785 liter

GAUGE PRESSURE ~~(psi)~~ kPa	ELAPSED TIME (min)	FLOW READING (l)	FLOW (l/min)	~~TANK LEVEL (m)~~	~~TANK FLOW (l/min)~~	AVERAGE FLOW (l/min)	Q	H_p (m)	H_t (m)	k (m/min)	k (cm/sec)
25	0	0	0.7								
	1	0.7	0.6								
	2	1.3	0.5								
	3	1.8	0.8					must update			
	4	2.6	0.5								
	5	3.1	0.8			#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	6	3.9	0.7								
	7	4.5	0.7								
	8	5.2	0.7								
	9	5.9									
	10										
50	0	0	2.2								
	1	2.2	2.2								
	2	4.4	2.0								
	3	6.4	1.7								
	4	8.1	1.7								
	5	9.8	1.6			#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	6	11.4	1.7								
	7	13.1	1.8								
	8	14.9	2.2								
	9	17.1	3.0								
	10	20.1									
75	0	0	11.1								
	1	11.1	11.0								
	2	22.1	10.9								
	3	33.0	11.0								
	4	44.0	11.2								
	5	55.2	13.0			#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	6	68.2									
	7										
	8										
	9										
	10										

50 kPa: When increased pressure to 50 kPa slight surface return of water. But by minute 2, surface return stopped & water lvl in casing returned to orig lvl & was steady.

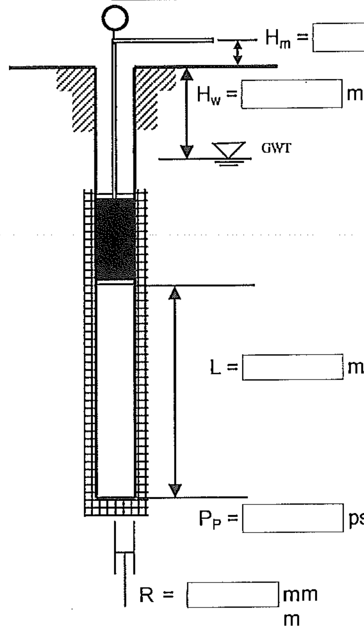
75 kPa: Surface return when raised press. Return remained @ steady rate throughout 6 min.
Pressure dropped to 70 kPa (at minute 3)
Increased press to 75 kPa (at minute 5)

SHEET 2 OF 3
FILE NO. 42626718
SUBCODE 6000

PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: KEVINS CORNER
LOCATION: 70 km N, Alpha, QLD

BORING NO. BH 1101
RES. ENG. CLH
DATE
TEST INTERVAL (m) 12.9 to 15
HEAD LOSS IN SYSTEM (H_c) (m) Use packe



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

Tank Diameter = m

Permeability

$k = [(Q)/(2\pi LH_t)] \times \ln(L/R)$ (L>10R)

$k = [(Q)/(2\pi LH_t)] \times \sinh^{-1}(L/2R)$ (10R>L>R)

$H_t = H_p + H_m + H_w - H_c$ where,

- Q - Flow Rate
- L - Test Interval
- 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 Head at Gauge
- Hc - Head Loss in System

Conversion

1 psi = 2.31 ft. of water = 0.7034 m

1 gal. = 0.1337 ft³ = 3.785 liter

GAUGE PRESSURE (psi)	ELAPSED TIME (min)	FLOW READING (l)	FLOW (l/min)	TANK LEVEL (m)	TANK FLOW (l/min)	AVERAGE FLOW (l/min)	Q	H_p (m)	H_t (m)	k (m/min)	k (cm/sec)
60	0	0	11.5								
	1	11.5	11.4								
	2	22.9									
	3	na	33.9								
	4	45.3	10.9								
	5	56.2	11.0			#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	6	67.2	11.0								
	7	78.2	11.2								
	8	89.4									
	9										
	10										

Surface return undiminished, when reduced pressure to 60 kPa. Steady surface return for 8 min.

GAUGE PRESSURE (psi)	ELAPSED TIME (min)	FLOW READING (l)	FLOW (l/min)	TANK LEVEL (m)	TANK FLOW (l/min)	AVERAGE FLOW (l/min)	Q	H_p (m)	H_t (m)	k (m/min)	k (cm/sec)
40	0	0	7.9								
	1	7.9	7.8								
	2	15.7	7.7								
	3	23.4	9.2								
	4	31.7	9.2								
	5	40.9	9.3			#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	6	50.2	9.4								
	7	59.6	9.5								
	8	69.1	9.7								
	9	78.8	9.6								
	10	88.4									

Surface return slowed @ pressure reduction. Slight pressure drop @ 2 min (<2 kPa). Increased press back to 40 kPa @ 3:40 min. Surface return steady for 9 min.

GAUGE PRESSURE (psi)	ELAPSED TIME (min)	FLOW READING (l)	FLOW (l/min)	TANK LEVEL (m)	TANK FLOW (l/min)	AVERAGE FLOW (l/min)	Q	H_p (m)	H_t (m)	k (m/min)	k (cm/sec)
20	0	0	7.4								
	1	7.4									
	2	na	14.7								
	3	22.1	7.4								
	4	29.5	7.5								
	5	37.0	7.5			#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	6	44.5									
	7										
	8										
	9										
	10										

Surface return stopped when pressure dropped to 20 kPa. Wtr level in casing returned to orig level before test started. By 1:45 min wtr lvl in casing dropped below start of test lvl

SHEET 3 ~~4~~ OF 3
FILE NO. 42626718
SUBCODE 6000

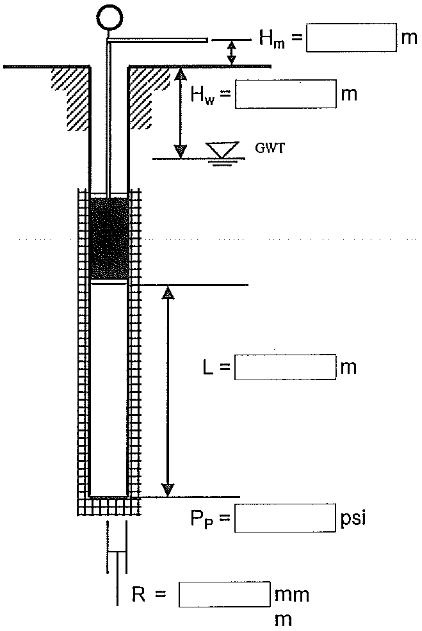
PACKER PERMEABILITY TEST (SINGLE PACKER)

PROJECT: KEVINS CORNER
LOCATION:

BORING NO. BH 1101
RES. ENG. CLH
DATE
TEST INTERVAL (m) 12.9 to 15
HEAD LOSS IN SYSTEM (H_c) (m) Use packe

Total length of rods and packer ______ m
Diameter of packer rods = ______ mm
Packer type

Tank Diameter = ______ m



Permeability

$k = [(Q)/(2\pi L H_t)] \times \ln(L/R)$ (L>10R)

$k = [(Q)/(2\pi L H_t)] \times \sinh^{-1}(L/2R)$ (10R>L>R)

$H_t = H_p + H_m + H_w - H_c$ where,

- Q - Flow Rate
- L - Test Interval
- 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 Head at Gauge
- Hc - Head Loss in System

Conversion

1 psi = 2.31 ft. of water = 0.7034 m

1 gal. = 0.1337 ft^3 = 3.785 liter

GAUGE PRESSURE (psi)	ELAPSED TIME (min)	FLOW READING (l)	FLOW (l/min)	TANK LEVEL (m)	TANK FLOW (l/min)	AVERAGE FLOW (l/min)	Q	H_p (m)	H_t (m)	k (m/min)	k (cm/sec)
10	0	0				#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	1										
	2	13.9	13.9								
	3	22.0	8.1								
	4	29.8	7.8								
	5	37.4	7.6								
	6	45.2	7.8								
	7	53.2	8.0								
	8:08	62.2									
	9	69.1									
	10	77.1	8.0								
0	0	0				#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	1	6.5	6.5								
	2	13.1	6.6								
	3	19.7	6.6								
	4	26.1	6.4								
	5										
	6										
	7										
	8										
	9										
	10										
	0					#DIV/0!	#DIV/0!	0.00	0.00E+00	#DIV/0!	#DIV/0!
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

DATE 23/2/2011

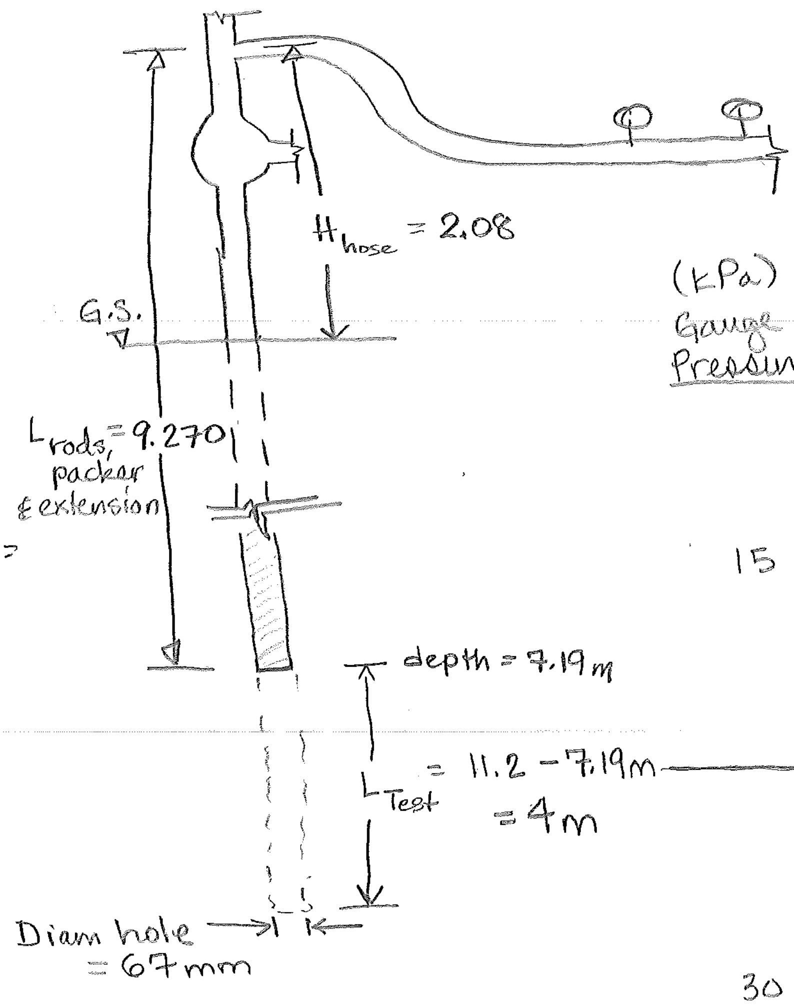
LOCATION: KEVINS CORNER

SHEET 1 OF 3

PROJECT 42626718.60000

BOREHOLE BH1103

$H_w = 0$ m



Gauge Pressure (kPa)	Time (min)	Flow Reading (l)	Flow (l/min)	
	0	0	0	
	1	0	0	
	2	0	0	
	3	0		
15	4			
	5			
	6			
	7			
	8			
	9			
	10			
	0	0		
	1	0		
	2	0		
	3	0		
30	4			
	5			
	6			
	7			
	8			
	9			
	10			
	0	0		
	1	0		
	2	0		
	3	0		
50	4			
	5			
	6			
	7			
	8			
	9			
	10			

RODS = 7.5 m

Extension = 0.350 m

Packer = 1.420 m

9.270

Need 7.62m in hole min

9.270
2.08
7.19

1145
935
2080

KEVINS CORNER 42626718

SHEET 2 OF 3

BH-1103

Test zone: 7.2-11.2

Gauge Pressure	Min Elapsed	Flow Reading (l)	Flow (l/min)
	0	0	0
	1	0	0
	2	0	
	3	0.1	0.1
75	4	0.2	0.1
	5	0.2	0
	6		0
	7	0.2	0
	8		
	9		
	10		
	0	0	
	1	0	0
	2	0.1	0.1
	3	0.2	0.1
	4	0.2	0
100	5	0.3	0.1
	6	0.5	0.2
	7	0.5	0
	8	0.6	0.1
	9	0.7	0.1
	10	0.7	0
	0	0	
	1	0.1	0.1
	2	0.2	0.1
	3	0.2	0
	4	0.5	0.3
125	5	0.5	0
	6	0.7	0.2
	7	0.8	0.1
	8	1.0	0.2
	9	1.1	0.1
	10	1.2	0.1

→ 13 min — Flow Rd 1.0 — Flow Rate 0.3

KEVINS CORNER 42626718

Date 23/2/11
Sheet 2 of 3
BH 1103
Test zone: 7.2 m to 11.2 m

kPa Gauge Pressure	Elapsed min	Flow Reading (l)	Flow (l/min)
	0	0	
	1	0	0
	2	0.1	0.1
	3	0.1	0
75	4	0.1	0
	5	0.1	0
	6	0.1	0
	7	0.1	0
	8		
	9		
	10		
	0	0	
	1	0	0
	2	0	0
	3	0	0
30	4	0	0
	5		
	6		
	7		
	8		
	9		
	10		
	0		
	1		
	2		
	3		
10	4		
	5		
	6		
	7		
	8		
	9		
	10		

Appendix D Results of Laboratory Testing

Trilab
www.trilab.com.au

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10/104 Newmarket Rd, Windsor
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Perth
2 Kimmer Place, Queens Park
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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.**	11040107-G
Project	Kevin's Corner	**Test Date**	18/04/2011
		Report Date	29/04/2011

Sample No.	11040107	11040109	11040110	11040111	11040112	11040113	11040114
Client ID	BH 1101	TP 1101	TP 1101	BH 1103	TP 1103	TP 1103	TP 1103
Depth (m)	S5-S10	0.00-1.70	3.50-4.70	S3-S5	0.00-1.00	1.4-2.0 + 2.5-3.7	4.30-5.20
Moisture (%)	10.6	6.1	12.5	12.8	7.8	12.8	8.9
AS SIEVE SIZE (mm)	**PERCENT PASSING**						
150							
75							
53							
37.5							
26.5							
19		100					
9.5	100	99		100		100	100
4.75	99	99		96	100	99	99
2.36	95	98	100	92	99	98	96
1.18	90	96	98	87	95	96	86
0.600	86	92	96	83	89	93	71
0.425	83	86	93	81	83	91	56
0.300	79	79	89	78	75	88	41
0.150	65	50	80	68	51	75	19
0.075	55	33	71	61	34	64	12

NOTES/REMARKS:

Sample/s supplied by the client

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IES 17025. The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Authorised Signatory
J. Russell

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Laboratory No. 9926

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Queens Park
WA 6107
Ph: +61 8 9258 8323

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.**	11040107-AL
Project	Kevin's Corner	**Test Date**	29/04/2011
		Report Date	29/04/2011

Sample No.	11040107	11040109	11040110	11040111	11040112	11040113
Client ID	BH 1101	TP 1101	TP 1101	BH 1103	TP 1103	TP 1103
Depth (m)	S5-S10	0.00-1.70	3.50-4.70	S3-S5	0.00-1.00	1.4-2.0 +2.5-3.7
Liquid Limit (%)	26	Not Obtainable	30	37	18	38
Plastic Limit (%)	13	Not Obtainable	15	15	15	15
Plasticity Index (%)	13	Non Plastic	15	22	3	23
Linear Shrinkage (%)	5.5*	Not Obtainable	6.5	8.5+	0.5	7.0*
Field Moisture Content (%)	10.6	6.1	12.5	12.8	7.8	12.8

Sample No.	11040114	-	-	-	-	-
Client ID	TP 1103	-	-	-	-	-
Depth (m)	4.30-5.20	-	-	-	-	-
Liquid Limit (%)	Not Obtainable	-	-	-	-	-
Plastic Limit (%)	Not Obtainable	-	-	-	-	-
Plasticity Index (%)	Non Plastic	-	-	-	-	-
Linear Shrinkage (%)	Not Obtainable	-	-	-	-	-
Field Moisture Content (%)	8.9	-	-	-	-	-

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

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SOIL PARTICLE DENSITY TEST REPORT

Test Method: AS 1289 3.5.1

Client	URS Australia Pty Ltd	**Report No.**	11040107-SG
Project	Kevin's Corner	**Test Date**	19/04/2011
		Report Date	29/04/2011

Sample No.	11040107	11040109	11040110	11040111	11040112	11040113	11040114
Client ID	BH 1101	TP 1101	TP 1101	BH 1103	TP 1103	TP 1103	TP 1103
Depth (m)	S5-S10	0.00-1.70	3.50-4.70	S3-S5	0.00-1.00	1.4-2.0+2.5-3.7	4.30-5.20
Soil Particle Density (t/m^3)	2.67	2.63	2.61	2.62	2.67	2.62	2.66

Sample No.	-	-	-	-	-	-	-
Client ID	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-	-
Soil Particle Density (t/m^3)	-	-	-	-	-	-	-

Sample No.	-	-	-	-	-	-	-
Client ID	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-	-
Soil Particle Density (t/m^3)	-	-	-	-	-	-	-

NOTES/REMARKS:

Sample/s supplied by the client

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IES 17025. The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

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NATA ACCREDITED FOR TECHNICAL COMPETENCE

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