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ENVIRONMENTAL SITE ASSESSMENT

Sheep Hill Marine Port Facility Baseline Study

Submitted to:
Centrex Metals Ltd
Level 3, 100 Pirie Street
Adelaide SA 5000

REPORT

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Executive Summary

Summary of Investigations

The site is located on the Eyre Peninsula at Sheep Hill, approximately 20 km north east of Tumby Bay. The site includes approximately 105 ha of coastal land and a potential road and rail transport access corridor approximately 8 km long x 0.3 km wide generally following the alignment of the existing Swaffers Road.

This report presents the results of a environmental site assessment undertaken for the purpose of obtaining baseline chemical information to characterise the existing site to assist in planning for the proposed development as a deep water port.

The assessment included an investigation of historical site activities and limited soil and groundwater investigations to further assess potential contamination of the Site from the historical activities. Results of the site history investigation indicated that the Site was previously used for agricultural activities.

Intrusive soil and groundwater investigations were spaced across the Site in a grid pattern to provide a geographical spread of assessment locations.

Limited Soil Assessment

Intrusive soil investigations included the collection of soil samples following the drilling of 8 boreholes, excavation of 32 test pits and the collection of 6 surface grab samples across the Site and transport access corridor.

Results of the soil assessment indicated that chemical concentrations were generally below the laboratory LOR or below the adopted investigation criteria for disposal and for the protection of human health and ecological receptors. There were samples with concentrations of copper, zinc, vanadium and TPH exceeding the NEPM EIL guideline and Waste Fill disposal criteria. However, sample concentrations were below the NEPM HIL[F] guideline for commercial/industrial landuse and the 95% Upper Confidence Limits (UCLs) of mean analyte concentrations were all below the NEPM EIL guideline and Waste Fill disposal criteria. The vanadium and copper concentrations were considered to be regional.

The TPH C_{10}-C_{36} concentration of 2,000 mg/kg, measured in the surface sample recovered from BH08, was associated with above average metal concentrations. It represents an oily hydrocarbon either from the drilling rig or support vehicles used during the investigations or represents possible random impacts from the many years of farming activities in the region. The PID reading for this sample was 0.0 ppm and no odours or visible evidence of contamination was observed.

The measured pH values ranged from 6.5 to 10.3. pH values above 9.0 are considered to be elevated and alkaline. However, the measurements for samples recovered from the port site and transport corridor are likely to be regionally influenced, with elevated measurements attributable to the prevalence of calcareous formations in the area.

Limited Groundwater Assessment

Groundwater investigations included the drilling and installation of eight groundwater wells at the proposed port site to a maximum depth of 21.5 m. A single, multi-lithology (different rocks contain the groundwater) aquifer is inferred beneath the site. Groundwater is hosted in this aquifer just above mean sea level (<3 m AHD) in either fractured rocks (granite, gneiss or schist) or unconsolidated sediments.

We interpret this uppermost aquifer to be unconfined and potentially the receiving environment for contaminants released to the land surface or just below. Groundwater appears to move from a ridge towards the east (sea), north (sandy beach to the north of the site) and west/northwest. The northwesterly

flow appears to be the most significant as it connects the fractured rock environment to the sedimentary deposits in a deltaic dampland.

The salinity, as measured by total dissolved solids ranges between fresh and saline water, with the majority of bores yielding brackish water. Considering the climate and expected low groundwater recharge, the presence of freshwater in one bore was unexpected.

All the reported groundwater samples were of sodium-chloride type (sodium being the major cation and chloride the dominant anion). Sodium-chloride type groundwater is typical to coastal groundwater discharge areas. Laboratory reported dissolved metals exceed SA EPA EPP criteria in all bores (but no bore exceeds systemically the metal guidelines) and in an unpredictable pattern. Considering the current land use and the general lack of potential contaminants, the most likely explanation is that the metals listed occur naturally and are the product of groundwater–metamorphised rock interaction. Pesticides and hydrocarbons were below their respective limits for reporting.

Golder undertook a groundwater bore reconnaissance survey of these wells in consultation with the current landowners. This survey indicated that the wells listed in government databases have either been decommissioned, are no longer operational or their location is unknown. We understand that the reasons for abandoning these bores include poor groundwater quality and the introduction of a piped water supply to the area.

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1.0 INTRODUCTION

1.1 General

Golder Associates Pty Ltd (Golder Associates) was engaged by Centrex Metals Ltd (Centrex) to undertake a baseline investigation of soil and groundwater quality at the site of a proposed deep water marine port. The site is located on the Eyre Peninsula at Sheep Hill, approximately 20 km north east of Tumby Bay. The location of the site is shown on Figure 1.

The investigation program was completed in general accordance with the Golder proposal, "*Sheep Hill Marine Port Facility – Development Approval and Baseline Study Proposal*", dated 11 August 2008 (Reference P87663074).

The aim of the baseline soil and groundwater study is to assess pre-existing soil and groundwater conditions at the site to allow a comparison of the existing contaminant levels (if present) with those present in the soils and groundwater when Centrex cease operations and exit the land. The report includes details of soil and groundwater investigations, the results of these investigations and discussions and recommendations based on analyses of investigation results.

1.2 Background

Centrex is an iron ore explorer on Eyre Peninsula with a number of exploration interests. The Wilgerup Mine is currently in start up phase.

Centrex requires a deep water marine port to facilitate transport of mined product to overseas markets. Existing marine shipping facilities within the Eyre Peninsula may not be suitable. Centrex has purchased two blocks of land at Sheep Hill with a view to developing a deep water marine port. Centrex has not provided a detailed project description or design to Golder, at the time of report preparation.

The Sheep Hill proposed port site includes approximately 105 ha of coastal land and a potential road and rail transport access corridor approximately 8 km long x 0.3 km wide generally following the alignment of the existing Swaffers Road.

2.0 SITE DESCRIPTION

2.1 Site Identification

The details for the port site are outlined in Table 1 below.

Table 1: Sheep Hill Site Information

Council	**District Council of Tumby Bay**	
Allotment Number	386	388
Zone	General farming	Coastal
Plan Details	CL 1132 26, Plan H511600, Parcel S386	CL 1132 26, Plan H511600, Parcel S388
Current Owner	R. D. Rogers	R. D. Rogers
Plan Area of Site (approx)	52.96 ha	51.09 ha

2.2 Current Site Description and Land Use

The port site is located within a predominantly rural area. Lipson Island Conservation Park is located approximately 1.5 km to the south of the site and a Crown Land coastal corridor, approximately 50 m wide, extends along the eastern boundary of the port site.

The port site is approximately trapezoidal in shape and is currently agricultural land. A fenceline runs approximately north-south through the site, designating the boundary of Allotments 386 and 388. The northern coastal portion of Allotment 388 consists of a small bay with sandy beach.

The potential road and rail transport access corridor generally follows the existing alignment of Swaffers Road from the intersection with the Lincoln Highway and passes through agricultural land to the south of the road reserve.

An aerial photograph showing surrounding land uses is provided as Figure 2.

2.3 Geology

The Lincoln mapsheet[1] indicates that the proposed port site and transport corridor is underlain by Archean age "*Undifferentiated metasediments, coarse grained augen gneisses, granitoid gneisses, amphibolites, mica schists, sericite schists. Doleritic dykes abundant along eastern coast*." This description of the site geology is consistent with the Tumby[2] and Neill[3] mapsheets.

Based on discussions with Wolfgang Preiss (PIRSA), we understand that the site is located in the Kalinjala Shear Zone. This is a large-scale crustal structure on the Eyre Peninsula which separates the Donington Suite granites to the east from metasedimentary schist, quartzite, dolomite marble and banded iron formations of the Hutchison Group to the west.

The rocks beneath the site and exposed at the nearby beach are granite, granitic gneiss (deformed and metamorphosed granite), and schist (extremely deformed sheared granite). The granites and gneiss are likely to belong to the Donington Suite. These were intruded in a long belt along the east coast of the Eyre

[1] Johns et al, Scale 1:250,000, Geological Survey of South Australia (1958)

[2] Johns R. K., Scale 1:63,360, Geological Survey of South Australia (1958)

[3] John & Thatcher, Scale 1:63,360, Geological Survey of South Australia (1958)

Peninsula, under the southern Spencer Gulf and outcrop also at the foot of the Yorke Peninsula. The schists may represent a subsidiary shear zone, possibly splintering off the main shear zone.

2.4 Topography

The site is flanked to the north, west and south by rounded hills approximately 50 m in elevation. The coastline to the north of the port site consists of a small bay with a sandy beach. The aerial photograph of the site (Figure 3A) shows an intertidal zone to the west of the small bay in the northern part of the site.

The western portion of the site slopes down gently towards an unsealed access track extending approximately north-south along the eastern allotment boundary. The headland on which the proposed port will be constructed rises from the track to approximately 25 m elevation. The headland is characterised by rocky outcrops. To the east it slopes steeply to a rocky shoreline.

The aerial photograph also shows a surface water drainage path extending from the south west of the site and curving towards the centre of the site where it becomes less well defined.

In the proposed Transport Access Corridor, Swaffers Road rises from its eastern end along a valley until it reaches a high point at the Coast Road intersection. Between Coast Road and the Lincoln Highway, Swaffers Road gradually falls through a series of hills and valleys. A surface water drainage path was present along one section of Swaffers Road near the eastern end of the road.

Two areas along Swaffers Road were identified as natural water collection areas (although these were dry at the time of the investigation) by the greener vegetation and surface salinity. One of these was located 1 km west of Coast Road and the other was located at the Swaffers Road – Lincoln Highway intersection, to the north of Swaffers Road.

2.5 Bore Search

A search of Primary Industry and Resources South Australia (PIRSA)'s Drillhole Enquiry System (DES)[4], for registered bores in the vicinity of the site was undertaken. Search results for bores located within an 8 km radius of the port site are summarised in Table 2 below. Additional information is presented in Appendix A.

Table 2: Shallow Groundwater Bore Information

PIRSA Bore No.	Approx. Distance from Site (m)	Direction from Site	Drilled Depth (m)	Depth to Standing Water Level (m)	TDS (mg/L)	Sample Date
6129-15	3,300	N	-	-	9,725	June 1948
6129-29	2,400	WNW	-	-	-	-
6129-30	1,500	W	-	2.7	18,864	June 1948
6129-31	2,200	WNW	-	-	-	-
6129-92	7,300	WSW	-	2.7	13,852	June 1948
6129-93	6,200	WSW	-	1.8	15,180	June 1948
6129-94	2,200	W	-	-	12,295	May 1938

[4] PIRSA's online Drillhole Enquiry System [https://des.pir.sa.gov.au/deshome.html], accessed 29 July 2008

6129-95	2,700	SSW	-	6.1	10,510	January 1960
6129-96	4,900	SW	16.76	-	-	-
6129-97	4,200	SW	11.28	-	10,353	August 1948
6129-98	3,300	SSW	18.59	14	10,210	August 1948
6129-507	4,900	WNW	-	-	31,597	July 1992

The PIRSA data suggests that the wells in the vicinity on the site are generally greater than 50 years old. Recorded standing water levels of the uppermost aquifer for these bores range between 1.8 m and 14 m below the ground surface. The PIRSA data also indicates that total dissolved solids (TDS) concentrations within the uppermost aquifer and close to the site are generally greater that about 10,000 mg/L. These concentrations indicate brackish to saline water and therefore likely uses of groundwater may be limited.

Golder undertook a groundwater bore reconnaissance survey of these wells in consultation with the current landowners. This survey indicated that the wells listed above have either been decommissioned, are no longer operational or their location is unknown. We understand that the reasons for abandoning these bores include poor groundwater quality and the introduction of a piped water supply to the area.

3.0 SCOPE OF WORKS AND METHODOLOGY

3.1 Soil Investigation

The preliminary soil investigation was conducted by Golder during October and November 2008. The investigation included the sampling of soil recovered from boreholes and test pits and the collection of surface grab samples.

The site investigations and laboratory analyses were performed in accordance with Golder's procedures, which are based on the National Environmental Protection Council's *'National Environmental Protection (Assessment of Site Contamination) Measure'* (1999) and Standards Australia, AS 4482.1 and AS 4482.2 – *'Guide to sampling and investigation of potentially contaminated soils'*, Parts 1 – 3.

3.1.1 Sampling Rationale and Methodology

A total of 24 test pits (TP01 to TP24) were excavated across the port site during the soil investigation. Test pit locations were positioned systematically across the Site and were spaced to provide a reasonable geographical spread. In addition, soil samples were collected from eight boreholes drilled at the site for the purpose of groundwater monitoring well installation.

Eight test pits (TP25 to TP32) were excavated within the proposed transport access corridor. The test pits were excavated at approximately 1 km intervals along the alignment. Six grab samples (G01 to G06) were also collected from surface soils at locations approximately halfway between the test pits.

The test pit, borehole and grab sample locations were measured using a handheld GPS to WGS84 datum and are presented on Figures 3A and 3B.

The test pits were excavated using a backhoe to depths ranging from 0.6 m (TP23) to 2.4 m (TP19). The boreholes were drilled by Boart Longyear using a truck-mounted sonic drilling rig to depths ranging from 10.3 m (BH03) to 21.5 m (BH06) below ground level. Grab samples were collected from surface soils by filling the appropriate laboratory supplied jars directly from soil sampled from the site surface at each location.

Reports of the test pits and boreholes are presented in Appendix B, together with Notes and Abbreviations used in their preparation.

A total of 180 samples (including 20 Quality Assurance/Quality Control (QA/QC) samples) were collected by environmental professionals from Golder. The sampling methodology included the following:

- Collection of soil samples from discrete depth intervals within each test pit and borehole, including the surface, near sub-surface and samples from each stratigraphic layer, where practicable.
- Samples were visually and olfactorily assessed for the presence of contamination.
- Soils encountered were environmentally logged.
- A Photoionisation Detector (PID) was used to assess the presence of volatile organic compounds within the soil.
- Soil samples selected for chemical analysis were submitted to either a primary or secondary National Association of Testing Authorities (NATA) registered laboratory in a chilled cool box with ice bricks under appropriate chain-of-custody (COC) documentation.

A discussion of QA/QC procedures adopted during the soil sampling program is presented in Section 4.0 and in Appendix C.

3.1.2 Chemical Analysis

Samples selected for laboratory analysis were analysed for one or more of the following analytes:

- pH value.
- Metals (aluminium, arsenic, cadmium, chromium, copper, iron, magnesium, mercury, nickel, lead and zinc).
- OCPs and OPPs.
- Total petroleum hydrocarbons (TPH)/benzene, toluene, ethylbenzenes and xylenes (BTEX).
- Polycyclic aromatic hydrocarbons (PAH).
- Chemicals contained in a comprehensive Vic EPA Screen.

The primary soil samples and intra-laboratory blind duplicate soil samples were analysed by SGS Environmental Services (SGS) and ALS Laboratory Group (ALS). The inter-laboratory split duplicate soil samples were analysed by LabMark Environmental Laboratories (LabMark). SGS, ALS and LabMark are NATA accredited for the tests performed.

3.1.3 Assessment Criteria

The results of the chemical analyses were compared with published Australian guidelines to assess the potential for contaminated soil to impact on the health of potential site users and environmental receptors and to assess off-site disposal options. The primary soil guidelines consulted were:

- ***National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (National Environment Protection Council 1999)***. The NEPM provides guidance for the investigation and management of site contamination, and provides health-based investigation levels (HILs) for soils in nominated settings (for example, standard residential [A], residential with minimum opportunities for soil access [D], and commercial / industrial [F]) and interim ecological investigation levels (EILs) for soils in an urban setting. The proposed future land use of the site is as a port. Accordingly, the NEPM NEPM HIL [F] (Commercial/Industrial) and the NEPM ecological investigation levels (NEPM EILs), were applied.
- ***Environment Protection (Fees and Levy) Regulations (1994), Schedule 6***. This schedule provides limiting concentrations of chemical substances in soil for off-site disposal as 'Waste Fill'. Waste Fill is soil that can be disposed of to landfill without incurring a waste levy. For off site disposal purposes, material not complying with the Waste Fill disposal criteria would need to be considered against specific landfill licence conditions, including 'intermediate landfill cover (ILC)' or 'low level contaminated soil (LLCS)' criteria.

3.2 Groundwater Investigations

3.2.1 General

Monitoring wells were installed concurrently with the soil investigation (borehole drilling) program. A total of eight wells were installed to a maximum depth of 21.5 m. The wells were constructed to intersect the uppermost groundwater table either in fractured rock (GW01 to GW06) or in unconsolidated sediments (GW07 and GW08).

The locations of these wells are shown in Figure 4. Well details are listed in Table 3.

Permits to install monitoring wells were obtained from DWLBC prior to commencement of drilling. These permits are included in Appendix D. Reports of the boreholes are presented in Appendix B, with groundwater well construction details presented in Appendix E.

3.2.2 Installation Methods and Materials of Construction

The boreholes in which the shallow wells were installed were drilled using a sonic rig with core samples recovered during the drilling process. The wells were constructed from 6 m of 50 mm diameter slotted PVC screen finished to above the surface using blank threaded PVC casing. Each well had an end cap placed on the base on the slotted (screened) section and top of the well. The annulus of the borehole surrounding the screened section and approximately 1 m above the screened section was backfilled with sand to form a filter pack. An approximately 1 m thick layer of bentonite was placed above the filter pack and the remaining borehole annulus backfilled to the surface with cement grout. The well was completed with a lockable metal standpipe/monument cemented around it for protection of the well head and to minimise tampering.

The top of each well casing was professionally surveyed to Australian Height Datum (m AHD).

Table 3: Groundwater Monitoring Wells

Monitoring Well	Easting (m)	Northing (m)	RL Top of Well Casing (m AHD)	Total Depth of Well (m bgl)	Screened Interval (m)	Depth to Top of Filter Pack (m)	Depth to Top of Bentonite Seal (m)	Completed With
GW 01	616712	6209958	9.107	13.5	7.3 -13.2	6.3	5.3	Concrete and standpipe cover
GW 02	616476	6209979	9.359	13.0	7.0 – 13.0	6.0	5.0	Concrete and standpipe cover
GW 03	616334	6209804	8.567	10.3	7.2 – 10.2	6.2	5.2	Concrete and standpipe cover
GW 04	616329	6209601	17.837	18.0	12.0 – 18.0	11.0	10.0	Concrete and standpipe cover
GW 05	616497	6209493	15.231	15.0	8.9 – 14.9	7.9	6.9	Concrete and standpipe cover
GW 06	616584	6209704	21.004	21.5	15.4 – 21.4	14.4	13.4	Concrete and standpipe cover
GW 07	616089	6210042	7.913	11.0	5.0 – 11.0	4.0	3.0	Concrete and standpipe cover
GW 08	615963	6209706	10.451	11.0	5.0 – 11.0	4.0	3.0	Concrete and standpipe cover

The wells were developed about 7 days after installation using a low-voltage purging pump for a total of approximately 30 minutes until the water became clear. Field measurements of groundwater chemistry were taken at regular intervals during development (measuring conductivity, RedOx, dissolved oxygen, pH and temperature) and are presented in Appendix F.

3.2.3 Sampling

Groundwater was sampled on 5 November 2008 by an environmental professional from Golder. Groundwater sampling procedures included the following:

- The groundwater level was measured using an interface probe prior to removal of any water from the well.
- The well was purged using a 12V electric submersible pump and LDPE tubing. Field measurements of groundwater chemistry were taken approximately every 10 litres during purging. Purging of groundwater continued until a volume of water, equivalent to at least twice the well storage, had been removed and the variation of pH and conductivity parameters had stabilised to the extent that consecutive water chemistry measurements were within $\pm$ 10% of each other. Purging was conducted so that a water sample representative of the surrounding aquifer could be obtained. For GW06, only one well-volume water could be purged prior to the water level reaching the base of the borehole.
- Field groundwater chemistry parameters (pH, RedOx, conductivity, dissolved oxygen and temperature) were measured using a TDS 90FLMV water quality meter during purging. The results of the field groundwater parameter testing are provided in the purging records contained in Appendix F.
- Samples were collected in containers provided by a NATA accredited analytical testing laboratory (ALS and LabMark). The samples to be analysed for metals were field filtered using a 0.45 micron filter.
- The sample bottles were placed in a cool box, stored on ice to keep chilled and delivered to the laboratory accompanied by the appropriate COC documentation.
- A blind duplicate (intra-laboratory) sample and a split duplicate (inter-laboratory) sample was collected from GW04.

Additional details regarding decontamination and quality control procedures used during the groundwater investigation are presented in the QA/QC discussion presented in Appendix C. Analytical results for the QA/QC samples collected during the investigation are also provided in Appendix C.

3.2.4 Chemical Analysis

The primary samples were analysed for the following analytes:

- pH value.
- Total Dissolved Solids (TDS).
- Major cations and anions.
- Chemicals contained in a comprehensive Vic EPA Screen.
- Additional metals (iron, magnesium, manganese).

The duplicate sample collected from GW04 was analysed for pH value, TDS, major cations and anions, and metals (aluminium, arsenic, cadmium, chromium, copper, iron, magnesium, manganese, mercury, nickel, lead and zinc).

Primary groundwater samples were analysed by ALS. The inter-laboratory split-duplicate sample was analysed by LabMark. ALS and LabMark are both NATA accredited for the tests performed. Analytical

methods used by each of these laboratories and the reporting limits achieved during the investigation are kept on file if required.

3.2.5 Assessment Criteria

The results of the chemical analyses were compared with published applicable guidelines to assess the potential for contaminated groundwater to impact on the health of potential site users and environmental receptors.

The SA EPA stipulates the use of Environment Protection (Water Quality) Policy 2003 for assessing water quality. In the absence chemical criteria in this Policy, the SA EPA does not formally endorse the use of regulations or policy from other States or countries. The presence of chemical contaminants, however, cannot be ignored based on the absence of guidelines. Therefore the use of other guidelines is considered appropriate.

The primary water guidelines consulted included:

- ***Environment Protection (Water Quality) Policy 2003*** *[EPP(WQ)].* The EPP(WQ) operates as a policy under the Environment Protection Act, 1993 (Reference 4). The EPP(WQ) assigns default *"protected environmental values"* for all water bodies, including groundwater, and provides "*water quality criteria"* for the protected values.

In the absence of guidance criteria in the above document for TPH, the *Dutch Intervention Guidelines, 2000* (Reference 5) were used.

The protected environmental values are beneficial aspects or uses of water for protection of the water body from pollution. For underground water bodies (groundwater), the EPP (WQ) designates the protected environmental values as fresh or marine aquatic ecosystems, recreational – primary contact (e.g. swimming), aesthetic (colour, smell, clarity and general appearance), potable, agricultural irrigation, livestock watering, aquaculture and industrial use. The protected environmental values are assigned irrespective of the salinity of the water or the proximity/presence of environmental receptors.

Given the likely future land use of the site (commercial/industrial), the generally low groundwater yields and the site setting, (adjacent to Spencer Gulf), the most applicable criteria provided in the EPP(WQ) is considered to be for the protection of *marine aquatic ecosystems*.

The salinity of groundwater under the site ranges from 786 mg/L to 19,500 mg/L, which is higher than the maximum concentration suitable for drinking purposes (of 1,000 mg/L). On this basis, beneficial use of groundwater for drinking (potable and stock) and irrigation usage (EPP (WQ)) is unlikely.

The guideline concentrations are listed in the summary table of analytical results presented in Appendix G.

4.0 QUALITY ASSURANCE / QUALITY CONTROL

The QA/QC procedures undertaken by Golder personnel as part of the soil and groundwater investigations were based on our standard procedures, guidance provided in AS 4482.1 and the NEPM for the Assessment of Site Contamination.

Based on a review of the overall data, the results of the QA/QC analysis indicate that the primary data set for the soil assessment is acceptable.

A more detailed explanation of the QA/QC information is provided in Appendix C.

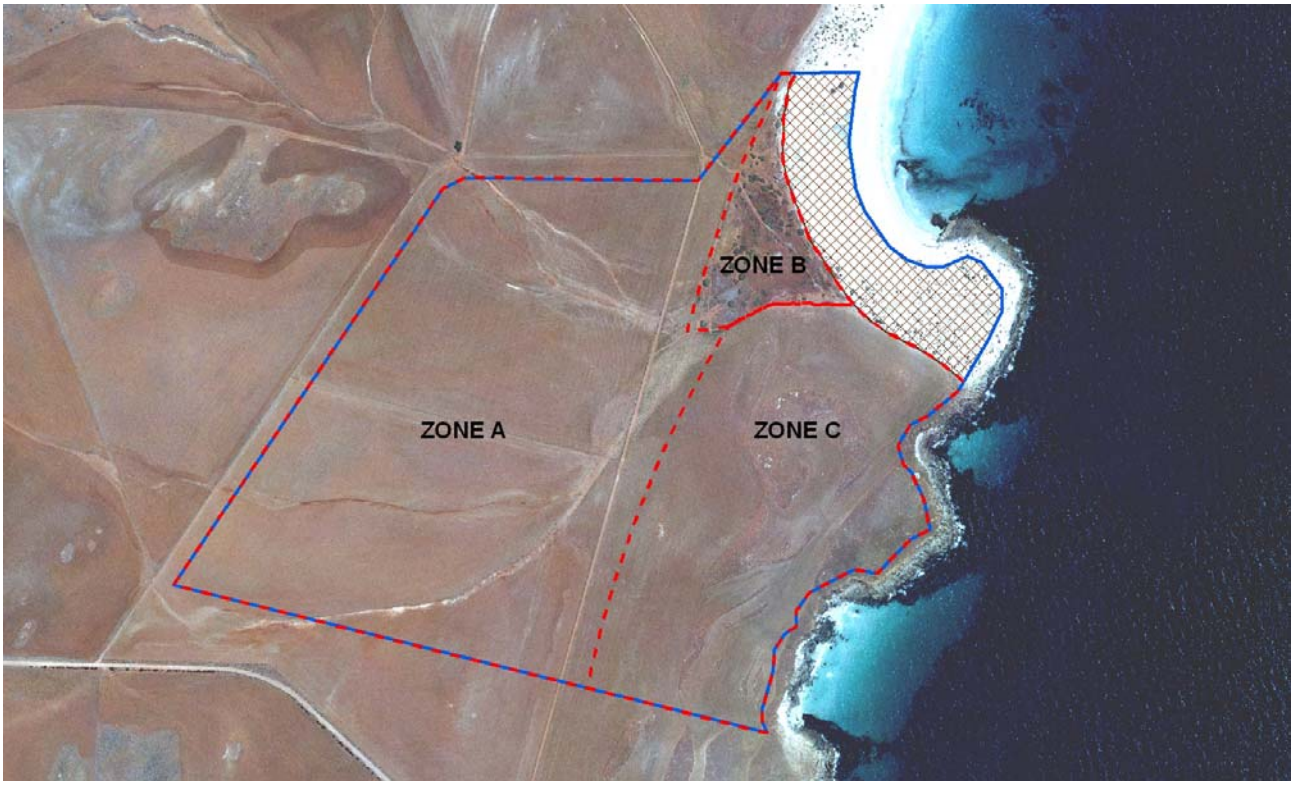
5.0 SUMMARY OF ASSESSMENT RESULTS

5.1 Soil Investigation

Reports of the test pits and boreholes are presented in Appendix B, together with Notes and Abbreviations used in their preparation. The laboratory certificates are available on file if required. Tables summarising the soil analytical data are included as Appendix H.

5.1.1 Summary of Subsurface Conditions – Port Site

Based on our investigations, the port site may be separated into three zones, each with distinct geotechnical characteristics. The zones are shown in the figure below.



The boundaries between the zones cannot be interpreted accurately on the basis of the relatively few widely spaced test pits and boreholes placed during the investigation and hence the interzone boundaries shown on the Figure 3A must be regarded as approximate only.

Descriptions of the subsurface conditions for the site zones are presented below.

Zone A

Zone A included Test Pits TP01 to TP04, TP06 to TP09 and Boreholes BH07 and BH08. These were located within the same cadastral boundary - the paddocks on the western half of the site, although Test Pit TP06 was to the east of that boundary. The aerial photo suggests that TP06 is in a surface water drainage path.

The soil profile in Zone A generally included topsoil - dark brown clayey sand or silty sand - to depths between 0.05 m and 0.15 m. Underlying the topsoil was dark red/brown medium to high plasticity sandy clay, present to depths between 0.1 m and 0.3 m. Below this we encountered brown/orange brown clayey sand or gravelly clayey sand to the base of the test pits between 1.9 m and 2.3 m below ground level. TP07

and TP08 encountered layers of calcrete gravel, cobbles or boulders in a matrix of clayey sand or sandy clay.

BH07 contained pale brown clayey sand, sand and sandy clay layers to 8 m depth. BH08 generally contained red brown high plasticity sandy clay or clay to 8 m depth. Below 8m depth in both boreholes we encountered yellow low plasticity silty sandy clay. This persisted to 11 m (termination) in BH07 and 9.5 m in BH08. Granite was present in BH08 from 9.5 m to the end of the borehole at 11 m.

Groundwater was not encountered in the test pits in Zone A. Groundwater levels in Boreholes BH07 and BH08 were around 6.6 m and 9.2 m below ground level (approximately 1.1 m AHD and 1.3 m AHD respectively).

Zone B

This is the low-lying intertidal zone in the north-east area of the site. Test pits TP05 and TP19 were located in Zone B.

The upper layers of TP05 and TP19 were dissimilar. TP05 encountered orange brown then dark brown low plasticity sandy clay to 0.6 m depth, underlain by pale grey/brown silty sand to 0.9 m depth. TP19 encountered orange brown sand to 0.7 m depth, underlain by orange brown sandy clay/clayey sand (high plasticity clay and fine to medium grained sand) to 1.5 m depth.

Beneath that the underlying materials were similar in both pits - high plasticity clay to between 1.6 m and 2.0 m depth underlain by grey clayey sand or silty sand to the base of the pits at 2.0 m and 2.4 m depth. In TP05 the high plasticity clay was striped grey, brown and white in layers, and the underlying sand layer collapsed during excavation. Excavation resistance in TP05 and TP19 was low to medium for their full depth.

Groundwater seepage was observed in both test pits. The observed groundwater level in TP05 was 1.65 m below ground level 1 hour after excavation was complete and 2.0 m below ground level in TP19 20 minutes after excavation was complete.

Zone C

Zone C comprises the headlands on the eastern half of the site. Test Pits TP10 to TP18, TP20 to TP24 and Boreholes BH01 to BH06 are located in this Zone.

The test pits encountered one to three near-surface layers of dark brown low plasticity clayey sand up to 0.5 m depth. Underlying this we generally observed pale orange brown silty sand or clayey sand, often including layers of grey/brown extremely weathered rock. Gravel, cobbles and boulders of calcrete, gneiss, schist, quartz or other weathered rocks were present at various depths throughout the pits, and as outcropping and scattered rocks on the ground surface. Weathered rock intrusions into upper test pit layers were occasionally present. Most of the test pits in Zone C contained calcareous soils or inclusions.

Ten of the fourteen test pits in Zone C met practical refusal at depths between 0.6 m and 1.8 m. Test Pits TP11, TP13, TP14 and TP20 did not meet refusal and were terminated at depths between 1.9 m and 2.35 m in inferred weathered rock or brown gravelly sand (TP13).

The boreholes in Zone C encountered topsoil generally underlain by soil strength materials (extremely weathered rock) to depths between 1.0 m and 11.5 m. The extremely weathered rock was generally clayey sand, silty sand or gravelly sand and often contained cobbles. The boreholes indicate significant variability in the depth of weathering. We do not consider that there are sufficient boreholes across the site to allow reliable assessment of the contact between soil and rock across the site.

The soil was underlain by distinctly weathered to slightly weathered granite or schist to the base of the boreholes at between 10.3 m and 21.5 m below ground level. The granite in the boreholes was generally high to very high strength while the schist ranged from medium to very high strength.

Based on the core recovered from the boreholes and limited geological mapping of rock outcrops at the site we make the following comments regarding the rock:

- The average defect spacing in the recovered core generally ranged between about 100 mm and 300 mm. There were a number of highly fractured zones.
- The main defect sets included sub-vertical foliation generally dipping in either east-southeast or west-northwest directions (dependent on dip angle) and sub-vertical cleavage. Occasional joint sets (approximately 45° to 65° dip) were observed in the recovered core. However, we were unable to assess their dip direction from the vertical boreholes drilled.

Groundwater was not encountered in the test pits in Zone C. Groundwater level measurements in boreholes BH01 to BH06 as part of the ESA were between approximately 0.9 m AHD (GW03) and 2.3 m AHD m (GW04 and GW06).

5.1.2 Summary of Subsurface Conditions – Transport Access Corridor

Test Pits TP01, TP03 and TP04 and Borehole BH07 were located at the eastern end of the transport access corridor. These test pits generally encountered clayey sand/sandy clay topsoil to between 0.15 and 0.3 m depth, underlain by orange/brown to brown clayey sand to the full extent of the pits - 1.9 to 2.3 m depth. BH07 contained pale brown clayey sand, sand and sandy clay to 8 m depth, underlain by yellow silty sandy clay of low plasticity to the base of the borehole at 11 m.

Test Pits TP25 to TP32 were located along the Transport Access Corridor (refer to Figure 3B), in numerical order from east to west:

- TP25 was located in a valley close to the base of a hill and encountered refusal on inferred calcrete at 0.9 m depth. We observed brown/dark brown clayey sand to 0.3 m depth, underlain by calcrete gravel and cobbles in a matrix of brown clayey sand.
- TP26 and TP27 were located in a valley. These pits contained brown or dark brown and fine to coarse grained clayey sand to 2 m depth. There were calcareous inclusions and pale brown or pale orange/white mottling from around 0.5 m to 1.5 m depth.
- TP28 was placed on a saddle, with the ground rising towards the north along Coast Road, and dropping in other directions. This pit encountered dark brown clayey sand to 0.4 m depth, underlain by pale brown gravelly clayey sand to 0.9 m depth. Beneath that there was red/white/yellow mottled silty sand to the base of the pit at 2.0 m.
- Test Pits TP29 to TP32 were located to the west of Coast Road in a series of hills and valleys. Pits TP29, TP31 and TP32 encountered practical refusal at between 1.1m and 1.6m. We observed topsoil up to 0.5 m depth in these pits. This was underlain by a mixture of gravel, cobbles and boulders (inferred to be calcrete, gneiss and sandstone) in a matrix of soil (clayey sandy gravel, clayey sand, gravelly clayey sand or sandy clay) in which we met refusal at various depths. TP30 encountered dark brown clayey sand to 0.4 m depth, underlain by low plasticity sandy clay to 2 m depth.

Groundwater was not encountered in the test pits at the time of the investigation.

5.1.3 Summary of Visual and Olfactory Contamination

An assessment of each sample was made in the field and involved ranking based on both odours and/or any visible evidence of contamination. Each soil sample recovered was given a rank according to Table 4 below.

Table 4: Environmental Ranking System for Soils

Visible Contamination		Odorous Soil	
Rank	**Description**	**Rank**	**Description**
0	No visible evidence of contamination	A	No odour
1	Slight evidence of visual contamination (trace quantities)	B	Slightly offensive odour
2	Visible contamination (e.g. more than trace)	C	Moderately offensive odour
3	Obviously contaminated (e.g. significant colour and staining)	D	Strongly offensive odour

No visible evidence of contamination was observed in the soil samples collected on site. Generally, the samples collected from the test pits and the boreholes recorded rankings of 0A.

As indicated in Section 3.1.1, the soil samples were screened with a PID to assess the potential presence of volatile organic hydrocarbons (measured in isobutylene equivalents). PID readings were 0.0 ppm in the screened samples, with the exception of:

- BH01 (0 to 0.2 m bgl) – 0.4 ppm.
- BH01 (0.4 to 0.5 m bgl) – 0.2 ppm.
- BH01 (1.5 to 1.8 m bgl) – 0.1 ppm

These PID readings are low. The soil samples from which the above readings were made did not have a visual appearance or odour which suggested the presence of organic contamination.

5.1.4 Summary of Analytical Results

The results of the laboratory analytical testing for the limited soil investigation conducted by Golder have been compared with the adopted assessment criteria outlined in Section 3.1.3.

Laboratory analytical results reported for soil samples are summarised below:

- Concentrations of metals were generally below the adopted assessment criteria with the following exceptions:
  - Zinc concentrations in three samples (BH08 0 to 0.2 m, BH08 1.5 to 1.8 m, and TP31 0 to 0.1 m) exceeded the NEPM EIL guideline and Waste Fill disposal criteria of 200 mg/kg.
  - Vanadium concentrations in four samples (TP02 0.15 to 0.3 m, TP0 0.3 to 0.6 m, TP11 0.05 to 0.2 m, and TP17 0 to 0.2 m) exceeded the NEPM EIL guideline of 50 mg/kg.
  - Copper concentrations in 21 samples exceeded the Waste Fill disposal criteria of 60 mg/kg. Of these samples, eight exceeded the NEPM EIL guideline of 100 mg/kg.

- For the samples analysed, aluminium concentrations ranged from 2,500 to 33,900 mg/kg, iron concentrations ranged from 3,800 to 58,200 mg/kg, and magnesium concentrations ranged from 760 to 36,600 mg/kg.
- pH measurement ranged from 6.5 to 10.3 pH units.
- TPH (both C_6-C_9 and C_{10}-C_{36}) were generally below the laboratory limit of reporting (LOR) with the exception of one sample from BH08 (0 to 0.2 m). The concentration of C_{10}-C_{36} was measured to be 2,000 mg/kg, exceeding the Waste Fill disposal criteria of 1,000 mg/kg. This did not correspond to measured PID readings.
- BTEX concentrations were below the laboratory LOR.
- BaP and total PAH concentrations were below the laboratory LOR.
- OCP, OPP, VOC, PCB, phenols, cyanide and fluoride concentrations were below the adopted assessment criteria or below the laboratory LOR.
- The 95% Upper Confidence Limits (UCLs) of mean analyte concentrations were below the assessment criteria, NEPM EIL guideline and Waste Fill disposal criteria.
- All analyte concentrations were below the NEPM HIL[F] guideline for commercial/industrial landuse.

Exceedences of the assessment criteria are highlighted in the results summary table provided in Appendix H.

5.2 Groundwater Investigation

5.2.1 Groundwater Levels

A summary of the groundwater level measurements for GW01 to GW08 are presented in Table 5 below.

Table 5: Summary of Groundwater Levels

Monitoring Well	Easting (m)	Northing (m)	RL Top of Well Casing (m AHD)	Groundwater Level (m AHD) Before Development 30 October 2008	Groundwater Level (m AHD) Before Sampling 5 November 2008
GW 01	616712	6209958	9.107	1.766	1.626
GW 02	616476	6209979	9.359	1.225	1.207
GW 03	616334	6209804	8.567	0.924	0.886
GW 04	616329	6209601	17.837	2.323	2.27
GW 05	616497	6209493	15.231	11.719	1.747
GW 06	616584	6209704	21.004	2.448	2.299
GW 07	616089	6210042	7.913	1.342	1.099
GW 08	615963	6209706	10.451	1.945	1.282

5.2.2 Groundwater Field Measurements and Observations

Details of sampling procedures and field water chemistry measurements for the groundwater monitoring wells are outlined in the groundwater sampling records contained in Appendix F.

A summary of the field water chemistry measurements for GW01 to GW08 are presented in Table 6 below.

Table 6: Summary of Groundwater Field Measurements

Monitoring Well	Date Sampled	Temp (°C)	DO (mg/L)	pH	Cond. (mS/cm)	Redox (mV)
GW 01	05/11/08	25.8	11.82	9.39	3.07	84
GW 02	05/11/08	26.8	3.26	7.71	8.61	175
GW 03	05/11/08	26.1	1.01	6.45	20.10	163
GW 04	05/11/08	26.7	1.63	7.84	4.31	152
GW 05	05/11/08	27.1	3.39	8.09	1.37	153
GW 06	05/11/08	27.7	3.02	7.47	22.9	183
GW 07	05/11/08	26.4	3.08	7.27	18.57	175
GW 08	05/11/08	26.8	2.24	7.38	13.03	165

The field conductivity values ranged from 1.37 mS/cm to 20.10 mS/cm which correspond to a TDS range of approximately 900 mg/L to 12,900 mg/L. These values are within the expected TDS range indicated by the PIRSA data (Table 2).

The dissolved oxygen and Redox values for GW02 to GW07 suggest generally oxidising conditions while the anomalous values measured for GW01 may be the result of an equipment malfunction or the particularly high pH has influenced the chemistry.

5.2.3 Summary of Analytical Results

A summary table presenting the results of groundwater sampling and the adopted assessment criteria is provided in Appendix G. The laboratory certificates and COCs are available on file if required.

A discussion of the sampling results with respect to the adopted assessment criteria is presented below.

6.0 DISCUSSION

6.1 Summary of Investigations

Golder has undertaken a limited environmental site assessment for the proposed port site and transport access corridor. This work was conducted for the purpose of obtaining baseline chemical information to assess pre-existing soil and groundwater conditions at the site to allow a comparison of the existing contaminant levels (if present) with those present in the soils and groundwater when Centrex cease operations and exit the land.

The assessment included an investigation of historic site activities and limited soil and groundwater investigations to assess potential contamination of the Site as a result of the historic activities.

The site history investigation indicated that the Site was previously used for agricultural activities. During a site walkover, several features of environmental interest were noted on the Site, including a number of stockpiles of large rocks and fence lines that may have been sprayed for weed control purposes.

Intrusive soil and groundwater investigations were spaced across the Site to provide an appropriate geographical spread of assessment locations.

6.2 Limited Soil Assessment

Results of the soil assessment indicated that chemical concentrations were generally below the laboratory LOR or below the adopted investigation criteria for disposal and for the protection of human health and ecological receptors. There were samples with concentrations of copper, zinc, vanadium and TPH exceeding the NEPM EIL guideline and Waste Fill disposal criteria. However, sample concentrations were below the NEPM HIL[F] guideline for commercial/industrial landuse and the 95% Upper Confidence Limits (UCLs) of mean analyte concentrations were below the NEPM EIL guideline and Waste Fill disposal criteria.

In Golder's experience, the soils of the Adelaide Plains and the Yorke and Eyre Peninsulas contain vanadium consistent with the concentrations reported in the samples collected.

The zinc in the surface sample of BH08 corresponds to the TPH concentrations discussed below. The samples also contains above average concentrations of many other metals.

The copper concentrations reported in the samples appear to represent typical regional geological characteristics. Copper concentrations exceeding the guidelines and criteria are associated with the upper weathered rock layers in Zone C.

The TPH C_{10}-C_{36} concentration of 2,000 mg/kg, measured in the surface sample recovered from BH08, may be associated with possible spillage of lubricants from the drilling rig or support vehicles used during the investigations. However, the PID reading for this sample was 0.0 ppm and no odours or visible evidence of contamination was observed. The association of the TPH with many metals indicates that it is likely to have been introduced by general activities in the area. It possibly represents one of many low-level impacts on the site.

The measured pH values ranged from 6.5 to 10.3. pH values above 9.0 are considered to be elevated and alkaline. However, the measurements for samples recovered from the port site and transport corridor are likely to be regionally influenced, with elevated measurements attributable to the prevalence of calcareous formations in the area. In our experience, this is typical of the Eyre Peninsula.

6.3 Limited Groundwater Assessment

Groundwater investigations (Section 5.2) included the drilling and installation of eight groundwater wells, the measurement of standing water levels and analysis of groundwater quality. A search of regional bore records (https://info.pir.sa.gov.au/des/desHome.html) and a subsequent reconnaissance survey have provided little information. Therefore the groundwater assessment was completed on the basis of the drillhole information and Golder's experience with similar hydrogeological settings.

6.3.1 Hydrostratigraphy

A single, multi-lithology (different rocks contain the groundwater) aquifer is inferred beneath the site. Groundwater is hosted in this aquifer just above mean sea level (<3 m AHD) in either fractured rocks (GW01 to GW06) or unconsolidated sediments (GW07 and GW08). The unconsolidated sediments above the fractured rocks (granite, gneiss or schist) are either a thin (few metres thick) veneer of extremely weathered rock or recent unconsolidated sediments (GW07 and GW08) approximately 10 m thick.

We interpret this uppermost aquifer to be unconfined and potentially the receiving environment for contaminants released to the land surface or just below. Although there is no data available on deeper groundwater, it is likely that negligible freshwater is stored in the deeper, less fractured parts of the granitic rocks. This is because the less fractured rock is expected to store less water and the limited (<3 m AHD) freshwater head implies a freshwater-saline interface above about -150 m AHD.

6.3.2 Lateral Groundwater Flow

Figure 5 shows measured groundwater elevations in the groundwater wells (in m AHD) and our interpretation of groundwater head contours. For the purpose of this map, the groundwater elevation was assumed to be ~0 m AHD at the coastline.

Assuming the groundwater system is isotropic, lateral groundwater movement would be perpendicular to the contours. Groundwater appears to move from a ridge (roughly following a line between GW01 to GW06) towards the east (sea), north (sandy beach to the north of the site) and west/northwest. The northwesterly flow appears to be the most significant as it connects the fractured rock environment to the sedimentary deposits. The fractured rock contains the groundwater beneath GW01 to GW06; the sediments were encountered in GW07 and GW08 and on the surface adjoining a drainage feature that terminates in a deltaic dampland. At present the dampland is separated from the sea by a sandy beach. The dampland appears to be the most likely receptor of surface water and the majority of groundwater flows. The dampland was probably an outlet to the sea under more humid conditions.

6.3.3 Groundwater Recharge

Bureau of Meteorology data indicates that mean annual rainfall for the area is just below 500 mm and that mean annual evaporation is likely to be about 1,500 mm.

Recharge to groundwater is expected to occur almost exclusively in winter because that is when most rains fall (between April and October) and temperatures (and hence evaporation) are lower. The hot and mostly dry summer, between the months of November to February, is characterised by large evaporation losses from surface water and groundwater close to the surface.

Over 80 Australian groundwater recharge studies were reviewed by Petheram *et al* (2000). These studies estimated recharge for annual rainfalls between 100 and 1150 mm/yr, various soil and land use types, including many South and Western Australian studies in winter-dominated rainfall areas.

In general, Petheram *et al* (2000) suggest groundwater recharge was found, at around 500 mm/year rainfall, to be up to 75 mm/year. Using a recharge range of 25 to 75 mm/year and assuming a porosity of 5% for the fractured rock, we would expect an annual fluctuation of about 1.5 m in groundwater levels in GW01 to GW06. Assuming 5% to 15% porosity for the unconsolidated sediments observed in GW07 and GW08 the annual fluctuation in these bores is expected to be less than 0.5 m.

6.3.4 Groundwater Discharge

Shallow groundwater is expected to be generally parallel to the land surface and drainage features. In general groundwater in an unconfined aquifer is therefore expected to discharge to either surface water or to the sea. Local groundwater is interpreted to discharge to the east to the sea or towards the dampland to the north (Section 6.3.2). During the site inspection and works in a dry October/November 2008 no seepage face could be observed at the beach or at the dampland.

6.4 Groundwater Quality

Groundwater investigations included the sampling and analyses of groundwater quality.

6.4.1 Salinity

Concentrations reported by PIRSA in Table 2 indicated brackish to saline water regionally. The salinity, as measured by total dissolved solids (TDS, in mg/L) is presented in Figure 4. TDS ranges between the high hundreds (786 mg/L at GW05, 'freshwater') to brackish/saline water (maximum 19,500 mg/L at GW07). Considering the climate and expected low groundwater recharge, the presence of freshwater in GW05 was unexpected.

The pattern of salinity is 'normally' expected to follow the groundwater flow path in an unconfined aquifer. Salinity, in general, is expected to be low near recharge areas (where rain or surface water enters the aquifer). Salinity is expected to increase along the path. As Figure 4 indicates, salinity is low (< 1,000 mg/L) in GW05, moderate (1,000 mg/L to 10,000 mg/L) in GW01, GW02 and GW04; and high (>10,000 mg/L) in GW03, GW06, GW07 and GW08. This pattern generally follows the expectation: low salinity in GW05 and GW01; and high salinity in GW03, GW07 and GW08. The reported high salinity in GW06 is, however, a surprise as this bore is situated close to the ridge of the headland and therefore a low salinity was anticipated.

6.4.2 Ionic Composition

All the reported groundwater samples are of sodium-chloride type (sodium being the major cation and chloride the dominant anion). Sodium-chloride type groundwater is typical to coastal groundwater discharge areas.

The reported pH values are between 6.85 and 9.52 with a median of 7.85. The pH of GW01, 9.52 is above SA EPA EPP livestock, potable and aquatic freshwater guidelines. This is typical of the calcareous nature of the region.

Of the reported anions, fluoride exceeded the SA EPA EPP Irrigation (GW01, GW02, GW03, GW07 and GW08); Livestock (GW01, GW02 and GW07); and potable (GW01, GW02, GW03, GW07 and GW08) guidelines. Reported sulphate concentrations were above the SA EPA EPP Potable guidelines in GW02, GW03, GW06, GW07 and GW08; and above the SA EPA EPP livestock guidelines in GW03, GW06, GW07 and GW08.

6.4.3 Dissolved Metals

Dissolved metals exceeding SA EPA *EPP(WQ)* include:

- 0.0002 mg/L mercury in GW04 above SA EPA EPP Aquatic Fresh and Marine Guidelines,
- 0.0002 mg/L cadmium in GW08 above SA EPA EPP Potable, Aquatic Fresh and Marine Guidelines,
- 0.1 to 0.8 mg/ L manganese in GW02, GW03, GW04 and GW06 above SA EPA EPP Aquaculture Guidelines,
- 0.034 and 0.06 mg/L (GW01 and GW05) molybdenum above SA EPA EPP Livestock Guidelines,
- 0.036 to 0.044 mg/L selenium (GW02, GW04, GW07 and GW08) above SA EPA EPP Irrigation, Livestock and Potable Guidelines,
- 0.157 mg/L mg/L selenium (GW01) above SA EPA EPP Aquaculture, Irrigation, Livestock, Potable and Aquatic Fresh and Marine Guidelines,
- 0.05 to 0.385 mg/L zinc (GW02, GW02, GW04, GW06, GW07 and GW08) above SA EPA EPP Aquatic Fresh and Marine Guidelines,

- 0.06 (GW01) and 0.021 mg/L (GW06) zinc above SA EPA EPP Aquaculture Guidelines; and
- 0.05 to 0.06 mg/L silver (GW03, GW07 and GW08) above SA EPA EPP Fresh and Marine Guidelines.

6.4.4 Pesticides and Hydrocarbons

Organochlorine pesticides, organophosphorus pesticides, phenolic compounds, polynuclear aromatic hydrocarbons, chlorinated hydrocarbons, total petroleum hydrocarbons, BTEX, fumigants, halogenated aliphatic compounds, halogenated aromatic compounds, trihalomethanes were below their respective limits for reporting.

6.4.5 Summary of Groundwater Quality

Metal exceedences occur in all bores (but no bore exceeds systemically the metal guidelines) and in an unpredictable pattern. Considering the current land use and the general lack of potential contaminants, the most likely explanation is that the metals listed in Section 6.4.3 occur naturally and are the product of groundwater–metamorphised rock interaction.

7.0 REFERENCES

1) Petheram, C., Zhang, L., Walker, G., Grayson, R., (2000). '*Towards a framework for predicting impacts of Land-use on Recharge: A Review of recharge studies in Australia*'. CSIRO Land and Water Technical report 28/00.

2) NEPC (1999). *'National Environment Protection (Assessment of Site Contamination) Measure'*. National Environment Protection Council, December 1999.

3) NSW Environmental Protection Authority (1994). *'Guidelines for Assessing Service Station Sites'*, December 1994.

4) EPP (WQ) (2003). '*Schedule 2, Water Quality Criteria',* February 2003.

5) The Netherlands Ministry of Housing (2000). *'Spatial Planning and Environment's Circular on Target Values and Intervention Values ',* February 2000.

6) Standards Australia (2005). *'AS4482.1 Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil', Part 1: Non-Volatile and Semi-Volatile Compounds'.*

8.0 LIMITATIONS

Your attention is drawn to the document – "Limitations", which is attached to this report (Appendix I). The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this letter are aware of the responsibilities each assumes in so doing.

Report Signature Page

Tom Hills
Senior Geotechnical Engineer

Andrew Howes
Associate

THH&GB/AWH/hh

A.B.N. 64 006 107 857

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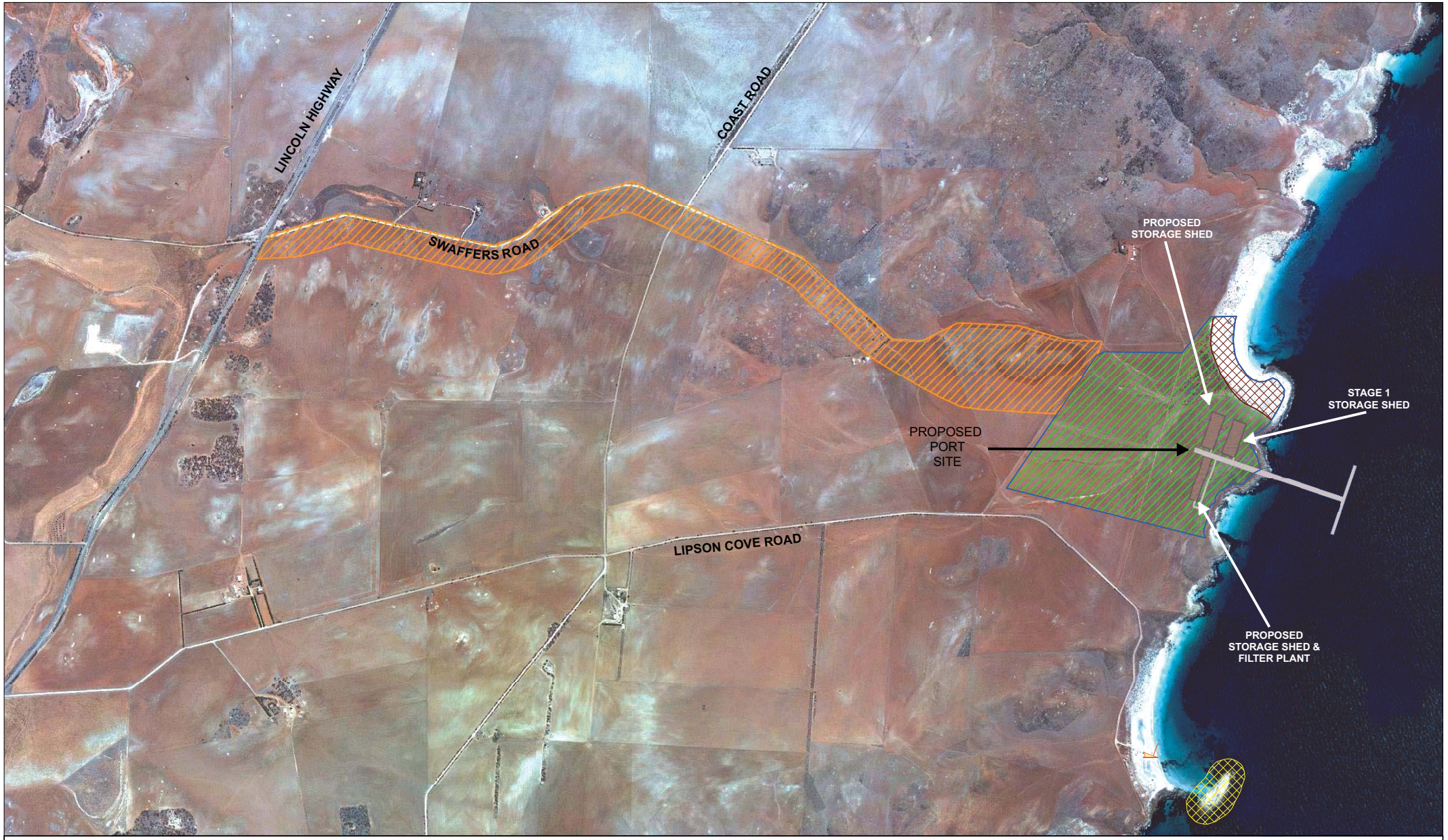
FIGURES



CENTREX METALS LIMITED

SHEEP HILL MARINE PORT FACILITY DEVELOPMENT APPROVAL AND BASELINE STUDY

SITE LOCATION PLAN

Legend

- Lands Title Cadastral Boundary
- Lipson Island Conservation Park
- Rogers Beach: Development Exclusion Zone
- Sheep Hill Marine Port Site Study Area
- Three Sisters Marine Wreck
- Transport Corridor Study Area

0 500 1,000

Scale in metres

N

SCALE 1:20,000

Project: 087661006 Figure No: F0001_Rev0
Drawn: KB Date: 23.01.2009
Checked: TH Date: 23.01.2009

Golder Associates

199 FRANKLIN STREET ADELAIDE SA 5000 AUSTRALIA
PH (08) 8213 2100 FAX (08) 8213 2101

DATUM GDA 1994
PROJECTION MGA Zone 53

FIGURE 1

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CENTREX METALS LIMITED

SHEEP HILL MARINE PORT FACILITY DEVELOPMENT APPROVAL AND BASELINE STUDY

SURROUNDING LAND USE

Legend

- Agriculture
- Recreation
- Rural Residence
- Vacant Land
- Lands Title Cadastral Boundary
- Lipson Island Conservation Park
- Rogers Beach: Development Exclusion Zone
- Sheep Hill Marine Port Site Study Area
- Transport Corridor Study Area
- Three Sisters Marine Wreck

0 500 1,000

Scale in metres

N

SCALE 1:20,000

Project: 087661006 Figure No: F0002_Rev0
Drawn: KB Date: 23.01.2009
Checked: TH Date: 23.01.2009

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DATUM GDA 1994
PROJECTION MGA Zone 53

FIGURE 2

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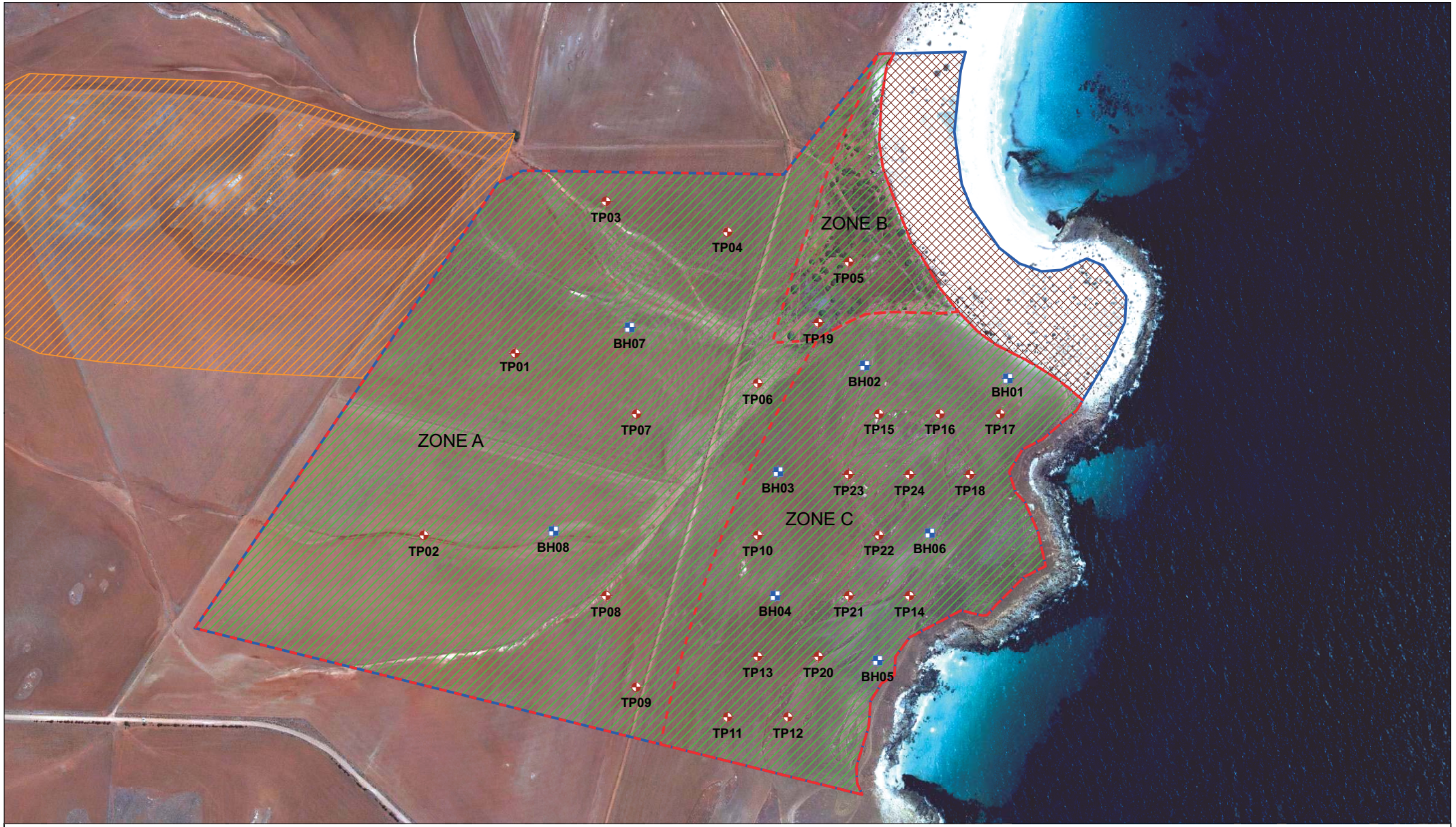

CENTREX METALS LIMITED

SHEEP HILL MARINE PORT FACILITY DEVELOPMENT APPROVAL AND BASELINE STUDY

INVESTIGATION LOCATION PLAN

Legend

- Borehole Location
- Test Pit Location
- Approximate Zone Boundry
- Lands Title Cadastral Boundary
- Rogers Beach: Development Exclusion Zone
- Sheep Hill Marine Port Site Study Area
- Transport Corridor Study Area

0 150 300

Scale in metres

N

SCALE 1:6,000

Project: 087661006 Figure No: F0003A_Rev0
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Checked: TH Date: 23.01.2009

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DATUM GDA 1994
PROJECTION MGA Zone 53

FIGURE 3A

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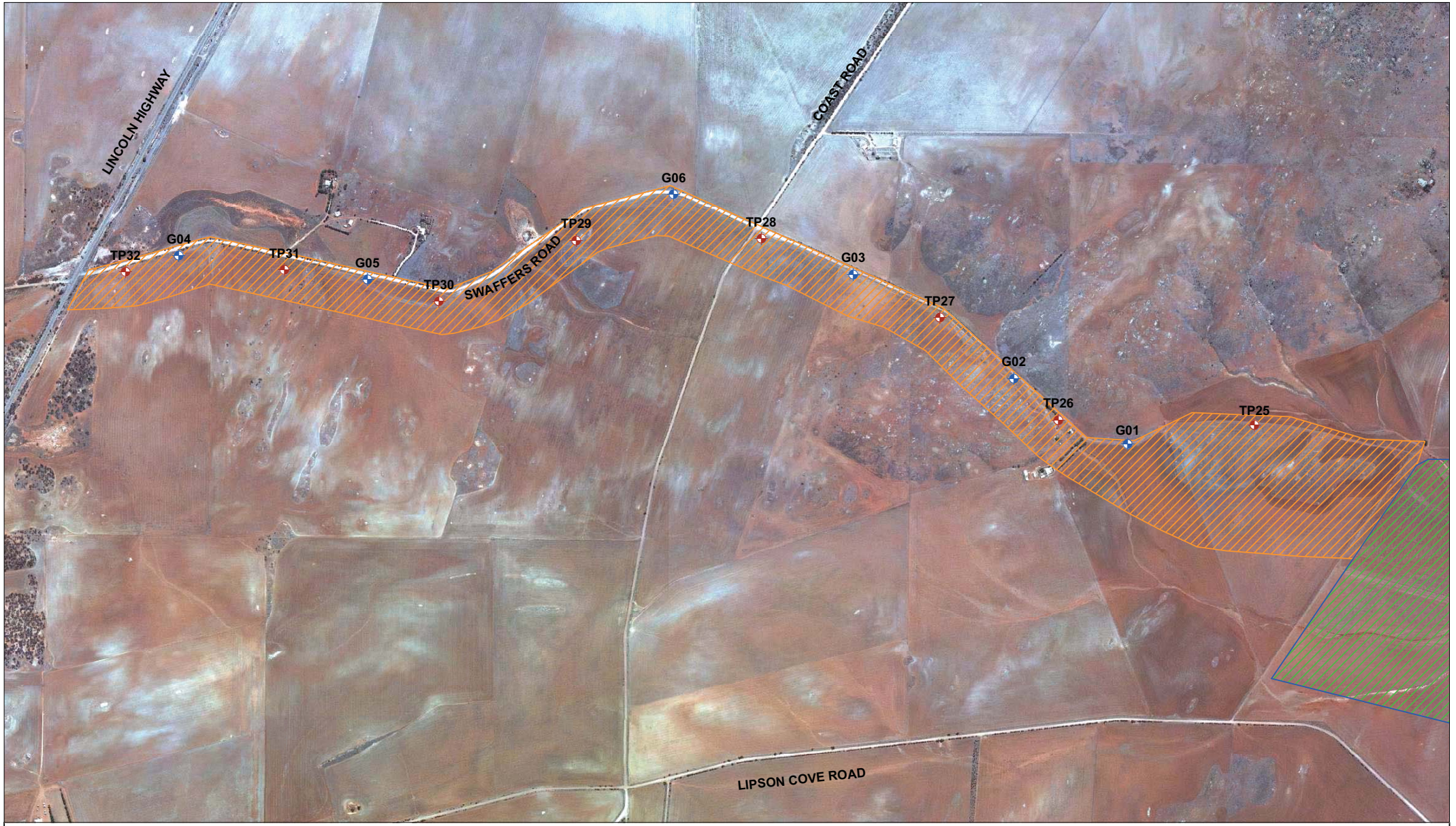

CENTREX METALS LIMITED

SHEEP HILL MARINE PORT FACILITY DEVELOPMENT APPROVAL AND BASELINE STUDY

INVESTIGATION LOCATION PLAN

Legend

- Test Pit Location
- Grab Sample Location
- Lands Title Cadastral Boundary
- Sheep Hill Marine Port Site Study Area
- Transport Corridor Study Area

0 300 600

Scale in metres

N

SCALE 1:12,500

Project: 087661006 Figure No: F0003B_Rev0
Drawn: KB Date: 23.01.2009
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FAX (08) 8213 2101

DATUM GDA 1994
PROJECTION MGA Zone 53

FIGURE 3B

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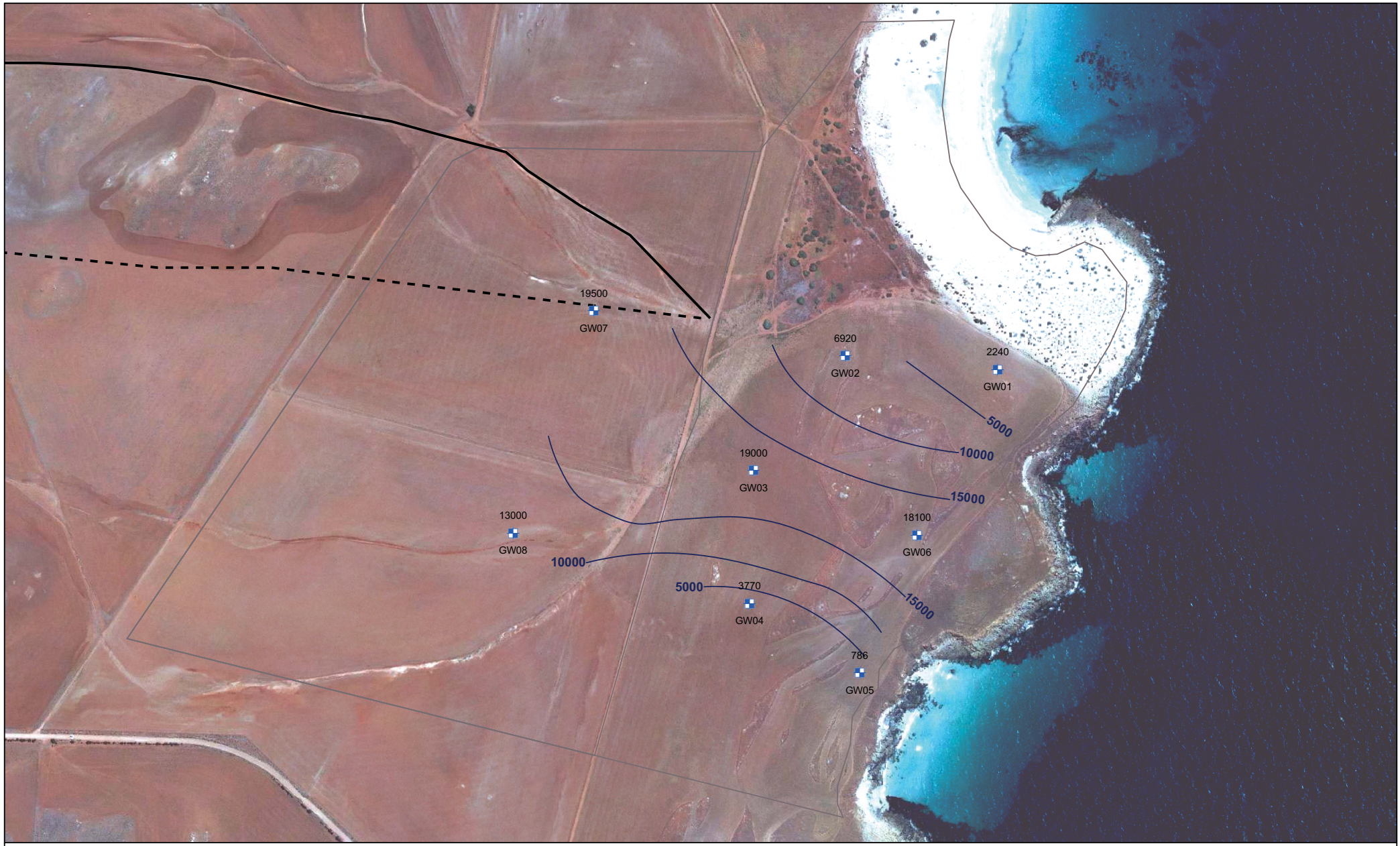

CENTREX METALS LIMITED

SHEEP HILL MARINE PORT FACILITY DEVELOPMENT APPROVAL AND BASELINE STUDY PROPOSAL

INTERPRETED TOTAL DISSOLVED SOLIDS IN GROUNDWATER

Legend

- Lands Title Cadastral Boundary
- Groundwater Well Location and Total Dissolved Solids (TDS), mg/L
- Inferred Groundwater TDS, mg/L
- Proposed Road Alignment
- Current Road

N

0 150 300

SCALE IN METRES

DATUM GDA 1994
PROJECTION MGA Zone 53

Project: 087661006 Figure No: F0004_Rev0
Drawn: KB Date: 23.01.2009
Checked: TH Date: 23.01.2009

SCALE 1:5,500 A3

FIGURE 4

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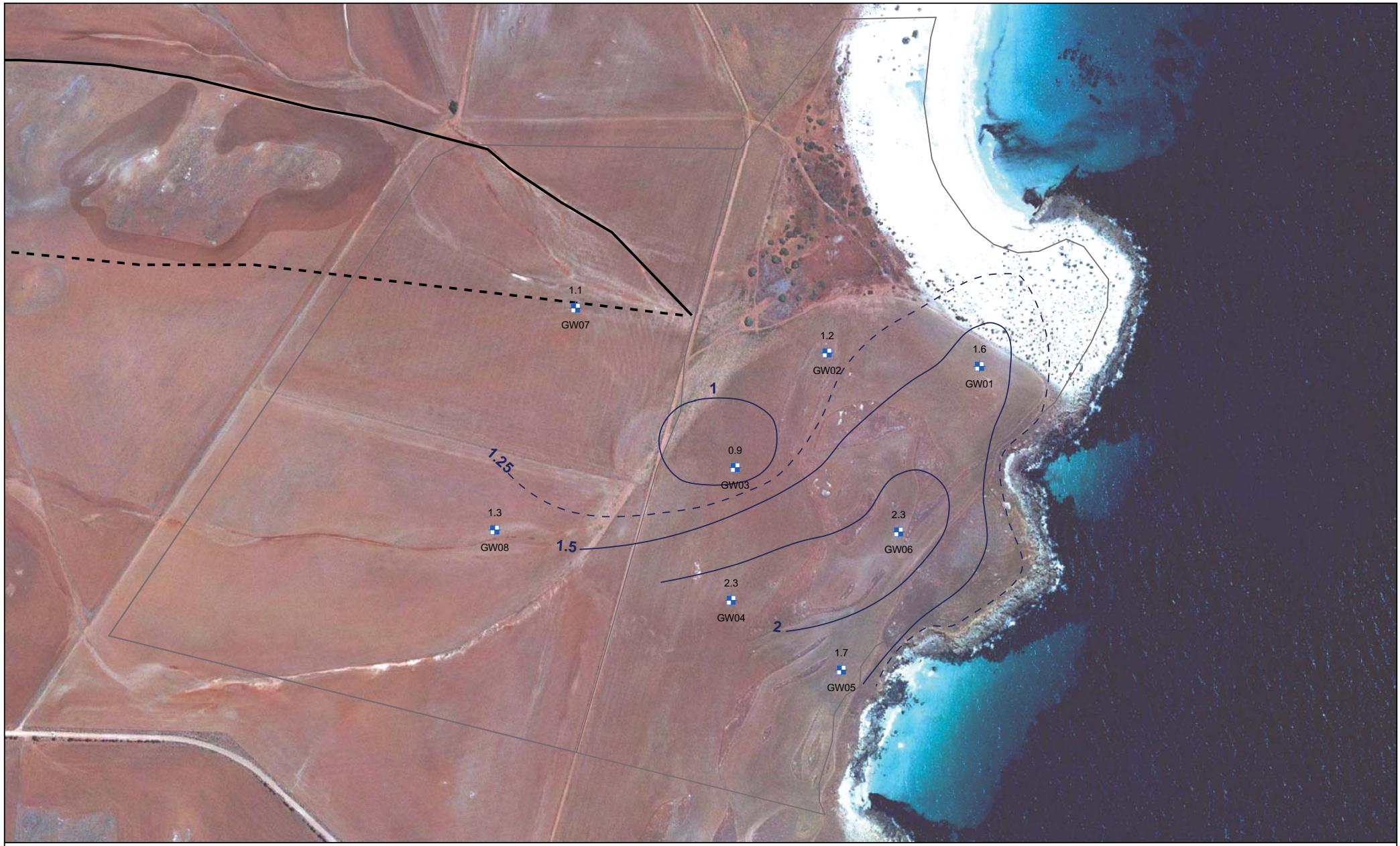

CENTREX METALS LIMITED

SHEEP HILL MARINE PORT FACILITY DEVELOPMENT APPROVAL AND BASELINE STUDY PROPOSAL

INTERPRETED GROUNDWATER ELEVATION

Legend

- Lands Title Cadastral Boundary
- Groundwater Well Location and Elevation, mAHD
- Inferred Groundwater Contour, m AHD
- Proposed Road Alignment
- Current Road

N

0 150 300

SCALE IN METRES

DATUM GDA 1994
PROJECTION MGA Zone 53

Project: 087661006 Figure No: F0005_Rev0
Drawn: KB Date: 23.01.2009
Checked: TH Date: 23.01.2009

SCALE 1:5,500 A3

FIGURE 5

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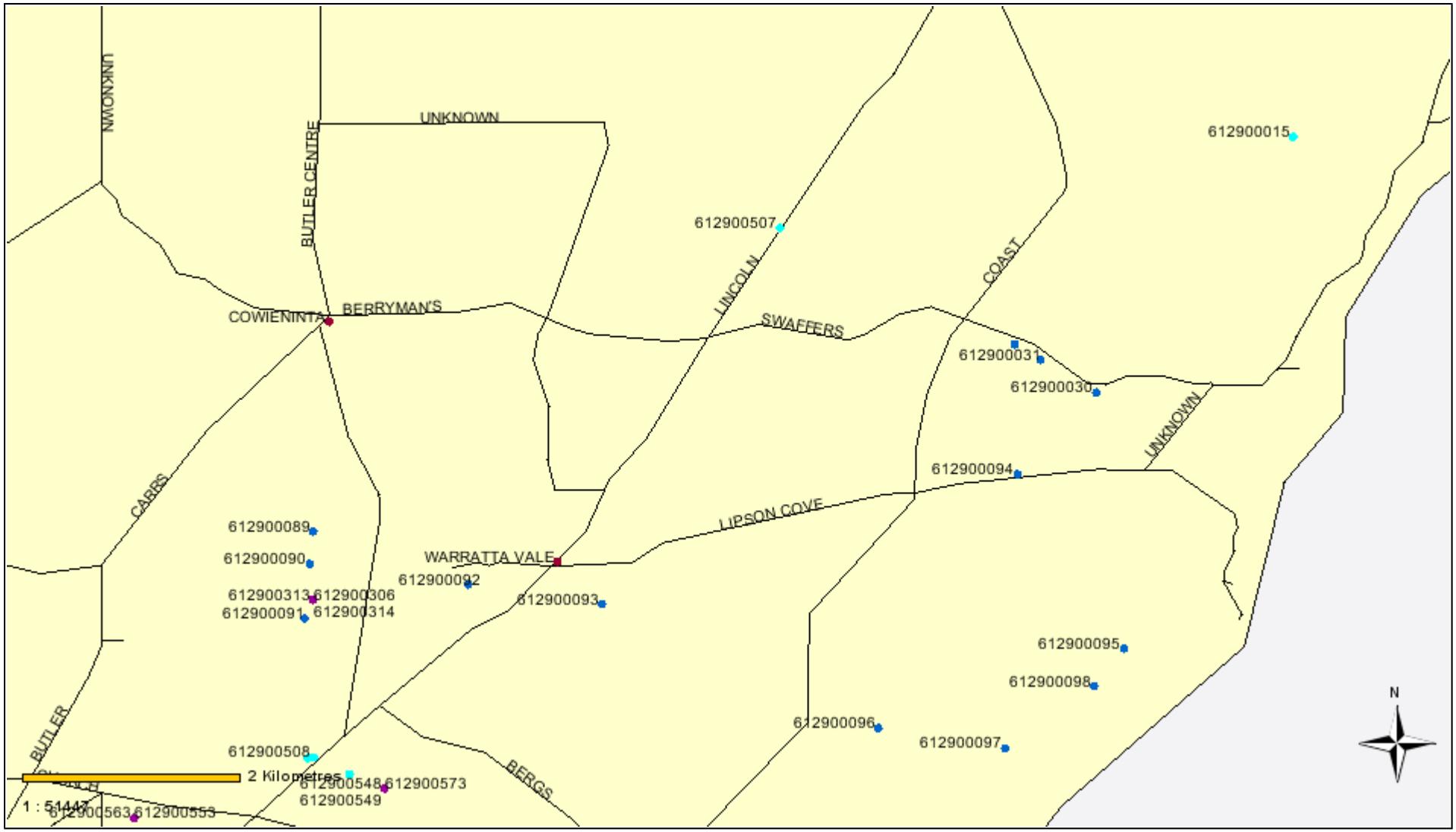
APPENDIX A

DWLBC Information for Groundwater

DRILLHOLE ENQUIRY SYSTEM

Map Projection: Not Projected



Government of South Australia
Department of Water, Land and Biodiversity Conservation

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APPENDIX A.2
Drillhole Summary *

Table A: Drillhole summary table for search results within 8km radius of the port site.

Unit_No	Obs No	drillhole name	class	orig drill depth	orig drill date	max drill depth	max drill date	late open depth	late open date	late permit no	cased to	case min diam	purpose	late status	late status date	SWL	RSWL	water level date	TDS	EC	salinity date	pH	pH date	yield	yield date
6129-15		SPRING IN PONTO CREEK					12/06/1948	0	12/06/1948				STK						9725	16659	13/06/1948				
6129-29			WW			17	1/01/1940	16.76	1/01/1940					ABD											
6129-30			WW			3	12/06/1948	3.05	12/06/1948				STK	UKN		2.7		12/06/1948	18864	30764	12/06/1948				
6129-31			WW			15		15.24						ABD											
6129-89			WW		1/01/1938	16	1/12/1950	15.85	1/12/1950										9339	16027	1/01/1938				
6129-90			WW				27/05/1938	0	27/05/1938										20934	33797	1/05/1938				
6129-91			WW	5.79	16/11/1937	6	16/11/1937	5.79	16/11/1937										6726	11737	1/11/1937				
6129-92			WW			4	13/06/1948	3.66	13/06/1948							2.7		13/06/1948	13852	23182	13/06/1948				
6129-93			WW			2	13/06/1948	2.44	13/06/1948							1.8		13/06/1948	15180	25228	12/06/1948				
6129-94			WW			15		15.24						ABD					12295	20760	1/05/1938				
6129-95			WW			9	18/01/1960	9.14	18/01/1960							6.1		18/01/1960	10510	17939	18/01/1960				
6129-96			WW	16.76	12/11/1937	17	12/11/1937	16.76	12/11/1937																
6129-97			WW	11.28	27/10/1937	11	27/10/1937	11.28	27/10/1937										10353	17671	27/08/1948			0.38	27/10/1937
6129-98			WW	18.59	5/11/1937	19	5/11/1937	18.59	1/12/1950		12.19	127				14		1/12/1950	10210	17458	27/08/1948			0.25	1/12/1950
6129-103		CREEK					25/05/1948	0	25/05/1948										34015	51864	28/05/1948				
6129-306		XX50E	MW	20	24/02/1975	20	24/02/1975	20	24/02/1975				EXP												
6129-307		XX00	MW	14	25/02/1975	14	25/02/1975	14	25/02/1975				EXP												
6129-308		XX50W	MW	3	25/02/1975	3	25/02/1975	3	25/02/1975				EXP												
6129-309		XX60W	MW	3	25/02/1975	3	25/02/1975	3	25/02/1975				EXP												
6129-310		XX70W	MW	5	25/02/1975	5	25/02/1975	5	25/02/1975				EXP												
6129-311		XX80W	MW	3	25/02/1975	3	25/02/1975	3	25/02/1975				EXP												
6129-312		XX10W	MW	11	25/02/1975	11	25/02/1975	11	25/02/1975				EXP												
6129-313		XX20W	MW	7	25/02/1975	7	25/02/1975	7	25/02/1975				EXP												
6129-314		XX30W	MW	9	25/02/1975	9	25/02/1975	9	25/02/1975				EXP												
6129-315		XX40W	MW	5	25/02/1975	5	25/02/1975	5	25/02/1975				EXP												
6129-507		B279											DRN						31597	48547	15/07/1992			0.05	15/07/1992
6129-508		B280											RIV						15628	25882	15/07/1992			10	25/10/2001
6129-539																			16963	27900	18/10/1999			10	18/10/1999
6129-548		YARANYACKA DH1	MW	28.5	10/08/1987	29	10/08/1987	28.5	10/08/1987																
6129-549		YARANYACKA DH3	MW	30	10/08/1987	30	10/08/1987	30	10/08/1987																
6129-573		YARANYACKA DH2	MW	29.5		30		29.5																	

Table A (cont.): Drillhole summary table for search results within 8km radius of the port site.

Unit_No	mga easting	mga northing	mga zone	long deg	long min	long sec	lat deg	lat min	lat sec	decimal long	decimal lat	neg decimal lat	hundred	plan	parcel	title reference	map 250k	map 100k	map 50k	map 10k	map 2_5k	map 1k	water info	salinity	water chemistry	geophys log	drill log	lith log
6129-15	616650.76	6213068.15	53	136	15	58.885	34	13	0.874	136.266357	34.2169094	-34.2169094	YARANYACKA	H511600	S322	CT 5464 279	SI5311	6129	1	23	f	2	N	Y	N	N	N	N
6129-29	614066.88	6210808.06	53	136	14	18.998	34	14	15.266	136.2386107	34.2375738	-34.2375738	YARANYACKA	H511600	S422	CL 1172 23	SI5311	6129	4	23	q	2	N	N	N	N	N	N
6129-30	614808.95	6210267.86	53	136	14	48.259	34	14	32.506	136.2467387	34.2423627	-34.2423627	YARANYACKA	F139690	A1	CT 5190 4	SI5311	6129	4	23	q	3	Y	Y	N	N	N	N
6129-31	614301.96	6210635.17	53	136	14	28.268	34	14	20.784	136.2411857	34.2391068	-34.2391068	YARANYACKA	F139690	A1	CT 5190 4	SI5311	6129	4	23	q	2	N	N	N	N	N	N
6129-89	607605.9	6208815.94	53	136	10	7.373	34	15	22.409	136.1687148	34.2562247	-34.2562247	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	c	3	N	Y	N	N	N	N
6129-90	607569.77	6208459.9	53	136	10	6.121	34	15	33.979	136.1683668	34.2594387	-34.2594387	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	c	4	N	Y	N	N	N	N
6129-91	607516.84	6207858.84	53	136	10	4.321	34	15	53.509	136.1678669	34.2648637	-34.2648637	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	Y	N	N	N	Y
6129-92	609022.87	6208214.88	53	136	11	3.04	34	15	41.388	136.1841777	34.2614966	-34.2614966	YARANYACKA	D24471	A5	CL 1170 15	SI5311	6129	3	29	d	5	Y	Y	N	N	N	N
6129-93	610246.98	6207983.96	53	136	11	51.002	34	15	48.418	136.1975006	34.2634494	-34.2634494	YARANYACKA	H511600	S429	CL 1171 39	SI5311	6129	3	29	e	3	Y	Y	N	N	N	N
6129-94	614075.78	6209372.9	53	136	14	20.029	34	15	1.846	136.2388969	34.2505129	-34.2505129	YARANYACKA	H511600	S422	CL 1172 23	SI5311	6129	3	28	b	2	N	Y	N	N	N	N
6129-95	615028.72	6207436.98	53	136	14	58.207	34	16	4.306	136.249502	34.2678629	-34.2678629	YARANYACKA	D28246	A7	CT 5180 894	SI5311	6129	3	28	g	3	Y	Y	N	N	N	N
6129-96	612764.87	6206583.97	53	136	13	30.099	34	16	32.888	136.2250274	34.2758022	-34.2758022	YARANYACKA	H511600	S428	CT 5460 335	SI5311	6129	3	28	k	1	N	N	N	N	N	Y
6129-97	613925.93	6206347.78	53	136	14	15.61	34	16	40.098	136.2376693	34.2778051	-34.2778051	YARANYACKA	H511600	S428	CT 5460 335	SI5311	6129	3	28	k	2	N	Y	N	N	N	Y
6129-98	614748.72	6207023.83	53	136	14	47.458	34	16	17.828	136.2465161	34.2716189	-34.2716189	YARANYACKA	H511600	S428	CT 5460 335	SI5311	6129	3	28	g	4	Y	Y	N	N	N	Y
6129-103	607908.84	6206132.84	53	136	10	20.424	34	16	49.389	136.1723401	34.2803858	-34.2803858	YARANYACKA	D24211	A60	CT 5400 934	SI5311	6129	3	29	l	3	N	Y	N	N	N	N
6129-306	607596.74	6208064.95	53	136	10	7.352	34	15	46.789	136.168709	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-307	607595	6208064.97	53	136	10	7.284	34	15	46.789	136.16869	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-308	607595	6208064.97	53	136	10	7.284	34	15	46.789	136.16869	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-309	607595	6208064.97	53	136	10	7.284	34	15	46.789	136.16869	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-310	607596.74	6208064.95	53	136	10	7.352	34	15	46.789	136.168709	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-311	607596.74	6208064.95	53	136	10	7.352	34	15	46.789	136.168709	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-312	607596.74	6208064.95	53	136	10	7.352	34	15	46.789	136.168709	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-313	607596.99	6208063.1	53	136	10	7.363	34	15	46.849	136.1687119	34.2630137	-34.2630137	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-314	607596.74	6208064.95	53	136	10	7.352	34	15	46.789	136.168709	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-315	607596.74	6208064.95	53	136	10	7.352	34	15	46.789	136.168709	34.262997	-34.262997	YARANYACKA	H511600	S418	CL 1170 15	SI5311	6129	3	29	f	3	N	N	N	N	N	N
6129-507	611928.91	6212120.88	53	136	12	54.827	34	13	33.488	136.2152298	34.225969	-34.225969	YARANYACKA				SI5311	6129	4	23	j	2	N	Y	N	N	N	N
6129-508	607586.02	6206321.97	53	136	10	7.716	34	16	43.37	136.16881	34.278714	-34.278714	YARANYACKA				SI5311	6129	3	29	l	3	N	Y	N	N	N	N
6129-539	607528.87	6206314.99	53	136	10	5.484	34	16	43.618	136.1681901	34.2787828	-34.2787828	YARANYACKA				SI5311	6129	3	29	l	3	N	Y	N	N	N	N
6129-548	608228.81	6205970.97	53	136	10	33.01	34	16	54.523	136.175836	34.281812	-34.281812	YARANYACKA	H511600	S103	CT 5400 934	SI5311	6129	3	29	m	6	N	N	N	N	N	N
6129-549	608228.81	6205970.97	53	136	10	33.01	34	16	54.523	136.175836	34.281812	-34.281812	YARANYACKA	H511600	S103	CT 5400 934	SI5311	6129	3	29	m	6	N	N	N	N	N	N
6129-573	608228.81	6205970.97	53	136	10	33.01	34	16	54.523	136.175836	34.281812	-34.281812	YARANYACKA	H511600	S103	CT 5400 934	SI5311	6129	3	29	m	6	N	N	N	N	N	N

* Data provided courtesy of PIRSA's online Drillhole Enquiry System [https://des.pir.sa.gov.au/deshome.html]

APPENDIX B

Reports of Test Pits and Boreholes

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS


FILL


GRAVEL (GP or GW)


SAND (SP or SW)


SILT (ML or MH)


CLAY (CL, CI or CH)


ORGANIC SOILS (OL or OH or Pt)


COBBLES or BOULDERS

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay.

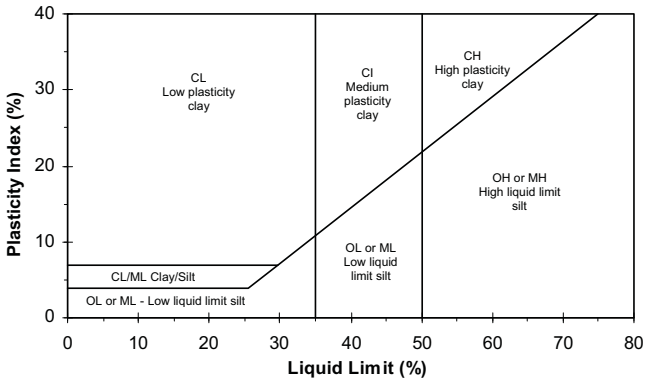
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. The material properties are assessed in the field by visual/tactile methods.

Particle Size

Major Division	Sub Division	Particle Size
BOULDERS		> 200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	20 to 63 mm
	Medium	6.0 to 20 mm
	Fine	2.0 to 6.0 mm
SAND	Coarse	0.6 to 2.0 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2 mm
SILT		0.002 to 0.075 mm
CLAY		< 0.002 mm

Plasticity Properties



MOISTURE CONDITION

AS1726 - 1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726 - 1993

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

SPT correlations are not stated in AS1726 – 1993, and may be subject to corrections for overburden pressure and equipment type.

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS*	Auger Screwing	RD	Rotary blade or drag bit	NQ	Diamond Core - 47 mm
AD*	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
*V	V-Bit	RAB	Rotary Air Blast	HQ	Diamond Core - 63 mm
*T	TC-Bit, e.g. ADT	RC	Reverse Circulation	HMLC	Diamond Core – 63mm
HA	Hand Auger	PT	Push Tube	BH	Tractor Mounted Backhoe
ADH	Hollow Auger	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
DTC	Diatube Coring	JET	Jetting	EE	Existing Excavation
WB	Washbore or Bailer	NDD	Non-destructive digging	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L **Low resistance.** Rapid penetration possible with little effort from the equipment used.

M **Medium resistance.** Excavation/possible at an acceptable rate with moderate effort from the equipment used.

H **High resistance** to penetration/excavation. Further penetration is possible at a slow rate and requires significant effort from the equipment.

R **Refusal or Practical Refusal.** No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER

▽	Water level at date shown	◁	Partial water loss
▷	Water inflow	◀	Complete water loss

GROUNDWATER NOT OBSERVED	The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.
GROUNDWATER NOT ENCOUNTERED	The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm seating
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
BDS	Bulk disturbed sample
G	Gas Sample
W	Water Sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength (s_v = peak value, s_r = residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
WPT	Water pressure tests
DCP	Dynamic cone penetration test
CPT	Static cone penetration test
CPTu	Static cone penetration test with pore pressure (u) measurement

Ranking of Visually Observable Contamination and Odour (for specific soil contamination assessment projects)

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$= \frac{\sum \text{Length of cylindrical core recovered}}{\text{Length of core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$= \frac{\sum \text{Axial lengths of core} > 100 \text{ mm}}{\text{Length of core run}} \times 100$$

TERMS FOR ROCK MATERIAL STRENGTH & WEATHERING AND ABBREVIATIONS FOR DEFECT DESCRIPTIONS

STRENGTH

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa)	Field Guide
EL	Extremely Low	< 0.03	Easily remoulded by hand to a material with soil properties.
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK STRENGTH TEST RESULTS

▼ Point Load Strength Index, $I_s(50)$, Axial test (MPa)

◀ Point Load Strength Index, $I_s(50)$, Diametral test (MPa)

Relationship between $I_s(50)$ and UCS (unconfined compressive strength) will vary with rock type and strength, and should be determined on a site-specific basis. UCS is typically 10 to 30 x $I_s(50)$, but can be as low as 5.

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
EW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

ABBREVIATIONS FOR DEFECT TYPES AND DESCRIPTIONS

Defect Type

B	Bedding parting
X	Foliation
C	Contact
L	Cleavage
J	Joint
SS/SZ	Sheared seam/zone (Fault)
CS/CZ	Crushed seam/zone (Fault)
DS/DZ	Decomposed seam/zone
IS/IZ	Infilled seam/zone
S	Schistocity
V	Vein

Coating or Infilling

Cn	Clean
Sn	Stain
Vr	Veneer
Ct	Coating or Infill

Planarity

Pl	Planar
Un	Undulating
St	Stepped

Roughness

Sl	Slickensided
Sm	Smooth
Ro	Rough

Vertical Boreholes – The dip (inclination from horizontal) of the defect is given.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

REPORT OF TEST PIT: TP01

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615900.0 m E 6210000.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.30 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 7/11/08
CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.05	TP01-01 0.00-0.05 m PID=0 Jar, SB Duplicates TP01-101, TP01-201			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		Inferred topsoil, wheat at surface.
				0.15	TP01-02 0.05-0.15 m PID=0 Jar, 2 x SB PP 0.15 m >500 kPa			SC / CH	Clayey SAND/ Sandy CLAY, fine to coarse grained sand, high plasticity clay, dark brown/ red, with fine to medium gravel.	D	H	
			0.5		TP01-03 0.35-0.60 m PID=0 Jar, SB, LB			SC	Gravelly Clayey SAND, fine to coarse grained, orange brown, low plasticity fines, fine to medium gravel.			Inferred calcrete up to 100mm in size.
	M		1.0		TP01-04 1.00-1.40 m PID=0 SB, LB					D - M		Cemented zones. Calcareous.
			1.5	1.60				SC	As above, brown.			
			2.0		TP01-05 1.80-2.00 m PID=0 Jar, SB				TEST PIT DISCONTINUED @ 2.30 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

REPORT OF TEST PIT: TP02

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615750.0 m E 6209700.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.20 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 7/11/08
CHECKED: DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0		TP02-01 0.00-0.15 m PID = 0 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, trace of fine to medium gravel.	D - M		Inferred topsoil, wheat at surface, scattered quartz cobbles at surface.
				0.15	TP02-02 0.15-0.30 m Duplicates TP02-102, TP02-202 PID = 0 Jar 2 x SB PP 0.20 m >500 kPa			CI	Sandy CLAY, medium plasticity, dark red/ brown, fine to coarse sand, trace of fine to medium gravel.	D	Fb - H	Contains vesicules. Roots
				0.30	TP02-03 0.30-0.60 m Duplicates TP02-103, TP02-203 PID = 0 Jar, SB, LB			SC	Gravelly Clayey SAND, fine to medium grained, dark orange/ brown, high plasticity fines.			Calcareous, gravel is inferred calcrete, cemented zones.
			0.5									
				0.60				SC	As above, brown.			
	M		1.0							D - M		
			1.5		TP02-04 1.50-2.00 m Jar, SB, LB							
				1.70				SC	As above, pale orange/ brown.			
			2.0						TEST PIT DISCONTINUED @ 2.20 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 15:59 8.1.025

REPORT OF TEST PIT: TP03

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616050.0 m E 6210250.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.90 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 7/11/08
CHECKED: DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP03-01 0.00-0.15 m PID=0 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		Inferred topsoil, wheat.
				0.15								
	L-M				TP03-02 0.15-0.30 m PID=0 Jar, 2 x SB PP 0.20 m >500 kPa			CH	Sandy CLAY, high plasticity, dark brown, fine to coarse sand, with fine gravel.	D	Fb - H	Roots.
				0.30								
					TP03-03 0.30-0.60 m PID=0 Duplicates TP03-103, TP03-203 Jar, SB, LB			SC	Clayey SAND, fine to coarse grained, orange/ brown, medium plasticity fines, with fine to medium gravel.			Calcareous. Cemented zones. Gravel is inferred calcrete.
			0.5	0.50				SC	As above, brown.			
	M-H		1.0		TP03-04 1.00-1.40 m PID=0 SB, LB					D - M		
			1.5									
									TEST PIT DISCONTINUED @ 1.90 m GROUNDWATER NOT ENCOUNTERED			
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02.LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 15:59 8.1.025

REPORT OF TEST PIT: TP04

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616250.0 m E 6210200.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 7/11/08
CHECKED: RL DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.10	TP04-01 0.00-0.10 m PID=0 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, with fine gravel.	D - M		Cobbles at surface - inferred granite, calcrete. Inferred top soil, wheat.
				0.20	TP04-02 0.10-0.20 m PID=0 Jar, 2 x SB			CH	Sandy CLAY, high plasticity, red brown, fine to medium grained sand.	D		
				0.50	TP04-03 0.20-0.50 m PID=0 SB, LB			SC	Clayey SAND, fine to medium, orange/ brown.			Calcareous
	M		0.5					SC	As above, brown.	D - M		
			1.0									
			1.5	1.60	TP04-04 1.60-2.10 m PID=0 Jar, SB, LB			SC	As above, medium to coarse grained.	M		
			2.0						TEST PIT DISCONTINUED @ 2.10 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 15:59 8.1.025

REPORT OF TEST PIT: TP05

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616450.0 m E 621050.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 4/11/08
CHECKED: fh DATE: 4/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M	04/11/08, AJB	0.0		TP05-01 0.00-0.20 m Jar, 2 x SB			CL	Sandy CLAY, low plasticity, orange brown, fine to coarse grained sand.	M		
				0.20				CL	Sandy CLAY, low plasticity, dark brown, fine to medium sand.			
			0.5		TP05-02 0.30-0.60 m Jar, SB, LB							
				0.60	TP05-03 0.60-0.90 m Jar, 2 x SB			SM	Silty SAND, medium to coarse grained, pale grey/ brown, low liquid limit fines.			
				0.90				CH	CLAY, high plasticity, grey/ brown/ white, trace of fine to coarse grained sand.	M-W		Grey/ brown/ white striped in layers.
			1.0		TP05-04 1.00-1.30 m Jar, SB, LB							
			1.5	1.60				SM	Silty SAND, medium to coarse grained, grey, low liquid limit fines.			Collapsing sand.
					TP05-05 1.70-2.00 m Jar, SB							
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER ENCOUNTERED @ 1.65m			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 15:59 8.1.025

REPORT OF TEST PIT: TP06

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616300.0 m E 6209950.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.30 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 4/11/08
CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.05	TP06-01 0.00-0.05 m PID=0 Jar, 2 x SB			SP	Gravelly SAND, medium to coarse grained, brown, fine to coarse gravel, with clay.	M		Gravel, cobbles at surface up to 100mm in size.
								SP	As above, fine to medium grained sand.			
				0.15				SP	As above, medium to coarse grained sand.			
				0.25				SP	Gravelly SAND, fine to coarse grained, grey, fine to medium gravel, trace of non-plastic fines.			1 cobble 150mm in size.
				0.40	TP06-02 0.40-0.80 m PID=0 Jar, SB, LB			SP	As above, grey/ brown.	D - M		
			0.5	0.80				SC	Clayey SAND, fine to coarse grained, orange brown, high plasticity fines with fine to coarse gravel.			Gravel is inferred sandstone.
			1.0									
					TP06-03 1.40-1.80 m PID=0 Jar, SB, LB					M		
			1.5									
			2.0						TEST PIT DISCONTINUED @ 2.30 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP07

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616100.0 m E 6209900.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: HL DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.15	TP07-01 0.00-0.15 m PID=0 Jar, SB			SM	Silty SAND, fine to coarse grained, dark brown, low liquid limit fines.	D - M		
				0.30	TP07-02 0.15-0.30 m PID=0 Jar, 2 x SB PP 0.20 m >500 kPa			CH	Sandy CLAY, high plasticity, red/ brown, fine to medium grained sand.	D		
			0.5	0.60	TP07-03 0.30-0.60 m PID=0 Jar, SB, LB PP 0.50 m >500 kPa			CH	Approximately 20% GRAVEL and COBBLES up to 200mm in size, inferred calcrete, in matrix of Sandy CLAY, high plasticity, orange brown, fine to coarse grained sand.		H	Calcareous, cemented zones up to 150mm in size.
	M		1.0		TP07-04 1.00-1.40 m PID=0 Jar, SB, LB			SC	Gravelly clayey SAND, fine to coarse grained, brown, high plasticity fines, fine to coarse gravel.	D - M		As above.
			1.5									
			2.0						TEST PIT DISCONTINUED @ 2.10 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP08

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616050.0 m E 6209600.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	M		0.0		TP08-01 0.00-0.30 m Jar, SB			SC	Approximately 40% GRAVEL and COBBLES, inferred calcrete, white, in a matrix of clayey SAND, fine to medium grained, brown, low plasticity fines.		Inferred topsoil. Rock is inferred calcrete, white.
				0.30	TP08-02 0.30-0.60 m Jar, SB, LB			SC	Approximately 40% GRAVEL, COBBLES and BOULDERS up to 400mm in size, inferred calcrete, in matrix of Clayey SAND, fine to coarse grained, pale brown, high plasticity fines.		Inferred calcareous.
			0.5	0.70				SC	Clayey SAND, fine to coarse grained, orange/ brown, mottled pale brown, high plasticity fines, mottled pale brown.	D - M	Contains cobbles, grey with black specks.
			1.0		TP08-03 1.00-1.40 m Jar, SB, LB						
			1.5		TP08-04 1.60-2.00 m Jar, SB						
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER NOT ENCOUNTERED		
			2.5								

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFiles>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP09

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616100.0 m E 6209450.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: RH DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP09-01 0.00-0.15 m PID=0 Jar, 2 x SB			SC	Clayey SAND, fine to medium grained, dark brown, low plasticity fines, with fine gravel.	D - M		Inferred topsoil.
				0.15	TP09-02 0.15-0.30 m PID=0 Jar, 2 x SB			SC / CH	Clayey SAND/ Sandy CLAY, fine to medium grained sand, high plasticity fines, red/ brown.	D	H - Fb	
				0.30	TP09-03 0.30-0.60 m PID=0 Jar, SB, LB			SC	Clayey SAND, fine to coarse grained, brown, mottled pale brown, high plasticity fines, with fine to coarse gravel.			Calcareous.
			0.5		PP 0.50 m >550 kPa							
	M		1.0							D - M		Gravel is inferred quartz. Calcareous.
					TP09-04 1.20-1.50 m PID=0 Jar, SB, LB							
			1.5									
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02.LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP10

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616300.0 m E 6209700.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.05 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 4/11/08
CHECKED: AL DATE: 2/12/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP10-01 0.00-0.30 m PID=0 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, with fine to coarse gravel.	D - M		Inferred topsoil, roots, calcareous inclusions, crystals. Cobbles, pale orange with black specks, inferred gneiss.
				0.30								
	H		0.5		TP10-02 0.30-0.45 m PID=0 Jar, SB			SM	Silty SAND, fine to medium grained, brown/ yellow, low liquid limit fines, with gravel.	D		Moderately cemented zones up to 150mm in size, roots, vesicules.
					TP10-03 0.50-0.80 m PID=0 LB							
				0.80								
			1.0		TP10-04 0.80-1.05 m PID=0 Jar, SB, LB			SM	Approximately 50% GRAVEL and COBBLES, pale grey with crystals, in matrix of Silty SAND, brown, fine to medium grained, low liquid limit fines, with gravel.			
									TEST PIT DISCONTINUED @ 1.05 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.05m			
			1.5									
			2.0									
			2.5									

REPORT OF TEST PIT: TP11

Golder Associates

CLIENT:	CENTREX	COORDS: 616250.0 m E 6209400.0 m N MGA94 53	SHEET: 1 OF 1
PROJECT:	SHEEP HILL PORT INVESTIGATION	SURFACE RL: DATUM: AHD	MACHINE: JCB BACKHOE
LOCATION:	SHEEP HILL	PIT DEPTH: 2.20 m	CONTRACTOR:
JOB NO:	087661006	BUCKET TYPE: 600mm Toothed	LOGGED: AJB DATE: 4/11/08
			CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.05	TP11-01 0.00-0.05 m Jar, 2 x SB PP 0.05 m >500 kPa TP11-02 0.05-0.20 m Jar, SB, LB			SC	Gravelly clayey SAND, fine to coarse grained, dark brown, low plasticity fines, fine to coarse gravel.			Inferred top soil, wheat and cobbles at surface.
								CH	Sandy CLAY, high plasticity, brown, fine to coarse grained sand, with fine to coarse gravel.	D - M	Fb - H	Contains vesicules, roots.
				0.20	PP 0.20 m >500 kPa			SC	Approximately 60% GRAVEL and COBBLES inferred calcrete up to 200mm in size, in a matrix of Clayey SAND, fine to coarse grained, brown, high plasticity fines.			Inferred calcareous.
			0.5		TP11-03 0.40-0.70 m PID=0 Jar, LB					D		
				0.80								Contains cobbles.
					TP11-04 0.80-1.00 m PID=0 Jar, SB, LB			SC	Gravelly clayey SAND, fine to coarse grained pale brown, high plasticity fines, fine to coarse gravel.			Inferred calcareous. Gravel and cobbles are inferred calcrete.
			1.0									
	M			1.20				SC	Approximately 40% GRAVEL and COBBBLES up to 100mm in size, laminated, brown, in a matrix of Clayey SAND, fine to coarse grained, brown, low plasticity fines.			Inferred weathered rock.
			1.5							D - M		
					TP11-05 1.90-2.20 m PID=0 Jar, 2 x SB							
			2.0									
									TEST PIT DISCONTINUED @ 2.20 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02.LIB GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP12

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616350.0 m E 6209400.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.80 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 4/11/08
CHECKED: DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0		TP12-01 0.00-0.20 m Jar, SB, LB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, with gravel.			Inferred topsoil, grass, wheat at surface. Inferred calcareous. Contains cobbles.
				0.20	TP12-02 0.20-0.50 m Jar, SB, LB			SC	Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with fine to medium grey gravel.			Cemented zones up to 150mm in size.
	H		0.5	0.80				SC	Approximately 50% GRAVEL and COBBLES up to 200mm in size, laminated, grey/ brown with gold specks, in a matrix of Clayey SAND, fine to coarse grained, brown, low plasticity fines.	D - M		Inferred weathered rock, breaks apart with hand pressure.
			1.0									
			1.5		TP12-03 1.50-1.80 m Jar, SB, LB				TEST PIT DISCONTINUED @ 1.80 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.8m			
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP13

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616300.0 m E 6209500.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 3/11/08
CHECKED: AL DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0		TP13-01 0.00-0.10 m Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		Inferred topsoil.
				0.10	PP 0.10 m >450 kPa TP13-02 0.10-0.30 m Jar, SB, LB			CH	Sandy CLAY, high plasticity, red brown, fine to coarse sand.		Fb - H	Roots.
				0.30	PP 0.30 m >450 kPa			CH	Sandy CLAY, high plasticity, orange/ brown, mottled pale brown, fine to coarse grained sand, trace of fine to medium gravel.	D	H	Calcareous.
			0.5		TP13-03 0.40-0.70 m Jar, SB, LB							
			1.0									
				1.20				SP	Gravelly SAND, fine to coarse grained, brown, fine to coarse gravel, with clay.			
			1.5		TP13-04 1.60-1.90 m Jar, SB					D - M		
			2.0						TEST PIT DISCONTINUED @ 2.10 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log_GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP14

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616550.0 m E 6209600.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.90 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 3/11/08
CHECKED: tl DATE: 2/2/09

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.25	TP14-01 0.00-0.25 m PID = 0 Duplicates TP14-011, TP14-012 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, fine to coarse gravel.	D - M		Weakly cemented zones up to 200mm in size, inferred topsoil, roots.
			0.5	0.60	TP14-02 0.30-0.60 m PID = 0 Duplicates TP14-021, TP14-022 Jar, SB, LB			SM	Approximately 20% GRAVEL and COBBLES, brown, shiny up to 100mm in size in a matrix of Silty SAND, fine to medium grained, brown/ pale brown, low liquid limit fines.			Inferred weathered rock.
	M		1.0		TP14-03 0.70-1.00 m PID = 0 LB			SC	Approximately 40% GRAVEL and COBBLES up to 150mm in size, brown/ red, shiny, in a matrix of Clayey SAND, fine to coarse grained, grey/ brown, low plasticity fines.	D		Inferred weathered rock.
			1.5		TP14-04 1.10-1.40 m PID = 0 Duplicates TP14-041, TP14-042 Jar, SB							
			2.0						TEST PIT DISCONTINUED @ 1.90 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e RL3

GAP 8_02.LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP15

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616500.0 m E 6209900.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: RL DATE: 2/2/09

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0	0.10	TP15-01 0.00-0.10 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		Roots, inferred topsoil.
	M			0.30	TP15-02 0.10-0.30 m PID=0 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark grey/ brown, low plasticity fines.			Strongly cemented zones, roots.
	M-H		0.5		TP15-03 0.40-0.60 m PID=0 Jar, SB, LB			SC	Clayey Gravelly SAND, fine to coarse grained, pale orange/ brown, fine to coarse gravel, high plasticity fines.	D		Calcareous. Contains cobbles and boulders up to 600mm in size, inferred gneiss. Zones of weathered rock observed.
			1.0						TEST PIT DISCONTINUED @ 1.00 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.0m			
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

REPORT OF TEST PIT: TP16

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616600.0 m E 6209900.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.85 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: [illegible] DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0	0.10	TP16-01 0.00-0.10 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, with fine to coarse gravel.	D - M		
	L-M			0.25	TP16-02 0.10-0.25 m PID=0 Jar, 2 x SB			CH	Sandy CLAY, high plasticity, red/ brown, fine to coarse grained sand, with gravel.	D	Fb - H	Contains orange/ white cobbles of inferred gneiss, some inferred quartz.
				0.35	TP16-03 0.25-0.35 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, brown, high plasticity fines, with gravel.			Intruded by weathered rock. Calcareous. Contains cobbles.
	H		0.5		TP16-04 0.50-0.80 m PID=0 Jar, SB, LB			SM	Silty SAND, fine to coarse grained, pale brown, low plasticity fines, with gravel.	D		Intruded by inferred weathered rock. Contains dark, flaky and grey inferred gneiss, shiny, throughout layer. Calcareous. Contains cobbles.
			1.0						TEST PIT DISCONTINUED @ 0.85 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 0.85m			
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

REPORT OF TEST PIT: TP17

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616700.0 m E 6209900.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: Th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP17-01 0.00-0.20 m Jar, 2 x SB			SC	Clayey Gravelly SAND, fine to coarse grained, dark brown, fine to coarse gravel, low plasticity fines.	D - M		Inferred topsoil, cemented zones up to 100mm in size, roots. 10 cobbles, inferred quartz, or grey rock.
				0.20								
	L-M				TP17-02 0.20-0.30 m PID=0 Jar, 2 x SB TP17-03 0.30-0.50 m PID=0 Jar, SB, LB			SM	Silty SAND, fine to medium grained, pale orange/ brown, low liquid limit fines.	D		Cemented zones, up to 150mm in size. Intruded by grey weathered rock. 1 quartz cobble 200mm in size.
				0.50								
	H		0.5		TP17-04 0.50-1.00 m PID=0 Jar SB			SC	Clayey SAND, fine to coarse grained, dark grey, low plasticity fines, interbedded with material described in the above layer.			Inferred weathered rock.
			1.0						TEST PIT DISCONTINUED @ 1.00 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.00m			
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

REPORT OF TEST PIT: TP18

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616650.0 m E 6209800.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.90 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP18-01 0.00-0.15 m PID=0 Jar, SB			SC	Clayey SAND, fine to medium grained, dark brown, low plasticity fines, with fine to coarse gravel.	D - M		Inferred topsoil, calcareous gravel.
				0.15								
	M				TP18-02 0.15-0.45 m PID=0 Jar, SB, LB			SC	Approximately 20% GRAVEL and COBBLES, inferred calcrete up to 200mm in size in a matrix of Clayey SAND, fine to medium grained, dark brown, low plasticity fines.			Calcareous. Vesicules, roots. Interbedded with inferred weathered rock.
				0.45								Cemented zones up to 200mm in size.
	H				TP18-03 0.45-0.90 m PID=0 Jar, 2 x SB			SP	Gravelly SAND, fine to coarse grained, grey, fine to medium gravel, with low plasticity fines.	D		Inferred weathered rock. Contains cobbles up to 200mm in size.
			0.5									
			1.0						TEST PIT DISCONTINUED @ 0.90 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 0.90m			
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP19

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616400.0 m E 6210050.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.40 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 4/11/08
CHECKED: Th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M	04/11/08, AJB	0.0		TP19-01 0.00-0.10 m Jar			SP	SAND, fine to coarse grained, orange/ brown, trace of low plasticity fines.			
				0.15				SP	As above, with fine to coarse gravel.			
				0.25				SP	As above, trace of fine gravel.			
			0.5		TP19-02 0.30-0.70 m Jar, SB, LB					D - M		
				0.70				CH / SC	Sandy CLAY, high plasticity, orange brown, fine to medium grained sand, interbedded with Clayey SAND, fine to medium grained, brown, high plasticity fines.			
			1.0		PP 0.70 m =100 kPa TP19-03 0.70-1.00 m CLAY Sample and SAND Sample Jar, SB, LB PP 0.71 m =90 kPa							Band of clay, dark grey.
										M		Pockets of pale brown, fine to coarse grained sand.
			1.5	1.50	TP19-04 1.50-2.00 m Jar, 2 x SB			CH	CLAY, high plasticity, pale grey / white, trace of fine to coarse grained sand.			
			2.0	2.00	TP19-05 2.00-2.40 m Jar, 2 x SB			SC	Clayey SAND, medium to coarse grained, grey, high plasticity fines.	W		
									TEST PIT DISCONTINUED @ 2.40 m GROUNDWATER ENCOUNTERED @ 2.0m			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP20

CLIENT:	CENTREX	COORDS: 616400.0 m E 6209500.0 m N MGA94 53	SHEET: 1 OF 1
PROJECT:	SHEEP HILL PORT INVESTIGATION	SURFACE RL: DATUM: AHD	MACHINE: JCB BACKHOE
LOCATION:	SHEEP HILL	PIT DEPTH: 2.35 m	CONTRACTOR:
JOB NO:	087661006	BUCKET TYPE: 600mm Toothed	LOGGED: AJB DATE: 3/11/08
			CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP20-01 0.00-0.20 m Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		
				0.20				SM	Approximately 40% GRAVEL and COBBLES, up to 150mm in size, pale grey, in a matrix of Silty SAND, fine grained, brown/ pale brown, low liquid limit fines.			
	M		0.5		TP20-02 0.40-0.70 m Jar, 2B, LB							
				0.75				SC	Approximately 40% GRAVEL, COBBLES and BOULDERS up to 250mm in size, brown, subangular, in a matrix of Clayey SAND, fine to coarse grained, pale brown, low plasticity fines.			Inferred weathered rock.
			1.0		TP20-03 0.75-1.00 m Jar, SB, LB							
	M-H		1.5									
			2.0		TP20-04 2.00-2.35 m SB							
			2.5						TEST PIT DISCONTINUED @ 2.35 m GROUNDWATER NOT ENCOUNTERED			

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP21

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616450.0 m E 6209600.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 3/11/08
CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0	0.07	TP21-01 0.00-0.07 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	M		Inferred topsoil.
					TP21-02 0.10-0.20 m PID=0 Jar, SB			SC	As above, brown.			
	M			0.20				SM	Silty SAND, fine to medium grained, pale brown, low liquid limit fines.			Cemented sand zones, up to 200mm in size.
					TP21-03 0.30-0.40 m PID=0 Jar, SB, LB							
				0.50								
	H		0.5		TP21-04 0.50-0.70 m PID=0 Jar, SB, LB			SC	Approximately 20% GRAVEL COBBLES and BOULDERS up to 250mm in size, black or grey inferred schist, in a matrix of Clayey SAND, fine to coarse grained, grey/ brown, low plasticity fines.	D		Rock breaks apart with hand pressure. Inferred weathered rock.
			1.0						TEST PIT DISCONTINUED @ 1.00 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.00m			
			1.5									
			2.0									
			2.5									

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REPORT OF TEST PIT: TP22

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616500.0 m E 6209700.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.30 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 3/11/08
CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.05	TP22-01 0.00-0.05 m Jar, SB			SP	SAND, fine to coarse grained, orange/ brown, with clay.	M		Many roots, inferred topsoil.
								SC	Gravelly Clayey SAND, fine to medium grained, dark brown, low plasticity fines, fine to coarse gravel.			Many roots.
				0.20	TP22-02 0.10-0.20 m Jar, SB							
					TP22-03 0.20-0.30 m Jar, SB			SC	Clayey SAND, fine to medium grained, brown, low plasticity fines.			
				0.30				SM	Approximately 40% GRAVEL and COBBLES up to 200mm in size, black and shiny inferred schist or mottled white and pale red inferred gneiss in a matrix of Silty SAND, fine to medium grained, pale brown/ white, low liquid limit fines.			
	H		0.5		TP22-04 0.40-0.60 m Jar, SB TP22-05 0.40-0.70 m LB							
			1.0		TP22-06 1.10-1.30 m Jar, SB, LB							
			1.5						TEST PIT DISCONTINUED @ 1.30 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.30m			
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

REPORT OF TEST PIT: TP23

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616450.0 m E 6209800.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.60 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: Hh DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP23-01 0.00-0.15 m Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, trace of fine to coarse gravel.	D - M		Inferred topsoil, weeds at surface, scattered quartz.
				0.15								
	M				TP23-02 0.15-0.30 m Jar, SB			SC	Gravelly Clayey SAND, fine to coarse grained, brown, low plasticity fines, fine to coarse gravel.			Contains pale orange mottled white, Cobbles, inferred gneiss. Contains inferred calcrete.
				0.30								
					TP23-03 0.30-0.45 m Jar, SB, LB			SC	Approximately 50% GRAVEL and COBBLES, pale orange mottled white, inferred gneiss, in a matrix of Clay SAND, fine to coarse grianed, brown, low plasticity fines.	D		
	H			0.45								
			0.5		TP23-04 0.45-0.60 m Jar, SB			SC	Gravelly Clayey SAND, fine to coarse grained, grey/ brown, low plasticity fines, fine to coarse gravel.			Inferred weathered rock, shiny.
									TEST PIT DISCONTINUED @ 0.60 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 0.60m			
			1.0									
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP24

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616550.0 m E 6209800.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.70 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: fh DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP24-01 0.00-0.20 m PID=0 Jar, 2 x SB			SC	Gravelly Clayey SAND, fine to medium grained, dark brown, fine to coarse gravel, low plasticity fines.	D - M		Calcareous.
				0.20	TP24-02 0.20-0.50 m PID=0 Jar, SB, LB			SC	As above, pale brown.			
	M-H		0.5	0.50	TP24-03 0.50-0.70 m PID=0 Jar, 2 x SB			SM	Gravelly Silty SAND, fine to medium grained, pale brown/ white, low liquid limit fines.	D		
									TEST PIT DISCONTINUED @ 0.70 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 0.70m			
			1.0									
			1.5									
			2.0									
			2.5									

REPORT OF TEST PIT: TP25

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615314.0 m E 6210419.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.90 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: fh DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP25-01 0.00-0.15 m PID=0 Jar, 2 x SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		Inferred topsoil
				0.15								
	M-H				TP25-02 0.15-0.30 m PID=0 Jar, SB			SC	As above, brown, with white calcareous gravel.			Weakly cemented zones up to 150mm in size.
				0.30								
	H		0.5		TP25-03 0.30-0.50 m PID=0 Duplicates: TP25-103, TP25-203 Jar, SB, LB			SC	Approximately 40% COBBLES up to 200mm in size, inferred calcrete, includes grey cobbles from 0.5m depth, in a matrix of Clayey Gravelly SAND, fine to coarse grained, brown, fine to coarse gravel, low plasticity fines.	D		
			1.0						TEST PIT DISCONTINUED @ 0.90 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 0.90m			
			1.5									
			2.0									
			2.5									

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REPORT OF TEST PIT: TP26

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 614640.0 m E 6210436.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: th DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0		TP26-01 0.00-0.30 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines, trace of fine gravel.	D - M		
					PP 0.20 m =90 kPa							
				0.30	TP26-02 0.30-0.50 m PID = 0 Jar, SB, LB			SC	As above, medium plasticity fines, trace of fine to medium gravel.			
			0.5	0.50	PP 0.50 m >500 kPa			SC	As above, mottled pale orange/ white.			Inferred calcareous inclusions.
					TP26-03 0.70-1.00 m PID=0 Jar, SB					D		
			1.0		PP 1.00 m =440 kPa							
			1.5	1.50				SC	Clayey SAND, fine to coarse grained, brown, high plasticity fines.			
					TP26-04 1.70-2.00 m PID=0 Jar SB, LB					D - M		
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02.LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP27

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 614233.0 m E 6210789.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: fh DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0		TP27-01 0.00-0.10 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.			Inferred topsoil, grass at surface.
				0.10	TP27-02 0.10-0.30 m PID=0 Jar, SB			SC	As above, fine to medium grained sand, brown.	D - M		Moderately cemented zones up to 200mm in size, contained vesicules, roots.
				0.30	TP27-03 0.30-0.60 m PID=0 Jar, SB, LB PP 0.40 m >500 kPa			SC	Clayey SAND, fine to coarse grained, dark brown, high plasticity fines.	D		
			0.5	0.60	TP27-04 0.60-1.00 m PID=0 Jar, SB, LB PP 0.70 m =150 kPa			SC	Clayey SAND, fine to coarse grained, brown mottled pale brown, medium plasticity fines, with fine to medium gravel.			Calcareous.
			1.0	1.30				SC	Clayey SAND, fine to coarse grained, brown, low plasticity fines.	D - M		
			1.5		TP27-05 1.70-2.00 m PID=0 Jar, SB							
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 UB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP28

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 613619.0 m E 6211060.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: kh DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP28-01 0.00-0.10 m Duplicates TP28-101, TP28-201 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.			Inferred topsoil, wheat at surface, roots.
					TP28-02 0.20-0.40 m Jar, SB, LB							Moderately cemented zones up to 100mm in size.
				0.40								
	L-M		0.5		TP28-03 0.40-0.80 m Jar, SB, LB			SC	Gravelly Clayey SAND, fine to coarse grained, pale brown, high plasticity fines, fine to medium gravel.	D - M		
				0.90				SM	Silty SAND, fine to medium grained, pale brown mottled red/ white/ yellow, with gravel.			Contains cobbles.
	M		1.0		TP28-04 1.00-1.40 m Jar, SB, LB					M		
			1.5									
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP29

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 612983.0 m E 6211054.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.30 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: fh DATE: 2/2/09

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION / CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L		0.0		TP29-01 0.00-0.15 m Jar, 2 x SB			CL	Sandy CLAY, low plasticity, dark brown, fine to coarse sand.		Inferred topsoil.
				0.15	TP29-02 0.15-0.35 m Jar, 2 x SB			GC	Approximately 50% COBBLES and BOULDERS, inferred calcrete, white, up to 100mm in size or inferred gneiss, pale orange up to 600mm in size, in a matrix of Clayey Sandy GRAVEL, fine to coarse grained, orange brown, fine to coarse grained sand, high plasticity fines.		
	H		0.5		TP29-03 0.40-0.70 m Duplicates: TP29-103, TP29-203 Jar, SB, LB					D - M	
			1.0								
			1.5						TEST PIT DISCONTINUED @ 1.30 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.30m		
			2.0								
			2.5								

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP30

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 612511.0 m E 6210845.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 5/11/08
CHECKED: DL DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0		TP30-01 0.05-0.40 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.			Inferred topsoil, wheat.
				0.40								
			0.5		TP30-02 0.40-0.60 m PID=0 Jar, SB, LB			CL	Sandy CLAY, low plasticity, orange/ brown, fine to coarse grained sand, trace of gravel.	D - M		Cemented zones up to 400mm in size.
					TP30-03 0.70-1.00 m PID=0 SB							Inferred calcareous.
			1.0									
				1.20				CL	As above, brown mottled pale brown.	M		
			1.5		TP30-04 1.70-2.00 m PID=0 Jar, SB, LB							
			2.0						TEST PIT DISCONTINUED @ 2.00 m GROUNDWATER NOT ENCOUNTERED			
			2.5									

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GAP gINT FN. F01e RL3

GAP 8_02 LIB.GLB Log GAP NON-CORED FULL PAGE 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 16:00 8.1.025

REPORT OF TEST PIT: TP31

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 611980.0 m E 6210951.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.10 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: DATE: 2/2/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.15	TP31-01 0.00-0.10 m			SC	Clayey SAND, fine to medium grained, dark brown, low plasticity fines.	D - M		Inferred topsoil, grass at surface.
					PP 0.15 m =260 - =320 kPa TP31-02 0.20-0.50 m			SC	Clayey Gravelly SAND, fine to coarse grained, brown mottled pale brown, fine to coarse gravel, medium plasticity fines.			Cemented zones up to 100mm in size. Calcareous inclusions.
	H		0.5	0.50	TP31-03 0.70-1.00 m			SC	Approximately 60% GRAVEL and COBBLES, inferred calcrete or grey gravel and cobbles up to 200mm in size, in a matrix of Clayey SAND, fine to coarse grained, brown mottled pale brown, medium plasticity fines.			Zones of inferred weathered rock observed.
			1.0		TP31-04 1.00-1.10 m				TEST PIT DISCONTINUED @ 1.10 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.10m			
			1.5									
			2.0									
			2.5									

REPORT OF TEST PIT: TP32

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 611434.0 m E 6210945.0 m N MGA94 53
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.60 m
BUCKET TYPE: 600mm Toothed

SHEET: 1 OF 1
MACHINE: JCB BACKHOE
CONTRACTOR:
LOGGED: AJB DATE: 6/11/08
CHECKED: fh DATE: 2/2/09

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
BH	L-M		0.0	0.10	TP32-01 0.00-0.10 m PID=0 Jar, SB			SC	Clayey SAND, fine to coarse grained, dark brown, low plasticity fines.	D - M		Inferred topsoil.
					TP32-02 0.10-0.30 m PID=0 Duplicates: TP32-102, TP32-202 Jar, 2 x SB			SC	As above, orange/ brown, trace of fine to coarse gravel.			Cemented zones up to 100mm in size. Gravel is inferred quartz.
				0.30	PP 0.30 m >500 kPa			CH	Gravelly Sandy CLAY, high plasticity, red/ brown, fine to coarse gravel, fine to coarse sand.			Calcareous.
	M		0.5	0.50	TP32-03 0.50-0.80 m PID=0 Jar, SB, LB			SC	Approximately 30% COBBLES, grey mottled pale red, inferred sandstone up to 200mm in size, in a matrix of Gravelly Clayey SAND, fine to coarse grained, orange / brown, high plasticity fines, fine to medium gravel.			
			1.0	1.10				CH	Approximately 80% GRAVEL, COBBLES and BOULDERS up to 300mm in size, grey mottled pale red inferred sandstone in a matrix of Sandy CLAY, high plasticity, brown, fine to coarse sand.			
			1.5		TP32-04 1.20-1.40 m PID=0 Jar, SB				TEST PIT DISCONTINUED @ 1.60 m GROUNDWATER NOT ENCOUNTERED PRACTICAL REFUSAL @ 1.60m			
			2.0									
			2.5									

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GAP gINT FN. F01e RL3

REPORT OF BOREHOLE: BH01

Golder Associates

SHEET: 1 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616712.0 m E 6209958.0 m N MGA94 53
SURFACE RL: 8.70 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: DATE: 30/1/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	8.70 0.20	BH01-01 DS 0.00-0.20 m 0A 0.00 m PID = 0.4 ppm			SC	Clayey SAND, fine to coarse grained, brown, low plasticity fines, trace of fine to coarse grained gravel.			Trace of gravel up to 10mm in size.
				8.50				SC	Clayey SAND, fine to coarse grained, pale brown/ white, low plasticity fines, trace of fine to coarse gravel.	D		Recovered as extremely weathered rock , fine to coarse granite and quartz gravel up to 70mm in size. Mica flecks in a matrix of Clayey Sand.
			1		BH01-02 DS 0.40-0.50 m 0A 0.40 m PID = 0.2 ppm							
				1.50								
				7.20	BH01-03 DS 1.50-1.80 m 0A 1.50 m PID = 0.1 ppm			SM	Silty SAND, fine to coarse grained, white, low plasticity fines.			Quartz gravel up to 70mm in size.
				1.90				SC	Clayey SAND, fine to coarse grained, pale brown/ white, low plasticity fines, trace of fine to coarse gravel. For Continuation Refer to Sheet 2			Recovered as extremely weathered rock, fine to coarse granite and quartz gravel up to 70mm in size. Mica flecks in a matrix of Clayey Sand.
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: BH01

SHEET: 2 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616712.0 m E 6209958.0 m N MGA94 53
SURFACE RL: 8.70 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: MH DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
					0							
					1							
					2	2.00		Continuation of Sheet 1				
Sonic		100			3	6.70	+ +	GRANITE, fine to coarse grained, layered, pale grey, white quartzite inclusions (up to 100mm) and veins of Mica Schist, some orange staining.	DW		2.00-7.60: Inferred drill breaks approx. every 100mm, 2.0 to 7.6m.	
		100			4						4.00-4.50: Recovered as subangular gravel, inferred highly fractured zone.	
		100			5							
		100			6							
					7	7.60						
					8	1.10 8.00		Gravelly SAND, pale brown, Quartz inclusions up to 5mm. Inferred RS/EW GRANITE	RS			
						0.70 8.60	+ +	GRANITE, fine to coarse grained, layered pale grey, white, quartzite inclusions up to 100mm and veins of mica schist, with some orange staining.	DW		8.00-8.60: Inferred drill breaks approx. every 100mm.	
		85			9	0.10		SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite veins up to 5mm, trace of orange staining.	SW		8.60-9.00: X, 50-55°, St, Sm, Cn 9.00-10.00: J, 90°, St, Sm, Cn	
					10							

REPORT OF BOREHOLE: BH01

SHEET: 3 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616712.0 m E 6209958.0 m N MGA94 53
SURFACE RL: 8.70 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: HL DATE: 3/11/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		85			10			SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite veins up to 5mm, trace of orange staining.	SW		10.60-10.80: X, 50-55°, St, Sm, Cn	
					11						11.00-11.50: J, 50-55°, Pl, Sm, Sn	
		60			12						12.00-12.40: J, 50-55°, Pl, Sm, Sn	
					13	13.50 -4.80						
					14			END OF BOREHOLE @ 13.50 m TARGET DEPTH STANDPIPE INSTALLED				
					15							
					16							
					17							
					18							
					19							
					20							

REPORT OF BOREHOLE: BH02

SHEET: 1 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616476.0 m E 6209979.0 m N MGA94 53
SURFACE RL: 8.91 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: [illegible] DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	0.10 8.81	BH02-01 DS 0.00-0.10 m 0A 0.00 m PID = 0 ppm			SC	Clayey SAND, fine to medium grained, brown, low plasticity fines, trace of Gravel.			Gravel up to 10mm in size.
								SC	Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, trace of fine to coarse Gravel.			Inferred extremely weathered rock, schist gravel up to 10mm in size and quartz gravel up to 15mm in size.
				0.80 8.11	BH02-02 DS 0.40-0.70 m 0A 0.40 m PID = 0 ppm			SM	Gravelly Silty SAND, fine to coarse grained, grey/ green, fine to coarse Gravel, low plasticity fines.	D		Inferred extremely weathered rock, quartz & granite gravel up to 40mm in size.
			1		BH02-03 DS 0.90-1.20 m 0A 0.90 m PID = 0 ppm							
			2						For Continuation Refer to Sheet 2			
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: BH02

SHEET: 2 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616476.0 m E 6209979.0 m N MGA94 53
SURFACE RL: 8.91 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: JL DATE: 30/1/09

Drilling							Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (Et 0.03, V 0.01, L 0.3, M 1, H 3, VH 10, Ext)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, >3000)
					0							
					1							
					2	2.00		Continuation of Sheet 1				
Sonic		50			3	6.91	+ +	GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.	DW		2.00-4.10: Recovered as subangular Gravel and Cobbles up to 100mm in size, inferred, highly fractured zone.	
		100			4						4.20-4.30: J, 90°, St, Sm, Cn 4.30-4.40: Recovered as subangular Gravel and cobbles up to 70mm in size, inferred, highly fractured zone. 4.40-4.50: J, 90°, St, Sm, Cn 4.50-4.60: X, 80-85°, St, Sm, Cn 4.70-4.80: J, 90°, St, Sm, Cn, Drill break at 4.7m. 4.80-5.10: J, 90°, St, Sm, Cn 5.10-7.00: Possible drill breaks or larger, fractured zone from 5.1m to 7.0 m.	
		100			5							
					6							
					7						7.00-7.10: Highly fractured zone. 7.10-7.40: Recovered as subangular Gravel and Cobbles up to 100mm in size.	
					8						8.00-10.50: Recovered as subangular Gravel and Cobbles up to 100mm in size, possible inferred, highly fractured zone. Inferred extremely low to high strength.	
		33			9							
					10							

REPORT OF BOREHOLE: BH02

SHEET: 3 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616476.0 m E 6209979.0 m N MGA94 53
SURFACE RL: 8.91 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: MH DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		33			10	10.50			DW			
						-1.69		SCHIST, fine to coarse grained, layered, dark grey.				
					11			GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.			11.20-11.40: J, 50-55°, St, Sm, Cn 11.40-12.00: Recovered as subangular Gravel and Cobbles up to 100mm in size, possible inferred, highly fractured zone.	
		100			12						12.60-13.00: Mica content increasing with depth.	
					13	13.00 -4.09		END OF BOREHOLE @ 13.00 m TARGET DEPTH STANDPIPE INSTALLED				
					14							
					15							
					16							
					17							
					18							
					19							
					20							

REPORT OF BOREHOLE: BH03

SHEET: 1 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616334.0 m E 6209804.0 m N MGA94 53
SURFACE RL: 8.05 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 10.30 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 24/10/08
CHECKED: MH DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	8.05 0.20 7.85	SPT 0.00-0.45 m 8, 15, 14 N=29 BH03-01 DS 0.00-0.20 m 0A 0.00 m PID = 0 ppm			SC	Clayey SAND, fine to coarse grained, brown, low plasticity fines, trace of gravel up to 5mm in size.	D		
			1		BH03-02 DS 0.40-0.60 m 0A 0.40 m PID = 0 ppm			SC	Clayey SAND, fine to coarse grained, red brown, low plasticity fines.			
			2	1.90 6.15	BH03-03 DS 1.40-1.50 m 0A 1.40 m PID = 0 ppm			CH	Sandy CLAY, high plasticity, red brown, fine to coarse sand.			
			3		SPT 2.00-2.30 m 23, 15/150mm HB N>15 BH03-04 DS 2.00-2.20 m 0A 2.00 m PID = 0 ppm							
			4	4.00 4.05				SP	Gravelly SAND, fine to coarse grained, pale brown, fine to coarse Gravel, trace of low plasticity fines.			Inferred extremely weathered granite with Mica flecks, trace of quartz gravel up to 40mm in size.
			5									
			6									
			7						For Continuation Refer to Sheet 2			
			8									
			9									
			10									

REPORT OF BOREHOLE: BH03

Golder Associates

SHEET: 2 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616334.0 m E 6209804.0 m N MGA94 53
SURFACE RL: 8.05 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 10.30 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 24/10/08
CHECKED: DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
					0							
					1							
					2							
					3							
					4							
					5							
					6							
					7	7.00		Continuation of Sheet 1				
Sonic		100				1.05		GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.	DW		7.00-8.00: Recovered as subangular Gravel and Cobbles up to 100mm in size, inferred, highly fractured zone.	
					8	8.00						
		20				0.05		Inferred extremely low to high strength, 8.0 to 10.3 m.	EW - DW		8.00-10.30: Poor recovery, inferred highly fractured zone. Inferred extremely low to high strength.	
					9							
					10							

REPORT OF BOREHOLE: BH03

SHEET: 3 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616334.0 m E 6209804.0 m N MGA94 53
SURFACE RL: 8.05 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 10.30 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 24/10/08
CHECKED: MH DATE: 30/1/09

Drilling							Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
		20			10	10.30	+ + +					
						-2.25		END OF BOREHOLE @ 10.30 m TARGET DEPTH STANDPIPE INSTALLED				
					11							
					12							
					13							
					14							
					15							
					16							
					17							
					18							
					19							
					20							

REPORT OF BOREHOLE: BH04

CLIENT:	CENTREX	COORDS: 616329.0 m E 6209601.0 m N MGA94 53	SHEET: 1 OF 3
PROJECT:	SHEEP HILL PORT INVESTIGATION	SURFACE RL: 17.30 m DATUM: AHD	DRILL RIG: SONIC
LOCATION:	SHEEP HILL	INCLINATION: -90°	CONTRACTOR: BOART LONGYEAR
JOB NO:	087661006	HOLE DIA: 150 mm HOLE DEPTH: 18.00 m	LOGGED: MH DATE: 26/10/08
			CHECKED: HL DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	17.30	SPT 0.00-0.45 m 11, 14, 33 N=47 BH04-01 0.00-0.20 m 0A 0.00 m PID = 0 ppm BH04-02 0.50-0.80 m 0A 0.50 m PID = 0 ppm BH04-03 1.50-1.60 m 0A 1.50 m PID = 0 ppm			SC	Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with Gravel.			Gravel up to 75mm in size.
				0.50 16.80				SM	Silty SAND, fine to coarse grained, grey/ green, with gravel.	D		Inferred extremely weathered micacious schist, quartz & granite gravel up to 50mm in size.
			1									
			2						For Continuation Refer to Sheet 2			
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: BH04

SHEET: 2 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616329.0 m E 6209601.0 m N MGA94 53
SURFACE RL: 17.30 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 18.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 26/10/08
CHECKED: DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
					0							
					1							
					2	2.00		Continuation of Sheet 1				
Sonic		100			3	15.30		SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite inclusions, some veins, trace of orange staining.	SW		2.00-2.40: Recovered as subangular Gravel and Cobbles, possible drill breaks or highly fractured rock. 2.40-2.60: J, 85-90°, St, Sm, Cn 2.60-3.60: Recovered as subangular Gravel and Cobbles, possible drill breaks or fractures. 3.60-3.80: J, 55-60°, St, Sm, Cn 3.80-4.00: J, 55-60°, St, Sm, Cn 4.00-4.10: X, 90°, St, Sm, Cn 4.10-4.20: X, 90°, St, Sm, Sn 4.20-4.40: X, 90°, St, Sm, Sn	
		100			4	4.50						
						12.80		GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.	DW		4.50-5.20: Recovered as subangular Gravel and Cobbles, possible drill breaks or highly fractured rock. 5.20-5.60: Inferred drill breaks every 50mm, 5.2m to 5.6m. 5.60-5.80: J, 55-60°, St, Ro, Cn 5.80-6.10: Inferred drill breaks every 50mm, 5.8m to 6.1m. 6.10-6.50: Recovered as subangular Gravels and Cobbles, inferred fractured zone. 6.50-6.80: J, 50°, St, Ro, Cn 6.80-7.50: Inferred drill breaks, or highly fractured zone. 7.50-7.60: J, 55-60°, St, Ro, Cn 7.60-7.80: J, 55-60°, St, Ro, Cn 7.80-8.00: Recovered as subangular Gravel and Cobbles. 8.00-8.20: J, 55-60°, St, Ro, Cn 8.50-9.00: J, 50-55°, St, Ro, Cn 9.00-9.90: Recovered as subangular Gravel and Cobbles, inferred drill break or highly fractured zone. 9.90-10.30: J, 50-55°, St, Ro, Cn	
		60			5							
					6							
					7							
		100			8							
					9							
		100			10							

REPORT OF BOREHOLE: BH04

Golder Associates

SHEET: 3 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616329.0 m E 6209601.0 m N MGA94 53
SURFACE RL: 17.30 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 18.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 26/10/08
CHECKED: DL DATE: 3/11/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.03, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		100			10			GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.	DW		10.30-10.50: X, 90°, St, Ro, Cn 10.50-10.70: X, 90°, St, Ro, Cn 10.70-11.00: X, 90°, St, Ro, Sn	
					11						11.00-12.00: Recovered as subangular Gravel and Cobbles, possible drill breaks.	
					12						12.00-12.10: J, 50-55°, St, Ro, Cn 12.30-13.80: Inferred drill breaks, or highly fractured zone.	
		100			13							
					14	14.00 3.30		SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions, some trace of orange staining.			13.80-14.00: X, 90°, St, Sm, Sn 14.00-14.20: J, 55°, St, Ro, Cn 14.40-14.40: X, 90°, St, Sm, Cn 14.40-14.50: X, 90°, St, Sm, Cn 14.50-14.80: X, 90°, St, Sm, Cn	
					15	15.00 2.30		GRANITE, fine to coarse grained, layered pale grey, pink, white, quartzite inclusions, veins of micaceous schist, patches of orange staining.			15.00-15.20: X, 90°, St, Sm, Cn 15.50-16.50: Drill breaks and possible subhorizontal joints approx. 50mm spacings.	
		95			16						16.60-16.80: X, 90°, Un, Ro, Cn	
					17						17.20-17.30: X, 85°, Un, Ro, Ct	
									EW		17.50-17.80: Extently weathered micacious schist in a sandy zone with trace of low plasticity fines, trace of quarts gravel.	
					18	18.00 -0.70		END OF BOREHOLE @ 18.00 m TARGET DEPTH STANDPIPE INSTALLED	DW		17.80-18.00: J, 50-55°, St, Ro, Cn	
					19							
					20							

REPORT OF BOREHOLE: BH05

SHEET: 1 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616497.0 m E 6209493.0 m N MGA94 53
SURFACE RL: 14.62 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 15.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 28/10/08
CHECKED: [illegible] DATE: 3/11/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	14.62 0.20 14.42	SPT 0.00-0.45 m 6, 13, 25 N=38 BH05-01 0.00-0.20 m 0A 0.00 m PID = 0 ppm BH05-02 0.40-0.60 m 0A 0.40 m PID = 0 ppm BH-05-03 0.80-1.00 m 0A 0.80 m PID = 0 ppm			SC SM	Clayey SAND, fine to coarse grained, brown, low plasticity fines, with subangular gravel up to 15 mm in size. Silty SAND, fine to coarse grained, grey/ green, with gravel.	D		Inferred extremely weathered micacious schist, quartz & granite gravel up to 30mm in size.
			1						For Continuation Refer to Sheet 2			
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: BH05

Golder Associates

SHEET: 2 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616497.0 m E 6209493.0 m N MGA94 53
SURFACE RL: 14.62 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 15.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 28/10/08
CHECKED: HL DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL, VL 0.03, L 0.1, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		100			0							
					1	1.00 13.62		Continuation of Sheet 1				
								SCHIST, fine to coarse grained, layered dark grey, occasional quartize inclusions up to 50mm, quartzite veins up to 5mm width, trace of granite inclusions.	DW		1.00-1.20: X, 85-90°, St, Sm, Sn, Inferred drill breaks every every 200mm, 1.0m and 3.0m at breaks subangular Gravel and Cobbles up to 100mm recovered.	
					2						2.30-2.40: X, 85-90°, St, Sm, Sn 2.50-2.60: X, 85-90°, St, Sm, Sn	
					3						2.90-3.00: X, 85-90°, St, Sm, Sn 3.40-3.50: X, 85-90°, St, Sm, Sn	
		100			4						3.80: Possible joint or drill break. 3.80-4.00: X, 80-85°, St, Sm, Sn 4.00: Inferred drill break.	
					5						4.60: Inferred drill break. 4.60-4.70: X, 80-85°, St, Sm, Cn 5.00-5.30: X, 80-85°, St, Sm, Cn 5.30-5.40: J, 90°, St, Sm, Cn 5.40-5.50: Inferred drill break. 5.50-6.00: X, 85-90°, St, Sm, Cn	
					6	6.00 8.62		SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite inclusions, quartzite veins up to 5mm width.			6.00: Inferred drill break. 6.00-6.30: X, 85-90°, St, Sm, Cn 6.30: Inferred drill break.	
		100			7						6.60: Inferred drill break. 6.70-7.00: X, 70-75°, St, Sm, Sn 7.00-7.30: X, 70-75°, St, Sm, Sn	
					8						7.60-7.80: X, 90°, St, Sm, Cn 7.80-7.90: Inferred drill breaks. 8.00-8.30: X, 70-75°, St, Sm, Cn 8.30-8.40: X, 65-70°, St, Sm, Ct 8.40-8.60: Inferred drill breaks.	
		100			9						8.70-9.00: X, 90°, St, Sm, Ct 9.00-10.00: X, 90°, St, Sm, Ct	
					10							

REPORT OF BOREHOLE: BH05

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616497.0 m E 6209493.0 m N MGA94 53
SURFACE RL: 14.62 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 15.00 m

SHEET: 3 OF 3
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 28/10/08
CHECKED: HL DATE: 3/11/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		100			10			SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite inclusions, quartzite veins up to 5mm width.	DW		10.00-10.40: X, 90°, St, Sm, Ct 10.40-10.50: Inferred drill break. 10.90-11.00: Inferred drill breaks, 10.9m to 11.0m, subangular Gravel and Cobbles. 11.00-11.30: X, 90°, St, Sm, Cn 11.30: Inferred drill break at 11.3m. 11.30-12.00: X, 90°, St, Sm, Ct 12.00-13.00: X, 85°, St, Sm, Ct 13.10-13.20: Inferred drill breaks. 13.20-13.80: J, 50-55°, St, Sm, Ct 13.90: Inferred drill break. 14.30: Inferred drill break. 14.50: Inferred drill break. 14.80: Inferred drill break.	
		100			11							
					12							
					13							
					14							
					15	15.00 -0.38		END OF BOREHOLE @ 15.00 m TARGET DEPTH STANDPIPE INSTALLED				
					16							
					17							
					18							
					19							
					20							

REPORT OF BOREHOLE: BH06

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616584.0 m E 6209704.0 m N MGA94 53
SURFACE RL: 20.54 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 21.50 m

SHEET: 1 OF 4
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 21/10/08
CHECKED: TH DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	0.10 20.34	BH06-01 0.00-0.10 m 0A 0.00 m PID = 0 ppm			SC	Clayey SAND, fine to medium grained, brown, low plasticity fines, trace of Gravel up to 10 mm in size.			
				0.20				SP	SAND, fine to medium grained, pale brown, trace of low plasticity fines.			Inferred extremely weathered rock, fine to coarse granite & quartz gravel in a matrix of clayey sand with mica flecks.
				0.70 19.84	BH06-02 0.30-0.50 m 0A 0.30 m PID = 0 ppm			SC	Clayey Gravelly SAND, fine to coarse grained, pale brown, fine to coarse Gravel, low plasticity fines.			
				0.90 19.64	BH06-03 0.80-0.90 m 0A 0.80 m PID = 0 ppm			GP	Sandy GRAVEL, fine to coarse grained, pale brown, fine to coarse Sand, trace cobbles up to 80 mm. Granite & quartz gravel, mica flecks.			
			1					SM	Silty SAND, fine to coarse grained, grey/ green, with granite & quartz gravel up to 30 mm.			Inferred extremely weathered micaceous schist.
			2									
				2.90								
			3	3.00 17.54				SC GP	Clayey Gravelly SAND, fine to coarse grained, pale brown, low plasticity fines, fine to coarse granite & quartz Gravel. Sandy GRAVEL, fine to coarse grained, pale brown, fine to coarse Sand. Granite & quartz gravel.			Inferred extremely weathered gneiss / granite.
				3.50 17.04				SC	Clayey Gravelly SAND, fine to coarse grained, brown, low plasticity fines, fine to coarse granite & quartz Gravel.			
			4	4.10 16.44				SC-SM	Clayey Silty SAND, fine to coarse grained, pale brown, low plasticity fines, with fine to coarse granite & quartz Gravel and Cobbles up to 70 mm. Mica flecks.			
			5	5.00 15.54				SC	Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with fine to coarse granite & quartz Gravel and Cobbles up to 80 mm. Mica flecks.	D		
				5.50 15.04				SM	Gravelly Silty SAND, fine to coarse grained, grey/ green, fine to coarse granite & quartz Gravel and Cobbles up to 90 mm.			Inferred extremely weathered micaceous schist.
			6									
			7									
			8									
			9									
				9.50 11.04				CL	Sandy CLAY, low to medium plasticity, green/ brown, fine to coarse Sand, with Gravel.			
			10									

REPORT OF BOREHOLE: BH06

CLIENT:	CENTREX	COORDS: 616584.0 m E 6209704.0 m N MGA94 53	SHEET: 2 OF 4
PROJECT:	SHEEP HILL PORT INVESTIGATION	SURFACE RL: 20.54 m DATUM: AHD	DRILL RIG: SONIC
LOCATION:	SHEEP HILL	INCLINATION: -90°	CONTRACTOR: BOART LONGYEAR
JOB NO:	087661006	HOLE DIA: 150 mm HOLE DEPTH: 21.50 m	LOGGED: MH DATE: 21/10/08
			CHECKED: DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			10					CL	Sandy CLAY, low to medium plasticity, green/ brown, fine to coarse Sand, with Gravel.	D		Inferred extremely weathered micaceous schist.
			11	11.00 9.54				CH	Sandy CLAY, medium to high plasticity, brown, fine to coarse Sand, with gneiss/schist Gravel up to 80mm, trace fine quartz gravel.	M		Inferred extremely weathered gneiss / schist.
									For Continuation Refer to Sheet 3			
			12									
			13									
			14									
			15									
			16									
			17									
			18									
			19									
			20									

REPORT OF BOREHOLE: BH06

Golder Associates

SHEET: 3 OF 4

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616584.0 m E 6209704.0 m N MGA94 53
SURFACE RL: 20.54 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 21.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 21/10/08
CHECKED: [illegible] DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		30			12	11.50		Continuation of Sheet 2				
		55			13	9.04		SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions up to 50mm in size and veins up to 5mm width.	DW		11.50-12.50: Recovered as subangular Gravel and cobbles. 12.50-12.75: X, 90°, St, Sm, Cn 12.75-13.70: Recovered as sub angular Gravels, inferred highly fractured zone.	
		100			14				SW		13.70-14.00: X, 85-90°, Un, Sm, Cn 13.80: Inferred drill break. 13.90: J, 50-55°, Pl, Sm, Cn 14.00-14.60: X, 85-90°, Un, Sm, Sn, Inferred drill break at 14.35m. 14.60-14.80: X, 80-85°, Un, Sm, Sn, Inferred drill break at 14.8m. 14.80-15.00: X, 85-90°, Pl, Sm, Sn 15.00-15.50: Recovered as subangular Gravel, inferred highly fractured zone. 15.50-15.80: X, 85-90°, Un, Sm, Sn, Inferred drill break at 15.8m.	
		95			16	16.00 4.54		SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions and veins, trace of orange staining.			16.00-16.40: J, 50-55°, Un, Sm, Sn, Inferred drill break at 16.0m. 16.50: Inferred drill break. 16.50-17.00: J, 65-70°, Un, Sm, Sn 17.00-17.50: J, 50-55°, Un, Sm, Sn 17.50-17.80: J, 45-50°, Un, Sm, Sn, Inferred drill break at 17.8m. 17.80-18.00: X, 75-80°, Pl, Sm, Cn, Possible drill break at 18.00m. 18.00-19.00: Poor recovery	
		75			18							
					20						19.00-20.00: X, 80-85°, Un, Sm, Cn	

REPORT OF BOREHOLE: BH06

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616584.0 m E 6209704.0 m N MGA94 53
SURFACE RL: 20.54 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 21.50 m

SHEET: 4 OF 4
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 21/10/08
CHECKED: HL DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		100			20			SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions and veins, trace of orange staining.	SW		20.00-20.10: Recovered as subangular Gravel and Cobbles, inferred fractured zone. 20.10-20.80: J, 90°, Un, Sm, Cn 20.80-21.00: X, 70-75°, Pl, Sm, Cn 21.00-21.30: X, 70-75°, Pl, Sm, Cn 21.30-21.40: X, 70-75°, Pl, Sm, Cn 21.40-21.50: Recovered as subangular Gravel and Cobbles, inferred fractured zone or multiple drill breaks.	
					21	21.50 -0.96		END OF BOREHOLE @ 21.50 m TARGET DEPTH STANDPIPE INSTALLED				
					22							
					23							
					24							
					25							
					26							
					27							
					28							
					29							
					30							

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for hydrogeological purposes only, without attempt to assess geotechnical properties or possible contamination. Any reference to geotechnical properties or potential contamination are for information only and do not necessarily indicate the presence or absence of the properties stated.

GAP gINT FN. F02a RL3

REPORT OF BOREHOLE: BH07

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616089.0 m E 6210042.0 m N MGA94 53
SURFACE RL: 7.27 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

SHEET: 1 OF 2
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 29/10/08
CHECKED: DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	7.27	SPT 0.00-0.45 m 4, 8, 10 N=18 BH07-01 0.00-0.20 m 0A 0.00 m PID = 0 ppm			SC	Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, trace of Gravel up to 10 mm.		D	
			1	1.00 6.27				SC	Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with Gravel up to 10 mm.			
					BH07-02 1.20-1.40 m 0A 1.20 m PID = 0 ppm							
				1.50 5.77				CL	Sandy CLAY, low plasticity, pale brown, fine to coarse Sand.			
			2		BH07-03 1.90-2.00 m 0A 1.90 m PID = 0 ppm SPT 2.00-2.45 m 6, 7, 9 N=16						VSt - H	
			3	3.00 4.27	BH07-04 3.00-3.20 m 0A 3.00 m PID = 0 ppm			SP	SAND, fine to coarse grained, pale brown, with low plasticity fines.		D	
				3.50 3.77				CH	Sandy CLAY, high plasticity, pale brown, fine to coarse Sand.		VSt - H	
			4	4.00 3.27	PP 3.80 m >600 kPa BH07-05 4.00-4.20 m 0A 4.00 m PID = 0 ppm			SP	SAND, fine to coarse grained, pale brown, with low plasticity fines.		D	
				4.80 2.47	PP 4.80 m =310 kPa			CH	Sandy CLAY, high plasticity, pale brown, fine to coarse Sand.	D		
			5		SPT 5.00-5.45 m 6, 10, 13 N=23							
			6		BH07-06 5.80-6.00 m 0A 5.80 m PID = 0 ppm PP 6.00 m =210 kPa							
			7		PP 7.50 m =210 kPa						H	
			8	8.00 -0.73	SPT 8.00-8.45 m 10, 19, 25 N=44			CL	Silty sandy CLAY, low plasticity, yellow, fine to coarse Sand, trace of Gravel and Cobbles.			Subangular Gravel and Cobbles up to 100mm in size.
			9									
			10									

REPORT OF BOREHOLE: BH07

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616089.0 m E 6210042.0 m N MGA94 53
SURFACE RL: 7.27 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

SHEET: 2 OF 2
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 29/10/08
CHECKED: TH DATE: 30/1/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			10					CL	Silty sandy CLAY, low plasticity, yellow, fine to coarse Sand, trace of Gravel and Cobbles.	D	H	Subangular Gravel and Cobbles up to 100mm in size.
			11	-3.73					END OF BOREHOLE @ 11.00 m TARGET DEPTH STANDPIPE INSTALLED			
			12									
			13									
			14									
			15									
			16									
			17									
			18									
			19									
			20									

REPORT OF BOREHOLE: BH08

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615963.0 m E 6209706.0 m N MGA94 53
SURFACE RL: 9.73 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

SHEET: 1 OF 3
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 30/10/08
CHECKED: HL DATE: 30/1/09

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
Sonic			0	9.73	SPT 0.00-0.45 m 6, 11, 12 N=23 BH08-01 0.00-0.20 m 0A 0.00 m PID = 0 ppm PP 0.20 m =340 kPa BH08-02 0.40-0.50 m 0A 0.40 m PID = 0 ppm PP 0.50 m =530 kPa 1.80 m PID = 0 ppm PP 1.80 m =550 kPa SPT 2.00-2.45 m 9, 12, 13 N=25			CH	Sandy CLAY, high plasticity, red brown, fine to coarse Sand, trace of Gravel.	D	VSt	
			1								H	
			2									
			3	3.50 6.23	BH08-04 3.50-3.80 m 0A 3.50 m PID = 0 ppm PP 3.80 m =210 kPa			SC	Clayey SAND, fine to coarse grained, red brown, high plasticity fines, trace of Gravel.			
			4	4.00 5.73				CH	Sandy CLAY, high plasticity, red brown, fine to coarse Sand, with Gravel.			
			5	5.00 4.73	BH08-05 4.50-4.80 m 0A 4.50 m PID = 0 ppm PP 4.80 m >600 kPa SPT 5.00-5.45 m 4, 4, 16 N=20 BH08-06 5.50-5.80 m 0A 5.50 m PID = 0 ppm PP 5.80 m >600 kPa			CH	CLAY, high plasticity, red brown, fine to coarse Sand.			
			6								H	
			7									With Gravel from 7.0m to 7.5m.
				7.50 2.23	BH08-07 7.50-7.80 m 0A 7.50 m PID = 0 ppm SPT 8.00-8.30 m 20, 50/150mm HB N>50			SC	Clayey SAND, fine to coarse grained, high plasticity fines, trace of Gravel.			Trace of Quartz Gravel up to 20mm in size.
			8	8.00 1.73				CL	Silty Sandy CLAY, low plasticity, yellow, fines, fine to coarse Sand, trace of Gravel.			
			9								H	
									For Continuation Refer to Sheet 2			
			10									

REPORT OF BOREHOLE: BH08

Golder Associates

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615963.0 m E 6209706.0 m N MGA94 53
SURFACE RL: 9.73 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

SHEET: 2 OF 3
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 30/10/08
CHECKED: HL DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		100			9.50	0.23		Continuation of Sheet 1	DW		9.50-11.00: Inferred drill breaks 9.5m to 11.0m, recovered as subangular Gravel and Cobbles.	

REPORT OF BOREHOLE: BH08

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615963.0 m E 6209706.0 m N MGA94 53
SURFACE RL: 9.73 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

SHEET: 3 OF 3
DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 30/10/08
CHECKED: MH DATE: 30/1/09

Drilling							Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	RECOVERED	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.01, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
Sonic		100			10		+ + + + + + + + + + + +	GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.	DW			
					11	11.00 -1.27		END OF BOREHOLE @ 11.00 m TARGET DEPTH STANDPIPE INSTALLED				
					12							
					13							
					14							
					15							
					16							
					17							
					18							
					19							
					20							

APPENDIX C

QA/QC Procedures

1.0 INTRODUCTION

The quality assurance and quality control procedures undertaken by Golder personnel as part of the investigation were based on the guidelines provided in AS 4482.1 and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM).

The following general quality assurance and quality control procedures were undertaken by Golder Associates personnel as part of this investigation:

- Use of a new pair of disposable gloves for each sample collected;
- Backhoe samples were taken away from the bucket;
- Tracking of sample movements using chain-of-custody documentation;
- Checking sample holding times;
- Use of NATA registered laboratories; and
- Performance of laboratory controlled tests and analysis of field duplicates (inter- and intra- laboratory duplicates) to check the reproducibility of the laboratory results.

Rinsate samples were not required due to the use of disposable nitrile gloves between each soil sampling location. During Groundwater sampling new tubing was used for each hole and the pump was washed in a solution of de-ionised water and Decon detergent and rinsed in de-ionised water between each sampling location.

Soil samples were collected in 250 mL jars capped with Teflon lined lids and groundwater samples in bottles provided by a NATA accredited analytical laboratory. The jars and bottles were labelled and stored in a chilled cool-box immediately.

Samples were dispatched to NATA accredited analytical testing laboratories (ALS Environmental or Labmark) under chain of custody documentation. A copy of the chain of custody information is presented in Appendices H and J.

2.0 SAMPLING FREQUENCY

2.1 Soil Sampling Frequency

The soil sampling frequency in AS4482.1, for a site of 105 hectares, is over 500 locations. A total of 127 soil samples recovered from 32 locations by borehole or hand were analysed as part of the baseline investigation of soil at the proposed marine port site.

The soil sampling was undertaken on an approximately 140 m square grid across the site and based on the land area of 105 hectares the sampling density equated to less than 1 location per hectare. However, given that no acute sources of contamination have been identified in past investigations carried out on the site or adjacent properties, the density and spread of soil sample locations are considered adequate to make a judgement of the contamination status of soil on site.

2.2 Groundwater Sampling Frequency

Eight groundwater primary samples were collected from eight groundwater monitoring wells on the site and were analysed for anions and cations and a VIC EPA Screen Comprehensive suite which includes heavy metals, total petroleum hydrocarbons (TPHs), benzene, toluene, ethylbenzene, xylenes (BTEX), polycyclic

aromatic hydrocarbons (PAHs), monocyclic aromatic hydrocarbons (MAHs), fumigants, total cyanide, fluoride, phenolic compounds, organochlorine pesticides (OCPs), organophosphorous pesticides (OPPs), polychlorinated biphenyls (PCBs) and chlorinated and non-chlorinated volatile organic compounds (VOCs).

The number of groundwater wells installed and the number of groundwater analyses are considered adequate to make a judgment of the contamination status of groundwater on site.

3.0 QUALITY CONTROL

3.1 Sample Holding Times

The samples were analysed within the prescribed holding times, with the exception of the following samples for pH analysis:

- Soil samples extracted 1 day out of holding time:
  - BH04/01, BH04/02, BH04/03
- Soil samples extracted 3 days out of holding time:
  - BH01/01
  - BH03/01, BH03/02, BH03/03
- Soil samples extracted 4 days out of holding time:
  - BH01/02, BH01/03
  - BH02/01, BH02/02, BH02/03
- Soil samples extracted 6 days out of holding time:
  - BH06/01, BH06/02, BH06/03

There were no holding time analyses errors reported for groundwater samples.

The cause of the late analyses for the above samples was due to the extended period of field work involved in collecting these samples, and to an oversight or delay by the laboratory in processing and registering the samples. Whilst the extraction/analyses in the above samples were conducted out of the holding times, it is considered unlikely that this has had an adverse affect on data quality or use of the data for purposes of this investigation since elevated pH values are persistent in the environment, and are therefore unlikely to have degraded or reduced as a consequence of the delayed processing.

3.2 Rate of Field Duplicate Testing

The NEPM refers to AS 4482.1 with respect to guidance on quality assurance testing. AS 4482.1 recommends intra-laboratory blind field duplicates and inter-laboratory split field duplicates are each taken at a rate of 1 in 20 samples (5%).

The rate of soil testing for blind duplicates was approximately 1 in 21 (6 out of 127 samples, a rate of 4.7%) at primary laboratories (ALS Environmental for groundwater samples, as well as soil samples from test pits and surface grab samples, and SGS for soil samples from boreholes) and the rate of testing for split duplicates was approximately 1 in 19 (5 out of 97 samples, a rate of 5.1%) at a secondary laboratory (LabMark).

One duplicate groundwater sample was analysed at each of the primary and secondary laboratories.

The key parameters for soil and groundwater are considered to be metals, TPH, BTEX, PAH, OCPs and OPPs. Generally the blind duplicate rates were above the 5% specified in AS4482.1. The blind duplicate rate for soils sampled for metals (4.7%) was marginally below the blind duplication rate recommended in AS4482.1. The significance of this will be dependent on the quality of the QC data.

The key parameters for groundwater are considered to be metals, TPH and VHCs. The groundwater blind and split duplication rates met the recommended 5% for metals, anion and cation analyte suites. Blind and split duplication rates recommended in AS4482.1 were not met by the other key chemicals.

3.3 QA/QC Results for Investigation

3.3.1 RPDs for Blind and Split Duplicates

To assess the acceptability of duplicate QC results, the relative percent difference (RPD) was calculated for the duplicate samples analysed. The RPD is the difference between each set of duplicate results and their mean, with the results expressed as a percentage of the mean. The RPD was considered to be 0% if both results were below the laboratory limit of reporting (LOR). If one result was below the LOR and the other above, the RPD was not calculated.

Calculated RPD values for the investigation are presented in Appendix I3 and K3.

The RPDs for the soil intra-laboratory blind duplicate results ranged from 0% to 28%. Of the 355 calculated RPD values, all were within the generally accepted limit of 50%. The RPDs for the soil inter-laboratory split duplicate results ranged from 7.7% to 199.3%. Of the 33 calculated RPD values, 23 were within the generally accepted limit of 50%.

The main contribution to the exceedences of the acceptable RPD of 50% was from the split duplicate results. The primary chemical results indicate some heterogeneity in the samples and this heterogeneity is likely to have been magnified when a different laboratory, using different techniques analysed the soil. Furthermore, the small variations at low concentrations for some of the contaminants reported may also have contributed to the high RPD results.

The RPDs for the groundwater intra-laboratory blind duplicate results ranged from 0% to 30.7%. Of the 26 calculated RPD values, all were within the generally accepted limit of 50%. The RPDs for the groundwater inter-laboratory split duplicate results ranged from 1.0% to 32.8%. Of the 17 calculated RPD values, all were within the generally accepted limit of 50%.

Therefore the reproducibility of soil and groundwater data for the contaminants of concern is considered sufficient to provide confidence in the primary data.

The concentrations of metals for the 124 soil samples analysed were below the laboratory LOR for many analytes in this suite, and exceedences were reported for copper, vanadium and zinc analytes only. The low duplication rates (<5%) noted in Section 3.2 are not considered to affect the outcome of the chemical testing.

The concentrations of OCPs/OPPs, phenols, CHCs, BTEX and VOCs (including VHCs) were generally below the laboratory LOR, and concentrations of TPH were generally below or marginally above the laboratory LOR in the groundwater samples analysed. The absence of duplication of groundwater samples noted in Section 3.2 is therefore not considered to affect the outcome of the chemical testing for these analytes.

3.3.2 Internal Laboratory QA/QC Analysis

Laboratory quality control procedures included the following:

- Analysis of a 'method blank'; an analyte-free matrix to which all reagents are added in the same volume or proportions as used in sample processing. Analysis should show analyte concentrations below the laboratory LORs. Failure was considered to have occurred if concentrations at or above the LOR were reported.
- Analysis of laboratory 'duplicate' samples; a separate portion of a sample being analysed that is treated the same as the other samples in the batch. Concentrations reported for the duplicates were compared to the corresponding primary sample and RPDs calculated. Failure was considered to have occurred if RPDs greater than 50% were calculated.
- Analysis of samples with added 'surrogate spike'; an organic compound which is similar to the target analytes in chemical composition and behaviour in the analytical process, but which is not normally found in environmental samples, or 'matrix spike'; an aliquot of sample spiked with a known concentration of target analytes during sample preparation and analysis, or 'laboratory control spike', is a reference material tested at the same time as a real sample. It is used to demonstrate that the analytical instrument is properly calibrated and is capable of providing accurate and quantitative results. Results from spikes are reported as the percentage recovery of the known quantity added to the sample. Surrogate spikes were also added to blank samples and duplicate samples and the percentage recovery reported. Failure was considered to have occurred if the percentage recovery reported was outside the acceptable recovery limits set by the laboratory. These limits generally differ for each analyte.

No laboratory internal duplicates for soil and groundwater returned results above RPDs greater than 50%.

No laboratory internal method blanks for soil and groundwater returned results above the respective laboratory LOR.

Most results from the primary laboratory (ALS Environmental), showed spike recoveries (for the matrix spikes, internal control spikes and internal surrogate spikes) within the acceptable range nominated by this laboratory for the analytes tested.

Phenol, OCP/OPP, and TPH/BTEX analyses conducted during the soil sampling and PCB, OCP/OPP, TPH/BTEX and VOCs during the groundwater sampling showed some spikes outside the acceptable range. However, the individual spike failures reported is considered low for each primary analyte tested. An example for both soil and groundwater spike recoveries are as follows.

For soil, spiked OCP/OPP samples had the highest number of poor recoveries (5). The number of OCP/OPP suites spiked was 63. However, the number of individual analytes within this suite is 42 (25 OCPs plus 17 OPPs). Only 5 OCP/OPP spike tests failed in 1890 individual analytes (giving a failure rate of 0.26%).

Similarly, for groundwater, spiked TPH/BTEX had the highest number of poor recoveries (5). The number of TPH/BTEX suites that were spiked was 8. However, the number of individual analytes within this suite is 9 (4 TPH plus 5 BTEX). Only 5 TPH/BTEX tests failed in 72 individual analytes tested (giving a failure rate of 6.9%). It must also be noted that the failures reported for TPH/BTEX spikes only marginally exceeded the acceptable recovery limits, ranging from just 2% to 4% greater than the upper data quality objective adopted by the laboratory.

Therefore, the number of spike failures is considered acceptable for the purpose of this investigation.

APPENDIX D

Groundwater Well Permits

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

RESOURCE ALLOCATION DIVISION
GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153464
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

2. All work is to be carried out in accordance with the enclosed general specifications.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. Water samples are required from all wells drilled in respect of this permit.
5. Strata samples are not required.
6. The licensed well driller must forward with his report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
7. All wells must be drilled vertical unless written permission is obtained from the

Minister.

NOTES:

1. Under section 202(1)(b)(ii) of the Natural Resources Management Act 2004, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or omissions may result in the variation, suspension or revocation of the permit.

Melinda Kovac
COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

RESOURCE ALLOCATION DIVISION
GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153463
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

2. All work is to be carried out in accordance with the enclosed general specifications.
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Melinda Kovac
COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

RESOURCE ALLOCATION DIVISION
GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153462
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

2. All work is to be carried out in accordance with the enclosed general specifications.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
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5. Strata samples are not required.
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7. All wells must be drilled vertical unless written permission is obtained from the

Minister.

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Melinda Kovac
COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

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RESOURCE ALLOCATION DIVISION
GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153461
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

2. All work is to be carried out in accordance with the enclosed general specifications.
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7. All wells must be drilled vertical unless written permission is obtained from the

Minister.

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Melinda Kovac
COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

GOVERNMENT OF SOUTH AUSTRALIA

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RESOURCE ALLOCATION DIVISION
GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153460
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

2. All work is to be carried out in accordance with the enclosed general specifications.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
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5. Strata samples are not required.
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Minister.

NOTES:

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Melinda Kovac
COORDINATOR WATER LICENSING
Date: 2/09/2008 Delegate of Minister for Environment and Conservation

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

RESOURCE ALLOCATION DIVISION
GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153459
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

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COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

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PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153458
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
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Minister.

NOTES:

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Delegate of Minister for Environment and Conservation

Date: 2/09/2008

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GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153457
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

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Melinda Kovac
COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

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GPO Box 2834 Adelaide SA 5001
Ph: 8463 6875 Fax: 8463 6840

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 135 of the *Natural Resources Management Act 2004*

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	153456
Expiry Date:	02/09/2009

Permission is hereby granted to: GOLDER ASSOCIATES P/L
ACN 006 107 857
199 FRANKLIN STREET
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction
Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CL 872/7
   Section 386
   Hundred of Yaranyacka

   CL 872/7
   Section 388
   Hundred of Yaranyacka

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Minister.

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Melinda Kovac
COORDINATOR WATER LICENSING
Delegate of Minister for Environment and Conservation

Date: 2/09/2008

APPENDIX E

Groundwater Well Construction Details

REPORT OF BOREHOLE: GW01

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616712.0 m E 6209958.0 m N MGA94 53
SURFACE RL: 8.70 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: th DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic	05/11/08	0	8.70				Clayey SAND, fine to coarse grained, brown, low plasticity fines, trace of fine to coarse grained gravel.		Cement Casing (0.0 - 5.3)
			0.20						
			8.50				Clayey SAND, fine to coarse grained, pale brown/ white, low plasticity fines, trace of fine to coarse gravel.		
		1							
			1.50						
			7.20				Silty SAND, fine to coarse grained, white, low plasticity fines.		
			1.90						
		2	2.00				Clayey SAND, fine to coarse grained, pale brown/ white, low plasticity fines, trace of fine to coarse gravel.		
			6.70				GRANITE, fine to coarse grained, layered, pale grey, white quartzite inclusions (up to 100mm) and veins of Mica Schist, some orange staining.		
		3							
		4							
		5							Bentonite Seal (5.3 - 6.3)
		6							Filter Pack (6.3 - 13.3)
		7							Screen (7.3 - 13.2)
			7.60				Gravelly SAND, pale brown, Quartz inclusions up to 5mm. Inferred RS/EW GRANITE		
			1.10						
		8	8.00				GRANITE, fine to coarse grained, layered pale grey, white, quartzite inclusions up to 100mm and veins of mica schist, with some orange staining.		
			0.70						
			8.50				SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite veins up to 5mm, trace of orange staining.		
			0.20						
		9							
		10							

REPORT OF BOREHOLE: GW01

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616712.0 m E 6209958.0 m N MGA94 53
SURFACE RL: 8.70 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: th DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		10					SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite veins up to 5mm, trace of orange staining.		
		11							
		12							
		13	13.50 -4.80				END OF BOREHOLE @ 13.50 m TARGET DEPTH STANDPIPE INSTALLED		
		14							
		15							
		16							
		17							
		18							
		19							
		20							

REPORT OF BOREHOLE: GW02

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616476.0 m E 6209979.0 m N MGA94 53
SURFACE RL: 8.91 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: [illegible] DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		0	0.10 8.81				Clayey SAND, fine to medium grained, brown, low plasticity fines, trace of Gravel.		Cement Casing (0.0 - 5.0)
							Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, trace of fine to coarse Gravel.		
			0.80 8.11						
		1					Gravelly Silty SAND, fine to coarse grained, grey/ green, fine to coarse Gravel, low plasticity fines.		
			2.00 6.91						
Sonic		2					GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.		Bentonite Seal (5.0 - 6.0)
		3							
		4							
		5							Filter Pack (6.0 - 13.0)
		6							
		7							Screen (7.0 - 13.0)
	05/11/08	8							
		9							
		10							

REPORT OF BOREHOLE: GW02

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616476.0 m E 6209979.0 m N MGA94 53
SURFACE RL: 8.91 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 13.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 23/10/08
CHECKED: MH DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		10	10.50				GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.		
			-1.69				SCHIST, fine to coarse grained, layered, dark grey.		
		11					GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.		
		12							
		13	13.00				END OF BOREHOLE @ 13.00 m TARGET DEPTH STANDPIPE INSTALLED		
		14	-4.09						
		15							
		16							
		17							
		18							
		19							
		20							

REPORT OF BOREHOLE: GW03

Golder Associates

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616334.0 m E 6209804.0 m N MGA94 53
SURFACE RL: 8.05 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 10.30 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 24/10/08
CHECKED: DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		0	8.05				Clayey SAND, fine to coarse grained, brown, low plasticity fines, trace of gravel up to 5mm in size.		Cement Casing (0.0 - 5.2)
			0.20						
			7.85				Clayey SAND, fine to coarse grained, red brown, low plasticity fines.		
		1							
			1.90						
		2	6.15				Sandy CLAY, high plasticity, red brown, fine to coarse sand.		
		3							
			4.00						
		4	4.05				Gravelly SAND, fine to coarse grained, pale brown, fine to coarse Gravel, trace of low plasticity fines.		
		5							Bentonite Seal (5.2 - 6.2)
		6							Filter Pack (6.2 - 10.3)
			7.00						
		7	1.05				GRANITE, fine to coarse grained, layered, pale grey, white, gravel-sized quartzite inclusions, veins of mica schist, some orange staining.		Screen (7.2 - 10.2)
Sonic	05/11/08	8							
		9							
		10							

REPORT OF BOREHOLE: GW03

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616334.0 m E 6209804.0 m N MGA94 53
SURFACE RL: 8.05 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 10.30 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 24/10/08
CHECKED: fi DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
		10	10.30 -2.25			+ +	END OF BOREHOLE @ 10.30 m TARGET DEPTH STANDPIPE INSTALLED		
		11							
		12							
		13							
		14							
		15							
		16							
		17							
		18							
		19							
		20							

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GAP gINT FN. F05 RL3

GAP 8_02.LIB.GLB Log GAP WELL 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 15:57 8.1.025

REPORT OF BOREHOLE: GW04

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616329.0 m E 6209601.0 m N MGA94 53
SURFACE RL: 17.30 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 18.10 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 26/10/08
CHECKED: th DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		0	17.30				Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with Gravel.		Cement Casing (0.0 - 10.0)
			0.50						
			16.80				Silty SAND, fine to coarse grained, grey/ green, with gravel.		
		1							
			2.00						
		2	15.30				SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite inclusions, some veins, trace of orange staining.		
		3							
		4							
			4.50						
Sonic			12.80				GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.		
		5							
		6							
		7							
		8							
		9							
		10							

REPORT OF BOREHOLE: GW04

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616329.0 m E 6209601.0 m N MGA94 53
SURFACE RL: 17.30 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 18.10 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 26/10/08
CHECKED: tl DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic	05/11/08	10					GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.		Bentonite Seal (10.0 - 11.0)
		11							Filter Pack (11.0 - 18.1)
		12							Screen (12.0 - 18.0)
		13							
		14	14.00 3.30				SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions, some trace of orange staining.		
		15	15.00 2.30				GRANITE, fine to coarse grained, layered pale grey, pink, white, quartzite inclusions, veins of micaceous schist, patches of orange staining.		
		16							
		17							
		18	18.00				END OF BOREHOLE @ 18.10 m TARGET DEPTH STANDPIPE INSTALLED		
		19							
		20							

REPORT OF BOREHOLE: GW05

Golder Associates

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616497.0 m E 6209493.0 m N MGA94 53
SURFACE RL: 14.62 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 15.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 28/10/08
CHECKED: TL DATE: 3/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		0	14.62				Clayey SAND, fine to coarse grained, brown, low plasticity fines, with subangular gravel up to 15 mm in size.		Cement Casing (0.0 - 6.9)
			0.20 14.42				Silty SAND, fine to coarse grained, grey/ green, with gravel.		
		1	1.00 13.62				SCHIST, fine to coarse grained, layered dark grey, occasional quartize inclusions up to 50mm, quartzite veins up to 5mm width, trace of granite inclusions.		
		2							
		3							
		4							
Sonic		5							
		6	6.00 8.62				SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite inclusions, quartzite veins up to 5mm width.		Bentonite Seal (6.9 - 7.9)
		7							Filter Pack (7.9 - 15.0)
		8							
		9							Screen (8.9 - 14.9)
		10							

REPORT OF BOREHOLE: GW05

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616497.0 m E 6209493.0 m N MGA94 53
SURFACE RL: 14.62 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 15.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 28/10/08
CHECKED: [illegible] DATE: 3/2/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic	05/11/08	10					SCHIST, fine to coarse grained, layered, dark grey, occasional quartzite inclusions, quartzite veins up to 5mm width.		
		11							
		12							
		13							
		14							
		15	15.00 -0.38				END OF BOREHOLE @ 15.00 m TARGET DEPTH STANDPIPE INSTALLED		
		16							
		17							
		18							
		19							
		20							

REPORT OF BOREHOLE: GW06

SHEET: 1 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616584.0 m E 6209704.0 m N MGA94 53
SURFACE RL: 20.54 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 21.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 21/10/08
CHECKED: fh DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		0	0.10 20.34 0.20 0.70 19.84 0.90 19.64				Clayey SAND, fine to medium grained, brown, low plasticity fines, trace of Gravel up to 10 mm in size.		Cement Casing (0.0 - 13.4)
							SAND, fine to medium grained, pale brown, trace of low plasticity fines.		
							Clayey Gravelly SAND, fine to coarse grained, pale brown, fine to coarse Gravel, low plasticity fines.		
		1					Sandy GRAVEL, fine to coarse grained, pale brown, fine to coarse Sand, trace cobbles up to 80 mm. Granite & quartz gravel, mica flecks.		
							Silty SAND, fine to coarse grained, grey/ green, with granite & quartz gravel up to 30 mm.		
		2							
		3	2.90 3.00 17.54				Clayey Gravelly SAND, fine to coarse grained, pale brown, low plasticity fines, fine to coarse granite & quartz Gravel.		
			3.50 17.04				Sandy GRAVEL, fine to coarse grained, pale brown, fine to coarse Sand. Granite & quartz gravel.		
		4	4.10 16.44				Clayey Gravelly SAND, fine to coarse grained, brown, low plasticity fines, fine to coarse granite & quartz Gravel.		
							Clayey Silty SAND, fine to coarse grained, pale brown, low plasticity fines, with fine to coarse granite & quartz Gravel and Cobbles up to 70 mm. Mica flecks.		
		5	5.00 15.54				Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with fine to coarse granite & quartz Gravel and Cobbles up to 80 mm. Mica flecks.		
			5.50 15.04				Gravelly Silty SAND, fine to coarse grained, grey/ green, fine to coarse granite & quartz Gravel and Cobbles up to 90 mm.		
		6							
		7							
		8							
		9	9.50 11.04				Sandy CLAY, low to medium plasticity, green/ brown, fine to coarse Sand, with Gravel.		
		10							

REPORT OF BOREHOLE: GW06

SHEET: 2 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616584.0 m E 6209704.0 m N MGA94 53
SURFACE RL: 20.54 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 21.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 21/10/08
CHECKED: Hh DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation		
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)

Sandy CLAY, low to medium plasticity, green/ brown, fine to coarse Sand, with Gravel.

11.00 / 9.54

Sandy CLAY, medium to high plasticity, brown, fine to coarse Sand, with gneiss/schist Gravel up to 80mm, trace fine quartz gravel.

11.50 / 9.04

SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions up to 50mm in size and veins up to 5mm width.

16.00 / 4.54

SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions and veins, trace of orange staining.

Sonic

05/11/08

CONSTRUCTION

Bentonite Seal (13.4 - 14.4)

Filter Pack (14.4 - 21.5)

Screen (15.4 - 21.4)

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GAP gINT FN. F05
RL3

GAP 8_02 LIB.GLB Log GAP WELL 087661006 - CENTREX SHEEP HILL.GPJ <<DrawingFile>> 30/01/2009 15:58 8.1.025

REPORT OF BOREHOLE: GW06

SHEET: 3 OF 3

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616584.0 m E 6209704.0 m N MGA94 53
SURFACE RL: 20.54 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 21.50 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 21/10/08
CHECKED: th DATE: 30/1/09.

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		20					SCHIST, fine to coarse grained, layered dark grey, occasional quartzite inclusions and veins, trace of orange staining.		
		21							
			21.50 -0.96				END OF BOREHOLE @ 21.50 m TARGET DEPTH STANDPIPE INSTALLED		
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

REPORT OF BOREHOLE: GW07

Golder Associates

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616089.0 m E 6210042.0 m N MGA94 53
SURFACE RL: 7.27 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 29/10/08
CHECKED: HL DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic	05/11/08	0	7.27				Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, trace of Gravel up to 10 mm.		Cement Casing (0.0 - 3.0)
		1	1.00 6.27				Clayey SAND, fine to coarse grained, pale brown, low plasticity fines, with Gravel up to 10 mm.		
			1.50 5.77				Sandy CLAY, low plasticity, pale brown, fine to coarse Sand.		
		2							
		3	3.00 4.27				SAND, fine to coarse grained, pale brown, with low plasticity fines.		Bentonite Seal (3.0 - 4.0)
			3.50 3.77				Sandy CLAY, high plasticity, pale brown, fine to coarse Sand.		
		4	4.00 3.27				SAND, fine to coarse grained, pale brown, with low plasticity fines.		Filter Pack (4.0 - 11.0)
			4.80 2.47				Sandy CLAY, high plasticity, pale brown, fine to coarse Sand.		Screen (5.0 - 11.0)
		5							
		6							
		7							
		8	8.00 -0.73				Silty sandy CLAY, low plasticity, yellow, fine to coarse Sand, trace of Gravel and Cobbles.		
		9							
		10							

REPORT OF BOREHOLE: GW07

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 616089.0 m E 6210042.0 m N MGA94 53
SURFACE RL: 7.27 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: 150 mm HOLE DEPTH: 11.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 29/10/08
CHECKED: DATE: 30/11/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		10					Silty sandy CLAY, low plasticity, yellow, fine to coarse Sand, trace of Gravel and Cobbles.		
		11	11.00 -3.73				END OF BOREHOLE @ 11.00 m TARGET DEPTH STANDPIPE INSTALLED		
		12							
		13							
		14							
		15							
		16							
		17							
		18							
		19							
		20							

REPORT OF BOREHOLE: GW08

SHEET: 1 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615963.0 m E 6209706.0 m N MGA94 53
SURFACE RL: 9.73 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 11.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 30/10/08
CHECKED: MH DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic	05/11/08	0	9.73				Sandy CLAY, high plasticity, red brown, fine to coarse Sand, trace of Gravel.		Cement Casing (0.0 - 3.0)
		3.50	6.23				Clayey SAND, fine to coarse grained, red brown, high plasticity fines, trace of Gravel.		Bentonite Seal (3.0 - 4.0)
		4.00	5.73				Sandy CLAY, high plasticity, red brown, fine to coarse Sand, with Gravel.		Filter Pack (4.0 - 11.0)
		5.00	4.73				CLAY, high plasticity, red brown, fine to coarse Sand.		Screen (5.0 - 11.0)
		7.50	2.23				Clayey SAND, fine to coarse grained, high plasticity fines, trace of Gravel.		
		8.00	1.73				Silty Sandy CLAY, low plasticity, yellow, fines, fine to coarse Sand, trace of Gravel.		
Sonic		9.50	0.23				GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.		
		10							

REPORT OF BOREHOLE: GW08

SHEET: 2 OF 2

CLIENT: CENTREX
PROJECT: SHEEP HILL PORT INVESTIGATION
LOCATION: SHEEP HILL
JOB NO: 087661006

COORDS: 615963.0 m E 6209706.0 m N MGA94 53
SURFACE RL: 9.73 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 11.00 m

DRILL RIG: SONIC
CONTRACTOR: BOART LONGYEAR
LOGGED: MH DATE: 30/10/08
CHECKED: th DATE: 30/1/09

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
Sonic		10				+ +	GRANITE, fine to coarse grained, layered, pale grey, pink, white, quartzite inclusions, veins of micaceous schist, some orange staining.		
		11	11.00 -1.27				END OF BOREHOLE @ 11.00 m TARGET DEPTH STANDPIPE INSTALLED		
		12							
		13							
		14							
		15							
		16							
		17							
		18							
		19							
		20							

APPENDIX F

Groundwater Well Development and Sampling Forms

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW01

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	7.341	9.812
Depth to product (m BRP)		
Thickness of product (m)		
Total Depth of Bore (m BRP)	13.021	13.232
Depth of Water in Column (m)	5.68	3.42
Bore Volume (L)	4.510	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:						
Time, min	Volume pumped (L)	Conductivity (ms)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	10	4.61	26.8	11.91	-13	208	Highly turbid/ Brown
	20	4.22	26.7	11.98	-24	196	Highly turbid/ Brown
	30	3.33	26.3	10.02	-5	938	Highly turbid/ Brown
	40	3.19	26.3	11.36	-2	1445	Highly turbid/ Brown
	50	3.20	26.6	11.64	-27	133	Highly turbid/ Brown
Total vol. pumped (L)		50.0		No. bore vol. Pumped	11.1		
Time Finish hr:min	:						

Developing Method: Submersible pump and regulator

NOTES

Well was pumped until water was clear and sediment was removed.

Golder Associates

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW02

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	8.134	12.484
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	14.895	14.901
Depth of Water in Column (m)	6.761	2.417
Bore Volume (L)	5.368	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:

Time, min	Volume pumped (L)	Conductivity (ms)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	20	18.70	27.8	11.27	108	3.38	Highly turbid/ Brown
	40	18.62	26.9	9.98	105	396	Highly turbid/ Brown
Total vol. pumped (L)		60.0	No. bore vol. Pumped		11.2		

Time Finish hr:min	:

Developing Method: Submersible pump and regulator

NOTES

Well was pumped until water was clear and sediment was removed.

Golder Associates

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW03

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	7.643	8.395
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	11.531	11.540
Depth of Water in Column (m)	3.888	3.145
Bore Volume (L)	3.087	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:						
Time, min	Volume pumped (L)	Conductivity (ms)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	10	6.64	26.5	9.32	118	16.39	Highly turbid/ Brown
	20	6.25	26.1	9.06	112	14.6	Highly turbid/ Brown
	30	10.20	27.8	8.45	110	2.52	Highly turbid/ Brown
	40	10.80	27.9	8.00	110	11.5	Highly turbid/ Brown
	50	16.53	27.7	7.00	153	2.71	Highly turbid/ Brown
	60	16.78	28.1	6.82	166	2.96	Highly turbid/ Brown
Total vol. pumped (L)		60.0		No. bore vol. Pumped	19.4		
Time Finish hr:min	:						

Developing Method: Submersible pump and regulator

NOTES

well was pumped until water was clear and sediment was removed

Golder Associates

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW04

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	15.514	18.341
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	18.543	18.546
Depth of Water in Column (m)	3.029	0.205
Bore Volume (L)	2.405	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:						
Time, min	Volume pumped (L)	Conductivity (ms)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	10	2.20	27.4	8.07	107	1.62	Highly turbid/ Brown
	20	1.79	27.4	8.2	90	0.92	Highly turbid/ Brown
Total vol. pumped (L)		30.0		No. bore vol. Pumped	12.5		
Time Finish hr:min	:						

Developing Method: submersible pump and regulator

NOTES

well was pumped until water was clear and sediemnt was removed

Golder Associates

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW05

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	3.512	15.921
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	16.00	16.00
Depth of Water in Column (m)	12.488	0.079
Bore Volume (L)	9.916	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:						
Time, min	Volume pumped (L)	Conductivity (us)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	20	1083.00	26.1	8.16	129	4.07	Highly turbid/ Brown
	40	1089.00	25.8	8.66	72	3.17	Highly turbid/ Brown
Total vol. pumped (L)		60.0		No. bore vol. Pumped	6.1		
Time Finish hr:min	:						

Developing Method: Submersible pump and regulator

NOTES

well was pumped until water was clear and sediment was removed.

Golder Associates

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW06

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	18.556	19.801
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	22.061	22.001
Depth of Water in Column (m)	3.505	2.2
Bore Volume (L)	2.783	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:						
Time, min	Volume pumped (L)	Conductivity (ms)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	18	19.70	27.8	8.92	41	1.17	Highly turbid/ Brown
	20	19.80	27.6	8.94	43	1.17	Highly turbid/ Brown
							Clear at end of tubing
Total vol. pumped (L)		38.0		No. bore vol. Pumped	13.7		
Time Finish hr:min	:						

Developing Method: Submersible pump and regulator

NOTES

Well was pumped until water was clear and sediment was removed.

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW07

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	6.571	3.572
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	11.951	11.952
Depth of Water in Column (m)	5.38	8.38
Bore Volume (L)	4.272	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:

Time, min	Volume pumped (L)	Conductivity (us)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	20	1460.00	28.4	8.01	9	1.48	Highly turbid/ Brown
	40	1556.00	28.3	7.99	27	1.46	Highly turbid/ Brown
	50	1579.00	28.7	7.96	14	1.85	Highly turbid/ Brown
	60	1627.00	28.9	7.95	5	2.11	Highly turbid/ Brown
Total vol. pumped (L)		60.0		No. bore vol. Pumped	14.0		

Time Finish hr:min	:

Developing Method: submersible pump and regulator

NOTES

well was pumped until water was clear and sediment was removed.

GROUNDWATER BORE DEVELOPMENT

RECORD FORM

BORE ID	GW08

PROJECT INFORMATION

Project Number: 087661006 **Date:** 30-Oct-08

Client: CENTREX **Time:** pm

Site Location: SHEEP HILL **Developed By:** MH

GROUNDWATER WELL DATA

Interface probe used?	YES

Reference point marked?	YES
Location of Reference Point	TOC

Diameter of Column (mm)	1200
Diameter of Bore (inc filter pack) (mm)	100
Standpipe height (m above ground level)	

	Before Developing	After Developing
Standing Water Level (m *BRP)	8.506	6.531
Depth to product (m BRP)	-	-
Thickness of product (m)	-	-
Total Depth of Bore (m BRP)	11.789	11.788
Depth of Water in Column (m)	3.283	5.257
Bore Volume (L)	2.607	

BRP - Below Reference Point

DEVELOPING RECORD

Time Start hr: min	:						
Time, min	Volume pumped (L)	Conductivity (ms)	Temp (^{o}C)	pH	Redox Potential (mV)	Dissolved Oxygen (mg/L)	Appearance (general observations)
	20	1.92	29.9	7.83	151	2.86	Highly turbid/ Brown
	40	1.80	29.3	7.83	0.48	2.63	Highly turbid/ Brown
Total vol. pumped (L)		60.0		No. bore vol. Pumped	23.0		
Time Finish hr:min	:						

Developing Method: submersible pump and regulator

NOTES

well was pumped until water was clear and sediment was removed.

Golder Associates

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW01

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	7.481
Total Depth of Bore (m BRP)	12.872
Depth of Water in Column (m)	5.391
Standpipe height (m above gl)	

Bore Volume (L): 20.1

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	7.481
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **9:15**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
7	3	51	1.82	8.121	25.6	6.32	11.59	4.39	27
14	7	30	1.87	8.273	25.7	3.79	11.44	4.09	18
30	11	42	2.56	8.279	25.7	3.44	11.36	3.81	19
28	14	12	1.97	8.301	25.7	2.40	9.71	3.36	54
34	18	9	1.87	8.321	25.7	2.07	9.58	3.23	65
40	22	19	1.79	8.333	25.8	11.24	9.40	3.11	83
47	27	21	1.72	8.341	25.8	11.81	9.39	3.07	84
55	32	18	1.70	8.345	25.8	11.82	9.39	3.07	84

Total volume purged (L): 55 **No. bore volumes purged**: 2.7

Time Finish hr:min: **9:45**

Water Quality Meter type: TDS 90FLMV **Water Dipper type:** Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 8.345

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 8.345

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:		Preservation:
Vial	2	NaHS04
250ml Plastic	1	none
1L Glass	1	none
125ml Plastic	1	none
500 ml Plastic	1	Na0H

OBSERVATIONS

Samples: Colour: Pale Brown/ Clear Turbidity Medium

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny Temperature 20^{o}C

Previous Week Sunny Temperature 20^{o}C - 25^{o}C

Notes: *Water cleared after first 3 minutes.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW02

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	8.152
Total Depth of Bore (m BRP)	13.539
Depth of Water in Column (m)	5.387
Standpipe height (m above gl)	

Bore Volume (L): 20.1

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	8.152
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **10:00**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
7	4	13	1.66	8.981	26.5	3.61	7.71	10.05	166
14	9	22	1.49	8.992	26.6	3.39	7.70	9.23	174
20	14	49	1.35	9.123	26.7	3.35	7.70	8.78	176
26	19	36	1.33	9.216	26.8	3.36	7.71	8.49	175
33	24	3	1.37	9.234	26.8	3.45	7.70	8.6	175
41	29	28	1.39	9.238	26.8	3.33	7.70	8.61	175
48	34	16	1.40	9.301	26.8	3.27	7.70	8.62	175
52	39	1	1.33	9.305	26.8	3.26	7.71	8.61	175

Total volume purged (L): 52 **No. bore volumes purged:** 2.6

Time Finish hr:min: **10:40**

Water Quality Meter type: TDS 90FLMV **Water Dipper type:** Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 9.305

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 9.305

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:		Preservation:
Vial	2	NaHS04
250ml Plastic	1	none
1L Glass	1	none
125ml Plastic	1	none
500 ml Plastic	1	Na0H

OBSERVATIONS

Samples: Colour: Pale Brown/ Clear Turbidity Low

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny, windy Temperature 20^{o}C

Previous Week Sunny, windy Temperature 20^{o}C - 25^{o}C

Notes: *Purged clear after first 30 seconds.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW03

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	7.681
Total Depth of Bore (m BRP)	10.751
Depth of Water in Column (m)	3.07
Standpipe height (m above gl)	

Bore Volume (L): 11.5

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	7.681
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **10:50**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
5	3	35	1.40	7.889	26.4	9.76	6.81	22.30	157
10	6	8	1.63	7.893	26.3	26.44	6.81	22.10	154
15	9	44	1.54	7.901	26.3	27.22	6.81	21.40	154
20	12	9	1.65	7.912	26.3	26.63	6.71	18.65	155
25	15	58	1.57	7.983	26.2	22.98	6.60	19.55	159
30	18	34	1.62	7.988	26.1	1.01	6.48	20.12	162
35	21	17	1.64	7.989	26.1	1.02	6.46	20.11	163
40	24	28	1.63	7.995	26.1	1.01	6.45	20.10	163

Total volume purged (L): 40 **No. bore volumes purged**: 3.5

Time Finish hr:min: **11:20**

Water Quality Meter type: TDS 90FLMV **Water Dipper type:** Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 7.995

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 7.995

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:	**Preservation:**
Vial 2	NaHS04
250ml Plastic 1	none
1L Glass 1	none
125ml Plastic 1	none
500 ml Plastic 1	Na0H

OBSERVATIONS

Samples: Colour: Pale Brown/ Clear Turbidity Medium

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny, windy Temperature 25^{o}C

Previous Week Sunny, windy Temperature 25^{o}C

Notes: *Purged clear after 1st minute.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW04

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	15.567
Total Depth of Bore (m BRP)	18.644
Depth of Water in Column (m)	3.077
Standpipe height (m above gl)	

Bore Volume (L): 11.5

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	15.567
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **11:30**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
5	4	35	1.09	16.202	26.7	2.89	7.90	4.41	152
10	8	19	1.20	16.215	26.7	2.06	7.90	4.32	151
15	12	58	1.16	16.310	26.6	1.84	7.87	4.21	152
20	16	5	1.24	16.319	26.7	1.88	7.85	4.39	152
25	20	33	1.22	16.319	26.7	1.63	7.85	4.32	152
30	24	54	1.20	16.412	26.7	1.92	7.85	4.34	153
35	28	9	1.24	16.413	26.7	1.84	7.85	4.33	152
46	32	45	1.40	16.415	26.7	1.63	7.84	4.31	152

Total volume purged (L): 46 **No. bore volumes purged:** 4.0

Time Finish hr:min: **12:15**

Water Quality Meter type: TDS 90FLMV **Water Dipper type:** Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 16.415

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? YES Duplicate ID: GW104 GW204

Time between sampling & purging: Instant

Water level prior to sampling (m): 16.415

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:		Preservation:
Vial	☐	Sodium BiShulphate
1L Plastic	1	none
1L Glass	☐	none
125ml Plastic	☐	HNO3
500 ml Plastic	1	none

OBSERVATIONS

Samples: Colour: Pale Brown/ clear Turbidity Medium

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny windy Temperature 25^{o}C

Previous Week Sunny windy Temperature 25^{o}C

Notes: *Purged clear after first 4 minutes.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW05

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	13.484
Total Depth of Bore (m BRP)	15.689
Depth of Water in Column (m)	2.205
Standpipe height (m above gl)	

Bore Volume (L): 8.2

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	13.484
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **12:40**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (µS/cm)	Redox Potential (mV)
5	3	13	1.55	14.041	26.9	3.46	8.10	1440	151
10	6	6	1.64	14.125	26.9	3.34	8.09	1412	151
15	8	42	1.72	14.231	27.0	3.40	8.09	1392	151
20	11	38	1.72	14.516	27.0	3.40	8.09	1373	152
25	12	27	2.01	15.581	27.1	3.39	8.09	1374	153

Total volume purged (L): 25 **No. bore volumes purged:** 3.0

Time Finish hr:min: **1:10**

Water Quality Meter type: TDS 90FLMV **Water Dipper type:** Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 15.581

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 15.581

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:		Preservation:
Vial	2	NaHS04
250ml Plastic	1	none
1L Glass	1	none
125ml Plastic	1	none
500 ml Plastic	1	Na0H

OBSERVATIONS

Samples: Colour: Pale Brown/ Clear Turbidity Medium

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny Temperature 20^{o}C

Previous Week Sunny Temperature 20^{o}C - 25^{o}C

Notes: *Well pumped dry x 2.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW06

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	18.705
Total Depth of Bore (m BRP)	22.041
Depth of Water in Column (m)	3.336
Standpipe height (m above gl)	

Bore Volume (L): 12.4

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	18.705
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **8:00**

Volume Purged (L) (discrete)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
3	2	21	1.28	18.916	27.9	2.44	7.49	23.5	184
3	4	30	0.67	19.476	27.8	2.37	7.48	23.3	183
3	6	48	0.44	21.321	27.7	3.01	7.47	23.1	182
3	8	52	0.34	21.965	27.7	3.02	7.47	22.9	183
Total volume purged (L)			12	**No. bore volumes purged**		1.0			

Time Finish hr:min: **8:30**

Water Quality Meter type: TDS 90FLMV

Water Dipper type: Solist interface dipper

Pumping Method: Bailer

SAMPLING RECORD

Minimum Water Level during Purging (m): 21.965

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 21.965

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:		Preservation:
Vial	☐	Sodium BiShulphate
1L Plastic	1	none
1L Glass	☐	none
125ml Plastic	☐	HNO3
500 ml Plastic	1	none

OBSERVATIONS

Samples: Colour: Pale Brown Turbidity Low / Medium / High

Odour: NIL Sheen? YES / NO

Weather Conditions: *Sampling Day* Sunny, windy Temperature 25^{o}C

Previous Week Sunny, windy Temperature 25^{o}C

Notes: *Bailer was used due to depth of well.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW07

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	6.814
Total Depth of Bore (m BRP)	11.631
Depth of Water in Column (m)	4.817
Standpipe height (m above gl)	

Bore Volume (L): 18.0

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	6.814
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **1:40**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
5	2	22	2.11	7.721	27.0	6.42	7.28	21.7	175
10	4	13	2.37	7.722	26.8	3.32	7.26	20.1	176
15	6	54	2.17	7.810	26.7	3.16	7.30	18.24	176
20	9	12	2.17	7.823	26.5	3.08	7.29	18.4	177
25	12	34	1.99	7.831	26.4	3.07	7.28	18.55	176
30	16	19	1.84	7.832	26.4	3.09	7.28	18.56	177
35	19	48	1.77	7.840	26.4	3.09	7.28	18.56	176
40	23	9	1.73	7.841	26.4	3.08	7.27	18.57	175
		Total volume purged (L)	40	**No. bore volumes purged**		2.2			

Time Finish hr:min: **2:00**

Water Quality Meter type: TDS 90FLMV

Water Dipper type: Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 7.841

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 7.841

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:		**Preservation:**
Vial	2	NaHS04
250ml Plastic	1	none
1L Glass	1	none
125ml Plastic	1	none
500 ml Plastic	1	Na0H

OBSERVATIONS

Samples: Colour: Pale Brown/ clear Turbidity Medium

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny, windy Temperature 21^{o}C

Previous Week Sunny, windy Temperature 21^{o}C

Notes: *Well was perged clear after first 9 minutes.*

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

Golder Associates

GROUNDWATER SAMPLING - RECORD FORM

BORE ID	GW08

PROJECT INFORMATION

Project Number:	087661006	**Site Location:**	SHEEP HILL
Client:	CENTREX	**Date of Sampling:**	5-Nov-08
Purged By:	MH	**Sampled By:**	MH

GROUNDWATER BORE DATA

Diameter of Column (mm)	50
Diameter of Bore (mm)	100
Standing Water Level (m BRP)	9.169
Total Depth of Bore (m BRP)	11.726
Depth of Water in Column (m)	2.557
Standpipe height (m above gl)	

Bore Volume (L): 9.5

Interface probe used?	YES
Depth to product (m BRP)	-
Depth to water (m BRP)	9.169
Thickness of product (m BRP)	-

BRP - Below Reference Point

PURGING RECORD AND FIELD PARAMETER MEASUREMENTS

Time Start hr: min: **2:20**

Volume Purged (L) (accum)	Time (min) (accum)	Time (seconds)	Rate, L/min	Depth to WL, m	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Redox Potential (mV)
5	4	31	1.11	9.183	27.1	4.99	7.49	14.66	160
10	9	48	1.02	9.276	27.0	14.05	7.48	14.24	161
15	13	56	1.08	9.459	26.8	2.13	7.40	13.06	163
20	18	29	1.08	9.761	26.8	2.21	7.40	13.03	164
25	22	17	1.12	10.392	26.8	2.23	7.39	13.02	165
30	26	7	1.15	10.398	26.8	2.24	7.38	13.03	165

Total volume purged (L): 30 **No. bore volumes purged:** 3.1

Time Finish hr:min: **2:55**

Water Quality Meter type: TDS 90FLMV **Water Dipper type:** Solist interface dipper

Pumping Method: Waterra Tubing with Submersible Pump and Regulator

SAMPLING RECORD

Minimum Water Level during Purging (m): 10.398

Rinsate sample taken BEFORE / AFTER this well? NO Rinsate ID: -

Samples taken? YES Duplicate taken? NO Duplicate ID: -

Time between sampling & purging: Instant

Water level prior to sampling (m): 10.398

Samples filtered? YES for metals Filter method: 0.45 mm filter

Container:	**Preservation:**
Vial 2	NaHS04
250ml Plastic 1	none
1L Glass 1	none
125ml Plastic 1	none
500 ml Plastic 1	Na0H

OBSERVATIONS

Samples: Colour: Pale Brown/ clear Turbidity Medium

Odour: NIL Sheen? NO

Weather Conditions: *Sampling Day* Sunny, windy Temperature 25^{o}C

Previous Week Sunny, windy Temperature 25^{o}C

Notes:

*Refer to "Groundwater Sampling Guidelines" VicEPA Publication 669 *discrete means to restart or batch the volumes and times (non accumulative)*

APPENDIX G

Summary Tables of Analytical Data - Groundwater

APPENDIX G.1
Job No. 087661006 - Groundwater Chemistry Results (Inorganics)
Centrex Metals - Sheep Hill Marine Port Facility

				Metals																					
		pH	Total Dissolved Solids	Aluminium	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Selenium	Thallium	Tin	Vanadium	Zinc	Silver	Mercury	Sulphate	Cyanide (total)
		pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		0.01	1	0.01	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.05	0.001	0.001	0.001	0.001	0.01	0.001	0.001	0.01	0.005	0.001	0.0001	1	0.004
GROUNDWATER CHEMICAL RESULTS (INORGANICS)																									
Sample ID	**Sample Date**																								
GW01	5/11/2008	*9.52*	*2240*		<0.001	0.001	**<0.001**	0.0002	0.012	0.001	0.008	<0.05	<0.001	0.009	*0.06*	0.005	*0.157*	<0.001	<0.001	0.03	**0.006**	<0.001	<0.0001	342	0.04
GW02	5/11/2008	7.96	6920		<0.001	<0.001	**<0.001**	0.0002	0.004	0.001	0.003	<0.05	<0.001	**0.184**	0.008	0.002	*0.041*	<0.001	<0.001	<0.01	**0.16**	0.001	<0.0001	767	0.005
GW03	5/11/2008	6.85	19000		<0.001	<0.001	**<0.001**	0.0012	<0.001	0.004	0.004	<0.05	<0.001	**0.349**	0.005	0.01	*0.044*	0.001	<0.001	<0.01	**0.222**	0.006	<0.0001	2070	<0.004
GW04	5/11/2008	8.14	3770	<0.01		<0.001		<0.0001	<0.001		0.003	<0.05	<0.001	**0.103**		0.006					**0.053**		0.0002	375	
GW05	5/11/2008	8.04	786		<0.001	<0.001	**<0.001**	0.0002	<0.001	<0.001	0.002	<0.05	<0.001	0.013	*0.034*	0.003	<0.01	<0.001	<0.001	<0.01	**0.021**	<0.001	<0.0001	60	<0.004
GW06	5/11/2008	7.74	18100	<0.01		<0.001		0.0012	0.001		0.01	<0.5	<0.001	**0.804**		0.014					**0.385**		<0.0001	1780	
GW07	5/11/2008	7.67	19500		<0.001	<0.001	**<0.001**	0.0019	<0.001	0.001	0.003	<0.05	<0.001	0.041	0.007	0.006	*0.036*	<0.001	<0.001	<0.01	**0.07**	0.006	<0.0001	1620	<0.004
GW08	5/11/2008	7.61	13000		<0.001	<0.001	**<0.001**	0.0062	<0.001	0.002	0.003	<0.05	<0.001	0.064	0.004	0.003	*0.042*	<0.001	<0.001	<0.01	**0.086**	0.004	<0.0001	1370	<0.004

ASSESSMENT CRITERIA/GUIDELINES																									
SA EPA EPP - Aquaculture						**0.02**	**0.0001**		**0.02**					**0.1**		**0.1**					**0.005**		**0.0005**		
SA EPA EPP - Irrigation	*4.5-9*		*1*		*0.1*	*0.1*	*0.01*	*1*	*0.05*	*0.2*	*1*	*0.2*	*2*	*0.01*	*0.2*	*0.02*			*0.1*	*2*		*0.002*		
SA EPA EPP - Livestock			5		0.5	0.1	0.01	1	1	0.5		0.1		0.01	1	0.02			0.1	20		0.002	1000	
SA EPA EPP - Potable	6.5-8.5			0.003	0.007		0.002			2		0.01	0.5	0.05	0.02	0.01					0.1	0.001	500	0.08
SA EPA EPP Aquatic Fresh	6.5-9		0.1	0.03	0.05	0.004	0.002			0.01	1	0.005			0.15	0.005	0.004			0.05	0.0001	0.0001		
SA EPA EPP Aquatic Marine				0.5	0.05		0.002			0.01		0.005			0.015	0.07	0.02			0.05	0.001	0.0001		

STATISTICAL SUMMARY																									
Number of Results	8	8	2	6	8	6	8	8	6	8	8	8	8	6	8	6	6	6	6	8	6	8	8	6
Number of Detects	8	9	1	0	1	0	7	3	5	8	0	0	8	6	8	5	1	0	1	9	4	1	8	2
Minimum Concentration	6.85	786	<0.01	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.009	0.004	0.002	<0.01	<0.001	<0.001	<0.01	0.006	<0.001	<0.0001	60	<0.004
Maximum Concentration	9.52	19500	<0.01	<0.001	0.001	<0.001	0.0062	0.012	0.004	0.01	<0.5	<0.001	0.804	0.06	0.014	0.157	0.001	<0.001	0.03	0.385	0.006	0.0002	2070	0.04
Average Concentration	8.00	9636	0.007	0.001	0.001	0.0005	0.0012	0.0022	0.002	0.043	0.050	0.0005	0.190	0.020	0.006	0.054	0.001	0.001	0.009	0.120	0.003	0.00007	959	0.009
Standard Deviation	0.71	7758	0.0029	0	0.0002	0	0.002	0.0038	0.0013	0.0027	0.075	0	0.25	0.023	0.0038	0.052	0.0002	0	0.01	0.12	0.0027	0.00005	757	0.015
95% UCL	8.49	15012	0.0107	-	0.0011	-	0.0026	0.00483	0.0026	0.0452	0.102	-	0.3632	0.0384	0.0086	0.0956	0.0007	-	0.0172	0.203	0.00516	0.000102	1484	0.02080
Number of Guideline Exceedances(Detects	1	0	0	0	0	0	1	0	0	1	0	0	4	2	0	5	1	0	0	8	4	1	5	0
% of Results at or above the EQL	100	100	33	0	11	0	78	33	83	100	0	0	100	100	100	83	17	0	17	100	67	11	100	33
% of Detects at or above Guidelines	13	0	0	0	0	0	13	0	0	1	0	0	50	25	0	83	0	0	0	100	67	1	63	0

Prepared by:	NJD	Date	21/01/2009
Checked by:	THH	Date	5/03/2009

Notes
Samples which reported analyte concentrations below the laboratory LOR (EQL) are indicated by a "<" sign, and lighter font.
Samples which exceed adopted guideline criteria are indicated by the appropriate formatting.

APPENDIX G.2
Job No. 087661006 - Groundwater Chemistry Results (Organics)
Centrex Metals - Sheep Hill Marine Port Facility

		Alkalinity				Major Cations and Anions									TPH				BTEX				OCPs/OPPs				PAH				
		Hydroxide Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)	Bicarbonate	Carbonate	Calcium	Magnesium	Potassium	Sodium	Total Cations	Fluoride	Chloride	Total Anions	Ionic Balance	C 6 - C 9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29-C36 Fraction	Benzene	Toluene	Ethylbenzene	Xylenes (m/p/o)	Total Aldrin & Dieldrin	Total DDT + DDE + DDD	Total OCPs	OPPs	Benzo(a)pyrene	PAH	CHCs	Phenols	Total PCBs
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				mg/L
EQL		1	1	1	1	1	1	1	1	0.01	0.1	1	0.01	0.01	0.02	0.05	0.1	0.05	0.001	0.002	0.002	0.001 - 0.002	0.001	0.003			0.002		0.113		0.001
GROUNDWATER CHEMICAL RESULTS (ORGANICS)																															
Sample ID	**Sample Date**																														
GW01	5/11/2008	<1	274	178	96	17	8	22	795	36.7	*11.4*	868	36.8	0.2	<0.02	<0.05	0.1	0.14	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
GW02	5/11/2008	<1	241	241	<1	152	164	53	2200	118	*5.4*	3800	128	3.99	<0.02	<0.05	0.6	0.11	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
GW03	5/11/2008	<1	109	109	<1	242	630	81	5860	321	*1.9*	9080	301	3.12	<0.02	<0.05	<0.1	<0.05	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
GW04	5/11/2008	<1	296	296	<1	90	69	34	1190	62.7		1800	64.5	1.46																	
GW05	5/11/2008	<1	211	211	<1	40	12	9	223	12.9	0.9	250	12.5	1.63	<0.02	<0.05	0.2	<0.05	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
GW06	5/11/2008	<1	137	137	<1	340	516	134	5610	307		8550	281	4.43																	
GW07	5/11/2008	<1	216	216	<1	357	580	93	6070	332	*3.1*	9500	306	4.05	<0.02	<0.05	<0.1	<0.05	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
GW08	5/11/2008	<1	154	154	<1	183	374	78	4680	246	*1.6*	6850	225	4.36	<0.02	<0.05	0.1	<0.05	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
ASSESSMENT CRITERIA/GUIDELINES																															
SA EPA EPP - Aquaculture																			**0.04**			**0.04**									**0.0005**
SA EPA EPP - Irrigation											*1*																				
SA EPA EPP - Livestock											*2*																				
SA EPA EPP - Potable											1.5								0.001	0.8	0.3	1.101							1.401	0.3	
SA EPA EPP Aquatic Fresh																			0.3	0.3		0.6							1.2	1.2	1e-006
SA EPA EPP Aquatic Marine																			0.3			0.3								0.05	4e-006
STATISTICAL SUMMARY																															
Number of Results		8	8	8	8	8	8	8	8	8	6	8	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Number of Detects		0	8	8	1	8	8	8	8	8	6	8	8	8	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration		<1	109	109	<1	17	8	9	223	12.9	0.9	250	12.5	0.2	<0.02	<0.05	<0.1	<0.05	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
Maximum Concentration		<1	307	307	96	357	630	134	6070	332	11.4	9500	306	4.43	<0.02	<0.05	0.6	0.14	<0.001	<0.005	<0.002	<0.001 - <0.002	<0.001	<0.003	<0.0005 - <0.002	<0.0005 - <0.002	<0.002	<0.002 - <0.004	<0.113	<0.002 - <0.004	<0.001
Average Concentration		0.5	216	205	11	168	269	60	3082	166	4.1	5087	157	2.8	0.01	0.025	0.18	0.058	0.0005	0.0025	0.001	-	0.0005	0.0015	-	-	0.001	-	0.057	-	0.0005
Median Concentration		0.5	216	211	0.5	152	164	53	2200	118	2.5	5325	128	3.12	0.01	0.025	0.1	0.025	0.0005	0.0025	0.001	0.0025	0.0005	0.0015	-	-	0.001	-	0.0565	-	0.0005
Standard Deviation		0	71	68	32	124	256	40	2430	133	3.9	3858	121	1.5	0	0	0.21	0.053	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL		-	265.2	252.1	33.2	253.9	446.4	87.7	4765.9	258.2	7.2206	7760	240.8	3.839	-	-	0.3	0.10041	-	-	-	-	-	-	-	-	-	-	-	-	-
Number of Guideline Exceedances(Detects		0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
% of Results at or above the EQL		0	100	100	11	100	100	100	100	100	100	100	100	100	0	0	67	33	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Detects at or above Guidelines		0	0	0	0	0	0	0	0	0	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100

Notes and Abbreviations
Samples which reported analyte concentrations below the laboratory LOR (EQL) are indicated by a "<" sign, and lighter font.
Samples which exceed adopted guideline criteria are indicated by the appropriate formatting.
TPH = Total Petroleum Hydrocarbons
BTEX = Benzene, tuolene, ethylbenzene and xylenes
OCP = Organochlorine Pesticides
OPP = Organophosphorous Pesticides
PAH = Polycyclic Aromatic Hydrocarbons
CHCs = Chlorinated Hydrocarbons
PCBs = Polychlorinated Biphenols

Prepared by:	NJD	Date	21/01/2009
Checked by:	THH	Date	5/03/2009

APPENDIX G.3
Job No. 087661006 - Groundwater Chemistry Results (QA/QC - RPDs)
Centrex Metals - Sheep Hill Marine Port Facility

				Metals											Alkalinity				Anions		Major Cations							
			pH	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc	Mercury (Filtered)	Hydroxide Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)	Bicarbonate	Carbonate	Chloride	Total Anions	Calcium	Magnesium	Potassium	Sodium	Total Cations	Ionic Balance	Sulphate	Total Dissolved Solids
			pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	mg/L	meq/L	%	mg/L	mg/L
EQL			0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.001	0.005	0.0001	1	1	1	1	1	0.01	1	1	1	1	0.01	0.01	1	1
Sample ID	**Sample Date**	**Laboratory**																										
GW04	5/11/2008	ALS Syd	8.14	<0.001	<0.001	<0.001	0.003	<0.05	<0.001	0.103	0.006	0.053	0.0002	<1	296	296	<1	1800	64.5	90	69	34	1190	62.7	1.46	342	3770
GW0104	5/11/2008	ALS Syd	8.16	<0.001	<0.0001	<0.001	0.003	<0.05	<0.001	0.131	0.005	0.066	<0.0001	<1	307	307	<1	1610	56.8	89	65	33	1110	58.9	1.81	251	3410
		RPD (%)	0.25	NA	NA	NA	0	NA	NA	24	18	22	NA	NA	4	4	NA	11	13	1	6	3	7	6	21	31	10
GW04	5/11/2008	ALS Syd	8.14	<0.001	<0.001	<0.001	0.003	<0.05	<0.001	0.103	0.006	0.053	0.0002	<1	296	296	<1	1800	64.5	90	69	34	1190	62.7	1.46	342	3770
GW204	3/11/2008	Labmark	7.7	<0.02	<0.0002	<0.005	<0.01	<0.05	<0.001	0.133	<0.005	0.057	<0.0001	-	299	-	-	1850	-	106	96.1	37.3	1420	61.74	-	377	3950
		RPD (%)	5.56	NA	NA	NA	NA	NA	NA	25	NA	7	NA	NA	1	NA	NA	3	NA	16	33	9	18	2	NA	10	5

Prepared by:	NJD	Date:	20/01/2009
Checked by:	TH	Date:	5/03/2009

APPENDIX H

Summary Tables of Analytical Data - Soil

APPENDIX H.1
Job No. 087661006 - Soil Chemistry Results (Inorganics)
Centrex Metals - Sheep Hill Marine Port Facility

			Metals																						
			pH	Aluminium	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Vanadium	Zinc	Cyanide (total)	Fluoride
			pH Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0	1	5	3	1	0.3	0.3	2	0.5	1	1	5	0.3	0.05	2	0.5	5	2	5	5	0.5	1	40
SOIL CHEMICAL RESULTS (INORGANIC) - Borehole Samples																									
Sample ID	**Sample Depth (m)**	**Sample Date**																							
BH01/01	0-0.2	23/10/2008	9.1	6300		<3		<0.3	13		38	10000	3	16000	61	0.06		13					45		
BH01/02	0.4-0.5	23/10/2008	9.7	17000		<3		<0.3	27		14	31000	3	17000	130	<0.05		23					26		
BH01/03	1.5-1.8	23/10/2008	9.7	2500		<3		<0.3	5.3		3.6	3800	3	1200	15	<0.05		2.6					170		
BH02/01	0-0.1	23/10/2008	9	7100		<3		<0.3	7.8		65	15000	4	4500	100	<0.05		8.2					28		
BH02/02	0.4-0.7	23/10/2008	9.2	5500		<3		<0.3	4.9		110	12000	2	9900	80	0.07		8.3					21		
BH02/03	0.9-1.2	23/10/2008	9.5	9200		<3		<0.3	7.3		140	25000	3	9800	160	<0.05		13					41		
BH03/01	0-0.2	24/10/2008	8.7	10000		<3		<0.3	14		21	18000	9.1	3300	150	<0.05		9.7					33		
BH03/02	0.4-0.6	24/10/2008	9.1	8600		<3		<0.3	11		25	14000	4	13000	62	<0.05		8.8					12		
BH03/03	1.4-1.5	24/10/2008	9.4	7300		<3		<0.3	11		15	14000	5	4600	61	<0.05		6.3					9		
BH04/01	0-0.2	26/10/2008	9	7300		<3		<0.3	11		38	16000	5	4000	97	<0.05		8.8					20		
BH04/02	0.5-0.8	26/10/2008	9.1	12000		<3		0.3	23		220	33000	5	11000	220	0.07		17					40		
BH04/03	1.5-1.6	26/10/2008	9.5	9000		<3		<0.3	8.4		120	23000	4	6900	230	<0.05		13					32		
BH05/01	0-0.2	28/10/2008	8.8	7900		<3		<0.3	12		28	24000	5	3900	130	<0.05		8.9					59		
BH05/02	0.4-0.6	28/10/2009	9.5	10000		<3		0.3	2.6		93	38000	5	11000	82	<0.05		12					34		
BH05/03	0.8-1	28/10/2010	9.5	13000		<3		0.3	2.1		88	40000	5	12000	120	<0.05		13					40		
BH06/01	0-0.1	21/10/2008	8.6	13000		<3		<0.3	20		38	30000	6	7800	130	<0.05		14					190		
BH06/02	0.3-0.5	21/10/2008	9.7	15000		<3		<0.3	26		36	37000	7	17000	140	<0.05		15					34		
BH06/03	0.8-0.9	21/10/2008	9.6	13000		<3		0.3	22		92	38000	17	11000	160	<0.05		20					42		
BH07/01	0-0.2	29/10/2008	8.9	12000		<3		<0.3	18		17	18000	6	3300	160	<0.05		10					21		
BH07/02	1.2-1.4	29/10/2008	8.9	8000		<3		<0.3	11		16	11000	4	5100	77	<0.05		7.3					58		
BH07/03	1.9-2	29/10/2008	9	7700		<3		<0.3	11		13	11000	3	11000	76	<0.05		6.8					9.7		
BH08/01	0-0.2	30/10/2008	9.3	23000		<3		0.3	27		28	29000	38	7000	180	0.07		19					1600		
BH08/02	0.4-0.5	30/10/2008	9.6	9900		<3		<0.3	14		11	14000	5	3500	80	<0.05		9.2					14		
BH08/03	1.5-1.8	30/10/2008	9.4	12000		<3		<0.3	15		21	15000	8	14000	160	<0.05		12					1500		
SOIL CHEMICAL RESULTS (INORGANIC) - Grab Samples																									
Sample ID	**Sample Depth**	**Sample Date**																							
G01	-	6/11/2008	9.3	9260	<0.05	<5		<1	22		17	18100	7	3540		<0.1		12					20		
G02	-	6/11/2008	8.2	7480	<0.05	<5		<1	16		11	11700	6	2390		0.1		6					108		
G03	-	6/11/2008	8.4	5660	<0.05	<5		<1	11		9	8160	<5	1810		<0.1		4					20		
G04	-	6/11/2008	7.6	7070	<0.05	<5		<1	17		11	14100	7	1350		<0.1		6					11		
G05	-	6/11/2008	8.3	5630	<0.05	<5		<1	14		7	10600	<5	1480		<0.1		4					13		
G06	-	6/11/2008	8.5	5920	<0.05	<5		<1	10		8	7640	<5	2440		<0.1		4					10		
SOIL CHEMICAL RESULTS (INORGANIC) - Test Pit Samples																									
Sample ID	**Sample Depth (m)**	**Sample Date**																							
TP01/01	0-0.05	7/11/2008	8.3	11100		<5		<1	19		17	13100	5	2510		<0.1		12					14		
TP01/02	0.05-0.15	7/11/2008	8.6	14200		<5		<1	20		25	13800	5	3580		<0.1		15					15		
TP01/03	0.35-0.6	7/11/2008	9.3	10100		<5		<1	14		24	9750	<5	12900		<0.1		11					8		
TP01/05	1.8-2	7/11/2008	10.1	15200		<5		<1	25		27	16600	6	9150		<0.1		14					15		
TP02/01	0-0.15	7/11/2008	6.5	6140		<5		<1	16		9	11900	<5	1280		<0.1		7					11		
TP02/02	0.15-0.3	7/11/2008	8.3		<5	<5	1	<1	36	10	27		10			<0.1	<2	21	<5	<2	<5	51	27	<1	130
TP02/03	0.3-0.6	7/11/2008	9.6	18400		<5		<1	26		33	19400	7	10400		<0.1		19					23		
TP03/01	0-0.15	7/11/2008	7.4		<5	<5	<1	<1	18	7	10		6			<0.1	<2	10	<5	<2	<5	28	15	<1	100
TP03/02	0.15-0.3	7/11/2008	9.2	22300		<5		<1	33		26	24800	9	7140		0.2		22					28		
TP04/01	0-0.1	7/11/2008	7.2	8460		<5		<1	18		12	13400	6	1870		<0.1		10					15		
TP04/04	1.6-2.1	7/11/2008	10	6990		<5		<1	14		12	10900	<5	4280		<0.1		9					11		
TP05/01	0-0.2	4/11/2008	7.8	15000		<5		<1	29		26	21400	9	4740		<0.1		16					28		
TP05/02	0.3-0.6	4/11/2008	8.2		<5	<5	1	<1	40	15	33		14			<0.1	<2	22	<5	<2	<5	64	36	<1	340
TP05/04	1-1.3	4/11/2008	8.5	23500		6		<1	38		68	28600	10	8780		<0.1		27					38		
TP05/05	1.7-2	4/11/2008	9.2																						
TP06/01	0-0.05	4/11/2008	9.3	3650		<5		<1	8		<5	5580	<5	820		<0.1		4					7		
TP06/02	0.4-0.8	4/11/2008	8.8	5260		<5		<1	13		11	10000	<5	1590		<0.1		8					11		
TP06/03	1.4-1.8	4/11/2008	10	15400		<5		<1	22		16	16600	6	4170		<0.1		12					18		
TP07/01	0-0.15	6/11/2008	7.3	6540		<5		<1	15		8	10700	<5	1210		0.1		8					9		
TP07/02	0.15-0.3	6/11/2008	8.3	17200		<5		<1	27		21	21400	8	3980		<0.1		20					21		
TP07/04	1-1.4	6/11/2008	9.7	12000		<5		<1	19		24	13200	5	22300		<0.1		13					12		
TP08/01	0-0.3	5/11/2008	9.2	12000		<5		<1	17		23	12500	<5	4650		<0.1		14					13		
TP08/02	0.3-0.6	5/11/2008	9.4	9840		<5		<1	13		19	9770	<5	8680		<0.1		11					10		
TP08/04	1.6-2	5/11/2008	9.9	15200		<5		<1	23		22	17100	7	14500		<0.1		16					17		
TP09/01	0-0.15	5/11/2008	7.7	7300		<5		<1	18		10	14000	6	1270		<0.1		8					12		
TP09/02	0.15-0.3	5/11/2008	8.6	17400		<5		<1	30		25	24700	10	3890		<0.1		18					22		
TP09/04	1.2-1.5	5/11/2008	9.8	19700		<5		<1	28		29	25300	9	8820		<0.1		18					17		
TP10/01	0-0.3	4/11/2008	8.3	7090		<5		<1	13		13	11200	5	1540		0.1		7					14		
TP10/02	0.3-0.45	4/11/2008	9.8	7080		<5		<1	6		70	7200	8	14400		<0.1		12					11		
TP10/04	0.8-1.05	4/11/2008	10	13800		<5		<1	12		68	19900	21	27800		<0.1		12					38		
TP11/01	0-0.05	4/11/2008	8.3	7380		<5		<1	14		10	10900	<5	1640		<0.1		8					12		
TP11/02	0.05-0.2	4/11/2008	8.6		<5	<5	1	<1	37	10	38		10			<0.1	<2	24	<5	<2	<5	55	27	<1	170
TP11/04	0.8-1	4/11/2008	10.2	15000		6		<1	38		23	34800	19	10900		<0.1		24					36		
TP12/01	0-0.2	4/11/2008	8.4	9280		<5		<1	18		20	15600	6	2900		<0.1		12					13		
TP12/02	0.2-0.5	4/11/2008	9.5	10100		<5		<1	9		66	14600	<5	14700		<0.1		15					9		
TP12/03	1.5-1.8	4/11/2008	10.1	25200		<5		<1	15		85	51800	<5	21200		<0.1		45					39		
TP13/01	0-0.1	3/11/2008	7.7	7110		<5		<1	15		13	11400	<5	1680		0.2		8					12		
TP13/03	0.4-0.6	3/11/2008	9.6	21400		<5		<1	29		40	22200	8	11300		<0.1		19					20		
TP13/04	1.6-1.9	3/11/2008	9.8	12500		<5		<1	20		26	30200	11	5140		<0.1		10					38		
TP14/01	0-0.25	3/11/2008	9	8140		<5		<1	16		26	19400	<5	4070		<0.1		11					19		
TP14/02	0.3-0.6	3/11/2008	9.9	26100		<5		<1	11		36	41200	<5	31700		<0.1		17					50		
TP14/04	1.1-1.4	3/11/2008	10.1	33900		<5		<1	12		13	58200	<5	36600		<0.1		20					75		
TP15/01	0-0.1	6/11/2008	7.3	7410		<5		<1	13		18	16400	7	2740		<0.1		7					18		
TP15/02	0.1-0.3	6/11/2008	8.9	17200		19		<1	19		25	30200	16	6480		<0.1		8					27		
TP15/03	0.4-0.6	6/11/2008	9.5	11000		<5		<1	10		20	17400	5	10200		<0.1		6					13		
TP16/01	0-0.1	6/11/2008	7.8	8200		<5		<1	17		24	17700	7	3050		<0.1		10					15		
TP16/02	0.1-0.2	6/11/2008	8.4	21200		7		<1	32		58	36400	15	6250		<0.1		21					26		
TP16/04	0.5-0.8	6/11/2008	9.9	10100		<5		<1	11		68	14700	<5	13000		<0.1		13					9		
TP17/01	0-0.2	6/11/2008	9.1		<5	<5	<1	<1	29	10	45		7			<0.1	<2	17	<5	<2	<5	55	20	<1	260
TP17/02	0.2-0.3	6/11/2008	9.4	11300		<5		<1	20		104	14400	<5	14000		<0.1		16					13		
TP17/03	0.3-0.5	6/11/2008	9.6	9990		<5		<1	22		165	14700	<5	20300		<0.1		18					14		
TP18/01	0-0.15	6/11/2008	10	11900		<5		<1	3		110	28800	<5	14400		<0.1		14					58		
TP18/02	0.15-0.45	6/11/2008	9.6	9920		<5		<1	10		63	19200	<5	9480		<0.1		11					25		
TP18/03	0.45-0.9	6/11/2008	9.4	8860		<5		<1	16		37	19300	5	4430		<0.1		11					20		
TP19/01	0-0.1	4/11/2008	8.5	9750		<5		<1	19		14	13300	5	2940		<0.1		10					21		
TP19/03	0.7-1	4/11/2008	8.5	17200		<5		<1	31		26	23800	10	7470		<0.1		19					28		
TP19/04	1.5-2	4/11/2008	8.8																						
TP19/05	2-2.4	4/11/2008	9	6180		<5		<1	9		13	7900	<5	8900		<0.1		8					12		
TP20/01	0-0.2	3/11/2008	8.5	9080		<5		<1	18		24	15700	5	3260		<0.1		12					13		
TP20/02	0.4-0.7	3/11/2008	9.7	16000		<5		<1	13		56	33000	<5	29300		<0.1		15					19		
TP20/03	0.25-1	3/11/2008	10.3	18100		<5		<1	11		69	57700	<5	17900		<0.1		16					34		
TP21/01	0-0.01	3/11/2008	9.1	11400		<5		<1	22		29	18000	5	6020		<0.1		15					16		
TP21/02	0.1-0.2	3/11/2008	9.1	13400		<5		<1	24		41	19500	5	8240		<0.1		19					17		
TP21/04	0.5-0.7	3/11/2008	10	12800		<5		<1	38		78	26500	6	14400		<0.1		37					16		
TP22/01	0-0.5	3/11/2008	8.6		<5	<5	<1	<1	12	4	10		<5			<0.1	<2	6	<5	<2	<5	21	10	<1	130
TP22/02	0.1-0.2	3/11/2008	9	10300		<5		<1	21		46	24400	6	4500		<0.1		11					11		
TP22/04	0.4-0.6	3/11/2008	9	13900		<5		<1	18		121	27400	<5	20500		<0.1		14					9		
TP23/01	0-0.15	6/11/2008	7.8	7780		<5		<1	14		12	17200	8	2120		<0.1		6					15		
TP23/02	0.15-0.3	6/11/2008	7.6	7800		<5		<1	13		11	16400	7	2030		<0.1		5					15		
TP24/01	0-0.2	6/11/2008	8.6	15600		<5		<1	27		50	28000	10	6070		<0.1		18					22		
TP24/02	0.2-0.5	6/11/2008	9.3	9150		<5		<1	10		30	19600	9	6910		<0.1		9					36		
TP24/03	0.5-0.7	6/11/2008	9.9	9680		6		<1	10		67	15400	5	16100		<0.1		10					18		
TP25/01	0-0.15	5/11/2008	9.1	14900		<5		<1	36		49	23500	7	10300		<0.1		21					40		
TP25/02	0.15-0.3	5/11/2008	9.4	12400		<5		<1	25		40	15900	5	12500		<0.1		15					27		
TP25/03	0.3-0.5	5/11/2008	9.3		<5	<5	<1	<1	26	8	37		<5			<0.1	<2	16	<5	<2	<5	46	27	<1	370
TP26/01	0-0.3	5/11/2008	7.6	7940		<5		<1	17		13	14500	7	1960		<0.1		7					15		
TP26/03	0.7-1	5/11/2008	9.1	16500		<5		<1	25		20	21500	7	7380		<0.1		13					21		
TP26/04	1.7-2	5/11/2008	9.8	8110		<5		<1	15		14	12000	<5	2880		<0.1		8					12		
TP27/01	0-0.1	5/11/2008	7.3	7050		<5		<1	17		11	11800	5	1980		<0.1		6					14		
TP27/02	0.1-0.3	5/11/2008	8.6	7160		<5		<1	22		11	15500	7	1980		<0.1		7					14		
~~TP27/03~~	~~0.3-0.6~~	~~5/11/2008~~																							
TP27/05	1.7-2	5/11/2008	9.7	11200		<5		<1	22		19	17200	6	4170		<0.1		10					19		
TP28/01	0-0.1	5/11/2008	8.6	6850		<5		<1	12		9	8580	<5	2040		<0.1		4					13		
TP28/02	0.2-0.4	5/11/2008	9.3	10200		<5		<1	15		11	9640	<5	3640		<0.1		6					8		
TP28/04	1-1.4	5/11/2008	9.1	2810		<5		<1	12		8	14500	<5	1420		<0.1		<2					<5		
TP29/01	0-0.15	5/11/2008	8.3	10200		<5		<1	18		16	14800	6	2520		<0.1		8					12		
TP29/02	0.15-0.3	5/11/2008	8.8	15100		<5		<1	19		38	15600	6	6940		<0.1		13					10		
TP29/03	0.4-0.7	5/11/2008	9.2	13300		<5		<1	15		43	14000	5	12100		<0.1		11					8		
TP30/01	0.1-0.4	5/11/2008	7.6	7000		<5		<1	18		8	17000	5	1180		<0.1		6					11		
TP30/02	0.4-0.6	5/11/2008	8.7	6580		<5		<1	16		7	13700	<5	1200		<0.1		6					7		
TP30/04	1.7-2	5/11/2008	9.3	17200		<5		<1	25		20	22500	7	5100		<0.1		12					10		
TP31/01	0-0.1	6/11/2008	7.4	10600		<5		<1	21		19	17000	19	2530		<0.1		11					1380		
TP31/02	0.2-0.5	6/11/2008	8.5	15900		<5		<1	23		36	17900	6	6650		<0.1		17					15		
TP31/03	0.7-1	6/11/2008	8.5	15100		<5		<1	20		44	17300	<5	10100		<0.1		19					14		
TP32/01	0-0.1	6/11/2008	7.2	5600		<5		<1	14		6	10900	6	760		0.1		4					10		
TP32/02	0.1-0.3	6/11/2008	8.1	8260		<5		<1	19		8	14200	8	1440		<0.1		6					8		
TP32/04	1.2-1.4	6/11/2008	9.2	26100		<5		<1	34		26	25900	13	9370		<0.1		18					12		

ASSESSMENT CRITERIA/ GUIDELINES																									
NEPM EILs (Interim Urban)						**20**		**3**			**100**		**600**		**500**	**1**		**60**				**50**	**200**		
NEPM HIL F						*500*	*100*	*100*		*500*	*5000*		*1500*		*7500*	*75*		*3000*					*35000*	*2500*	
NSW EPA Service Stns (94) Threshold Concentrations													300												
Waste Fill Disposal Criteria						20	20	3	400^^	170	60		300		500	1		60					200		

STATISTICAL SUMMARY																									
Number of Detects	126	117	0	5	3	5	124	7	123	117	89	117	24	10	0	123	0	0	0	7	123	0	7		
Minimum Concentration	6.5	2500	<0.05	<3	<1	<0.3	2.1	4	3.6	3800	2	760	15	<0.05	<2	<2	<5	<2	<5	21	<5	<1	100		
Maximum Concentration	10.3	33900	<5	19	1	<1	40	15	220	58200	38	36600	230	0.2	<2	45	<5	<2	<5	64	1600	<1	370		
Average Concentration	8.9	11586	1.4	2.6	0.71	0.44	18	9.1	36	19330	6.1	7863	119	0.051	1	13	2.5	1	2.5	46	60	0.5	214		
Standard Deviation	0.79	5385	1.3	1.7	0.27	0.13	8.2	3.4	35	9899	4.7	6869	53	0.024	-	6.5	-	-	-	16	228	-	109		
95% UCL of Mean Concentration	9.04	12561.76	2.11	2.90	0.91	0.46	19.44	11.62	42.16	21123.7	6.93	9107.7	140.2	0.06	-	14.14	-	-	-	57.85	100.1	-	294.7		
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	4	3	0	0		
% of Results at or above the EQL	100	100	0	4	43	4	100	100	99	100	72	100	100	8	0	99	0	0	0	100	99	0	100		
% of Detects at or above Guidelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Notes and Abbreviations
^^ Chromium III Waste Fill criteria value used
Samples which reported analyte concentrations below the laboratory LOR (EQL) are indicated by a "<" sign, and lighter font.
Samples which exceed adopted guideline criteria are indicated by the appropriate formatting.

Prepared by	NJD	Date	14/01/2009
Checked by	THH	Date	5/03/2009

APPENDIX H.2
Job No. 087661006 - Soil Chemistry Results (Organics)
Centrex Metals - Sheep Hill Marine Port Facility

			TPH				MAH				OCPs/OPPs				PAHs				
			C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29-C36 Fraction	Benzene	Toluene	Ethylbenzene	Xylenes (Total m/p/o)	Total Aldrin & Dieldrin	Total DDT+DDE+DDD	Total OCPs	Total OPPs	Benzo(a)pyrene	Total PAHs	Total Phenols	Total PCBs	VOCs
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			10	20	100	100	0.2	0.5	0.5	1.0 - 1.5	0.1	0.3	0.05 - 0.2	0.05 - 0.2	0.05	0.8	3	0.1	0.5 - 5.0
SOIL CHEMICAL RESULTS (ORGANIC) - Borehole Samples																			
Sample ID	**Sample Depth**	**Sample Date**																	
BH01/01	0-0.2	23/10/2008	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5					<0.05	<0.8			
BH01/02	0.4-0.5	23/10/2008																	
BH01/03	1.5-1.8	23/10/2008																	
BH02/01	0-0.1	23/10/2008																	
BH02/02	0.4-0.7	23/10/2008																	
BH02/03	0.9-1.2	23/10/2008																	
BH03/01	0-0.2	24/10/2008	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5					<0.05	<0.8			
BH03/02	0.4-0.6	24/10/2008																	
BH03/03	1.4-1.5	24/10/2008																	
BH04/01	0-0.2	26/10/2008																	
BH04/02	0.5-0.8	26/10/2008																	
BH04/03	1.5-1.6	26/10/2008																	
BH05/01	0-0.2	28/10/2008	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5					<0.05	<0.8			
BH05/02	0.4-0.6	28/10/2009																	
BH05/03	0.8-1	28/10/2010																	
BH06/01	0-0.1	21/10/2008																	
BH06/02	0.3-0.5	21/10/2008																	
BH06/03	0.8-0.9	21/10/2008																	
BH07/01	0-0.2	29/10/2008																	
BH07/02	1.2-1.4	29/10/2008																	
BH07/03	1.9-2	29/10/2008																	
BH08/01	0-0.2	30/10/2008	<20	<20	300	1700	<0.5	<0.5	<0.5	<1.5					<0.05	<0.8			
BH08/02	0.4-0.5	30/10/2008																	
BH08/03	1.5-1.8	30/10/2008																	
SOIL CHEMICAL RESULTS (ORGANIC) - Grab Samples																			
Sample ID	**Sample Depth**	**Sample Date**																	
G01	-	6/11/2008																	
G02	-	6/11/2008																	
G03	-	6/11/2008																	
G04	-	6/11/2008																	
G05	-	6/11/2008																	
G06	-	6/11/2008																	
SOIL CHEMICAL RESULTS (ORGANIC) - Test Pit Samples																			
Sample ID	**Sample Depth**	**Sample Date**																	
TP01/01	0-0.05	7/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP01/02	0.05-0.15	7/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP01/03	0.35-0.6	7/11/2008																	
TP01/05	1.8-2	7/11/2008																	
TP02/01	0-0.15	7/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP02/02	0.15-0.3	7/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP02/03	0.3-0.6	7/11/2008																	
TP03/01	0-0.15	7/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP03/02	0.15-0.3	7/11/2008																	
TP04/01	0-0.1	7/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP04/04	1.6-2.1	7/11/2008																	
TP05/01	0-0.2	4/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP05/02	0.3-0.6	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP05/04	1-1.3	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP05/05	1.7-2	4/11/2008																	
TP06/01	0-0.05	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP06/02	0.4-0.8	4/11/2008																	
TP06/03	1.4-1.8	4/11/2008																	
TP07/01	0-0.15	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP07/02	0.15-0.3	6/11/2008																	
TP07/04	1-1.4	6/11/2008																	
TP08/01	0-0.3	5/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP08/02	0.3-0.6	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP08/04	1.6-2	5/11/2008																	
TP09/01	0-0.15	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP09/02	0.15-0.3	5/11/2008																	
TP09/04	1.2-1.5	5/11/2008																	
TP10/01	0-0.3	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP10/02	0.3-0.45	4/11/2008																	
TP10/04	0.8-1.05	4/11/2008																	
TP11/01	0-0.05	4/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP11/02	0.05-0.2	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP11/04	0.8-1	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP12/01	0-0.2	4/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP12/02	0.2-0.5	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP12/03	1.5-1.8	4/11/2008																	
TP13/01	0-0.1	3/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP13/03	0.4-0.6	3/11/2008																	
TP13/04	1.6-1.9	3/11/2008																	
TP14/01	0-0.25	3/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP14/02	0.3-0.6	3/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP14/04	1.1-1.4	3/11/2008																	
TP15/01	0-0.1	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP15/02	0.1-0.3	6/11/2008																	
TP15/03	0.4-0.6	6/11/2008																	
TP16/01	0-0.1	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP16/02	0.1-0.2	6/11/2008																	
TP16/04	0.5-0.8	6/11/2008																	
TP17/01	0-0.2	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP17/02	0.2-0.3	6/11/2008																	
TP17/03	0.3-0.5	6/11/2008																	
TP18/01	0-0.15	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP18/02	0.15-0.45	6/11/2008																	
TP18/03	0.45-0.9	6/11/2008																	
TP19/01	0-0.1	4/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP19/03	0.7-1	4/11/2008																	
TP19/04	1.5-2	4/11/2008																	
TP19/05	2-2.4	4/11/2008																	
TP20/01	0-0.2	3/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP20/02	0.4-0.7	3/11/2008																	
TP20/03	0.25-1	3/11/2008																	
TP21/01	0-0.01	3/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP21/02	0.1-0.2	3/11/2008																	
TP21/04	0.5-0.7	3/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP22/01	0-0.5	3/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP22/02	0.1-0.2	3/11/2008																	
TP22/04	0.4-0.6	3/11/2008																	
TP23/01	0-0.15	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP23/02	0.15-0.3	6/11/2008																	
TP24/01	0-0.2	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP24/02	0.2-0.5	6/11/2008																	
TP24/03	0.5-0.7	6/11/2008																	
TP25/01	0-0.15	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP25/02	0.15-0.3	5/11/2008																	
TP25/03	0.3-0.5	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<10	<3	<0.1	< 0.5 - 5.0
TP26/01	0-0.3	5/11/2008									<0.1	<0.3	< 0.05 - 0.2	<1.3					
TP26/03	0.7-1	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP26/04	1.7-2	5/11/2008																	
TP27/01	0-0.1	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP27/02	0.1-0.3	5/11/2008																	
TP27/03	0.3-0.6	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP27/05	1.7-2	5/11/2008																	
TP28/01	0-0.1	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP28/02	0.2-0.4	5/11/2008																	
TP28/04	1-1.4	5/11/2008																	
TP29/01	0-0.15	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP29/02	0.15-0.3	5/11/2008																	
TP29/03	0.4-0.7	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0					<0.5	<8			
TP30/01	0.1-0.4	5/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP30/02	0.4-0.6	5/11/2008																	
TP30/04	1.7-2	5/11/2008																	
TP31/01	0-0.1	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP31/02	0.2-0.5	6/11/2008																	
TP31/03	0.7-1	6/11/2008																	
TP32/01	0-0.1	6/11/2008	<10	<50	<100	<100	<0.2	<0.5	<0.5	<1.0	<0.1	<0.3	< 0.05 - 0.2	<1.3	<0.5	<8			
TP32/02	0.1-0.3	6/11/2008																	
TP32/04	1.2-1.4	6/11/2008																	

ASSESSMENT CRITERIA/ GUIDELINES																			
NEPM EILs (Interim Urban)																			
NEPM HIL F											*50*	*1000*			*5*	*100*		*50*	
NSW EPA Service Stns (94) Threshold Concentrations		65					1	1.4	3.1	14					1	20			
Waste Fill Disposal Criteria		65			1000		1	3.1	1.4	14	2	2		2	1	5	0.5		

STATISTICAL SUMMARY																			
Number of Detects		0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	7	
Minimum Concentration		<10	<20	<50	<50	<0.2	<0.5	<0.5	<1	<0.1	<0.3	<0.3	<1.3	<0.05	<0.8	<3	<0.1	<0.5 - <5.0	
Maximum Concentration		<20	<50	300	1700	<0.5	<0.5	<0.5	<1.5	<0.1	<0.3	<0.3	<1.3	<0.5	<10	<3	<0.1	5	
Average Concentration		5.5	24	54	87	0.11	0.25	0.25	0.52	0.05	0.15	0.15	0.65	0.23	3.8	1.5	0.05	0.25	
Standard Deviation		1.5	4.4	39	252	0.044	0	0	0.073	0	0	0	0	0.066	1.2	0	0	0	
95% UCL of Mean Concentration		5.9483	25.315	65.657	162.32	0.1232	-	-	0.54182	-	-	-	-	0.25	4.15867	-	-	-	
Number of Guideline Exceedances(Detects Only)		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
% of Results at or above the EQL		0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	100	
% of Detects at or above Guidelines		0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	

Notes and Abbreviations
Samples which reported analyte concentrations below the laboratory LOR (EQL) are indicated by a "<" sign, and lighter font.
Samples which exceed adopted guideline criteria are indicated by the appropriate formatting.
TPH = Total Petroleum Hydrocarbons
MAH = Monocyclic Aromatic Hydrocarbons (includes BTEX analytes)
OCP = Organochlorine Pesticides
OPP = Organophosphorous Pesticides
PAH = Polycyclic Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenols
VOC = Volatile Organic Compounds

Prepared by	NJD	Date	14/01/2009
Checked by	THH	Date	5/03/2009

APPENDIX H.3
Job No. 087661006 - Soil Chemistry Results (Inorganics)
Centrex Metals - Sheep Hill Marine Port Facility

		Sample ID Sample Date	TP32/02 6/11/2008	TP32/102 6/11/2008	TP32/202 6/11/2008	RPD Split	RPD Blind	TP02/02 7/11/2008	TP02/102 7/11/2008	TP02/202 7/11/2008	RPD Split	RPD Blind	TP14/01 3/11/2008	TP14/101 3/11/2008	RPD Split	TP29/03 5/11/2008	TP29/103 5/11/2008	TP29/203 5/11/2008	RPD Split	RPD Blind	TP25/03 5/11/2008	TP25/103 5/11/2008	TP25/203 5/11/2008	RPD Split	RPD Blind	TP01/01 7/11/2008	TP01/101 7/11/2008	TP01/201 7/11/2008	RPD Split	RPD Blind
ChemName	**Units**	**EQL**				%	%				%	%			%				%	%				%	%				%	%
Bromophos	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Hexachloropropene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Halogenated Benzenes																														
1,2,3-Trichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2-Chlorotoluene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
4-Chlorotoluene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Bromobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Chlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Hexachlorobenzene	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	-	NA	NA	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Pentachlorobenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Halogenated Phenols																														
2,4,5-Trichlorophenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2,6-Dichlorophenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2-Chlorophenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Pentachlorophenol	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	-	NA	NA	-	-	-	-	-
Inorganics																														
Aluminium	mg/kg	50	8260	8620	3300	4.3	**85.8**	-	-	6200	NA	NA	8140	7820	4.0	13300	13400	6900	0.7	**63.4**	-	-	5900	NA	NA	11100	12100	4000	8.6	**94.0**
Antimony	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Arsenic	mg/kg	5	<5	<5	1	NA	NA	<5	<5	1	NA	NA	<5	<5	NA	<5	<5	<1	NA	NA	<5	<5	<1	NA	NA	<5	<5	1	NA	NA
Beryllium	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	-	NA	NA	-	-	-	-	-
Cadmium	mg/kg	1	<1	<1	<0.1	NA	NA	<1	<1	<0.1	NA	NA	<1	<1	NA	<1	<1	<0.1	NA	NA	<1	<1	<0.1	NA	NA	<1	<1	<0.1	NA	NA
Chromium	mg/kg	2	19	18	14	5.4	30.3	36	40	23	10.5	44.1	16	16	0.0	15	15	9	0.0	**50.0**	26	22	14	16.7	**60.0**	19	20	11	5.1	**53.3**
Cobalt	mg/kg	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8	-	0.0	NA	-	-	-	-	-
Copper	mg/kg	5	8	8	7	0.0	13.3	27	32	25	16.9	7.7	26	24	8.0	43	45	29	4.5	38.9	37	38	26	2.7	34.9	17	19	11	11.1	42.9
Iron	mg/kg	50	14200	13700	12300	3.6	14.3	-	-	78200	NA	NA	19400	19200	1.0	14000	13400	9710	4.4	36.2			11200	NA	NA	13100	13500	10100	3.0	25.9
Lead	mg/kg	5	8	8	7	0.0	13.3	10	11	9	9.5	10.5	<5	<5	NA	5	5	4	0.0	22.2	<5	<5	3	NA	NA	5	6	4	18.2	22.2
Magnesium	mg/kg	50	1440	1460	18	1.4	**195.1**	-	-	73	-	-	4070	3910	4.0	12100	14300	22	16.7	**199.3**			12	NA	NA	2510	2620	13	4.3	**197.9**
Mercury	mg/kg	0.1	<0.1	<0.1	<0.05	NA	NA	<0.1	<0.1	0.10	NA	NA	<0.1	<0.1	NA	<0.1	<0.1	0.12	NA	NA	<0.1	<0.1	0.10	NA	NA	<0.1	<0.1	0.05	NA	NA
Molybdenum	mg/kg	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	-	NA	NA	-	-	-	-	-
Nickel	mg/kg	2	6	6	5	0.0	18.2	21	23	13	9.1	47.1	11	10	9.5	11	11	13	0.0	16.7	16	15	13	6.5	20.7	12	13	7	8.0	**52.6**
Selenium	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Silver	mg/kg	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	-	NA	NA	-	-	-	-	-
Tin	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Vanadium	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	42	-	9.1	NA	-	-	-	-	-
Zinc	mg/kg	5	8	9	7	11.8	13.3	27	31	11	13.8	**84.2**	19	17	11.1	8	8	9	0.0	11.8	27	23	18	16.0	40.0	14	14	9	0.0	43.5
MAH																														
Benzene	mg/kg	0.2	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	NA	<0.2	<0.2	-	NA	NA	<0.2	<0.2	-	NA	NA	-	-	-	-	-
Ethylbenzene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Toluene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Xylenes (m & p)	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Xylene (o)	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Organochlorine Pesticides																														
4,4-DDE	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
a-BHC	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Aldrin	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
b-BHC	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
cis-Chlordane	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
trans-Chlordane	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
d-BHC	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
DDD	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
DDT	mg/kg	0.2	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	NA	-	-	-	-	-	<0.2	<0.2	-	NA	NA	<0.2	<0.2	-	NA	NA
Dieldrin	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Endosulfan I	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Endosulfan II	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Endosulfan sulphate	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Endrin	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Endrin aldehyde	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Endrin ketone	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
g-BHC	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Heptachlor	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Heptachlor epoxide	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Methoxychlor	mg/kg	0.2	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	NA	-	-	-	-	-	<0.2	<0.2	-	NA	NA	<0.2	<0.2	-	NA	NA
Organophosphorous Pesticides																														
Azinophos-methyl	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Carbophenothion	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Chlorfenvinphos	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Chlorpyriphos	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Chlorpyriphos-methyl	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Diazinon	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Dichlorvos	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Dimethoate	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Ethion	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Fenamiphos	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Fenthion	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Malathion	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Parathion-methyl	mg/kg	0.2	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	NA	-	-	-	-	-	<0.2	<0.2	-	NA	NA	<0.2	<0.2	-	NA	NA
Monocrotophos	mg/kg	0.2	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	NA	-	-	-	-	-	<0.2	<0.2	-	NA	NA	<0.2	<0.2	-	NA	NA
Parathion	mg/kg	0.2	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	NA	-	-	-	-	-	<0.2	<0.2	-	NA	NA	<0.2	<0.2	-	NA	NA
Pirimphos-ethyl	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Prothiofos	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
PAH																														
2-Chloronaphthalene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
3-Methylcholanthrene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
7,12-Dimethylbenz(a)anthracene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Acenaphthene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Acenaphthylene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Anthracene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Benz(a)anthracene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Benzo(b)&(k)fluoranthene	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	NA	<1	<1	-	NA	NA	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-	-	-	-	-	-
Chrysene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Fluoranthene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Fluorene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Naphthalene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Phenanthrene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Pyrene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	NA	<0.5	<0.5	-	NA	NA	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Pesticides-Others																														
Demeton-s-methyl	mg/kg	0.05	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	NA	-	-	-	-	-	<0.05	<0.05	-	NA	NA	<0.05	<0.05	-	NA	NA
Phenolics																														
2,4-Dimethylphenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2-Methylphenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2-Nitrophenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
3- & 4- Methylphenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Phenol	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Physical																														
Electrolytic Conductivity	uS/cm	1	679	641	-	5.8	NA	300	227	-	27.7	NA	-	-	-	408	405	-	0.7	NA	204	200	-	2.0	NA	131	147	-	11.5	NA
Moisture	%	1	4.7	5	3	6.2	44.2	8.2	10.9	7	28.3	15.8	3.1	3.5	12.1	8.8	8.9	6	1.1	37.8	5	5.4	4	7.7	22.2	3.8	4.9	3	25.3	23.5
pH (Lab)	pH_Units	0.1	8.1	8.1	-	0.0	NA	8.3	8.3	-	0.0	NA	9	9.1	1.1	9.2	9.3	-	1.1	NA	9.3	9.3	-	0.0	NA	8.3	8.1	-	2.4	NA
Polychlorinated Biphenyls																														
PCB (Sum of total)	mg/kg	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	NA	NA	-	-	-	-	-
SVOCs																														
2-(Acetylamino) fluorene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Hexachlorocyclopentadiene	mg/kg	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2.5	<2.5	-	NA	NA	-	-	-	-	-
Total Petroleum Hydrocarbons																														
TPH C 6 - C 9 Fraction	mg/kg	10	-	-	-	-	-	-	-	-	-	-	<10	<10	NA	<10	<10	-	NA	NA	<10	<10	-	NA	NA	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	50	-	-	-	-	-	-	-	-	-	-	<50	<50	NA	<50	<50	-	NA	NA	<50	<50	-	NA	NA	-	-	-	-	-
TPH C15 - C28 Fraction	mg/kg	100	-	-	-	-	-	-	-	-	-	-	<100	<100	NA	<100	<100	-	NA	NA	<100	<100	-	NA	NA	-	-	-	-	-
TPH C29-C36 Fraction	mg/kg	100	-	-	-	-	-	-	-	-	-	-	<100	<100	NA	<100	<100	-	NA	NA	<100	<100	-	NA	NA	-	-	-	-	-
Volatile Organic Compounds																														
1,1,1,2-Tetrachloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,1,1-Trichloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,1,2-Trichloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,1-Dichloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,1-Dichloroethene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,1-Dichloropropene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2,3-Trichloropropane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2-Dibromo-3-chloropropane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2-Dibromoethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2-Dichloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,2-Dichloropropane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
1,3-Dichloropropane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
2,2-Dichloropropane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Bromodichloromethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Bromoform	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Bromomethane	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Carbon tetrachloride	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Chlorodibromomethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Chloroethane	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Chloroform	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Chloromethane	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
cis-1,2-Dichloroethene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
cis-1,3-Dichloropropene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
cis-1,4-Dichloro-2-butene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Dibromomethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Dichlorodifluoromethane	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Hexachloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Iodomethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Pentachloroethane	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Trichloroethylene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Tetrachloroethene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
trans-1,2-dichloroethene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
trans-1,3-dichloropropene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
trans-1,4-Dichloro-2-butene	mg/kg	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	-	NA	NA	-	-	-	-	-
Trichlorofluoromethane	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Vinyl chloride	mg/kg	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	-	NA	NA	-	-	-	-	-
Other																														
Cyanide (total)	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	-	NA	NA	-	-	-	-	-
Fluoride	mg/kg	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370	420	-	12.7	NA	-	-	-	-	-

*RPDs have only been considered where a concentration is greater than 5 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 50 (5-10 x EQL); 50 (10-30 x EQL); 50 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

APPENDIX I

Limitations

LIMITATIONS

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Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Pty Ltd
199 Franklin Street
Adelaide South Australia 5000
Australia
T: +61 8 8213 2100

Golder Associates