ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

HEALTH INFRASTRUCTURE NSW

ON

PRELIMINARY STAGE 2 ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED ROYAL PRINCE ALFRED HOSPITAL NORTH WEST PRECINCT REDEVELOPMENT

AT

1 & 25 LUCAS STREET AND 67-73 MISSENDEN ROAD, CAMPERDOWN, NSW

JULY 2012

REF: E25797Krpt

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EXECUTIVE SUMMARY

Health Infrastructure NSW commissioned Environmental Investigation Services (EIS), a division of Jeffery & Katauskas Pty Ltd (J&K), to undertake a Stage 2 Environmental Site Assessment (ESA) for the proposed Royal Prince Alfred (RPA) Hospital North West (NW) precinct redevelopment at 1 and 25 Lucas Street and 67-73 Missenden Road, Camperdown, NSW. EIS understand that following the demolition of existing structures the proposed development includes the construction of a seven storey hospital building with one level of basement car park. The basement floor level will be at RL 28.0m and will require excavation of up to 3m to 4m below existing site levels. A temporary car park will front Missenden Road and will be a site for future development.

The site assessment included a detailed site inspection, review of previous phase 1 report prepared by E3 consulting, a soil and groundwater contamination assessment, and a waste classification of the soils for waste disposal. The soil assessment criteria adopted as part of the site assessment were generally derived from NEPM (1999) commercial/industrial health investigation levels.

The soil assessment included sampling from eight boreholes distributed across the site. Soil samples were analysed for a range of potential contaminants (heavy metals, hydrocarbons, pesticides, polychlorinated biphenyls and asbestos). The groundwater assessment included the installation and sampling from three monitoring wells across the site. Groundwater samples were analysed for a range of potential contaminants (heavy metals, hydrocarbons, volatile organic compounds, pH, EC and hardness).

Elevated concentrations of contaminants were not encountered in the soil samples analysed for the investigation. All results were below the site assessment criteria (SAC).

Elevated concentrations of copper, arsenic, zinc, phenanthrene and anthracene were encountered in the three groundwater sample. The groundwater data has indicated the presence of hydrocarbons (C6-C9) within MW9. There are no SAC for light fraction hydrocarbons C6-C9.

Based on the results of the assessment, the fill material is classified as 'General Solid Waste (non-putrescible)' according to the criteria outlined in Waste Classification Guidelines 2009. The fill material must be disposed of to a NSW EPA licensed facility. It is the responsibility of the receiving facility to ensure that the material meets their EPA license conditions. EIS accepts no liability whatsoever for illegal or inappropriate disposal of excavated material.

Based on the current data the natural silty clay and underlying shale bedrock at the site is likely to be classified as virgin excavated natural material (VENM). Due to the PAH detections, including B(a)P, within the BH2 0.9-1m natural sample. Further sampling and analysis is recommended before assigning a VENM classification to the natural soil at the site.

Based on the scope of work undertaken for this assessment EIS consider that the site can be made suitable for the proposed development provided that the following recommendations are implemented:

- Boreholes are drilled within the existing building footpints once they have been vacated (as per original scope of works) to meet the density of a stage 2 ESA;
- Undertake a Ground Penetrating Radar (GPR) scan to identify the suspected UST. If the GPR identifies a UST, additional soil sampling is required around the UST;
- If USTs or former tank pits are identified a Remedial Action Plan (RAP) is prepared to document and manage the removal/excavation works;
- A further round of groundwater monitoring should be undertaken to assess whether the contaminated levels in groundwater are rising, falling or stable. Following this a decision can be made as to whether more monitoring wells are required;

- Additional soils samples are obtained in the vicinity of BH2 once all fill materials have been removed from the site to confirm the classification of the natural soils;
- Asbestos within the existing buildings has been identified by others as mentioned within the E3 2010 report. All hazardous building materials should be removed by an authorised person prior to demolition; and

Undertake inspections during demolition and excavation works to assess any unexpected conditions or subsurface facilities that may be discovered between investigation locations. This should facilitate appropriate adjustment of the works programme and schedule in relation to the changed site conditions. Inspections should be undertaken by experienced environmental personnel.

The conclusions presented in this report have been made within the limitations of the scope of works undertaken for the investigation. The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

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1 INTRODUCTION

Health Infrastructure NSW commissioned Environmental Investigation Services (EIS), a division of Jeffery & Katauskas Pty Ltd (J&K), to undertake a Stage 2 Environmental Site Assessment (ESA) for the proposed Royal Prince Alfred (RPA) Hospital North West (NW) precinct redevelopment at 1 and 25 Lucas Street and 67-73 Missenden Road, Camperdown, NSW.

At the time of this investigation the site was occupied by a one and two storey brick hospital building and asphalt carpark. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

The assessment was undertaken generally in accordance with an EIS proposal (Ref: EP6319Krev1) of 8 May 2012 and written acceptance from Amanda Bock on behalf of Health Infrastructure NSW by 'Letter of Award' of 30 May 2012.

This report describes the investigation procedures and presents the results of the ESA, together with comments, discussion and recommendations.

A geotechnical investigation was undertaken in conjunction with the environmental site screening by J&K and the results are presented in a separate report (Ref. 25797Lrpt, dated July, 2012).

1.1 Proposed Development Details

EIS understand that following the demolition of existing structures the proposed development includes the construction of a seven storey hospital building with one level of basement car park. The basement floor level will be at RL 28.0m and will require excavation of up to 3m to 4m below existing site levels. A temporary car park will front Missenden Road and will be a site for future development.

1.2 References to the State Body for Environmental Regulation

Over the past few years the environmental regulatory body has undergone a number of name changes, including:

- Environment Protection Authority (EPA);
- Department of Environment and Conservation (DEC);
- Department of Environment and Climate Change (DECC);
- Department of Environment, Climate Change and Water (DECCW); and
- Office of Environment and Heritage (OEH).

The department is currently known as the EPA.

1.3 Previous Investigation Reports and Documents

E3 Consulting has previously undertaken a Phase 1 environmental site assessment for the proposed development at the site. The results of the assessment are summarised in:

- "*Health Infrastructure NSW Royal Prince Alfred Hospital- north west Precinct: Phase 1 Environmental Site Assessment*", Ref: S10281.1, Revision: draft, dated 25 October 2010[1]

A summary of the E3 (E3 2010) environmental assessment is presented in Section 4.1 of this report. This report should be read in conjunction with the above reports.

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[1] *Health Infrastructure NSW Royal Prince Alfred Hospital- North West Precinct: Phase 1 Environmental Site Assessment*", E3 Consulting, Ref: S10281.1, Revision: draft, dated 25 October 2010 (E3 2010)

2 OBJECTIVES AND SCOPE OF WORK

2.1 Objectives

The primary objectives of the investigation were to:

- Assess the soil and groundwater contamination conditions at the site in relation to the proposed commercial/industrial land use;
- Undertake a waste classification assessment for off-site disposal of excavated soil associated with the proposed development works; and
- Prepare a report presenting the results of the assessment generally in accordance with the *NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997[2])* and *State Environmental Planning Policy No.55 – Remediation of Land (1998[3])*.

2.2 Scope of Work

The scope of work undertaken to achieve the objective included:

1. Review of E3 Consulting Phase 1 report of the site;
2. Walkover inspection of the site and immediate surrounds to identify potential contamination sources;
3. Design and implementation of a field sampling program;
4. Laboratory analysis of selected soil and groundwater samples; and
5. Preparation of a report presenting the results of the assessment together with recommendations and comments on the suitability of the site for the proposed development.

Field work for this investigation was undertaken on the following dates:

- Drilling, soil sampling and installation of the groundwater monitoring wells was undertaken on 18 June 2012 to 21 June 2012;
- The groundwater monitoring wells were developed on 21 June 2012; and
- Groundwater samples were obtained from the monitoring wells on 27 June 2012.

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[2] *Guidelines for Consultants Reporting on Contaminated Sites,* NSW EPA, 1997 (Reporting Guidelines 1997)

[3] *State Environmental Planning Policy No. 55 – Remediation of Land,* NSW Government, 1998 (SEPP55)

3 SITE INFORMATION

3.1 Site Identification

The site identification details summarised below have been obtained from the E3 phase 1 report (E3 2010):

Site Owner:	Sydney South West Area Health Service
Site Address:	67-73 Missenden Road, 1 & 25 Lucas Street, Camperdown, NSW
Current Land Use:	Commercial (hospital)
Proposed Land Use:	Commercial (hospital)
Local Government Authority:	City of Sydney
Current Zoning:	Zone 5: Special uses
Site Area:	Approximately 4,100m^2
AHD:	Approximately 30m
Geographical Location (MGA):	N: 6248686 E: 331755 (approximately)
Site Locality Plan:	Refer to Figure 1
Borehole Location Plan:	Refer to Figure 2

3.2 Site Description

The site is located on the western side of Missenden Road and south west of the Missenden Road and Lucas Street junction. The site is located within undulating regional topography with the site itself located on a gentle sloping hillside that falls to the north/northwest.

At the time of the fieldwork the site was occupied by a linked one and two storey brick hospital buildings over the eastern part of the site and an asphalt paved car park to the western part of the site. An above ground oxygen storage tank was located along the southern section of this car park. The strip of land located along (and within) the south boundary of the site was formerly a road that was used for car parking and vehicle thoroughfare from Missenden Road. Sections of the car park and thoroughfare were 0.5 metre to 1 metre higher than the rear of the existing buildings of the site.

To the north of Lucas Street were multi-storey brick and rendered buildings. To the south of the site were two two-storey buildings, 'Building 12' and 'Cyclotron' buildings. Neighbouring the site to the west was a single storey brick building used as a child care facility. Missenden Road was located east of the site with Sydney university and RPAH buildings located further east of the site.

4 SUMMARY OF PREVIOUS INVESTIGATIONS

4.1 Phase 1 Environmental Site Assessment (E3 2010)

E3 obtained historical information about the site and identified previous land uses. The report indicated that the site had been used for a motor body workshop, small electrical manufacturing prior to becoming part of the RPAH. These activities were considered to have the potential to contaminate the soil and/or groundwater at the site. Another potential contamination source was considered to be hospital incinerator waste (sourced from adjoining areas of RPAH) that may have been used as fill materials on the site. Aerial photographs indicated that the existing structure on the site had been constructed prior to 1930. An asbestos Material Survey of these buildings has been completed by others and identified bonded and friable asbestos. A search of WorkCover records did not locate any records relating to the site.

From the available historical information E3 concluded that for the redevelopment of the site for continued use or for a more sensitive land use that a phase 2 ESA be undertaken.

5 CONCEPTUAL SITE MODEL

5.1 Summary of Site Conditions

Inspection of the site and a review of the site history information (E3 report 2010) have indicated the following:

- The site is located in a predominantly commercial/industrial area of Camperdown;
- A review of the regional geology indicates that the site is underlain by residual clay soils and shale bedrock; and
- The site history information indicates that the site was occupied by potential contaminating land uses (motor vehicle workshop, electrical goods manufacture and hospital).

5.2 Potential On-Site Contamination Sources

Based on the scope of work undertaken for the assessment, the following potential contamination sources or potentially contaminating activities have been identified at the site:

- Potentially contaminated, imported fill material;
- Potential asbestos contamination associated with demolition of the former site buildings/sheds;
- Historical use of the site for commercial/industrial purposes; and
- Historical activities such as use of pesticides.

5.3 Potential Off-Site Contamination Sources

No significant and/or obvious potential off-site contamination sources were identified during the assessment

5.4 Contaminants of Concern

The assessment has identified a number of potential onsite contamination sources and/or potentially contaminating activities which could have resulted in soil and groundwater contamination at the site.

Contaminants of concern identified for this investigation/assessment are listed in the following table:

Potential Contaminant	Potential Source and/or Land Use Associated with the Contaminant
Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	• Imported fill material; • Previous industrial use of the site; • Off-site migration of groundwater containing elevated concentrations of heavy metals;
Total Petroleum Hydrocarbons (TPHs)	• Imported fill material; • Previous industrial use of the site for servicing motor vehicles; • Off-site migration of groundwater containing elevated concentrations of TPH;
Monocyclic Aromatic Hydrocarbons (BTEX compounds)	• Imported fill material; • Previous industrial use of the site for servicing motor vehicles; • Off-site migration of groundwater containing elevated concentrations of BTEX;
Volatile Organic Compounds (VOCs)	• Imported fill material;
Polycyclic Aromatic Hydrocarbons (PAHs)	• Imported fill material; • The suspected UST located in the south-west section of the site; • Off-site migration of groundwater containing elevated concentrations of PAHs;
Organochlorine and Organophosphorus pesticides (OCPs and OPPs)	• Imported fill soils; • The application of pesticides for pest control during use of the site for commercial/industrial purposes;
Polychlorinated Biphenyls (PCBs)	• Imported fill soils;
Asbestos	• Imported fill soils; • Demolition of the former buildings at the site; and • Asbestos identified within the existing structures in a Asbestos Material Survey report prepared by others in 2009.

5.5 Potential Receptors

The main potential receptors are considered to include:

- Johnsons Creek located approximately 400m north and 1km north west of the site;
- Site visitors, workers and adjacent property owners, who may come into contact with contaminated soil and/or be exposed to contaminated dust arising from construction activity; and
- Future site occupants.

5.6 Contaminant Fate and Transport

At this site, mobile contaminants would be expected to move down to the rock surface and migrate laterally down-slope from the source. The movement of contaminants would be expected to be associated with groundwater flow and seepage at the top of the bedrock.

6 ASSESSMENT CRITERIA DEVELOPMENT

6.1 Regulatory Background

In 1997 the NSW Government introduced the CLM Act. This Act has been amended by the *Contaminated Land Management Amendment Act* (2008[4]). The CLM Act 1997, associated regulations, SEPP55 and NSW EPA guidelines, were designed to provide uniform state-wide control of the management, investigation and remediation of contaminated land.

Prior to granting consent for any proposed rezoning or development, SEPP55 requires the consent authority to:

- Consider whether the land is contaminated;
- Consider whether the site is suitable, or if contaminated, can be made suitable by remediation, for the proposed land use; and
- Be satisfied that remediation works will be undertaken prior to use of the site for the proposed use.

Should the assessment indicate that the site poses a risk to human health or the environment, remediation of the site may be required prior to occupation of the proposed development. SEPP55 requires that the relevant local council be notified of all remediation works, whether or not development consent is required. Where development consent is not required, 30 days written notice of the proposed works must be provided to council. Details of validation of remediation work must also be submitted to Council within one month of completion of remediation works.

The consent authority may request that a site audit be undertaken during, or following the completion of the site assessment process. Under the terms of the CLM Act 1997 the NSW EPA Site Auditor Scheme was developed to provide a system of independent review for assessment reports. An accredited Contaminated Site Auditor is engaged to review reports prepared by suitably qualified consultants to ensure that the investigation has been undertaken in accordance with the guidelines and confirm that the sites are suitable for their intended use.

Section 59(2) of the CLM Act 1997 states that specific notation relating to contaminated land issues must be included on Section149 (s149) planning certificates prepared by Council where the land to which the certificate relates is:

- Within an investigation or remediation area;

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[4] *Contaminated Land Management Amendment Act,* NSW Government Legislation, 2008 (CLM Amendment Act 2008)

- Subject to an investigation or remediation order by the EPA;
- The subject of a voluntary investigation or remediation proposal; and/or
- The subject of a site audit statement.

Submission of contaminated site investigation and validation reports to council as part of rezoning or development application submissions may also result in notation of actual or potential site contamination on future s149 certificates prepared for the site.

Section 60 of the CLM Amendment Act 2008 sets out a positive duty on a land owner, or person whose activities have caused contamination, to notify the EPA if they are or become aware that contamination exists on a site that generally poses "*an unacceptable risk to human health or the environment, given the site's current or approved use*". This duty to report is based on trigger values, above which notification is required.

Off-site disposal of fill, contaminated material and excess soil/rock excavated as part of the proposed development works is regulated by the provisions of the *Protection of the Environment Operations Act* (1997[5]) and associated regulations and guidelines including the *NSW DECC Waste Classification Guidelines - Part 1: Classifying Waste* (2009[6]). All materials should be classified in accordance with these guidelines prior to disposal.

Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.

6.1.1 Underground Petroleum Storage Systems (UPSS)

In 2008 the NSW Government introduced the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation* (2008[7]) under the POEO Act 1997. This regulation is designed to regulate the storage of petroleum in underground storage systems so as to minimise the risk of the discharge of substances that cause significant damage to the environment. The regulation has specific criteria that must be met for the: design and modification of new and existing storage systems; and repair and decommissioning of existing systems.

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[5] *Protection of Environment Operations Act,* NSW Government, 1997 (POEO Act 1997)

[6] *Waste Classification Guidelines, Part 1: Classifying Waste,* NSW DECC, 2009 (Waste Classification Guidelines 2009)

[7] *Protection of Environment Operation (Underground Petroleum Storage Systems) Regulation*, NSW Government, 2008 (UPSS Regulation 2008)

For new and existing storage systems this includes installation of ground water monitoring wells and preparation of environmental management plans. The regulations states that '*A storage system must not be used unless groundwater monitoring wells are installed on the storage site*' and that the wells should be located '*with a view to maximising the likelihood that the wells will intercept contaminated groundwater*'.

Installation of groundwater wells and subsequent monitoring has been a requirement as of 1 June 2008.

6.2 Soil Contaminant Threshold Concentrations

The soil investigation levels adopted for this investigation are derived from the NSW DEC document *Guidelines for the NSW Site Auditor Scheme, 2nd Edition* (2006[8]) and the National Environmental Protection Council document *National Environmental Protection (Assessment of Site Contamination) Measure* (1999[9]). The contaminant thresholds listed below are levels at which further investigation and evaluation is required to assess whether the site is considered suitable for the proposed urban land use.

To accommodate the range of human and ecological exposure settings, a number of generic settings are used on which the Health based Investigation Levels (HILs) can be based. Four categories of HILs are adopted for urban site assessments. Contaminant levels for a standard residential site with gardens and accessible soil (Column A) are based on protection of a young child resident at the site. The remaining categories (Columns D to F) present alternative exposure settings where there is reduced access to soil or reduced exposure time. These categories include residential land use with limited soil access, recreational and public open space and commercial/industrial use. Where the proposed land use will include more than one land use category (eg. mixed residential/commercial development) the exposure setting of the most "sensitive" land use is adopted for the site.

Threshold concentrations for petroleum hydrocarbon contaminants including total TPH and BTEX compounds have previously been established in the *NSW EPA Contaminated Sites: Guidelines for Assessing Service Station Sites* (1994[10]) publication and this document is referenced in the Site Auditor Guidelines 2006. Heavy fraction petroleum

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[8] *Guidelines for the NSW Site Auditor Scheme, 2nd ed.,* NSW DEC, 2006 (Site Auditor Guidelines 2006)

[9] *National Environmental Protection (Assessment of Site Contamination) Measure,* National Environment Protection Council (NEPC), 1999 (NEPM 1999)

[10] *Guidelines for Assessing Service Station Sites,* NSW EPA, 1994 (Service Station Guidelines 1994)

hydrocarbon aliphatic/aromatic component threshold concentrations have also been introduced in NEPM 1999.

Soil samples for this investigation have been analysed for total recoverable hydrocarbons (TRH) rather than TPH. TRH analysis is undertaken without a preliminary silica gel clean-up of the sample. Consequently the TRH result may include other compounds such as phthalates, humic acids, fatty acids and sterols (if present).

6.2.1 Asbestos in Soil

NEPM 1999 does not provide numeric guidelines for the assessment of asbestos in soil. NSW EPA advice (2006) has indicated that consultants should use their 'professional judgement' regarding determination of appropriate investigation and remediation levels for asbestos in soils; however the NSW EPA have not published numerical guidelines for the assessment of asbestos in subsurface soils.

The WorkCover publication *Working with Asbestos Guide* (2008[11]) states that, where buried asbestos is encountered, "A competent occupational hygienist should assess the site to determine:

- If asbestos material is bonded or friable
- The extent of asbestos contamination
- Safe work procedures for the remediation of the site"

"Any asbestos cement products that have been subjected to weathering, or damaged by hail, fire or water blasting are considered to be friable asbestos and an asbestos removal contractor with a WorkCover license for friable asbestos removal is required for its removal". Under the *NSW Occupational Health and Safety (OHS) Regulations 2001*[12] and WorkCover requirements all necessary disturbance works associated with friable asbestos containing materials must be conducted by a licensed AS-1 Asbestos Removal Contractor.

6.2.2 Site Assessment Criteria (SAC) for Soil Contaminants

The 'commercial/industrial' (Column F) exposure setting has been adopted for this assessment and the appropriate soil criteria are listed in the following table:

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[11] *Working with Asbestos Guide,* NSW WorkCover, 2008 (WorkCover Working with Asbestos Guide 2008)

[12] *Occupational Health and Safety Regulation,* NSW Government, 2001 (NSW OH&S Regulation 2001)

Contaminant	**SAC - HILs Column F (mg/kg)**
Heavy Metals	
Arsenic (total)	500
Cadmium	100
Chromium (III)	60%
Copper	5000
Lead	1500
Mercury (inorganic)	75
Nickel	3000
Zinc	35000
Petroleum Hydrocarbons	
TPH (C_6-C_9)	65 [a]
TPH (C_{10}-C_{36})	1000 [a]
Benzene	1 [a]
Toluene	1.4 [a]
Ethylbenzene	3.1 [a]
Total Xylenes	14 [a]
PAHs	
Total PAHs	100
Benzo(a)pyrene	5
Pesticides (OCPs & OPPs)	
Aldrin + Dieldrin	50
Chlordane	250
DDT + DDD + DDE	1000
Heptachlor	50
Total OPPs	0.1[b]
Others	
PCBs (Total)	50
Asbestos	NDLR [c]

Note:

[a] Service Station Guidelines 1994

[b] Due to the absence of locally endorsed guideline criteria, the laboratory practical quantitation limit (PQL) has been adopted.

[c] Not Detected at Limit of Reporting (NDLR)

6.2.3 Waste Classification Assessment Criteria

For the purpose of off-site disposal, the classification of soil into 'General Solid Waste (non-putrescible)', 'Restricted Solid Waste (non-putrescible)' and 'Hazardous Waste (non-putrescible)' categories is defined by chemical contaminant criteria outlined in the Waste Classification Guidelines 2009. The contaminant criteria are summarised in Table A.

6.3 Evaluation of Soil Analysis Data and Contaminant Threshold Concentrations

Assessment of the soil analytical data using the soil contaminant threshold concentrations has been undertaken in accordance with the methodology outlined in the NEPM 1999 Schedule 7(a).

The following criteria have been adopted for assessment of the analytical data:

- For a site to be considered suitable for the proposed land use each individual contaminant concentration should be less than the SAC; and
- Where the concentration of each contaminant is less than the SAC in all samples, the suitability of the site for the proposed use may be assessed based solely on individual analytical results.

Where contamination results exceed the SAC, a method of remediating the site is to physically and selectively remove the contamination hotspots from the site. This process should be continued until statistical analysis of the data meets the SAC. Validation of the remediated site is generally required to demonstrate that the site is suitable for the proposed land use.

6.4 Groundwater Contaminant Trigger Values

Groundwater resources in NSW are managed and regulated by environmental and planning legislation which include the POEO Act 1997, *Environmental Planning and Assessment Act* (1979[13]) and the *Water Management Act* (2000[14]).

In 2000, Australian and New Zealand Environment Conservation Council (ANZECC) released the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000[15]) which superseded the previous guideline documents.

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[13] *Environmental Planning and Assessment Act,* NSW Government, 1979 (EP&AA 1979)

[14] *Water Management Act*, NSW Government, 2000 (Water Act 2000)

[15] *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* ANZECC, 2000 (ANZECC 2000)

The ANZECC 2000 guidelines include a complete framework for the development of appropriate guidelines for aquifer assessment. The above guidelines provide water quality parameters at the point of use including aquatic ecosystems (fresh and marine waters), drinking water, industrial and agricultural/irrigation uses.

The National Health and Medical Research Council (NHMRC) released the *Australian Drinking Water Guidelines* (2011[16]). These guidelines are predominantly used to assess drinking water quality and have been referenced in some cases.

The appropriate settings for current and potential uses of groundwater should be identified in establishing applicable groundwater trigger values:

- raw drinking water source;
- agricultural use – stock watering;
- agricultural and domestic use – irrigation;
- protection of aquatic ecosystems – freshwater; and
- protection of aquatic ecosystems – marine.

The presence of elevated contaminant concentrations in groundwater triggers further investigation of aquifer conditions to assess the source(s) of contamination and the lateral and vertical extent of the contamination.

Guidance on the remediation and management of contaminated groundwater is presented in the document *NSW DECCW Guidelines for the Assessment and Management of Groundwater Contamination (2007[17]).*

6.4.1 Petroleum Hydrocarbons in Groundwater

In the absence of locally endorsed guidelines for petroleum hydrocarbon compounds in water, the 'intervention value' concentration for mineral oil specified in the *Circular on Target Values and Intervention Values for Soil Remediation* (2000[18]) has been adopted as the trigger value for TPH (C_{10}-C_{36} fractions only).

It is noted that these guidelines have not been endorsed by NSW EPA and are used only as a preliminary screening tool.

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[16] *Australian Drinking Water Guidelines*, National Health and Medical Research Council, 2011 (NHMRC 2011)

[17] *Guidelines for the Assessment and Management of Groundwater Contamination,* NSW DECCW, 2007 (Groundwater Contamination Guidelines 2007)

[18] *Circular on Target Values and Intervention Values for Soil Remediation,* Ministry of Housing, Spatial Planning and Environment, 2000 (Dutch Guidelines 2000)

6.4.2 Hardness Modified Trigger Values (HMTVs)

Water hardness can affect the bioavailability of metals/metalloids in fresh water. Consequently, Section 3.4.3.2 of the ANZECC 2000 guidelines includes algorithms to derive hardness modified trigger values (HMTVs) for metals/metalloid concentrations in fresh water. The calculations for the HMTVs are included in Appendix E and have been included in the SAC table below.

6.4.3 Site Assessment Criteria (SAC) for Groundwater Contaminants

The fresh water trigger values have been adopted along with other guideline values for this investigation as outlined in the table:

Contaminant	Units	Fresh Water Criteria[1]	Drinking Water Criteria[2]	USEPA[5]	*Preliminary Remediation Goal (PRG) for tapwater (USEPA 2004)*
Metals					
Arsenic (total)[6]	µg/L	24	10	-	-
Cadmium	µg/L	0.3[a^]	2	-	-
Chromium (VI)	µg/L	1.4[a^]	50	-	-
Copper	µg/L	2[a^]	2000	-	-
Lead	µg/L	5.8[a^]	10	-	-
Mercury	µg/L	0.6	1	-	-
Nickel	µg/L	15.7[a^]	20	-	-
Zinc	µg/L	11.4[a^]	3000[d]	-	-
Petroleum Hydrocarbons					
TPH C_{10}-C_{36}	µg/L	600[b]	nsl	-	-
Benzene	µg/L	500[a]	1	-	-
Toluene	µg/L	180[a]	800	-	-
Ethylbenzene	µg/L	5[a]	300	-	-
o-Xylene	µg/L	350[a]	nsl	-	-
m+p Xylene	µg/L	75[a*]	nsl	-	-
PAHs					
Naphthalene	µg/L	16[a]	nsl	0.14	-
Anthracene	µg/L	0.01[c]	nsl	11000	-
Phenanthrene	µg/L	0.6[c]	nsl	-	-
Fluoranthene	µg/L	1[c]	nsl	1500	-
Benzo(a)pyrene	µg/L	0.1[c]	0.01	-	-
VOCs					
Dichlorodifluoromethane	µg/L	-	-	-	390
Chloromethane	µg/L	-	-	-	160
Vinyl Chloride	µg/L	100	-	-	-
Bromomethane	µg/L	8.7^	-	-	-
Chloroethane	µg/L	-	-	-	4.6
Trichlorofluoromethane	µg/L	-	-	-	1300
1,1-Dichloroethene	µg/L	700	-	-	-
Trans-1,2-dichloroethene	µg/L	-	-	-	120
1,1-dichloroethane	µg/L	90^	-	-	-
Cis-1,2-	µg/L	61^	-	-	-

Contaminant	Units	Fresh Water Criteria[1]	Drinking Water Criteria[2]	USEPA[5]	*Preliminary Remediation Goal (PRG) for tapwater (USEPA 2004)*
dichloroethene					
Bromochloromethane	µg/L	-	-	-	-
Chloroform	µg/L	370	-	-	-
2,2-dichloropropane	µg/L	-	-	-	-
1,2-dichloroethane	µg/L	1900	-	-	-
1,1,1-trichloroethane	µg/L	270	-	-	-
1,1-dichloropropene	µg/L	-	-	-	-
Cyclohexane	µg/L	-	-	-	10000
Carbon tetrachloride	µg/L	240	-	-	-
Benzene	µg/L	950	-	-	-
Dibromomethane	µg/L	-	-	-	-
1,2-dichloropropane	µg/L	900	-	-	-
Trichloroethene	µg/L	330	-	-	-
Bromodichloromethane	µg/L	-	-	-	1.1
trans-1,3-dichloropropene	µg/L	-	-	-	0.1
cis-1,3-dichloropropene	µg/L	-	-	-	0.1
1,1,2-trichloroethane	µg/L	6500	-	-	-
Toluene	µg/L	180	-	-	-
1,3-dichloropropane	µg/L	1100	-	-	-
Dibromochloromethane	µg/L	-	-	-	0.13
1,2-dibromoethane	µg/L	-	-	-	0.0056
Tetrachloroethene	µg/L	70	-	-	-
1,1,1,2-tetrachloroethane	µg/L	-	-	-	0.43
Chlorobenzene	µg/L	55	-	-	

Contaminant	Units	Fresh Water Criteria[1]	Drinking Water Criteria[2]	USEPA[5]	*Preliminary Remediation Goal (PRG) for tapwater (USEPA 2004)*
Ethylbenzene	µg/L	80	-	-	-
Bromoform	µg/L	-	-	-	8.5
m+p-xylene	µg/L	200 +75	-	-	-
Styrene	µg/L	-	-	-	2100
1,1,2,2-tetrachloroethane	µg/L	400	-	-	
o-xylene	µg/L	350	-	-	-
1,2,3-trichloropropane	µg/L	-	-	-	0.0056
Isopropylbenzene	µg/L	30	-	-	-
Bromobenzene	µg/L	-	-	-	20
n-propyl benzene	µg/L	-	-	-	240
2-chlorotoluene	µg/L	-	-	-	-
4-chlorotoluene	µg/L	-	-	-	-
1,3,5-trimethyl benzene	µg/L	-	-	-	12
Tert-butyl benzene	µg/L	-	-	-	240
1,2,4-trimethyl benzene	µg/L	-	-	-	12
1,3-dichlorobenzene	µg/L	260	-	-	-
Sec-butyl benzene	µg/L	-	-	-	240
1,4-dichlorobenzene	µg/L	60	-	-	-
4-isopropyl toluene	µg/L	-	-	-	-
1,2-dichlorobenzene	µg/L	160	-	-	-
n-butyl benzene	µg/L	-	-	-	240
1,2-dibromo-3-chloropropane	µg/L	-	-	-	0.048
1,2,4-trichlorobenzene	µg/L	85	-	-	-
Hexachlorobutadiene	µg/L	-	-	-	0.86
1,2,3-trichlorobenzene	µg/L	3	-	-	-

Contaminant	Units	Fresh Water Criteria[1]	Drinking Water Criteria[2]	USEPA[5]	***Preliminary Remediation Goal (PRG) for tapwater (USEPA 2004)***
Others					
pH	-	7 – 8.5[i]	6.5 – 8.5[d]	nsl	-
EC	mS/cm	nsl	nsl	nsl	-

Notes:

[1] 95% Trigger Values for Marine Water (ANZECC 2000)

[2] Australian Drinking Water Guidelines (NHMRC 2011)

[5] Due to the absence of locally endorsed criteria, the USEPA Region 9 PRGs for Tap water have been adopted

[6] The Arsenic (III) trigger value has been quoted

[a] Low or Moderate Reliability Trigger Values have been quoted (ANZECC 2000)

[b] In the absence of locally endorsed guidelines, the Dutch investigation levels have been quoted

[c] 99% trigger values have been adopted due to the potential for bioaccumulation effects

[d] The aesthetic guideline concentration has been quoted

[a*] Low or Moderate Reliability Trigger Values (ANZECC 2000) for m-Xylenes have been quoted. We note that m-Xylene guideline value is 75μg/L and the p-Xylene guideline value is 200μg/L. However, these two isomers cannot currently be distinguished analytically

nsl – No set limit

a^ - hardness modified trigger values (HMTV)

7 ASSESSMENT PLAN

7.1 Soil Sampling Density

The *NSW EPA Contaminated Sites Sampling Design Guidelines* (1995[19]) for contaminated site investigations state that samples should be obtained from a minimum of 11 evenly spaced sampling points for a site of this size (approximately 4,100m^2).

Samples were obtained from 8 sampling locations for this investigation. This density meets (is approximately 73% of) the minimum sampling density.

Sampling was not undertaken beneath the existing buildings at the site as access was not possible during the field investigation.

7.2 Groundwater Sampling

The assessment included the installation of 3 groundwater monitoring wells in selected boreholes. The location of the groundwater monitoring wells is shown on Figure 2.

7.3 Data Quality Objectives (DQOs)

The DQOs for the assessment were developed with reference to the US EPA document *Data Quality Objectives Process for Hazardous Waste Site Investigations* (2000[20]). The document includes seven steps as follows:

1. State the problem
2. Identify the decision
3. Identify inputs into the decision
4. Study Boundaries
5. Develop a Decision Rule
6. Specify Limits on Decision Errors
7. Optimise the Design for Obtaining data

Field investigations are undertaken generally in accordance with EIS sampling protocols outlined in Appendix D.

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[19] *Contaminated Sites Sampling Design Guidelines,* NSW EPA, 1995 (EPA Sampling Design Guidelines 1995)

[20] *Data Quality Objectives Process for Hazardous Waste Site Investigations,* US EPA, *2000* (US EPA 2000)

7.4 Data Quality Indicators (DQIs) and Quality Assurance

The validation, as part of the DQOs, involves the technical review of the data using defined QA Assessment Criteria. The success of the DQIs is based on assessment of the data set as a whole and not on individual acceptance or exceedance within the data set.

Review of QA criteria was based on laboratory data including surrogate recovery, repeat analysis, laboratory control sample (LCS), matrix spikes and method blanks.

Field QA/QC included collection and analysis of the following for the contaminants of concern:

- approximately 3% of field soil samples as inter-laboratory duplicates;
- approximately 3% of field soil samples as intra-laboratory duplicates;
- field blank samples, rinsate samples of field equipment, and
- soil and water trip spike sample.

Success of field DQIs is based on the following criteria:

- Relative percentage differences (RPDs) were calculated for the inter-laboratory and intra-laboratory duplicates. The RPD was calculated as the absolute value of the difference between the initial and repeat result divided by the average value, expressed as a percentage. The following acceptance criteria were used to assess the RPD results:
  - For results that were greater than 10 times the Practical Quantitation Limit (PQL) RPDs less than 50% were considered acceptable.
  - For results that were between 5 and 10 times PQL RPDs less than 75% were considered acceptable.
  - For results that were less than 5 times the PQL RPDs less than 100% were considered acceptable.
- Acceptable concentrations in blank samples.

Success of laboratory DQIs is based on the following criteria:

- RPDs were calculated for the laboratory duplicates (as detailed above). The following acceptance criteria were used to assess the RPD results:
  - For results that were less than 5 times the PQL, any RPD was considered acceptable;
  - For results that were greater than 5 times the PQL, RPDs between 0-50% were considered acceptable.
- The following acceptance criteria were used to assess the matrix spikes and LCS recovery:
  - 70-130% recovery was considered acceptable for metals and inorganics;

  - ➢ 60-140% recovery was considered acceptable for organics; and
  - ➢ 10-140% recovery was considered acceptable for VOCs.
- The following acceptance criteria were used to assess the surrogate spike recovery:
  - ➢ 60-140% recovery was considered acceptable for general organics; and
  - ➢ 10-140% recovery was considered acceptable for VOCs.
- No contaminant concentrations above the Practical Quantitation Limit (PQL) in the blank samples.

8 INVESTIGATION PROCEDURE

8.1 Soil Sampling Methods

Subsurface investigation was undertaken using a track mounted hydraulically operated drill rig equipped with spiral flight augers. Due to access restrictions associated with the existing development, 2 sampling locations were undertaken using hand equipment. Soil samples from the drill rig boreholes were obtained from a Standard Penetration Test (SPT) sampler or directly from the auger when conditions did not allow use of the SPT sampler.

The SPT sampler was washed with phosphate free detergent and rinsed following each sampling event. The spiral flight augers and hand equipment were decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water. Details of the decontamination procedure adopted during sampling are presented in Appendix D.

Soil samples were obtained at various depths, based on observations made during the field investigation. During sampling, soil at selected depths was split into initial and duplicate samples for QA/QC assessment.

All samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. Sampling personnel used disposable nitrile gloves during sampling activities.

During the investigation, soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with AS 4482.1-2005[21] and AS 4482.2-1999[22] as summarised in the following table:

Analyte	Preservation	Storage
Heavy metals	Unpreserved glass jar with Teflon lined lid	Store at <4°, analysis within 28 days (mercury and Cr[VI]) and 180 days (other metals).
VOCs (TPH/BTEX)		Store at <4°, nil headspace, extract within 14 days, analysis within forty days
PAHs, OCP, OPP & PCBs		
Asbestos	Sealed plastic bag	None

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[21] *Guide to the Investigation and Sampling of sites with Potentially Contaminated Soil,* Standards Australia, 2005 (AS 2005)

[22] *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part2: Volatile Substances,* Standards Australia, 1999 (AS 1999)

The samples were labelled with the job number, sampling location, sampling depth and date. All samples were recorded on the borehole logs presented in Appendix A and on the laboratory chain of custody (COC) record presented in Appendix B.

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures. Detailed EIS field sampling protocols are included in Appendix D.

8.2 Photoionisation Detector (PID) Screening

A portable PID was used to screen the samples for the presence of volatile organic compounds (VOCs) and to assist with selection of samples for laboratory hydrocarbon (TPH/BTEX) analysis.

The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source.

The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents.

PID screening of detectable volatile organic compounds (VOCs) was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. The PID headspace data is presented on the COC documents. PID calibration records are presented in Appendix F.

8.3 Groundwater Monitoring Well Installation

Three monitoring wells were installed in boreholes BH3, BH4 and BH9 as shown on Figure 1. The monitoring well construction details are documented on appropriate borehole logs presented in Appendix A.

Applications to license the monitoring wells were submitted to NSW Office of Water by EIS.

The well construction details are summarised in the following table:

Well No.	Final Depth (m)	Machine Slotted PVC[2] Screen (m)	Un-slotted PVC[2] Casing (m)	Sand Filter Pack (m)	Bentonite Seal (m)	Well Finishing Details[3]
MW3	15.0	15.0 to 9.0	9.0 to 0	15.0 to 1.0	1.0 to 0	Gatic cover
MW4	14.8	14.8 to 5.8	5.8 to 0	14.8 to 1.0	1.0 to 0	Gatic cover
MW9	3.0	3.0 to 1.0	1.0 to 0	3.0 to 0.5	0.5 to 0	Gatic cover

Notes:

[2] 50mm diameter Class 18 PVC has been used for the wells

[3] Concrete grout was used to seal the monitoring well

8.4 Monitoring Well Development

Groundwater was purged from the monitoring wells using a submersible electric pump. The pH, temperature, conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) were monitored during development using calibrated field instruments to assess the development of steady state conditions.

Steady state conditions were considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%. Typically a minimum of 5L to 45L were purged to remove stagnant water and sediment from the monitoring well prior to sampling to obtain samples representative of the general aquifer conditions.

The monitoring well development sheets and the equipment calibration records are presented in Appendix F.

The monitoring wells were allowed to recharge prior to sampling. The pump and hose were flushed between sampling point with potable water followed by a pulse of demineralised water. Details of the decontamination procedure adopted during sampling are presented in Appendix D.

Groundwater removed from the wells during purging was transported to EIS, where the water is stored in a holding drum prior to collection by licensed waste water contractors. When the drum is filled a sample is analysed to classify the water for disposal.

8.5 Groundwater Sampling

Groundwater samples were obtained from the monitoring wells using low flow sampling equipment to reduce the disturbance of the water column and loss of volatiles.

Due to the relatively slow infiltration of groundwater into the monitoring wells, steady state conditions were not achieved during sampling of MW9.

The sampling data sheets and the calibration documentation for the instruments are presented in Appendix F.

Once steady state conditions were considered to have been achieved, groundwater samples were obtained directly from the pump tubing and placed in appropriate glass bottles, BTEX vials or plastic bottles.

Duplicate samples were obtained by alternate filling of sample containers. This technique was adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing of liquids in secondary containers, etc.

The samples were preserved in accordance with water sampling requirements detailed in NEPM 1999 and placed in an insulated container with ice. During the investigation, groundwater samples were preserved by immediate storage in an insulated sample container with ice in accordance with AS/NZS 5667.1:1998[23] as summarised in the following table:

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[23] *Water Quality – Part 1: Sampling, Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples,* Standards Australia, 1998 (AS/NZS 5667.1:1998)

Analyte	Preservation	Storage Period
Heavy metals	45μm Filter, acidify with nitric acid to pH 1-2.	Store at <4°, analysis within 30 days
VOCs (TPH)	Zero headspace, teflon seal	Store at <4°, analysis within 7 days
VOCs (BTEX + Light TPH)	Zero headspace, Teflon seal, acidify with HCl to pH 1-2.	Store at <4°, analysis within 7 days
sVOCs (PAHs)	nil	Store at <4°, analysis within 7 days
Polycyclic Aromatic Hydrocarbons (PAHs)	nil	Store at <4°, analysis within 7 days
Electrical Conductivity	Zero headspace	Store at <4°, analysis within 1 month
pH	nil	Store at <4°, analysis within 6 hours
Hardness	Zero headspace	Analysis within 7 days

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody procedures.

8.6 Laboratory Analysis

Laboratory analysis was undertaken by Envirolab Services Pty Ltd (NATA Accreditation No. 2901) with additional Quality Control Analysis undertaken by National Measurement Institute (NMI) (NATA Accreditation No. 198).

8.6.1 Soil Samples

Soil samples were analysed using the following analytical methods detailed in Schedule B(3) of NEPM (1999[24]):

Analyte	Laboratory Procedure
Heavy Metals	Nitric acid digestion. Analysis by ICP-MS (NMI) or ICP/AES.
Low level mercury	Cold vapour ASS.
OCP, OPP, PCB	Dichloromethane/acetone extraction. Analysis by twin column GC-ECD. NMI: Hexane or acetone extraction. Sulfate and alumina filtration (some

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[24] *Guideline on Laboratory Analysis of Potentially Contaminated Soils*, Schedule B(3), NEPM, 1999 (Schedule B(3))

	samples may require GPC and/or sulfate removal). Analysis by twin column GC-ECD or GC/NPD.
PAHs	Dichloromethane/acetone. Analysis by GC-MS in SIM mode. NMI: Dichloromethane/acetone extraction by sonication. Analysis by GC-MS.
TPH (C_6-C_9), BTEX	Methanol extraction. Analysis by P&T GC/MS. NMI: Dichloromethane/acetone or methanol extraction. Analysis by P&T GC/MS.
TPH (C_{10}-C_{36})	Dichloromethane/acetone extraction. Analysis by GC/FID.
Asbestos	Polarizing light microscopy.
VOCs	Analysis by P&T GC/MS
TCLPs	Toxicity characteristic leaching procedure (TCLP) leachates were prepared by rotating soil samples in a mild acid solution for 18 hours (NSW EPA WD-3 Method). Leachates were analysed using the analytical procedures outlined above.

8.6.2 Groundwater Samples

Groundwater samples were analysed using the following analytical methods endorsed by the NSW EPA (Schedule B(3) does not apply to water samples):

Analyte	Laboratory Procedure
Heavy Metals	Direct injection. Analysis by ICP-AES.
Low level mercury	Direct injection. Analysis by flow injection ASS.
PAHs	Triple solvent dichloromethane extraction. Analysis by GC/MS.
TPH (C_6-C_9), BTEX	Analysis by P&T GC/MS.
TPH (C_{10}-C_{36})	Solvent dichloromethane extraction. Analysis by GC/FID.
pH	Measured using pH meter and electrode in accordance with APHA 20th ED, 4500-H+.
Electrical Conductivity (EC)	Measured using a conductivity cell and dedicated meter.
Hardness	By calculation following analysis of calcium and magnesium by direct injection and ICP-AES.

9 RESULTS OF INVESTIGATION

9.1 Subsurface Conditions

Borehole locations are shown on Figure 2. For details of the subsurface soil profile reference should be made to the borehole logs in Appendix A. A summary of the subsurface conditions encountered in the boreholes is presented below:

Pavement

All boreholes were drilled through asphaltic or concrete pavement, with the exception of BH7. Pavement thickness varied from 30mm to 140mm. A second concrete pavement, of 80mm thickness, was encountered at a depth of 0.23m in BH10. In BH4, the asphaltic concrete was underlain by a 100mm thick concrete slab.

Fill

Fill was encountered in all boreholes to depths between 0.4m and 2.2m. The fill material typically consisted of silty clay, with gravelly sand, sandy gravel, gravelly sandy clay, silty gravel, sandy clay, gravelly silty clay and silty sand encountered in some boreholes. The silty sand fill material encountered in BH9 and subsequent hydrocarbon odour in the underlying natural soil indicate the possible presence of a UST. The fill material contained inclusions of ash, slag, glass, plastic, root fibres, concrete and brick fragments, igneous, sandstone and ironstone gravels.

Natural Soils

Natural residual silty clay was encountered beneath the fill material in all boreholes. Natural silty clay in BH9 had a hydrocarbon odour. The lab results for the BH9 0.9-1m sample has indicated that this soil is possibly fill.

Groundwater

Groundwater seepage was encountered in BH3, BH4, BH5 and BH9 during drilling at depths of approximately 1.2m to 11.0m below ground level (bgl). Standing water level (SWL) was measured in BH2, BH3, BH4, BH5 and BH9 at depths ranging from 2.17m to 9.2m bgl a short time after completion of drilling. The remaining boreholes were dry during and a short time after completion of drilling.

Groundwater monitoring wells were installed in BH3, BH4 and BH9. SWL measured in the monitoring wells during the investigation is presented in the following table:

Monitoring Well	SWL (m) bgl on 21/6/2012	SWL (m) bgl on 27/6/2012
MW3	4.57	4.65
MW4	3.80	4.90
MW9	1.51	1.09

9.2 Direction of Groundwater Flow

EIS expect groundwater to flow generally with the slope of the topography in a north/northwest direction.

9.3 Laboratory Results

The laboratory reports are presented in Appendix B. The results have been assessed against the SAC adopted for this investigation.

9.3.1 Soil Samples

The soil laboratory results are presented in Table B to Table D inclusive. The results of the analyses are summarised below.

Heavy Metals

Eight fill and four natural soil samples were analysed for heavy metals. The results of the analyses were below the SAC.

Waste Classification:

The lead results of 150mg/kg and 190mg/kg in the BH7 0.1-0.3m and BH10 0.4-0.6m samples respectively were above the CT1 criteria outlined in the Waste Classification Guidelines 2009. The remaining results of all analyses were less than the CT1and SCC1 criteria outlined in the Waste Classification Guidelines 2009.

TCLP leachates were prepared from the eight fill samples and analysed for heavy metals. The results were less than the TCLP1 criteria.

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

PID soil sample headspace readings were between zero ppm and 11.5ppm equivalent isobutylene. These results indicate PID detectable volatile organic contaminants.

Eight fill and seven natural soil samples were analysed for TPH and BTEX compounds. The results of the analyses were below the SAC.

Waste Classification:

The results of all analyses were less than the relevant CT1and SCC1 criteria outlined in the Waste Classification Guidelines 2009.

Polycyclic Aromatic Hydrocarbons (PAHs)

Eight fill and four natural soil samples were analysed for a range of PAHs including Benzo(a)pyrene. The results of the analyses were less than the SAC.

Waste Classification:

The B(a)P results of 1.6mg/kg and 2.6mg/kg in the BH2 0.9-1m and BH8 0.15-0.4m samples respectively were above the relevant CT1 criteria outlined in the Waste Classification Guidelines 2009. The remaining results of all analyses were less than the relevant CT1 and SCC1 criteria outlined in the Waste Classification Guidelines 2009.

TCLP leachates were prepared from the eight fill samples and the BH2 0.9-1m sample and analysed for PAHs. The results were less than the TCLP1 criteria.

Organochlorine (OCPs) and Organophosphorous (OPPs) Pesticides

Eight fill and four natural soil samples were analysed for a range of OCPs and OPPs. The results of the analyses were below the laboratory PQL and less than the SAC.

Waste Classification:

The results of all analyses were less than the SCC1 criteria outlined in the Waste Classification Guidelines 2009.

Polychlorinated Biphenyls (PCBs)

Eight fill and four natural soil samples were analysed for a range of PCBs. The results of the analyses were below the laboratory PQL and less than the SAC.

Waste Classification:

The results of all analyses were less than the SCC1 criteria outlined in the Waste Classification Guidelines 2009.

Asbestos

Eight fill soil samples were screened for the presence of asbestos fibres. The results of the analyses indicated that asbestos fibres were not encountered within the samples and no respirable fibres were detected.

9.3.2 Groundwater Samples

The groundwater laboratory results are presented in Table E. The results of the analysis are summarised below:

Heavy Metals

Three groundwater samples were analysed for heavy metals. The elevated results are summarised in the following table:

Elevated Groundwater Results (μg/L)					
Heavy metal	Cadmium	Chromium (III)	Copper	Nickel	Zinc
SAC	$0.3^{a\hat{}}$	$1.4^{a\hat{}}$	$2^{a\hat{}}$	$15.7^{a\hat{}}$	$11.4^{a\hat{}}$
MW3	0.3	-	11	16	43
MW4	-	-	4	-	19
MW9	-	6	2	-	-

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

Three groundwater samples were analysed for TPH and BTEX compounds. The results of the analyses were below the SAC. Light fraction hydrocarbons TPH C_6-C_9 were detected in MW9 at a concentration of 150μg/L. there are no SAC for light fraction hydrocarbons.

Volatile Organic Compounds (VOCs)

Three groundwater samples were analysed for VOCs. A trace (1μg/L) of toluene was detected in MW3 and MW4 at concentrations below the SAC. The remaining VOC concentrations were all less than the practical quantitation limit.

Polycyclic Aromatic Hydrocarbons (PAHs)

Three groundwater samples were analysed for a range of PAHs including Benzo(a)pyrene. The Phenanthrene and Anthracene results of 0.7μg/L and 0.3

μg/L in MW9 respectively were above the SAC. The remaining results of the analyses were less than the SAC.

Other Parameters

Three groundwater samples were analysed for pH, EC and hardness. The results were as follows:

- pH ranged from 4.8 to 7.2;
- EC ranged from 570μS/cm to 2300μS/cm; and
- Hardness ranged from 17mg$CaCO_3$/L to 100mg$CaCO_3$/L

Field Measurements

Field measurements recorded during sampling are as follows:

- pH ranged from 4.33 to 7.0;
- EC ranged from 408.2μS/cm to 1722μS/cm;
- Eh ranged from 167.6mV to 246.6mV; and
- DO ranged from 0.7ppm to 1.7ppm.

10 ASSESSMENT OF ANALYTICAL QA/QC

The DQOs and DQIs established for the investigation have been assessed in this section of the report. The assessment includes a review of the laboratory QA/QC procedure to assess whether the sample data is reliable.

The laboratory reports for this investigation have been checked and issued as final by:

- Envirolab Services Pty Ltd (NATA Accreditation No. 2901), Report numbers: 75183, 75183-A and 75372; and
- NMI (NATA Accreditation No. 198), Report numbers: RN922455.

A summary of the field QA/QC samples are specified in the following table:

Field QA/QC	Sample Details
Inter-laboratory duplicates	*Soil Samples:* Dup B is a soil duplicate of sample BH7 0.1-0.3m
Intra-laboratory duplicates	*Soil Samples:* Dup A is a soil duplicate of sample BH9 0.2-0.3m *Groundwater Samples:* Dup A is a water duplicate of sample MW4
Trip blanks	TB1 (sand blank) (18/6/12)
Trip spike	Trip Spike (soil) is a BTEX spike (19/6/12) Trip Spike (water) is a BTEX spike (27/6/12)
Rinsate	RS1 is a field rinsate from the SPT decontamination process (18/6/12); and RS2 is a field rinsate from the SPT decontamination process (21/6/12)

The RPD results for the field QA/QC duplicate samples are summarised in Table F to Table H. The analysis results for the field blank, rinsate and trip spike samples are presented in Table I. An assessment of the DQIs is summarised in the following table. A brief explanation of the individual DQI is presented in Appendix D.

Summary Discussion of DQIs

Precision

Intra-laboratory RPD Results:
The intra-laboratory RPD values for the soil samples indicated that field precision was acceptable.

The RPD values for pyrene and a range of heavy metals were outside the acceptance criteria. Values outside the acceptable limits have been attributed to sample heterogeneity and the difficulties associated with obtaining homogenous duplicate samples of heterogenous matrices. Where applicable, the higher duplicate value has been adopted as a conservative measure.

The intra-laboratory RPD values of the groundwater samples indicated that the field precision was acceptable.

Inter-laboratory RPD Results:
The inter-laboratory RPD values for the soil samples indicated that field and laboratory precision were acceptable.

The RPD values for mid to heavy fraction hydrocarbons, arsenic and chromium were outside the acceptance criteria. RPD values outside the acceptable limits have been attributed to sample heterogeneity and the difficulties associated with obtaining homogenous duplicate samples of heterogenous matrices. Where applicable, the higher duplicate value has been adopted as a conservative measure.

Laboratory Duplicate RPD Results:
Laboratory duplicate RPD results for the soil/groundwater analysis were generally within the acceptance criteria adopted by the laboratory/laboratories.

Trip Spike Results:
The BTEX results for the trip spikes ranged from 85% to 131%, (refer to Table I) and indicated that field preservation methods were appropriate.

Field Rinsate Results:
The field rinsate samples (refer to Table I) did not identify any cross-contamination artefacts associated with sampling equipment.

Trip Blank Results:
The soil trip blank results were all less than the PQLs (refer to Table I).

Accuracy

Matrix Spike Recovery:
Matrix spike recovery concentrations were within the acceptable limits of 60-140% for organics and 70-130% for inorganics.

Surrogate Spike Recovery:
Surrogate spike recovery concentrations were within the acceptable limits of 60-140% for organics and 70-130% for inorganics.

Laboratory Control Samples (LCS) Results:
LCS recovery concentrations were within the acceptable limits of 60-140% for organics and

Summary Discussion of DQIs
70-130% for inorganics.
Representativeness
• Sample collection, handling, storage and preservation were considered appropriate; • No laboratory artefacts were detected; and Soil sample analysis for TCLP PAHs were outside of the 14 day holding time for the following samples: Ref BH2 0.9-1.0m. This was not considered to have had a significant impact on the data set due to the following: • The main contaminant of concern from a health based point of view was benzo[a]pyrene. This PAH has a high molecular weight and low vapour pressure and is relatively stable; • The sample has been stored in a refrigerator at the lab; and • The sample was analysed within 28 days of sampling. Laboratory Blank Results: All laboratory blanks were found to be free of analyte concentrations above the PQLs.
Comparability
• Same sampling procedures and handling techniques outlined in Appendix D were used; • Samples were obtained by qualified staff; • Samples were collected in appropriate containers; • No significant influence on sampling from climatic or sampling conditions were reported; and • Standard laboratory analytical methods were used.
Completeness
• Documentation (including site notes, borehole logs, COC etc) was correctly maintained; • Samples obtained were analysed for the contaminants of concern; and • Appropriate analytical methods used by the laboratory.

Based on the review of the DQIs outlined in the above table, EIS are of the opinion that the DQOs adopted for this investigation/assessment have been addressed.

11 DISCUSSION AND CONCLUSION

11.1 Summary of Soil Contamination

Soil samples obtained for the investigation were analysed for the potential contaminants of concern identified in **Section 5.4** of this report.

Elevated concentrations of contaminants were not encountered in the soil samples analysed for the investigation. All results were below the SAC adopted for this assessment.

Based on the results and pending future works beneath the existing building footprints, EIS are of the opinion that the potential for significant widespread soil contamination at the site is relatively low.

The hydrocarbon odour, silty sand fill and PID readings within the natural soils, in BH9, indicate that potentially there could be a UST or a backfilled UST pit in the vicinity of this borehole. Although there were no records discovered within the Phase 1 report by E3 (2010), a lot of older USTs locations were never registered with WorkCover. EIS recommend that a Ground Penetrating Radar (GPR) scan be completed to locate/identify the possible presence of a UST around BH9. If a potential UST or backfilled tank pit is identified by the GPR scan we recommend that additional boreholes are drilled in this area to better assess this location.

11.1.1 Asbestos in Soil

Asbestos was not detected above the reporting limit in the soil samples analysed for the investigation.

11.2 Summary of Groundwater Contamination

Groundwater samples obtained for the investigation were analysed for the potential contaminants of concern identified in **Section 5.4** of this report.

Elevated concentrations of cadmium, chromium (VI), copper, nickel, zinc, phenanthrene and anthracene were encountered in the samples as outlined in the following table:

Contaminant	Cadmium	Chromium (III)	Copper	Nickel	Zinc	Phenanthrene	Anthracene
SAC (μg/L)	$0.3^{a\hat{}}$	$1.4^{a\hat{}}$	$2^{a\hat{}}$	$15.7^{a\hat{}}$	$11.4^{a\hat{}}$	0.6	0.01
MW3	0.3	-	11	16	43	-	-
MW4	-	-	4	-	19	-	-
MW9	-	6	2	-	-	0.7	0.3

The groundwater data has indicated the presence of hydrocarbons at concentrations below the SAC within MW9. The most likely source of hydrocarbons within this monitoring well is the suspected UST referred to in Section 11.1.

The results of the remaining analyses were below the SAC.

11.2.1 Source of Groundwater Contamination

The heavy metal concentrations in the groundwater were considered to be the result of regional groundwater conditions rather than a site specific issue for the following reasons:

- Significant concentrations of heavy metals were not encountered in the fill or natural soil which would represent a potential groundwater contamination source;
- Elevated concentrations of copper, lead and zinc are commonly encountered in groundwater in urban environments and are associated with factors such as surface water infiltration and leaking water infra-structure;
- Elevations of heavy metals are often encountered in shale aquifers, MW3 and MW4 were installed within a shale aquifer; and
- Elevations may be associated with regional groundwater conditions in the immediate vicinity of the site.

The detections of the low to mid molecular weight PAHs phenanthrene and anthracene within the MW9 groundwater sample are considered to be associated with the detections of hydrocarbons within the same sample.

As a result of uncontrolled filling at the beginning of the twentieth century the groundwater beneath the Camperdown area is considered to be a *"highly disturbed system"*. Imposition of a regulatory framework that attempts to impose the same level of protection as for a pristine ecosystem to the Camperdown area groundwater is considered to be impractical. The general philosophy outlined in the ANZECC 2000 promotes this approach. However, care should be taken to minimise further degradation of the groundwater quality.

11.2.2 Extent of Groundwater Contamination

A contour plot was not prepared for the groundwater levels at the site. However, EIS expect groundwater to generally flow with the slope of the topography in a north and North West direction.

The movement of contaminants would generally be expected to be associated with groundwater flow with movement through the soils in addition to a deeper regional groundwater system within the shale bedrock.

11.2.3 Dewatering During Development

In the event groundwater is intercepted during excavation works, dewatering will be required. Council and other relevant approvals will be required prior to disposal of groundwater into the stormwater system.

11.3 Contaminant Exposure Pathway

No elevated concentrations of contaminants were encountered in the soil at this site. This together with the fact that the site is paved means that the risk of exposure to soil contamination by the current site occupiers is very low.

Some elevated concentrations of contaminants were encountered in the groundwater. The principal exposure route for these contaminants is ingestion. The likelihood of groundwater from this site being used for domestic consumption is considered to be very low. Therefore the risk of exposure to groundwater contamination by the current site occupiers is very low.

11.4 Waste Classification

11.4.1 Classification of Fill Soils

Based on the results of the assessment, the fill material is classified as 'General Solid Waste (non-putrescible)' according to the criteria outlined in Waste Classification Guidelines 2009.

The fill material must be disposed of to a NSW EPA licensed facility. It is the responsibility of the receiving facility to ensure that the material meets their EPA license conditions. EIS accepts no liability whatsoever for illegal or inappropriate disposal of excavated material.

11.4.2 Classification of Natural Soil and/or Bedrock

Based on the current data the natural silty clay and underlying shale bedrock at the site is likely to be classified as virgin excavated natural material (VENM). Due to the PAH detections, including B(a)P, within the BH2 0.9-1m natural sample further sampling and analysis is recommended before assigning a VENM classification to the natural soil at the site. EIS recommend that following the removal of all fill soils from the site, natural soil samples should be obtained from this area and analysed to classify the natural soil. Where doubt exists about the difference between fill and VENM material an environmental/geotechnical engineer should be contacted.

11.5 Conclusion

Based on the scope of work undertaken for this assessment EIS consider that the site can be made suitable for the proposed development provided that the following recommendations are implemented:

- Boreholes are drilled within the existing building footpints once they have been vacated (as per original scope of works) to meet the density of a stage 2 ESA;
- Undertake a Ground Penetrating Radar (GPR) scan to identify the suspected UST. If the GPR identifies a UST, additional soil sampling is required around the UST;
- If USTs or former tank pits are identified a Remedial Action Plan (RAP) is prepared to document and manage the removal/excavation works;
- A further round of groundwater monitoring should be undertaken to assess whether the contaminated levels in groundwater are rising, falling or stable. Following this a decision can be made as to whether more monitoring wells are required;
- Additional soils samples are obtained in the vicinity of BH2 once all fill materials have been removed from the site to confirm the classification of the natural soils;
- Asbestos within the existing buildings has been identified by others as mentioned within the E3 2010 report. All hazardous building materials should be removed by an authorised person prior to demolition; and
- Undertake inspections during demolition and excavation works to assess any unexpected conditions or subsurface facilities that may be discovered between investigation locations. This should facilitate appropriate adjustment of the works programme and schedule in relation to the changed site conditions. Inspections should be undertaken by experienced environmental personnel.

11.6 Regulatory Requirement

The requirement to report to the EPA under Section 60 and *Guidelines on the Duty to Report Contamination*[25] under the CLM Amendment Act 2008 should be assessed once the results of the additional investigation works have been reviewed and (if necessary) a remedial strategy has been selected.

Please note that in the event the recommendations for additional work are not undertaken, there may be justification to report to the EPA. EIS can be contacted for further advice regarding notification.

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[25] *Guidelines on the Duty to Report Contamination*, NSW Government Legislation, 2008 (Duty to Report Contamination 2008)

12 LIMITATIONS

The boreholes drilled for the investigation have enabled an assessment to be made of the risk of the existence of significant, large quantities of contaminated soils. The conclusions based on this investigation are that, while major contamination of the site is not apparent, problems may be encountered with smaller scale features between boreholes. EIS adopts no responsibility whatsoever for any problems such as underground storage tanks, buried items or contaminated material that may be encountered between sampling locations at the site. The proposed construction activities at the site should be planned on this basis, and any unexpected problem areas that are encountered between boreholes should be immediately inspected by experienced environmental personnel. This should ensure that such problems are dealt with in an appropriate manner, with minimal disruption to the project timetable and budget.

The conclusions developed in this report are based on site conditions which existed at the time of the site assessment and the scope of work outlined previously in this report. They are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, and visual observations of the site and vicinity, together with the interpretation of available historical information and documents reviewed as described in this report.

The investigation for this assessment and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined previously in this report.

Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated.

EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination.

Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes.

Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work.

EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site.

EIS have not and will not make any determination regarding finances associated with the site.

Changes in the proposed or current site use may result in remediation or further investigation being required at the site.

During construction at the site, soil, fill and any unsuspected materials that are encountered should be monitored by qualified environmental and geotechnical engineers to confirm assumptions made on the basis of the limited investigation data, and possible changes in site level and other conditions since the investigation. Soil materials considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. Copyright in this report is the property of EIS. EIS has used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report.

ABBREVIATIONS

AAS	Atomic Absorption Spectrometry
AGST	Above Ground Storage Tank
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ASS	Acid Sulfate Soil
B(a)P	Benzo(a)pyrene
BH	Borehole
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
COC	Chain of Custody documentation
CLM	Contaminated Land Management
DNR	NSW Department of Natural Resources (now part of DWE and OEH)
DWE	NSW Department of Water and Energy
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
GC-ECD	Gas Chromatograph-Electron Capture Detector
GC-FID	Gas Chromatograph-Flame Ionisation Detector
GC-MS	Gas Chromatograph-Mass Spectrometer
HIL	Health Based Investigation Level
HM	Heavy Metals
ICP-AES	Inductively Couple Plasma – Atomic Emission Spectra
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCPs	Organochlorine Pesticides
OPPs	Organophosphate Pesticides
WHS	Workplace, Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photo-ionisation Detector
PPIL	Provisional Phyto-toxicity Investigation Levels
PQL	Practical Quantitation Limit
P&T	Purge & Trap
RAP	Remedial Action Plan
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SEPP	State Environmental Planning Policy
sPOCAS	suspension Peroxide Oxidation Combined Acidity and Sulfate
SPT	Standard Penetration Test
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

IMPORTANT INFORMATION ABOUT THE SITE ASSESSMENT REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is Based on a Unique Set of Project Specific Factors:

This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- the proposed land use is altered;
- the defined subject site is increased or sub-divided;
- the proposed development details including size, configuration, location, orientation of the structures are modified;
- the proposed development levels are altered, eg addition of basement levels; or
- ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (eg. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is Based on Professional Interpretations of Factual Data

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Environmental Site Assessment Limitations

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Environmental Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an environmental assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Environmental Assessment Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problems, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the test of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

REPORT TABLES

TABLE A
CHEMICAL CONTAMINANT CRITERIA FOR WASTE CLASSIFICATION

Waste Classification Guidelines. Part 1: Classifying Waste DECC (now OEH) NSW July 2009

GENERAL SOLID WASTE	RESTRICTED SOLID WASTE	HAZARDOUS WASTE
IF SCC ≤ CT1, TCLP NOT NEEDED TO CLASSIFY AS GENERAL SOLID WASTE	IF SCC ≤ CT2, TCLP NOT NEEDED TO CLASSIFY AS RESTRICTED SOLID WASTE	IF SCC > CT2, TCLP NOT NEEDED TO CLASSIFY AS HAZARDOUS WASTE
IF TCLP ≤ TCLP1 AND SCC ≤ SCC1 TREAT AS GENERAL SOLID WASTE	IF TCLP ≤ TCLP2 AND SCC ≤ SCC2 TREAT AS RESTRICTED SOLID WASTE	IF TCLP > TCLP2 AND/OR SCC > SCC2 TREAT AS HAZARDOUS WASTE

	GENERAL SOLID WASTE			RESTRICTED SOLID WASTE		
CONTAMINANT	CT1 (mg/kg)	TCLP1 (mg/L)	SCC1 (mg/kg)	CT2 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)
Arsenic	100	5	500	400	20	2,000
Beryllium	20	1.0	100	80	4	400
Cadmium	20	1.0	100	80	4	400
Chromium VI	100	5	1,900	400	20	7,600
Cyanide (total)	320	16	5,900	1280	64	23,600
Cyanide (Amenable)	70	3.5	300	280	14	1,200
Fluoride	3,000	150	10,000	12,000	600	40,000
Lead	100	5	1,500	400	20	6,000
Mercury	4	0.2	50	16	0.8	200
Molybdenum	100	5	1,000	400	20	4,000
Nickel	40	2	1,050	160	8	4,200
Selenium	20	1	50	80	4	200
Silver	100	5.0	180	400	20	720
Benzene	10	0.5	18	40	2	72
Toluene	288	14.4	518	1,152	57.6	2,073
Ethylbenzene	600	30	1,080	2,400	120	4,320
Total xylenes	1,000	50	1,800	4,000	200	7,200
Total petroleum hydrocarbons (C6-C9)	-	-	650	-	-	2,600
Total petroleum hydrocarbons (C10-C36) (C10-C14, C15-C28, C29-C36)	-	-	10,000	-	-	40,000
Benzo(a)pyrene	0.8	0.04	10	3.2	0.16	23
Polycyclic aromatic hydrocarbons (Total)	-	-	200	-	-	800
Polychlorinated biphenyls	-	-	<50	-	-	<50
Phenol (nonhalogenated)	288	14.4	518	1,152	57.6	2,073
Scheduled chemicals	-	-	<50	-	-	<50

NOTE:

SCC – Specific Contaminant Concentration
CT – Contaminant Threshold
TCLP – Toxicity Characteristics Leaching Procedure

TABLE B
SUMMARY OF SOIL LABORATORY RESULTS
All data in mg/kg unless stated otherwise

ANALYTE			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES				OP PESTICIDES	PCBs	PETROLEUM HYDROCARBONS									PID VALUES	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor			Petroleum Hydrocarbons					Benzene	Toluene	Ethyl benzene	Total Xylenes		
																			C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	C_{10} - C_{36}						
PQL - Envirolab Services			4	0.5	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.5	0.5	1	3		100
Site Assessment Criteria (SAC)			500	100	60%	5000	1500	75	3000	35000	100	5	50	250	1000	50	0.1^	50	65*	nsl	nsl	nsl	1000*	1*	1.4*	3.1*	14*		100^
General Solid Waste CT1$^+$			100	20	100	nsl	100	4	40	nsl	nsl	0.8	nsl					nsl	nsl	nsl			nsl	10	288	600	1000	-	-
General Solid Waste SCC1$^+$			500	100	1900	nsl	1500	50	1050	nsl	200	10	50					50	650	nsl			10000	18	518	1080	1800	-	-
Restricted Solid Waste CT2$^+$			400	80	400	nsl	400	16	160	nsl	nsl	3.2	nsl					nsl	nsl	nsl			nsl	40	1152	2400	4000	-	-
Restricted Solid Waste SCC2$^+$			2000	400	7600	nsl	6000	200	4200	nsl	800	23	50					50	2600	nsl			40000	72	2073	4320	7200	-	-
Sample Reference	**Sample Depth**	**Sample Description**																											
BH2	0.5-0.9	Fill: Silty Clay	7	0.6	31	LPQL	18	LPQL	LPQL	3	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH2	0.9-1.0	Silty Clay	7	LPQL	19	2	23	LPQL	LPQL	8	27.5	1.6	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
BH3	0.5-0.95	Fill: Silty Clay	6	LPQL	38	1	20	0.2	5	12	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH3	1.5-1.95	Silty Clay	10	0.8	58	LPQL	21	LPQL	2	20	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
BH4	0.8-1.0	Fill: Silty Clay	7	0.5	40	2	17	LPQL	3	95	6.02	0.62	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH5	0.5-0.95	Fill: Silty Clay	10	LPQL	41	2	29	LPQL	3	33	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH5	1.5-1.95	Silty Clay	8	0.7	41	LPQL	16	LPQL	1	1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
BH7	0.1-0.3	Fill: Silty Clay	14	LPQL	19	25	150	0.2	8	170	3.44	0.34	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	120	LPQL	120	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH8	0.15-0.4	Fill: Silty Gravel	6	LPQL	29	7	94	0.1	4	66	18.4	2.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH9	0.2-0.3	Fill: Sandy Clay	9	LPQL	17	14	61	0.2	3	52	0.15	0.05	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH9	3-3.45	Silty Clay	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.7	na
BH9	4.5-4.95	Silty Clay	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.4	na
BH9	5.8-6	Silty Clay	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	11.2	na
BH10	0.4-0.6	Fill: Gravelly Silty Clay	7	LPQL	22	21	190	0.6	3	390	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH10	0.6-1.0	Silty Clay	7	LPQL	24	LPQL	19	LPQL	LPQL	9	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
Total Number of samples			12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	15	15	15	15	15	15	15	15	15	15	8
Maximum Value			14	0.8	58	25	190	0.6	8	390	27.5	2.5	0	0	0	0	0	0	0	0	120	0	120	0	0	0	0	11.2	nc

EXPLANATION:

Site Assessment Criteria (SAC): Guideline concentrations adopted for the investigation as outlined below:

National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC Guidelines): Health Investigation Levels (HIL) - Column F, 'Commercial/industrial'

Provisional Phyto-toxicity Investigation Levels (PPILs)

* NSW DECC Guidelines for Assessing Service Station Sites (1994)

^ In the absence of Australian guidelines, the laboratory PQL has been adopted as the site assessment criteria

$^+$ NSW DECCW Waste Classification Guidelines (2009)

Concentration above the Site Assessment Criteria	***VALUE***

ABBREVIATIONS:

PAHs: Polycyclic Aromatic Hydrocarbons	UCL: Upper Level Confidence Limit on Mean Value
B(a)P: Benzo(a)pyrene	ALPQL: All values less than PQL
PQL: Practical Quantitation Limit	na: Not Analysed
LPQL: Less than PQL	nc: Not Calculated
OP: Organophosphorus Pesticides	nsl: No Set Limit
PID: Photoionisation Detector	
PCBs: Polychlorinated Biphenyls	

TABLE C

SUMMARY OF SOIL LABORATORY RESULTS- WASTE CLASSIFICATION

All data in mg/kg unless stated otherwise

ANALYTE			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES				Total Scheduled Chemicals	PCBs	PETROLEUM HYDROCARBONS									PID VALUES	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor			Petroleum Hydrocarbons					Benzene	Toluene	Ethyl benzene	Total Xylenes		
																			C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	C_{10} - C_{36}						
PQL - Envirolab Services			4	0.5	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.5	0.5	1	3		100
General Solid Waste CT1⁺			100	20	100	nsl	100	4	40	nsl	nsl	0.8	nsl					nsl	nsl	nsl			nsl	10	288	600	1000	-	-
General Solid Waste SCC1⁺			500	100	1900	nsl	1500	50	1050	nsl	200	10	50					50	650	nsl			10000	18	518	1080	1800	-	-
Restricted Solid Waste CT2⁺			400	80	400	nsl	400	16	160	nsl	nsl	3.2	nsl					nsl	nsl	nsl			nsl	40	1152	2400	4000	-	-
Restricted Solid Waste SCC2⁺			2000	400	7600	nsl	6000	200	4200	nsl	800	23	50					50	2600	nsl			40000	72	2073	4320	7200	-	-
Sample Reference	**Sample Depth**	**Sample Description**																											
BH2	0.5-0.9	Fill: Silty Clay	7	0.6	31	LPQL	18	LPQL	LPQL	3	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH2	0.9-1.0	Silty Clay	7	LPQL	19	2	23	LPQL	LPQL	8	27.5	**1.6**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
BH3	0.5-0.95	Fill: Silty Clay	6	LPQL	38	1	20	0.2	5	12	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH3	1.5-1.95	Silty Clay	10	0.8	58	LPQL	21	LPQL	2	20	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
BH4	0.8-1.0	Fill: Silty Clay	7	0.5	40	2	17	LPQL	3	95	6.02	0.62	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH5	0.5-0.95	Fill: Silty Clay	10	LPQL	41	2	29	LPQL	3	33	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH5	1.5-1.95	Silty Clay	8	0.7	41	LPQL	16	LPQL	1	1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
BH7	0.1-0.3	Fill: Silty Clay	14	LPQL	19	25	**150**	0.2	8	170	3.44	0.34	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	120	LPQL	120	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH8	0.15-0.4	Fill: Silty Gravel	6	LPQL	29	7	94	0.1	4	66	18.4	**2.5**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH9	0.2-0.3	Fill: Sandy Clay	9	LPQL	17	14	61	0.2	3	52	0.15	0.05	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH9	3-3.45	Silty Clay	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.7	na
BH9	4.5-4.95	Silty Clay	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.4	na
BH9	5.8-6	Silty Clay	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	11.2	na
BH10	0.4-0.6	Fill: Gravelly Silty Clay	7	LPQL	22	21	**190**	0.6	3	390	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH10	0.6-1.0	Silty Clay	7	LPQL	24	LPQL	19	LPQL	LPQL	9	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	na
Total Number of samples			12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	15	15	15	15	15	15	15	15	15	15	8
Maximum Value			14	0.8	58	25	190	0.6	8	390	27.5	2.5	0	0	0	0	0	0	0	0	120	0	120	0	0	0	0	11.2	nc

EXPLANATION:

⁺ NSW DECCW Waste Classification Guidelines (2009)

Concentration above the CT1	🟩 VALUE
Concentration above SCC1	🟧 VALUE
Concentration above the SCC2	🟥 VALUE

ABBREVIATIONS:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
OP: Organophosphorus Pesticides
PID: Photoionisation Detector
PCBs: Polychlorinated Biphenyls

UCL: Upper Level Confidence Limit on Mean Value
ALPQL: All values less than PQL
na: Not Analysed
nc: Not Calculated
nsl: No Set Limit

TABLE D
SUMMARY OF LABORATORY RESULTS
TOXICITY CHARACTERISTICS LEACHING PROCEDURE (TCLP)
All data in mg/L unless stated otherwise

ANALYTE		Arsenic	Cadmium	Chromium	Lead	Mercury	Nickel	B(a)P
PQL - Envirolab Services		0.05	0.01	0.01	0.03	0.0005	0.02	0.001
TCLP1 - General Solid Waste +		5	1	5	5	0.2	2	0.04
TCLP2 - Restricted Solid Waste +		20	4	20	20	0.8	8	0.16
TCLP3 - Hazardous Waste +		>20	>4	>20	>20	>0.8	>8	>0.16
Sample Reference	**Sample Depth**							
BH2	0.5-0.9	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	0.9-1.0	na	na	na	na	na	na	LPQL
BH3	0.5-0.95	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH4	0.8-1.0	LPQL	LPQL	LPQL	0.04	LPQL	LPQL	LPQL
BH5	0.5-0.95	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH7	0.1-0.3	LPQL	LPQL	LPQL	0.04	LPQL	LPQL	LPQL
BH8	0.15-0.4	LPQL	LPQL	LPQL	0.06	LPQL	LPQL	LPQL
BH9	0.2-0.3	LPQL	LPQL	LPQL	0.05	LPQL	LPQL	LPQL
BH10	0.4-0.6	LPQL	LPQL	LPQL	0.8	LPQL	LPQL	LPQL
Total Number of samples		8	8	8	8	8	8	9
Maximum Value		0	0	0	0.8	0	0	0

EXPLANATION:

+ NSW DECCW Waste Classification Guidelines (2009)

General Solid Waste	**VALUE**
Restricted Solid Waste	🟧 **VALUE**
Hazardous Waste	🟥 **VALUE**

ABBREVIATIONS:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
B(a)P: Benzo(a)pyrene
nc: Not Calculated
na: Not Analysed

TABLE E
GROUNDAWATER SAC MASTER FILE
All results in µg/L unless stated otherwise.

ANALYTE	PQL Envirolab Services	SAC	SAC	SAC	SAC	SAMPLES			
		ANZECC 2000 Fresh Waters[1]	US EPA[5]	Drinking Water[2]	Sydney Water[4] Acceptance Standards	MW3	MW4	MW9	Dup A
Field Measurements *									
Dissolved oxygen (ppm)	-	nsl	nsl	>85%[d]	nsl	1	0.7	1.7	na
Redox potential (mV)	-	nsl	nsl	nsl	nsl	219.7	246.6	167.6	na
pH	-	7 - 8.5[j]	nsl	6.5 - 8.5[d]	7-10	4.33	4.67	7	na
Conductivity (µS/cm)	-	nsl	nsl	nsl	nsl	1722	408.2	477.9	na
Temperature °C	-	nsl	nsl	nsl	38	19.1	19	17.8	na
Inorganic Compounds and Parameters									
pH	0.1	7 - 8.5[j]	nsl	6.5 - 8.5[d]	7-10	**4.8**	**5.1**	7.2	na
Electrical Conductivity (µS/cm)	1	nsl	nsl	nsl	nsl	2300	570	690	na
Hardness (mgCaCo3/L)	1	nsl	nsl	200[d]	nsl	100	20	17	na
Heavy Metals									
Arsenic (As III)	1	24	-	10	1000	7	LPQL	1	LPQL
Cadmium	0.1	0.3[a^]	-	2	1000	**0.3**	LPQL	LPQL	LPQL
Chromium (III)	1	1.4[a^]	-	nsl	3000	LPQL	LPQL	**6**	LPQL
Copper	1	2[a^]	-	2000	5000	**11**	**4**	**2**	**4**
Lead	1	5.8[a^]	-	10	2000	LPQL	LPQL	LPQL	1
Mercury (inorganic)	0.5	0.6	-	1	30	LPQL	LPQL	LPQL	LPQL
Nickel	1	15.7[a^]	-	20	3000	**16**	3	LPQL	3
Zinc	1	11.4[a^]	-	3000[d]	5000	**43**	**19**	LPQL	**18**
Petroleum Hydrocarbons									
Hydrocarbons C6-C9	10	nsl	-	nsl	10000	LPQL	LPQL	150	LPQL
Hydrocarbons C10-C14	50	nsl	-	nsl	nsl	LPQL	LPQL	120	LPQL
Hydrocarbons C15-C28	100	nsl	-	nsl	nsl	LPQL	LPQL	LPQL	LPQL
Hydrocarbons C29-C36	100	nsl	-	nsl	nsl	LPQL	LPQL	LPQL	LPQL
Total Hydrocarbons C10-C36	-	600[b]	-	nsl	nsl	LPQL	LPQL	120	LPQL
BTEX									
Benzene	1	950[a]	-	1	100	LPQL	LPQL	LPQL	LPQL
Toluene	1	180[a]	-	800	500	1	1	LPQL	1
Ethylbenzene	1	5[a]	-	300	1000	LPQL	LPQL	LPQL	LPQL
m+p-xylene	2	75[a*]	-	nsl	See total xylenes	LPQL	LPQL	LPQL	LPQL
o-xylene	1	350[a]	-	nsl	See total xylenes	LPQL	LPQL	LPQL	LPQL
Total xylenes	1	nsl	-	600	1000	LPQL	LPQL	LPQL	LPQL
VOCs									
Toluene	1	see BTEX	see BTEX	see BTEX	See total VOCs	1	1	LPQL	1
Total VOCs	-				1000	1	1	LPQL	1
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.1	16[a]	0.14	nsl	see total PAHs	LPQL	LPQL	1	LPQL
Acenaphthylene	0.1	nsl	nsl	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Acenaphthene	0.1	nsl	2200	nsl	see total PAHs	LPQL	LPQL	0.3	LPQL
Fluorene	0.1	nsl	1500	nsl	see total PAHs	LPQL	LPQL	0.4	LPQL
Phenanthrene	0.1	0.6[c]	nsl	nsl	see total PAHs	LPQL	LPQL	**0.7**	LPQL
Anthracene	0.1	0.01[c]	11000	nsl	see total PAHs	LPQL	LPQL	**0.3**	LPQL
Fluoranthene	0.1	1[c]	1500	nsl	see total PAHs	LPQL	LPQL	0.1	LPQL
Pyrene	0.1	nsl	1100	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Benzo(a)anthracene	0.1	nsl	0.029	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Chrysene	0.1	nsl	2.9	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Benzo(b,k)fluoranthene	0.2	nsl	nsl	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Benzo(a)pyrene	0.1	0.1[c]	-	0.01	see total PAHs	LPQL	LPQL	LPQL	LPQL
Indeno(1,2,3-c,d)pyrene	0.1	nsl	0.029	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Dibenzo(a,h)anthracene	0.1	nsl	0.0029	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Benzo(g,h,i)perylene	0.1	nsl	nsl	nsl	see total PAHs	LPQL	LPQL	LPQL	LPQL
Total PAHs	-	nsl	nsl	nsl	5000	LPQL	LPQL	2.8	LPQL

EXPLANATION:

1 - ANZECC Australian Water Quality Guidelines for Fresh Waters, 2000 - Trigger Values for protection of 95% of species
2 - NHMRC Australian Drinking Water Guidelines (2011)
4 - Sydney Water Industrial Customers, Acceptance Standards and Charging Rates for 2010-11 (reference should be made to the Notes to Acceptance Standards presented in this document)
5 - In the absence of Australian guidelines, the USEPA (2010) Region 9 Screening Levels for tapwater have been adopted as a preliminary screening tool

a - In the absence of a high reliability guideline concentration, the moderate or low reliability guideline concentration has been quoted
b - In the absence of locally endorsed guidelines, the Dutch intervention levels specified in 'Circular on target values and intervention values for soil remediation' (Ministry of Housing and the Environment 2000) have been quoted
c - 99% trigger values adopted due to the potential for bioaccumulation effects
d - In the absence of a health guideline the aesthetic guideline concentration has been quoted
j - ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 - Level for South-East Australian Estuaries
a* - Guideline value adopted for m-Xylene. We note that the m-Xylene guideline value is 75ug/L and the p-Xylene guideline value is 200ug/L. However these two isomers cannot be distinguished analytically. Therefore EIS have adopted the more conservative guideline value
a^ - hardness modified trigger values (HMTV)

* Field Measurements Undertaken on **27/6/12**

Concentration above the SAC	VALUE
Concentration above Drinking Water Guidelines	VALUE

ABBREVIATIONS:

na: Not Analysed
nsl: No Set Limit
PQL: Practical Quantitation Limit
LPQL: Less than Practical Quantitation Limit
ALPQL: All results less than the PQL
(-) : Not Applicable

TABLE F
SOIL INTRA-LABORATORY DUPLICATE RESULTS
QA/QC - RELATIVE PERCENTAGE DIFFERENCES

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Intra-laboratory Soil sample ID = BH9 0.2-0.3m Dup ID = Dup A Envirolab Report: 75183	Arsenic	4	9	12	10.5	28.6
	Cadmium	0.5	LPQL	LPQL	nc	nc
	Chromium	1	17	18	17.5	5.7
	Copper	1	14	30	22	72.7
	Lead	1	61	110	85.5	57.3
	Mercury	0.1	0.2	0.3	0.25	40.0
	Nickel	1	3	5	4	50.0
	Zinc	1	52	89	70.5	52.5
	Naphthalene	0.1	LPQL	LPQL	nc	nc
	Acenaphthylene	0.1	LPQL	LPQL	nc	nc
	Acenaphthene	0.1	LPQL	LPQL	nc	nc
	Fluorene	0.1	LPQL	LPQL	nc	nc
	Phenanthrene	0.1	LPQL	0.1	0.075	66.7
	Anthracene	0.1	LPQL	LPQL	nc	nc
	Fluoranthene	0.1	0.1	0.2	0.15	66.7
	Pyrene	0.1	LPQL	0.2	0.125	120.0
	Benzo(a)anthracene	0.1	LPQL	0.1	0.075	66.7
	Chrysene	0.1	LPQL	0.1	0.075	66.7
	Benzo(b)&(k)fluorant	0.2	LPQL	LPQL	nc	nc
	Benzo(a)pyrene	0.05	0.05	0.09	0.07	57.1
	Indeno(123-cd)pyrene	0.1	LPQL	LPQL	nc	nc
	Dibenzo(ah)anthracene	0.1	LPQL	LPQL	nc	nc
	Benzo(ghi)perylene	0.1	LPQL	LPQL	nc	nc
	Total OCPs	0.1	LPQL	LPQL	nc	nc
	Total OPPs	0.1	LPQL	LPQL	nc	nc
	Total PCBs	0.1	LPQL	LPQL	nc	nc
	C_6-C_9 TPH	25	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	50	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	100	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	100	LPQL	LPQL	nc	nc
	Benzene	0.5	LPQL	LPQL	nc	nc
	Toluene	0.5	LPQL	LPQL	nc	nc
	Ethylbenzene	1	LPQL	LPQL	nc	nc
	m+p-xylene	2	LPQL	LPQL	nc	nc
	o-xylene	1	LPQL	LPQL	nc	nc

EXPLANATION:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

- Results > 10 times PQL = RPD value <= 50% are acceptable
- Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
- Results < 5 times PQL = RPD value <= 100% are acceptable

RPD Results Above the Acceptance Criteria	VALUE

ABBREVIATIONS:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
nc: Not Calculated

TABLE G
SOIL INTER-LABORATORY DUPLICATE RESULTS
QA/QC - RELATIVE PERCENTAGE DIFFERENCES
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	NMI PQL	INITIAL	REPEAT	MEAN	RPD %
Inter-laboratory Soil sample ID = BH7 0.1-0.3 Dup ID = Dup B Envirolab Report: 75183 and NMI Report: RN922455	Arsenic	4	0.5	14	33	23.5	80.9
	Cadmium	0.5	0.5	LPQL	LPQL	nc	nc
	Chromium	1	0.5	19	32	25.5	51.0
	Copper	1	0.5	25	26	25.5	3.9
	Lead	1	0.5	150	230	190	42.1
	Mercury	0.1	0.2	0.2	0.43	0.315	73.0
	Nickel	1	0.5	8	8.5	8.25	6.1
	Zinc	1	0.5	170	200	185	16.2
	Naphthalene	0.1	0.5	LPQL	LPQL	nc	nc
	Acenaphthylene	0.1	0.5	LPQL	LPQL	nc	nc
	Acenaphthene	0.1	0.5	LPQL	LPQL	nc	nc
	Fluorene	0.1	0.5	LPQL	LPQL	nc	nc
	Phenanthrene	0.1	0.5	0.3	LPQL	0.275	18.2
	Anthracene	0.1	0.5	LPQL	LPQL	nc	nc
	Fluoranthene	0.1	0.5	0.6	0.7	0.65	15.4
	Pyrene	0.1	0.5	0.6	0.71	0.655	16.8
	Benzo(a)anthracene	0.1	0.5	0.3	LPQL	0.275	18.2
	Chrysene	0.1	0.5	0.3	LPQL	0.275	18.2
	Benzo(b)&(k)fluorant	0.2	1	0.6	LPQL	0.55	18.2
	Benzo(a)pyrene	0.05	0.5	0.34	LPQL	0.295	30.5
	Indeno(123-cd)pyrene	0.1	0.5	0.2	LPQL	0.225	22.2
	Dibenzo(ah)anthracene	0.1	0.5	LPQL	LPQL	nc	nc
	Benzo(ghi)perylene	0.1	0.5	0.2	LPQL	0.225	22.2
	Total OCPs	0.1	0.1	LPQL	LPQL	nc	nc
	Total OPPs	0.1	0.1	LPQL	LPQL	nc	nc
	Total PCBs	0.1	0.1	LPQL	LPQL	nc	nc
	C_6-C_9 TPH	25	25	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	50	50	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	100	100	120	380	250	104.0
	C_{29}-C_{36} TPH	100	100	LPQL	170	110	109.1
	Benzene	0.5	0.5	LPQL	LPQL	nc	nc
	Toluene	0.5	0.5	LPQL	LPQL	nc	nc
	Ethylbenzene	1	0.5	LPQL	LPQL	nc	nc
	m+p-xylene	2	1	LPQL	LPQL	nc	nc
	o-xylene	1	0.5	LPQL	LPQL	nc	nc

EXPLANATION:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

- Results > 10 times PQL = RPD value < 50% are acceptable
- Results between 5 & 10 times PQL = RPD value < 75% are acceptable
- Results < 5 times PQL = RPD value < 100% are acceptable

RPD Results Above the Acceptance Criteria VALUE

ABBREVIATIONS:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
nc: Not Calculated

TABLE H
GROUNDWATER INTRA-LABORATORY DUPLICATE RESULTS
QA/QC - RELATIVE PERCENTAGE DIFFERENCES
All results in µg/L unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Intra-laboratory Water sample ID = MW4 Dup ID = Dup A Envirolab Report: 75372	Arsenic	1	LPQL	LPQL	nc	nc
	Cadmium	0.1	LPQL	LPQL	nc	nc
	Chromium	1	LPQL	LPQL	nc	nc
	Copper	1	4	4	4	0.0
	Lead	1	LPQL	1	0.75	66.7
	Mercury	0.5	LPQL	LPQL	nc	nc
	Nickel	1	3	3	3	0.0
	Zinc	1	19	18	18.5	5.4
	Naphthalene	0.1	LPQL	LPQL	nc	nc
	Acenaphthylene	0.1	LPQL	LPQL	nc	nc
	Acenaphthene	0.1	LPQL	LPQL	nc	nc
	Fluorene	0.1	LPQL	LPQL	nc	nc
	Phenanthrene	0.1	LPQL	LPQL	nc	nc
	Anthracene	0.1	LPQL	LPQL	nc	nc
	Fluoranthene	0.1	LPQL	LPQL	nc	nc
	Pyrene	0.1	LPQL	LPQL	nc	nc
	Benzo(a)anthracene	0.1	LPQL	LPQL	nc	nc
	Chrysene	0.1	LPQL	LPQL	nc	nc
	Benzo(b)&(k)fluorant	0.2	LPQL	LPQL	nc	nc
	Benzo(a)pyrene	0.1	LPQL	LPQL	nc	nc
	Indeno(123-cd)pyrene	0.1	LPQL	LPQL	nc	nc
	Dibenzo(ah)anthracene	0.1	LPQL	LPQL	nc	nc
	Benzo(ghi)perylene	0.1	LPQL	LPQL	nc	nc
	Total OCPs	0.1	na	na	nc	nc
	Total OPPs	0.1	na	na	nc	nc
	Total PCBs	0.1	na	na	nc	nc
	C_6-C_9 TPH	10	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	50	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	100	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	100	LPQL	LPQL	nc	nc
	Benzene	1	LPQL	LPQL	nc	nc
	Toluene	1	1	1	1	0.0
	Ethylbenzene	1	LPQL	LPQL	nc	nc
	m+p-xylene	2	LPQL	LPQL	nc	nc
	o-xylene	1	LPQL	LPQL	nc	nc

EXPLANATION:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

- Results > 10 times PQL = RPD value < 50% are acceptable
- Results between 5 & 10 times PQL = RPD value < 75% are acceptable
- Results < 5 times PQL = RPD value < 100% are acceptable

RPD Results Above the Acceptance Criteria	VALUE

ABBREVIATIONS:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
na: Not Analysed
nc: Not Calculated

TABLE I
SUMMARY OF LABORATORY RESULTS
QA/QC - TRIP SPIKE, TRIP BLANK AND RINSATE

ANALYSIS	**Envirolab PQL**		TB1[s] 18/06/2012 75183 mg/kg	RS1[w] 18/06/2012 75183 µg/L	RS2[w] 21/06/2012 75183 µg/L	TS1[s] 19/06/2012 75183 % Recovery	TS1[w] 27/06/2012 75372 % Recovery
	mg/kg	**µg/L**					
Benzene	1	1	LPQL	LPQL	LPQL	129%	85%
Toluene	1	1	LPQL	LPQL	LPQL	129%	88%
Ethylbenzene	1	1	LPQL	LPQL	LPQL	131%	93%
m+p-xylene	2	2	LPQL	LPQL	LPQL	130%	93%
o-xylene	1	1	LPQL	LPQL	LPQL	131%	94%

EXPLANATION:

[W] Sample type (water)
[S] Sample type (sand)
BTEX concentrations in trip spikes are presented as % recovery

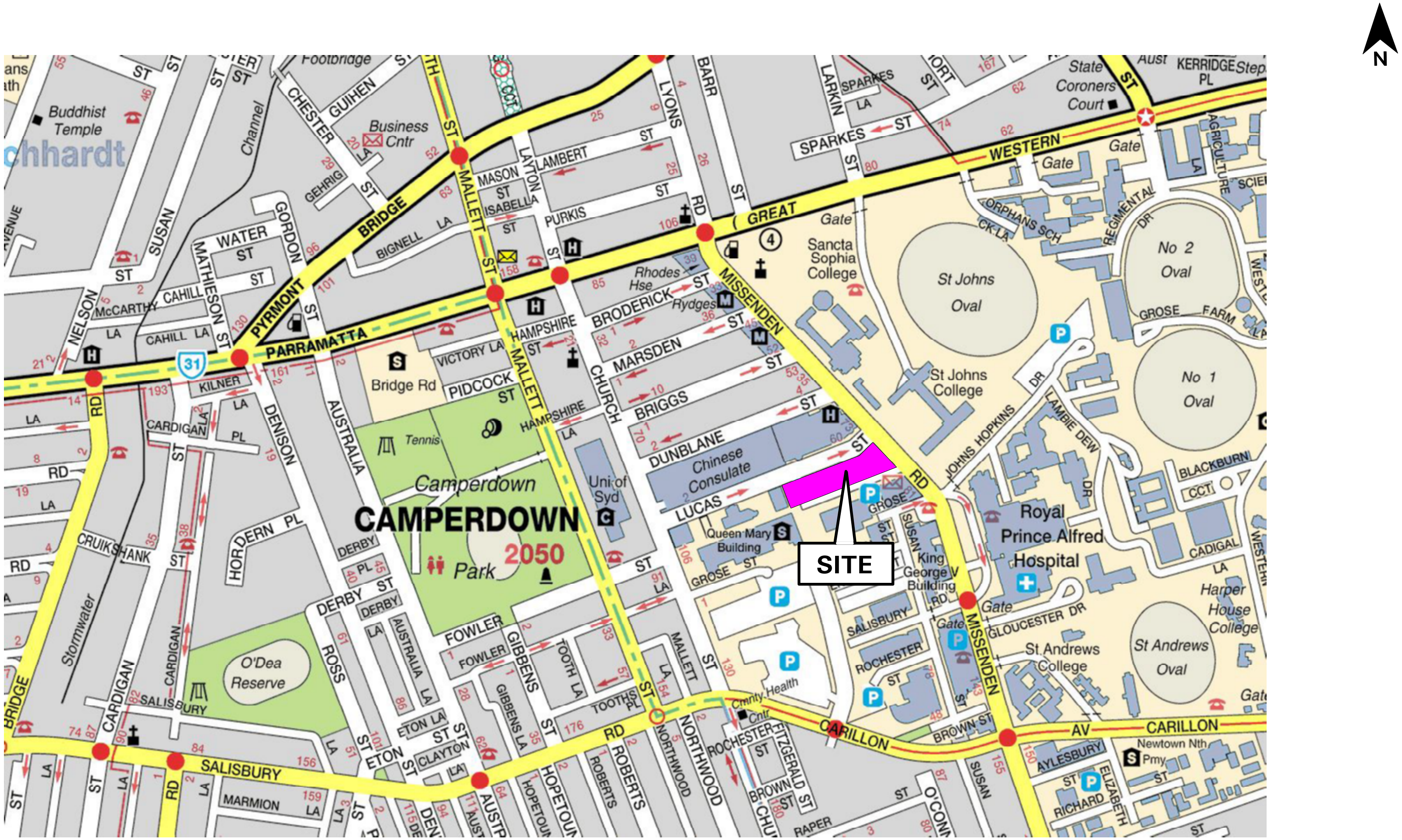
Results Above the PQLs VALUE

ABBREVIATIONS:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
(-) : Not Applicable / Not Analysed
OPP: Organophosphorus Pesticides
OCP: Organochlorine Pesticides
PCBs: Polychlorinated Biphenyls
na: Not Analysed

TB: Trip Blank
TS: Trip Spike
RS: Rinsate Sample

REPORT FIGURES



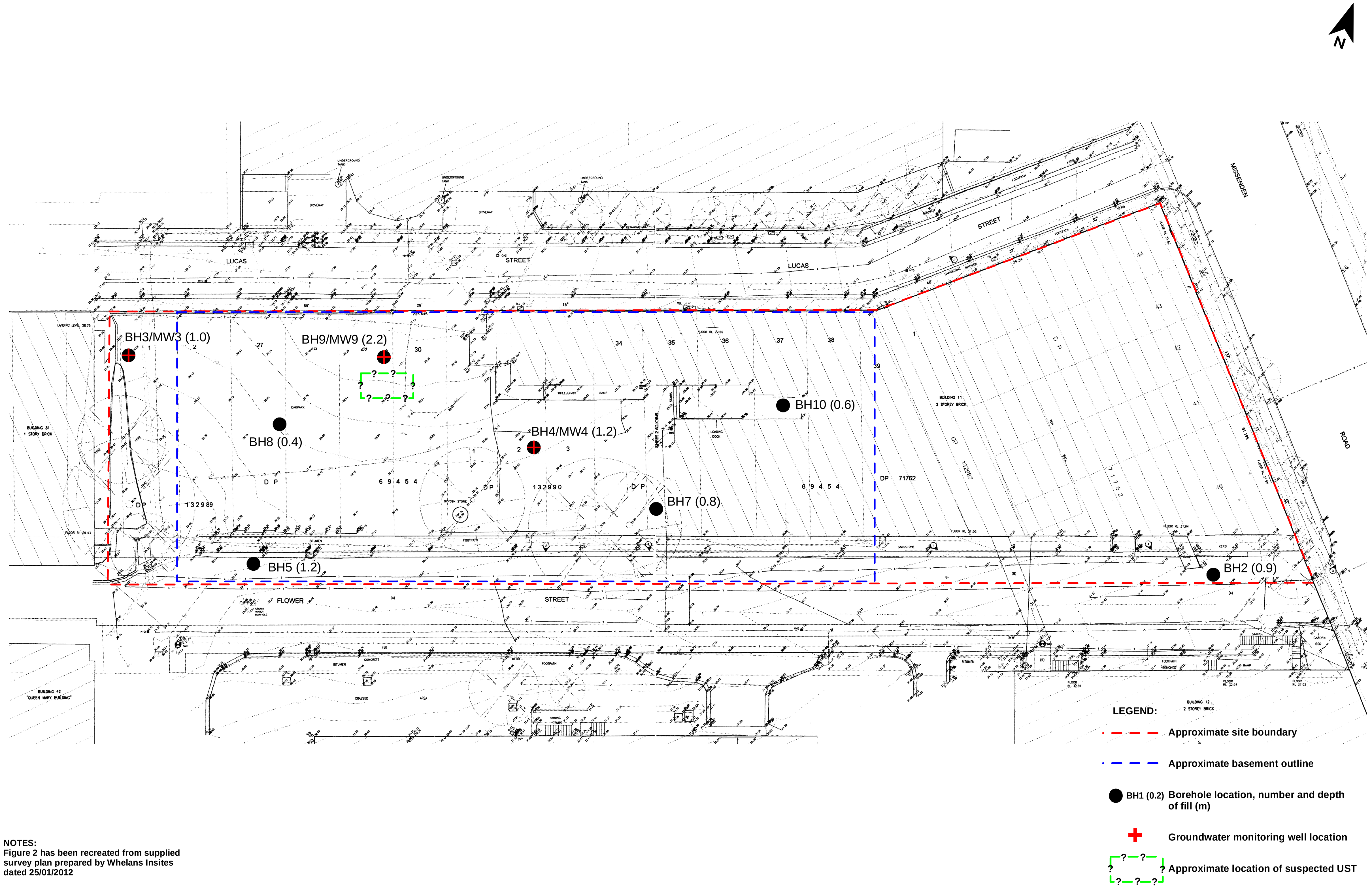
NOTES:
Figure 1 has been recreated from UBD on disc (version 5.0). Figure is not to scale.

UBD Map ref: 255 J2 & J3

Reference should be made to the report text for a full understanding of this plan.

EIS
ENVIRONMENTAL INVESTIGATION SERVICES

Project Number: E25797K	Title: SITE LOCATION PLAN
Figure: 1	Address: CORNER LUCAS STREET AND MISSENDEN ROAD, CAMPERDOWN, NSW



NOTES:
Figure 2 has been recreated from supplied survey plan prepared by Whelans Insites dated 25/01/2012

The borehole locations presented on this plan have been established from site measurements only and should not be construed as survey points.

Reference should be made to the report text for a full understanding of this plan.

Approximate Scale (m):

0 10 20 30 40

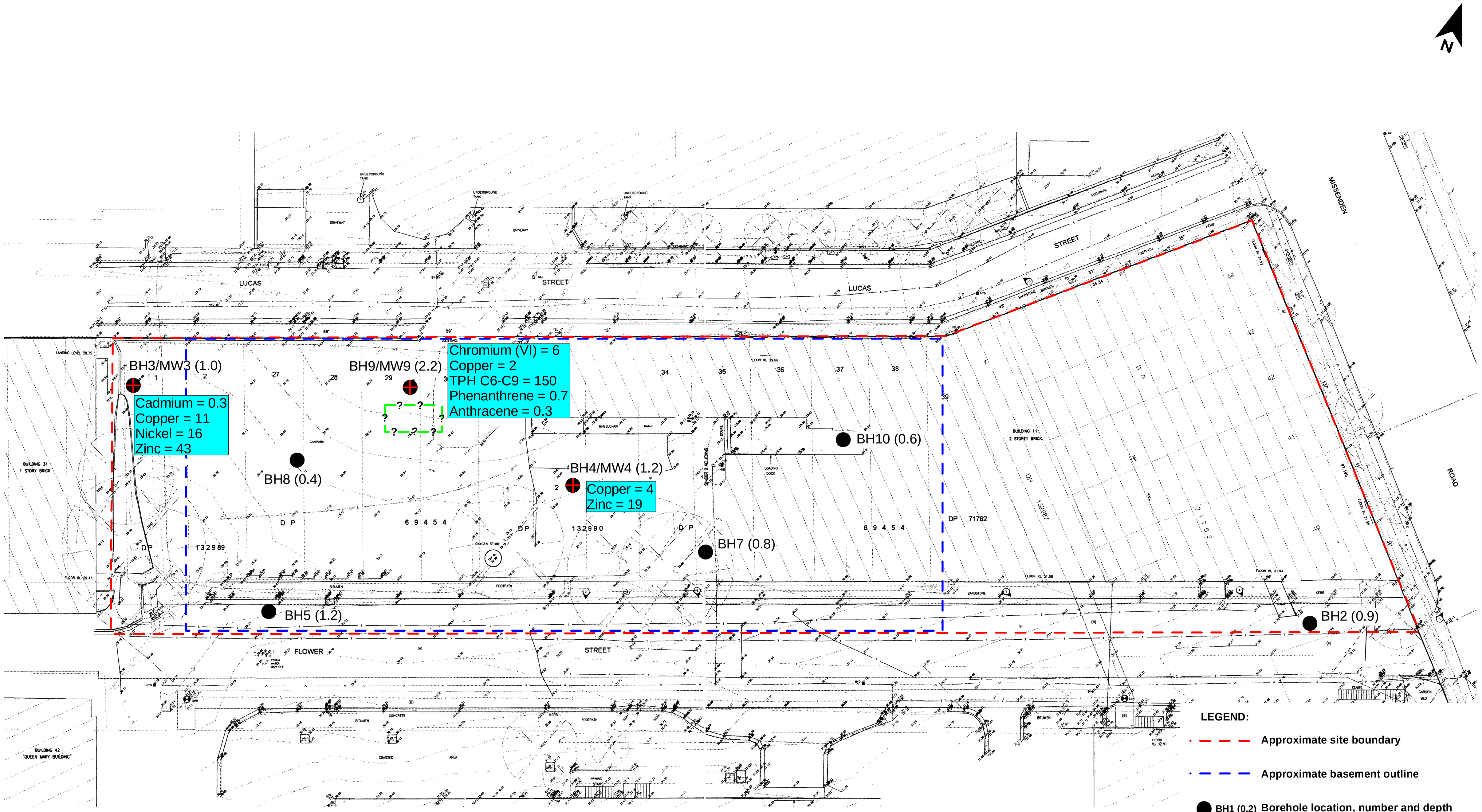
EIS
ENVIRONMENTAL INVESTIGATION SERVICES

Project Number:
E25797K

Title:
BOREHOLE LOCATION PLAN

Figure:
2

Address:
CORNER LUCAS STREET AND
MISSENDEN ROAD,
CAMPERDOWN, NSW



LEGEND:

🟥 - - -	Approximate site boundary
🟦 - - -	Approximate basement outline
● BH1 (0.2)	Borehole location, number and depth of fill (m)
✚	Groundwater monitoring well location
? ? ?	Approximate location of suspected UST
TPH = 600 Lead = 700	Groundwater contamination data (ug/L) above SAC adopted for the investigation (see report text)

NOTES:
Figure 3 has been recreated from supplied survey plan prepared by Whelans Insites dated 25/01/2012

The borehole locations presented on this plan have been established from site measurements only and should not be construed as survey points.

Reference should be made to the report text for a full understanding of this plan.

Approximate Scale (m):
0 10 20 30 40

EIS
ENVIRONMENTAL
INVESTIGATION
SERVICES

Project Number: E25797K

Figure: 3

Title: GROUNDWATER CONTAMINATION DATA PLAN

Address: CORNER LUCAS STREET AND MISSENDEN ROAD, CAMPERDOWN, NSW

APPENDIX A

(Borehole Logs and Geotechnical Explanatory Notes)

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BOREHOLE LOG

Borehole No.
2
1/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Method: SPIRAL AUGER
JK305
R.L. Surface: ≈ 31.8m
Date: 19-6-12
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				■		0		-	ASPHALTIC CONCRTE: 40mm.t	M	-	-	
									FILL: Gravelly sand, fine to medium grained, fine to medium grained igneous gravel.				APPEARS WELL COMPACTED
	■			■	N = 14 5,7,7				as above, but light brown and with medium grained sandstone gravel.	MC<PL			
						1		CL-CH	FILL: Silty clay, medium to high plasticity, red brown mottled orange brown, trace of ash.	MC<PL	H	500 450	RESIDUAL
									SILTY CLAY: medium to high plasticity, light grey mottled red brown and orange brown.				
	■			■	N = 16 7,8,8				as above, but light grey, with red brown fine grained ironstone gravel.			530 570 490	
						2							
				■	SPT 22/120mm REFUSAL	3		-	SHALE: light grey, with M-H strength red brown iron indurated bands.	XW	EL	>600	VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
						4							
ON COMPLETION OF CORING				■	N = 46 8,23,23							>600 >600 >600	
						5							
						6			as above, but dark grey, with red brown M-H strength iron indurated bands.	XW-DW	EL-L		MODERATE RESISTANCE VERY LOW RESISTANCE WITH LOW BANDS
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
2
2/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 19-6-12
Method: SPIRAL AUGER JK305
R.L. Surface: ≈ 31.8m
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▼ ON COMPLETION OF AUGERING				■					SHALE: dark grey, with red brown M-H strength iron indurated bands.	XW-DW	EL-L		VERY LOW RESISTANCE WITH LOW BANDS
									SHALE: dark grey.	DW	M		MODERATE RESISTANCE
						8					VL-L		LOW RESISTANCE
				■							L-M		LOW TO MODERATE RESISTANCE
						9			REFER TO CORED BOREHOLE LOG				
						10							
						11							
						12							
						13							
						14							

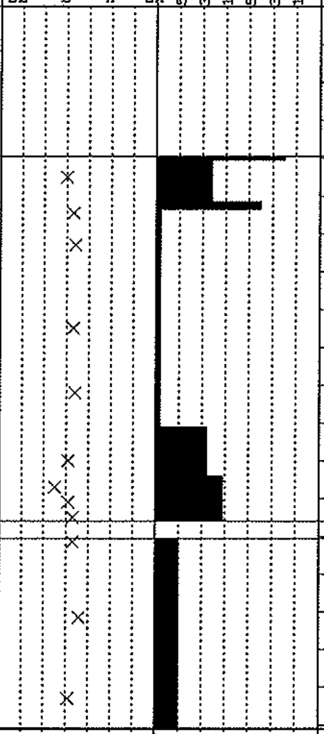
CORED BOREHOLE LOG

Borehole No.
2

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Core Size: NMLC
R.L. Surface: ≈ 31.8m
Date: 19-6-12
Inclination: VERTICAL
Datum: AHD
Drill Type: JK305
Bearing: -
Logged/Checked by: D.W./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL VL L M H VH EH	DEFECT DETAILS: DEFECT SPACING (mm) 500 300 100 50 30 10	DEFECT DETAILS: DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific	General
		8		START CORING AT 8.79m						
				SHALE: dark grey and light grey laminae, bedded at 0°.	SW	L-M			- CS, 0°, 1mm.t	
		9							- Be, 0°, P, S - Be, 0°, P, S	
						M				
		10							- J, 60°, P, S	
					DW	L-M			- XWS, 0°, 3mm.t	
				CORE LOSS 0.09m						
				SHALE: dark grey and light grey laminae, bedded at 0°.	SW	M				
		11								
									- CS, 0°, 1mm.t	
				END OF BOREHOLE AT 11.82m						
		12								
		13								
		14								



BOREHOLE LOG

Borehole No.
3
1/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 18-6-12
Method: SPIRAL AUGER
JK305
R.L. Surface: ≈ 29.1m
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	■					0		-	ASPHALTIC CONCRETE: 40mm.t	MC>PL	-	-	APPEARS MODERATELY COMPACTED
							▨		FILL: Gravelly sandy clay, medium to high plasticity, dark grey, fine to medium grained igneous gravel, ash, trace of grass and slag.				
	■			■	N = 6 4,3,3		▨		FILL: Silty clay, medium to high plasticity, trace of ash, sand and root fibres.			120 220 200	
	■		■			1	▨	CH	SILTY CLAY: high plasticity, red brown mottled light grey, trace of fine grained sand.	MC>PL	(VSt)		RESIDUAL
	■			■	N = 19 7,8,11		▨		as above, but trace of ironstone gravel.	MC<PL	VSt- H	210 410 460	
						2	▨						
							▨	CL-CH	as above, but medium to high plasticity, light grey mottled dark red brown, with M-H strength ironstone gravel.				BANDS OF VERY LOW 'TC' BIT RESISTANCE
				■	N = 18 8,8,10	3	▨				H	560 600 >600	
AFTER 24 HRS ▼						4	▤	-	SHALE: light grey, with dark red brown M strength iron indurated bands and clay bands.	XW	EL	-	VERY LOW TO LOW 'TC' BIT RESISTANCE BANDED
▼ 1.30pm 18-6-12				■	N = 32 9,13,19		▤					>600 >600 550	
						5	▤						
				■	N = 45 9,17,28	6	▤					>600 >600 >600	
						7							

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BOREHOLE LOG

Borehole No.
3
2/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 18-6-12
Method: SPIRAL AUGER
JK305
R.L. Surface: ≈ 29.1m
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: light grey, with red brown iron indurated bands and clay bands.	XW	EL		VERY LOW TO LOW RESISTANCE BANDED
					SPT 19/110mm REFUSAL	8			as above, but grey.	XW-DW	EL-VL		
ON COMPLETION OF AUGERING						9			as above, but grey, with light grey sandstone laminae.				
						10			as above, but with clay bands and XW bands.	DW	VL-L		LOW RESISTANCE
						11				XW-DW	EL-VL		VERY LOW RESISTANCE BANDED
										DW	L-M		LOW TO MODERATE RESISTANCE
						12 13 14			REFER TO CORED BOREHOLE LOG				CLASS 18 MONITORING WELL INSTALLED TO 15m DEPTH. SLOTTED BETWEEN 15m AND 9m, CASING FROM 9m TO SURFACE, BACKFILLED WITH SAND FROM 15m TO 1m, BENTONITE SEAL 1m TO SURFACE, COMPLETED WITH GATIC COVER

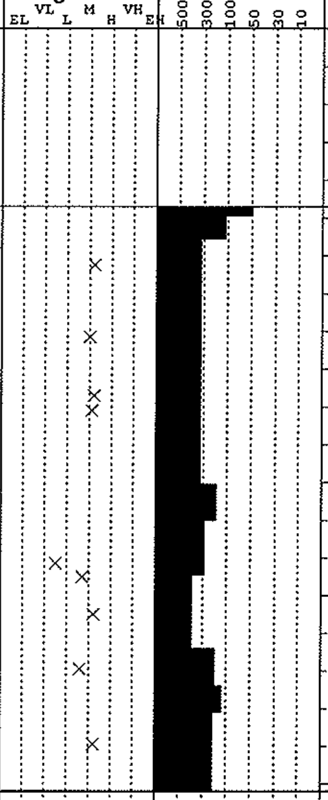
CORED BOREHOLE LOG

Borehole No.
3
3/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 18-6-12
Drill Type: JK305
Core Size: NMLC
Inclination: VERTICAL
Bearing: -
R.L. Surface: ≈ 29.1m
Datum: AHD
Logged/Checked by: D.W./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$	DEFECT SPACING (mm)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific	General
		11		START CORING AT 11.94m						
FULL RET-URN		12 13 14 15		SHALE: dark grey, with light grey laminae, and occasional healed joints.	SW	M-H H L M-H			- XWS, 0°, 1mm.t - 2xJ, 75°, P, S - J, 75°, P, S - J, 75°, P, S - J, 80°, P, S - 2xJ, 45°, P, S - J, 75°, P, S - J, 45°, P, S - J, 60°, P, S - J, 45°, P, S - J, 75°, P, S - J, 80°, P, R - J, 75°, P, R	
		16 17		END OF BOREHOLE AT 15.04m						



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BOREHOLE LOG

Borehole No.
4
1/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 18-6-12
Method: SPIRAL AUGER JK305
Logged/Checked by: D.W./
R.L. Surface: ≈ 28.8m
Datum: AHD

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		-	ASPHALTIC CONCRETE: 50mm.t				
	■							-	CONCRETE: 100mm.t	M	-	-	
									FILL: Sandy gravel, medium grained igneous, dark grey.				APPEARS MODERATELY COMPACTED
				■	N = 9 3,4,5				FILL: Silty sand, medium grained, brown.	MC>PL		210 170 280	
	■					1			FILL: Silty clay, medium to high plasticity, red brown, trace of ash and root fibres.				
								CH	SILTY CLAY: high plasticity, light grey mottled red brown.	MC>PL	VSt-H	-	RESIDUAL
	■			■	N = 14 7,7,7					MC<PL		470 340 480	
						2							
									as above, but medium plasticity, trace of fine to medium grained ironstone gravel.				
				■	N = 19 6,8,11	3					H	>600 600 590	
AFTER 17 HRS									as above, but with M-H strength fine to medium grained ironstone gravel.				
						4							
				■	N = 36 12,17,19				as above, but with XW shale bands.			>600 >600 470	
						5							
ON COMPLETION OF AUGERING													
				■	N = 26 15,16,10	6		-	SHALE: light grey mottled red brown, with iron indurated bands.	XW	EL	>600 >600 >600	VERY LOW RESISTANCE BANDED
						7							

BOREHOLE LOG

Borehole No.
4
2/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 18-6-12
Method: SPIRAL AUGER
JK305
R.L. Surface: ≈ 28.8m
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				■			▤		SHALE: dark grey.	DW	L		LOW RESISTANCE
▶						8	▤						
							▤				L-M		LOW TO MODERATE RESISTANCE
						9 10 11 12 13 14			REFER TO CORED BOREHOLE LOG				CLASS 18 MONITORING WELL INSTALLED TO 14.8m DEPTH. SLOTTED BETWEEN 14.8m AND 5.8m, CASING 5.8m TO SURFACE, SAND FILTER 14.8m TO 1m, BENTONITE SEAL 1m TO SURFACE, COMPLETED WITH GATIC COVER AT SURFACE

CORED BOREHOLE LOG

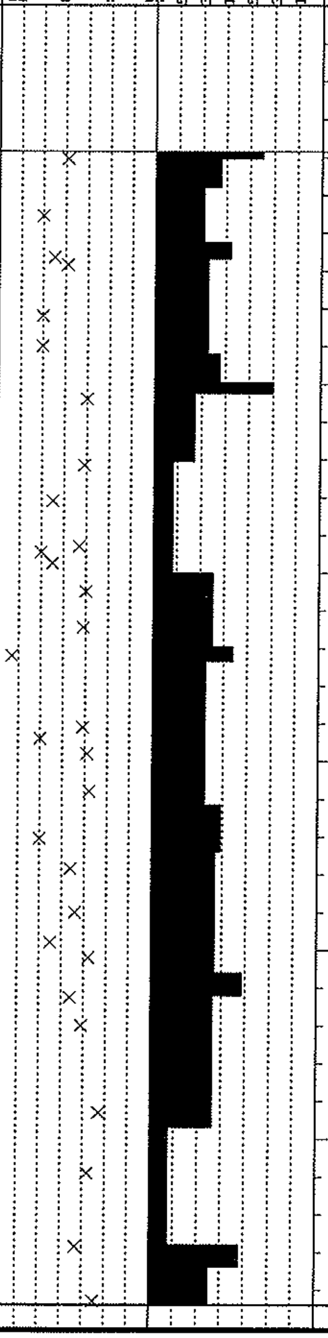
Borehole No.
4
3/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Core Size: NMLC
R.L. Surface: ≈ 28.8m
Date: 18-6-12
Inclination: VERTICAL
Datum: AHD
Drill Type: JK305
Bearing: -
Logged/Checked by: D.W./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific	General
		8		START CORING AT 8.77m				
10% RETURN				SHALE: dark grey, with light grey laminae.	DW	M	- Be, 0°, P, S	
		9				VL-M	- XWS, 0°, 1mm.t	
							- Be, 0°, P, S - J, 70-80°, P, S	
						VL-L	- XWS, 0°, 2mm.t	
		10					- CS, 0°, 1mm.t - CS, 0°, 1mm.t - CS, 0°, 2mm.t	
						M-H	- CS, 0°, 1mm.t	
						L-M		
		11				VL-L	- CS, 0°, 2mm.t	
						M-H	- XWS, 0°, 55mm.t	
						VL-M	- CS, 0°, 5mm.t - CS, 0°, 3mm.t	
							- CS, 0°, 3mm.t	
90% RETURN						M-H		
		12				VL-H	- CS, 0°, 3mm.t	
							- 4xCS, 0°, 1-3mm.t	
							- CS, 0°, 7mm.t - CS, 0°, 5mm.t	
							- 2xCS, 0°, 1mm.t	
						M	- VL STRENGTH BAND, 10mm.t - VL STRENGTH BAND, 10mm.t	
		13			SW	M-H M-H	- 4xCS, 0°, 1mm.t	
							- CS, 0°, 2mm.t	
							- 3xCS, 0°, 1mm.t	
		14						
							- 3xCS, 0°, 1mm.t - VL STRENGTH BAND, 20mm.t	
						H		
				END OF BOREHOLE AT 14.88m				

POINT LOAD STRENGTH INDEX $I_s(50)$ | DEFECT SPACING (mm)



BOREHOLE LOG

Borehole No.
5
1/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 19-6-12
Method: SPIRAL AUGER JK305
R.L. Surface: ≈ 30.0m
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	■					0		-	ASPHALTIC CONCRETE: 30mm.t	M	-	-	
									FILL: Gravelly sand, fine to medium grained igneous gravel, dark grey.				APPEARS MODERATELY COMPACTED
	■			■	N = 8 3,3,5				as above, but light brown, with medium grained sandstone gravel.	MC>PL		310 270 230	
	■					1			FILL: Silty clay, medium to high plasticity, brown, trace of ash and fine grained ironstone gravel.				
								CH	SILTY CLAY: high plasticity, red brown mottled light grey, with fine to coarse grained ironstone gravel.	MC<PL	(VSt)	-	RESIDUAL
	■			■	N = 15 8,7,8	2					H	>600 >600 440	
				■	N = 29 8,13,16	3			as above, but medium to high plasticity, light grey mottled red brown, with fine grained ironstone gravel.			>600 >600 >600	
				■	N = 24 8,10,14	4			as above, but red brown mottled light grey, with fine to medium grained ironstone gravel and XW shale bands.			>600 >600 >600	BANDS OF VERY LOW TO LOW 'TC' BIT RESISTANCE
▼ ON COMPLETION OF AUGERING						5							VERY LOW RESISTANCE BANDED
				■	N = 38 12,18,20	6 7		-	SHALE: light grey, with red brown M-H strength iron indurated bands.	XW	EL	-	VERY LOW AND LOW RESISTANCE BANDED

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BOREHOLE LOG

Borehole No.
5
2/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Date: 19-6-12
Method: SPIRAL AUGER
JK305
R.L. Surface: ≈ 30.0m
Datum: AHD
Logged/Checked by: D.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: light grey, orange brown and red brown, with M-H strength iron indurated bands and clay bands.	XW	EL		VERY LOW RESISTANCE BANDED
				■	N = 36 10,20,16							>600 >600 >600	
						8							
▶				■					as above, but dark grey.	XW-DW	EL-L		LOW RESISTANCE BANDED
					SPT 19/70mm REFUSAL	9				DW	VL-M		LOW TO MODERATE RESISTANCE WITH VERY LOW BANDS
									REFER TO CORED BOREHOLE LOG				
						10							
						11							
						12							
						13							
						14							

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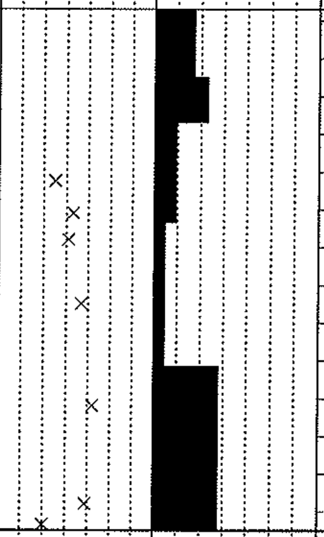
CORED BOREHOLE LOG

Borehole No.
5
3/3

Client: HEALTH INFRASTRUCTURE
Project: RPA HOSPITAL NW PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. 25797L
Core Size: NMLC
R.L. Surface: ≈ 30.0m
Date: 19-6-12
Inclination: VERTICAL
Datum: AHD
Drill Type: JK305
Bearing: -
Logged/Checked by: D.W./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL VL L M H VH EH	DEFECT SPACING (mm) 500 300 100 50 30 10	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific	General
		9		START CORING AT 9.54m						
				SHALE: dark grey, with XW, EL bands and L and M strength bands.	DW	VL			- Be, 0°, P, S	
		10							- Be, 0°, P, S	
				SHALE: dark grey and light grey laminae, bedded at 0°.	SW	L-M			- Be, 0°, P, S	
									- CS, 0°, 1mm.t	
FULL RET-URN						M				
		11								
									- 2xJ, 60-70°, P, R	
						M-H			- 2xJ, 70°, P, R	
		12							- J, 80°, P, R - J, 70°, P, R	
									- VL-L STRENGTH BAND, 30mm.t	
				END OF BOREHOLE AT 12.30m						
		13								
		14								
		15								



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ENVIRONMENTAL LOG

Borehole No.
7
1/1

Environmental logs are not to be used for geotechnical purposes

Client: HEALTH INFRASTRUCTURE NSW

Project: PROPOSED RPA NORTH WEST PRECINCT REDEVELOPMENT

Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. E25797K **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 21-6-12 **Datum:**

Logged/Checked by: G.F./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■ ■		■ ■			0	▩		FILL: Silty clay, medium to high plasticity, brown, trace of root fibres, ash, fine to medium grained ironstone gravel and brick fragments.	MC>PL			
						1	▨	CH	SILTY CLAY: high plasticity, light brown, trace of root fibres, ash and fine to medium grained ironstone gravel.	MC>PL	-	-	RESIDUAL
						2 3 4 5 6 7			END OF BOREHOLE AT 1.4m				HAND AUGER REFUSAL ON VERY STIFF HARD CLAY

ENVIRONMENTAL LOG

Borehole No.
8
1/1

Environmental logs are not to be used for geotechnical purposes

Client: HEALTH INFRASTRUCTURE NSW
Project: PROPOSED RPA NORTH WEST PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. E25797K
Date: 21-6-12
Method: SPIRAL AUGER
JK305
Logged/Checked by: G.F./
R.L. Surface: N/A
Datum:

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t				
									FILL: Silty gravel, fine to medium grained, igneous, grey.	D	-	-	
					N = 14 5,7,7			CH	SILTY CLAY: high plasticity, light brown mottled red brown, trace of fine to medium grained ironstone gravel.	MC>PL	-	-	RESIDUAL
					N = 16 8,8,8	1			SILTY CLAY: high plasticity, red brown and light grey, trace of fine to medium grained ironstone gravel.				
					N = 17 7,8,9	2 3		CL	SILTY CLAY: medium plasticity, light grey mottled red brown, trace of fine to medium grained ironstone gravel.				
						4			END OF BOREHOLE AT 4.0m				
						5 6 7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No.
9
1/1

Environmental logs are not to be used for geotechnical purposes

Client: HEALTH INFRASTRUCTURE NSW
Project: PROPOSED RPA NORTH WEST PRECINCT REDEVELOPMENT
Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. E25797K
Date: 21-6-12
Method: SPIRAL AUGER
JK305
R.L. Surface: N/A
Datum:
Logged/Checked by: G.F./

Groundwater Record	SAMPLES ES ASS ASB SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0			ASPHALTIC CONCRETE: 100mm.t				
					-	FILL: Sandy clay, low to medium plasticity, brown and grey, fine to medium grained sand, trace of fine to medium grained igneous gravel.	MC<PL	-	-	
		N = 5 2,3,2				FILL: Silty clay, medium to high plasticity, brown, trace of root fibres, ash, fine to medium grained ironstone gravel, and fine to medium grained sand.	MC>PL			
			1							
▼ AFTER 4 HRS						FILL: Silty sand, fine to medium grained, yellow brown and orange brown.	W			
		N = 0 0,0,0								SPT SUNK UNDER HAMMER WEIGHT
▼ ON COMPLETION			2							
					CL-CH	SILTY CLAY: medium to high plasticity, light grey mottled red brown.	MC>PL	-	-	HYDROCARBON ODOUR RESIDUAL 50mm CLASS 18 PC STANDPIPE INSTALLED TO 3.0m. MACHINE SLOTTED FROM 3m TO 1m. CASING FROM 1m TO SURFACE, 2mm FILTER SAND FROM 3m TO 0.5m, BENTONITE SEAL FROM 0.5m TO SURFACE, COMPLETED WITH A STEEL GATIC COVER AT SURFACE
		N = 20 8,9,11	3							
			4							
		N = 34 12,16,18								
			5							
			6			END OF BOREHOLE AT 6.0m				
			7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No.
10
1/1

Environmental logs are not to be used for geotechnical purposes

Client: HEALTH INFRASTRUCTURE NSW

Project: PROPOSED RPA NORTH WEST PRECINCT REDEVELOPMENT

Location: CNR. MISSENDEN ROAD AND LUCAS STREET, CAMPERDOWN, NSW

Job No. E25797K

Date: 21-6-12

Method: SPIRAL AUGER
JK305

R.L. Surface: N/A

Datum:

Logged/Checked by: G.F./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0	░		CONCRETE: 140mm.t				
							▨	-	FILL: Silty sand, fine to medium grained, brown.	M	-	-	
							░	-		-	-	-	
	■		■				▨	-	CONCRETE: 80mm.t	MC>PL	-	-	
	■		■			1	▧	CH	FILL: Gravelly silty clay, medium plasticity, brown, fine to medium grained sandstone and igneous gravel, trace of concrete and plastic fragments.	MC>PL	-	-	RESIDUAL
							▧		SILTY CLAY: high plasticity, light brown mottled red brown.				
									END OF BOREHOLE AT 1.5m				HAND AUGER REFUSAL IN VERY STIFF HARD CLAY
						2							
						3							
						4							
						5							
						6							
						7							

REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (eg sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'Shale' is used to describe thinly bedded to laminated siltstone.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from “feel” and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term ‘mud’ encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, “Methods of Testing Soils for Engineering Purposes” – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the ‘N’ value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N>30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c” on the borehole logs, together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

  The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than “straight line” variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or ‘reverted’ chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soil for Engineering Purposes'*. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed that at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document *'Guidelines for the Provision of Geotechnical Information in Tender Documents'*, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed <u>or</u> where only a limited investigation has been completed <u>or</u> where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

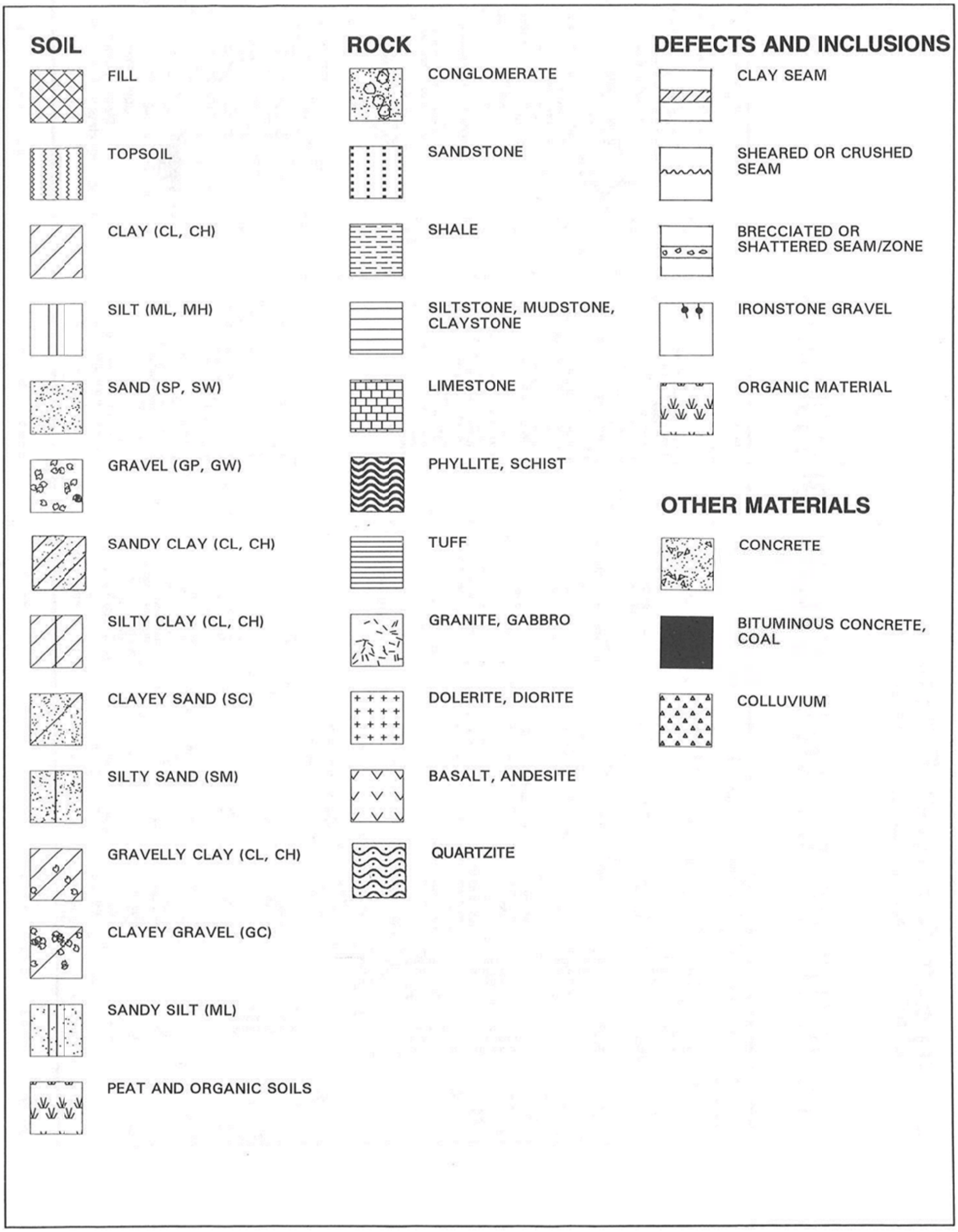
Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

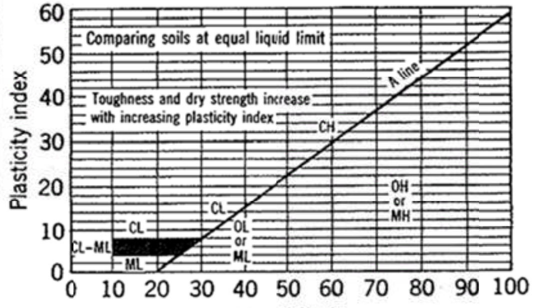
ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or

iii) full time engineering presence on site.

GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS



Field Identification Procedures (Excluding particles larger than 75 µm and basing fractions on estimated weights)						Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria			
Coarse-grained soils More than half of material is *larger* than 75 µm sieve size[b] (The 75 µm sieve size is about the smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes			*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Use grain size curve in identifying the fractions as given under field identification	Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than 75 µm sieve size) coarse grained soils are classified as follows: Less than 5% *GW, GP, SW, SP* More than 12% *GM, GC, SM, SC* 5% to 12% *Borderline* cases requiring use of dual symbols	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			Predominantly one size or a range of sizes with some intermediate sizes missing			*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines				Not meeting all gradation requirements for *GW*	
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)			*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures				Atterberg limits below "A" line, or *PI* less than 4	Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures				Atterberg limits above "A" line, with *PI* greater than 7	
	Sands More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes			*SW*	Well graded sands, gravelly sands, little or no fines				$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			Predominantly one size or a range of sizes with some intermediate sizes missing			*SP*	Poorly graded sands, gravelly sands, little or no fines				Not meeting all gradation requirements for *SW*	
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)			*SM*	Silty sands, poorly graded sand-silt mixtures				Atterberg limits below "A" line or *PI* less than 5	Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*SC*	Clayey sands, poorly graded sand-clay mixtures				Atterberg limits below "A" line with *PI* greater than 7	
Fine-grained soils More than half of material is *smaller* than 75 µm sieve size	Identification Procedures on Fraction Smaller than 380 µm Sieve Size											
			Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)							
	Silts and clays liquid limit less than 50		None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)				
			Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays					
			Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity					
	Silts and clays liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts					
			High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays					
			Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity					
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils					



Plasticity chart for laboratory classification of fine grained soils

Note: 1 Soils possessing characteristics of two groups are designated by combinations of group symbols (eg. GW-GC, well graded gravel-sand mixture with clay fines).
2 Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record	—▼— —C— ►—	Standing water level. Time delay following completion of drilling may be shown. Extent of borehole collapse shortly after drilling. Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES U50 DB DS ASB ASS SAL	Soil sample taken over depth indicated, for environmental analysis. Undisturbed 50mm diameter tube sample taken over depth indicated. Bulk disturbed sample taken over depth indicated. Small disturbed bag sample taken over depth indicated. Soil sample taken over depth indicated, for asbestos screening. Soil sample taken over depth indicated, for acid sulfate soil analysis. Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of Undrained Shear Strength. Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils) (Cohesionless Soils)	MC>PL MC≈PL MC<PL D M W	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. DRY – Runs freely through fingers. MOIST – Does not run freely but no free water visible on soil surface. WET – Free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt H ( )	VERY SOFT – Unconfined compressive strength less than 25kPa SOFT – Unconfined compressive strength 25-50kPa FIRM – Unconfined compressive strength 50-100kPa STIFF – Unconfined compressive strength 100-200kPa VERY STIFF – Unconfined compressive strength 200-400kPa HARD – Unconfined compressive strength greater than 400kPa Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)	 VL L MD D VD ( )	**Density Index (I_D) Range (%)** — **SPT 'N' Value Range (Blows/300mm)** Very Loose <15 — 0-4 Loose 15-35 — 4-10 Medium Dense 35-65 — 10-30 Dense 65-85 — 30-50 Very Dense >85 — >50 Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
Remarks	'V' bit 'TC' bit T_{60}	Hardened steel 'V' shaped bit. Tungsten carbide wing bit. Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

LOG SYMBOLS continued

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	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.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL		Easily remoulded by hand to a material with soil properties.
----------------------	--------------	0.03	
Very Low:	VL		May be crumbled in the hand. Sandstone is "sugary" and friable.
----------------------	--------------	0.1	
Low:	L		A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
----------------------	--------------	0.3	
Medium Strength:	M		A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
----------------------	--------------	1	
High:	H		A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
----------------------	---------------	3	
Very High:	VH		A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
----------------------	---------------	10	
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	

APPENDIX B

(Laboratory Reports and Chain of Custody Documents)

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 75183

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Geoff Fletcher

Sample log in details:

Your Reference:	**E25797K, Camperdown**		
No. of samples:	18 soils, 2 waters		
Date samples received / completed instructions received	22/06/12	/	22/06/12

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	29/06/12	/	29/06/12
Date of Preliminary Report:	Not issued		

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Rhian Morgan
Rhian Morgan
Reporting Supervisor

Paul Ching
Approved Signatory

Jeremy Faircloth
Chemist

vTRH & BTEX in Soil Our Reference:	UNITS	75183-1	75183-2	75183-3	75183-4	75183-5
Your Reference	-------------	BH2	BH2	BH3	BH3	BH4
Depth	------------	0.5-0.9	0.9-1.0	0.5-0.95	1.5-1.95	0.8-1.0
Date Sampled		19/06/2012	19/06/2012	18/06/2012	18/06/2012	18/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	101	102	100	113	105

vTRH & BTEX in Soil Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	-------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	98	97	114	112	108

vTRH & BTEX in Soil Our Reference:	UNITS	75183-11	75183-12	75183-13	75183-14	75183-15
Your Reference	-------------	BH9	BH9	BH9	BH10	BH10
Depth	------------	3-3.45	4.5-4.95	5.8-6	0.4-0.6	0.6-1.0
Date Sampled		21/06/2012	21/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	99	105	101	104	108

vTRH & BTEX in Soil				
Our Reference:	UNITS	75183-16	75183-19	75183-20
Your Reference	-------------	DUPA	TB1	TS1
Depth	------------	-	-	-
Date Sampled		21/06/2012	18/06/2012	19/06/2012
Type of sample		Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012
vTRH C_6 - C_9	mg/kg	<25	[NA]	[NA]
Benzene	mg/kg	<0.2	<0.2	129%
Toluene	mg/kg	<0.5	<0.5	129%
Ethylbenzene	mg/kg	<1	<1	131%
m+p-xylene	mg/kg	<2	<2	130%
o-Xylene	mg/kg	<1	<1	131%
Surrogate aaa-Trifluorotoluene	%	111	111	126

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	75183-1	75183-2	75183-3	75183-4	75183-5
Your Reference	-------------	BH2	BH2	BH3	BH3	BH4
Depth	------------	0.5-0.9	0.9-1.0	0.5-0.95	1.5-1.95	0.8-1.0
Date Sampled		19/06/2012	19/06/2012	18/06/2012	18/06/2012	18/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
TRHC_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRHC_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRHC_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	109	93	87	91	93

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	-------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
TRHC_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRHC_{15} - C_{28}	mg/kg	<100	<100	120	<100	<100
TRHC_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	92	90	107	96	89

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	75183-11	75183-12	75183-13	75183-14	75183-15
Your Reference	-------------	BH9	BH9	BH9	BH10	BH10
Depth	------------	3-3.45	4.5-4.95	5.8-6	0.4-0.6	0.6-1.0
Date Sampled		21/06/2012	21/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
TRHC_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRHC_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRHC_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	97	92	86	90	92

sTRH in Soil (C10-C36)		
Our Reference:	UNITS	75183-16
Your Reference	-------------	DUPA
Depth	------------	-
Date Sampled		21/06/2012
Type of sample		Soil
Date extracted	-	25/06/2012
Date analysed	-	26/06/2012
TRHC_{10} - C_{14}	mg/kg	<50
TRHC_{15} - C_{28}	mg/kg	<100
TRHC_{29} - C_{36}	mg/kg	<100
Surrogate o-Terphenyl	%	88

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------ ------------	75183-1 BH2 0.5-0.9 19/06/2012 Soil	75183-2 BH2 0.9-1.0 19/06/2012 Soil	75183-3 BH3 0.5-0.95 18/06/2012 Soil	75183-4 BH3 1.5-1.95 18/06/2012 Soil	75183-5 BH4 0.8-1.0 18/06/2012 Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Naphthalene	mg/kg	<0.1	0.7	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.8	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.9	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	6.0	<0.1	<0.1	0.4
Anthracene	mg/kg	<0.1	1.4	<0.1	<0.1	0.1
Fluoranthene	mg/kg	<0.1	4.5	<0.1	<0.1	1.1
Pyrene	mg/kg	<0.1	4.6	<0.1	<0.1	1.1
Benzo(a)anthracene	mg/kg	<0.1	1.6	<0.1	<0.1	0.6
Chrysene	mg/kg	<0.1	1.7	<0.1	<0.1	0.5
Benzo(b+k)fluoranthene	mg/kg	<0.2	2.1	<0.2	<0.2	0.9
Benzo(a)pyrene	mg/kg	<0.05	1.6	<0.05	<0.05	0.62
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.8	<0.1	<0.1	0.4
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.7	<0.1	<0.1	0.3
Surrogate p-Terphenyl-d_{14}	%	102	103	100	99	108

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------ ------------	75183-6 BH5 0.5-0.95 19/06/2012 Soil	75183-7 BH5 1.5-1.95 19/06/2012 Soil	75183-8 BH7 0.1-0.3 21/06/2012 Soil	75183-9 BH8 0.15-0.4 21/06/2012 Soil	75183-10 BH9 0.2-0.3 21/06/2012 Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.3	0.7	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.6	2.5	0.1
Pyrene	mg/kg	<0.1	<0.1	0.6	2.8	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.3	1.6	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.3	1.7	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	0.6	3.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.34	2.5	0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.2	1.4	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.2	1.2	<0.1
Surrogate p-Terphenyl-d_{14}	%	95	102	101	95	97

PAHs in Soil				
Our Reference:	UNITS	75183-14	75183-15	75183-16
Your Reference	-------------	BH10	BH10	DUPA
Depth	------------	0.4-0.6	0.6-1.0	-
Date Sampled		21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	25/06/2012	25/06/2012	25/06/2012
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.2
Pyrene	mg/kg	<0.1	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.1
Chrysene	mg/kg	<0.1	<0.1	0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	107	102	101

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------ ------------	75183-1 BH2 0.5-0.9 19/06/2012 Soil	75183-2 BH2 0.9-1.0 19/06/2012 Soil	75183-3 BH3 0.5-0.95 18/06/2012 Soil	75183-4 BH3 1.5-1.95 18/06/2012 Soil	75183-5 BH4 0.8-1.0 18/06/2012 Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	107	96	95	101	97

Organochlorine Pesticides in soil Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	-------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	99	95	89	99

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	75183-14 BH10 0.4-0.6 21/06/2012 Soil	75183-15 BH10 0.6-1.0 21/06/2012 Soil	75183-16 DUPA - 21/06/2012 Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	101	91

Organophosphorus Pesticides						
Our Reference:	UNITS	75183-1	75183-2	75183-3	75183-4	75183-5
Your Reference	-------------	BH2	BH2	BH3	BH3	BH4
Depth	------------	0.5-0.9	0.9-1.0	0.5-0.95	1.5-1.95	0.8-1.0
Date Sampled		19/06/2012	19/06/2012	18/06/2012	18/06/2012	18/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	107	96	95	101	97

Organophosphorus Pesticides						
Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	-------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	99	95	89	99

Organophosphorus Pesticides				
Our Reference:	UNITS	75183-14	75183-15	75183-16
Your Reference	-------------	BH10	BH10	DUPA
Depth	------------	0.4-0.6	0.6-1.0	-
Date Sampled		21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012
Diazinon	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	101	91

PCBs in Soil						
Our Reference:	UNITS	75183-1	75183-2	75183-3	75183-4	75183-5
Your Reference	------------	BH2	BH2	BH3	BH3	BH4
Depth	------------	0.5-0.9	0.9-1.0	0.5-0.95	1.5-1.95	0.8-1.0
Date Sampled		19/06/2012	19/06/2012	18/06/2012	18/06/2012	18/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	107	96	95	101	97

PCBs in Soil						
Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	99	95	89	99

PCBs in Soil				
Our Reference:	UNITS	75183-14	75183-15	75183-16
Your Reference	------------	BH10	BH10	DUPA
Depth	------------	0.4-0.6	0.6-1.0	-
Date Sampled		21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil
Date extracted	-	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	101	91

Acid Extractable metals in soil						
Our Reference:	UNITS	75183-1	75183-2	75183-3	75183-4	75183-5
Your Reference	-------------	BH2	BH2	BH3	BH3	BH4
Depth	------------	0.5-0.9	0.9-1.0	0.5-0.95	1.5-1.95	0.8-1.0
Date Sampled		19/06/2012	19/06/2012	18/06/2012	18/06/2012	18/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Arsenic	mg/kg	7	7	6	10	7
Cadmium	mg/kg	0.6	<0.5	<0.5	0.8	0.5
Chromium	mg/kg	31	19	38	58	40
Copper	mg/kg	<1	2	1	<1	2
Lead	mg/kg	18	23	20	21	17
Mercury	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Nickel	mg/kg	<1	<1	5	2	3
Zinc	mg/kg	3	8	12	20	95

Acid Extractable metals in soil						
Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	-------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Arsenic	mg/kg	10	8	14	6	9
Cadmium	mg/kg	<0.5	0.7	<0.5	<0.5	<0.5
Chromium	mg/kg	41	41	19	29	17
Copper	mg/kg	2	<1	25	7	14
Lead	mg/kg	29	16	150	94	61
Mercury	mg/kg	<0.1	<0.1	0.2	0.1	0.2
Nickel	mg/kg	3	1	8	4	3
Zinc	mg/kg	33	1	170	66	52

Acid Extractable metals in soil					
Our Reference:	UNITS	75183-14	75183-15	75183-16	75183-21
Your Reference	-------------	BH10	BH10	DUPA	BH10 - Triplicate
Depth	------------	0.4-0.6	0.6-1.0	-	0.4-0.6
Date Sampled		21/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil
Date digested	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Date analysed	-	25/06/2012	25/06/2012	25/06/2012	25/06/2012
Arsenic	mg/kg	7	7	12	6
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	22	24	18	26
Copper	mg/kg	21	<1	30	19
Lead	mg/kg	190	19	110	140
Mercury	mg/kg	0.6	<0.1	0.3	<0.1
Nickel	mg/kg	3	<1	5	3

Acid Extractable metals in soil					
Our Reference:	UNITS	75183-14	75183-15	75183-16	75183-21
Your Reference	-------------	BH10	BH10	DUPA	BH10 - Triplicate
Depth	------------	0.4-0.6	0.6-1.0	-	0.4-0.6
Date Sampled		21/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil
Zinc	mg/kg	390	9	89	180

Moisture						
Our Reference:	UNITS	75183-1	75183-2	75183-3	75183-4	75183-5
Your Reference	-------------	BH2	BH2	BH3	BH3	BH4
Depth	------------	0.5-0.9	0.9-1.0	0.5-0.95	1.5-1.95	0.8-1.0
Date Sampled		19/06/2012	19/06/2012	18/06/2012	18/06/2012	18/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/06/12	25/06/12	25/06/12	25/06/12	25/06/12
Date analysed	-	26/06/12	26/06/12	26/06/12	26/06/12	26/06/12
Moisture	%	23	19	38	25	29

Moisture						
Our Reference:	UNITS	75183-6	75183-7	75183-8	75183-9	75183-10
Your Reference	-------------	BH5	BH5	BH7	BH8	BH9
Depth	------------	0.5-0.95	1.5-1.95	0.1-0.3	0.15-0.4	0.2-0.3
Date Sampled		19/06/2012	19/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/06/12	25/06/12	25/06/12	25/06/12	25/06/12
Date analysed	-	26/06/12	26/06/12	26/06/12	26/06/12	26/06/12
Moisture	%	30	16	18	20	13

Moisture						
Our Reference:	UNITS	75183-11	75183-12	75183-13	75183-14	75183-15
Your Reference	-------------	BH9	BH9	BH9	BH10	BH10
Depth	------------	3-3.45	4.5-4.95	5.8-6	0.4-0.6	0.6-1.0
Date Sampled		21/06/2012	21/06/2012	21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/06/12	25/06/12	25/06/12	25/06/12	25/06/12
Date analysed	-	26/06/12	26/06/12	26/06/12	26/06/12	26/06/12
Moisture	%	17	15	17	29	25

Moisture		
Our Reference:	UNITS	75183-16
Your Reference	-------------	DUPA
Depth	------------	-
Date Sampled		21/06/2012
Type of sample		Soil
Date prepared	-	25/06/12
Date analysed	-	26/06/12
Moisture	%	16

Asbestos ID - soils						
Our Reference:	UNITS	75183-1	75183-3	75183-5	75183-6	75183-8
Your Reference	-------------	BH2	BH3	BH4	BH5	BH7
Depth	------------	0.5-0.9	0.5-0.95	0.8-1.0	0.5-0.95	0.1-0.3
Date Sampled		19/06/2012	18/06/2012	18/06/2012	19/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	28/06/2012	28/06/2012	28/06/2012	28/06/2012	28/06/2012
Sample mass tested	g	Approx 15g	Approx 20g	Approx 20g	Approx 15g	Approx 30g
Sample Description	-	Brown clayey soil	Brown clayey soil	Brown clayey soil	Red-brown clayey soil	Brown coarse-grained soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Asbestos ID - soils				
Our Reference:	UNITS	75183-9	75183-10	75183-14
Your Reference	-------------	BH8	BH9	BH10
Depth	------------	0.15-0.4	0.2-0.3	0.4-0.6
Date Sampled		21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil
Date analysed	-	28/06/2012	28/06/2012	28/06/2012
Sample mass tested	g	Approx 30g	Approx 25g	Approx 40g
Sample Description	-	Brown coarse-grained soil	Brown coarse-grained soil	Brown coarse-grained clayey soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

PAHs in TCLP (USEPA 1311) Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	75183-1 BH2 0.5-0.9 19/06/2012 Soil	75183-3 BH3 0.5-0.95 18/06/2012 Soil	75183-5 BH4 0.8-1.0 18/06/2012 Soil	75183-6 BH5 0.5-0.95 19/06/2012 Soil	75183-8 BH7 0.1-0.3 21/06/2012 Soil
pH of soil for fluid# determ.	pH units	5.1	6.0	5.9	5.9	7.2
pH of soil for fluid # determ. (acid)	pH units	1.6	1.8	1.7	1.6	1.7
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.9	4.9	4.9	4.9	4.9
Date extracted	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012	26/06/2012	26/06/2012
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b+k)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Surrogate p-Terphenyl-d_{14}	%	121	121	124	108	104

PAHs in TCLP (USEPA 1311) Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	75183-9 BH8 0.15-0.4 21/06/2012 Soil	75183-10 BH9 0.2-0.3 21/06/2012 Soil	75183-14 BH10 0.4-0.6 21/06/2012 Soil
pH of soil for fluid# determ.	pH units	6.9	7.0	7.9
pH of soil for fluid # determ. (acid)	pH units	1.9	1.9	1.7
Extraction fluid used	-	1	1	1
pH of final Leachate	pH units	4.9	5.0	5.5
Date extracted	-	26/06/2012	26/06/2012	26/06/2012
Date analysed	-	26/06/2012	26/06/2012	26/06/2012
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(b+k)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001
Surrogate p-Terphenyl-d_{14}	%	112	127	99

Metals in TCLP USEPA1311						
Our Reference:	UNITS	75183-1	75183-3	75183-5	75183-6	75183-8
Your Reference	-------------	BH2	BH3	BH4	BH5	BH7
Depth	------------	0.5-0.9	0.5-0.95	0.8-1.0	0.5-0.95	0.1-0.3
Date Sampled		19/06/2012	18/06/2012	18/06/2012	19/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/06/2012	27/06/2012	27/06/2012	27/06/2012	27/06/2012
Date analysed	-	27/06/2012	27/06/2012	27/06/2012	27/06/2012	27/06/2012
pH of soil for fluid# determ.	pH units	5.1	6.0	5.9	5.9	7.2
pH of soil for fluid # determ. (acid)	pH units	1.6	1.8	1.7	1.6	1.7
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.9	4.9	4.9	4.9	4.9
Arsenic in TCLP	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	<0.03	0.04	<0.03	0.04
Mercury in TCLP	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Metals in TCLP USEPA1311				
Our Reference:	UNITS	75183-9	75183-10	75183-14
Your Reference	-------------	BH8	BH9	BH10
Depth	------------	0.15-0.4	0.2-0.3	0.4-0.6
Date Sampled		21/06/2012	21/06/2012	21/06/2012
Type of sample		Soil	Soil	Soil
Date extracted	-	27/06/2012	27/06/2012	27/06/2012
Date analysed	-	27/06/2012	27/06/2012	27/06/2012
pH of soil for fluid# determ.	pH units	6.9	7.9	7.9
pH of soil for fluid # determ. (acid)	pH units	1.9	1.9	1.7
Extraction fluid used	-	1	1	1
pH of final Leachate	pH units	4.9	5.0	5.5
Arsenic in TCLP	mg/L	<0.05	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	0.06	0.05	0.8
Mercury in TCLP	mg/L	<0.0005	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02	<0.02

BTEX in Water			
Our Reference:	UNITS	75183-17	75183-18
Your Reference	-------------	RS1	RS2
Depth	------------	-	-
Date Sampled		18/06/2012	21/06/2012
Type of sample		water	water
Date extracted	-	22/06/2012	22/06/2012
Date analysed	-	23/06/2012	23/06/2012
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	101	101
Surrogate toluene-d8	%	96	96
Surrogate 4-BFB	%	94	98

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439 and USEPA 1311.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
Org-012 subset	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL vTRH & BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-9	25/06/2012
Date analysed	-			26/06/2012	75183-1	26/06/2012 || 26/06/2012	LCS-9	26/06/2012
vTRH C_6 - C_9	mg/kg	25	Org-016	<25	75183-1	<25 || <25	LCS-9	111%
Benzene	mg/kg	0.2	Org-016	<0.2	75183-1	<0.2 || <0.2	LCS-9	111%
Toluene	mg/kg	0.5	Org-016	<0.5	75183-1	<0.5 || <0.5	LCS-9	108%
Ethylbenzene	mg/kg	1	Org-016	<1	75183-1	<1 || <1	LCS-9	109%
m+p-xylene	mg/kg	2	Org-016	<2	75183-1	<2 || <2	LCS-9	114%
o-Xylene	mg/kg	1	Org-016	<1	75183-1	<1 || <1	LCS-9	121%
Surrogate aaa-Trifluorotoluene	%		Org-016	112	75183-1	101 || 103 || RPD: 2	LCS-9	113%

QUALITY CONTROL sTRH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-8	25/06/2012
Date analysed	-			26/06/2012	75183-1	26/06/2012 || 26/06/2012	LCS-8	26/06/2012
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	75183-1	<50 || <50	LCS-8	80%
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	75183-1	<100 || <100	LCS-8	103%
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	75183-1	<100 || <100	LCS-8	84%
Surrogate o-Terphenyl	%		Org-003	94	75183-1	109 || 84 || RPD: 26	LCS-8	105%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-8	25/06/2012
Date analysed	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-8	25/06/2012
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	LCS-8	101%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	LCS-8	106%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	0.1 || 0.3 || RPD: 100	LCS-8	98%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || 0.2	LCS-8	93%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || 0.2	LCS-8	97%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	LCS-8	102%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	75183-1	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	75183-1	<0.05 || 0.06	LCS-8	111%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Surrogate *p*-Terphenyl-d_{14}	%		Org-012 subset	93	75183-1	102 || 101 || RPD: 1	LCS-8	87%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-8	25/06/2012
Date analysed	-			26/06/2012	75183-1	26/06/2012 || 26/06/2012	LCS-8	26/06/2012
HCB	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	87%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	90%
Heptachlor	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	84%
delta-BHC	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	93%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	98%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	98%
Dieldrin	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	105%
Endrin	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	101%
pp-DDD	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	109%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	LCS-8	106%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-005	93	75183-1	107 || 102 || RPD: 5	LCS-8	76%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-8	25/06/2012
Date analysed	-			26/06/2012	75183-1	26/06/2012 || 26/06/2012	LCS-8	26/06/2012
Diazinon	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	LCS-8	104%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	LCS-8	105%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	75183-1	<0.1 || <0.1	LCS-8	110%
Surrogate TCLMX	%		Org-008	93	75183-1	107 || 102 || RPD: 5	LCS-8	90%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-8	25/06/2012
Date analysed	-			26/06/2012	75183-1	26/06/2012 || 26/06/2012	LCS-8	26/06/2012
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	LCS-8	123%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	75183-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	93	75183-1	107 || 102 || RPD: 5	LCS-8	91%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date digested	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-1	25/06/2012
Date analysed	-			25/06/2012	75183-1	25/06/2012 || 25/06/2012	LCS-1	25/06/2012
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	75183-1	7 || 7 || RPD: 0	LCS-1	98%
Cadmium	mg/kg	0.5	Metals-020 ICP-AES	<0.5	75183-1	0.6 || <0.5	LCS-1	103%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	75183-1	31 || 26 || RPD: 18	LCS-1	100%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	75183-1	<1 || <1	LCS-1	102%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	75183-1	18 || 16 || RPD: 12	LCS-1	96%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	75183-1	<0.1 || <0.1	LCS-1	116%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	75183-1	<1 || <1	LCS-1	102%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	75183-1	3 || 4 || RPD: 29	LCS-1	100%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			[NT]
Date analysed	-			[NT]
Moisture	%	0.1	Inorg-008	[NT]

QUALITY CONTROL Asbestos ID - soils	UNITS	PQL	METHOD	Blank
Date analysed	-			[NT]

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			26/06/2012	[NT]	[NT]	LCS-W2	26/06/2012
Date analysed	-			26/06/2012	[NT]	[NT]	LCS-W2	26/06/2012
Naphthalene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	72%
Acenaphthylene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	88%
Phenanthrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	81%
Anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	95%
Pyrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	91%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	89%
Benzo(b+k)fluoranthene in TCLP	mg/L	0.002	Org-012 subset	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W2	126%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Surrogate p-Terphenyl-d$_{14}$	%		Org-012	102	[NT]	[NT]	LCS-W2	114%

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			27/06/2012	75183-9	27/06/2012 || 27/06/2012	LCS-W1	27/06/2012
Date analysed	-			27/06/2012	75183-9	27/06/2012 || 27/06/2012	LCS-W1	27/06/2012
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	75183-9	<0.05 || <0.05	LCS-W1	107%
Cadmium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	75183-9	<0.01 || <0.01	LCS-W1	106%
Chromium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	75183-9	<0.01 || <0.01	LCS-W1	102%
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	75183-9	0.06 || 0.06 || RPD: 0	LCS-W1	97%
Mercury in TCLP	mg/L	0.0005	Metals-021 CV-AAS	<0.0005	75183-9	<0.0005 || <0.0005	LCS-W1	112%
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	75183-9	<0.02 || <0.02	LCS-W1	102%

QUALITY CONTROL BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/06/2012	[NT]	[NT]	LCS-W1	22/06/2012
Date analysed	-			23/06/2012	[NT]	[NT]	LCS-W1	23/06/2012
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	107%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	106%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	109%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	109%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	109%
Surrogate Dibromofluoromethane	%		Org-016	99	[NT]	[NT]	LCS-W1	96%
Surrogate toluene-d8	%		Org-016	100	[NT]	[NT]	LCS-W1	99%
Surrogate 4-BFB	%		Org-016	105	[NT]	[NT]	LCS-W1	100%

QUALITY CONTROL vTRH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	75183-11	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-11	26/06/2012 || 26/06/2012	75183-2	26/06/2012
vTRH C_6 - C_9	mg/kg	75183-11	<25 || <25	75183-2	98%
Benzene	mg/kg	75183-11	<0.2 || <0.2	75183-2	98%
Toluene	mg/kg	75183-11	<0.5 || <0.5	75183-2	93%
Ethylbenzene	mg/kg	75183-11	<1 || <1	75183-2	96%
m+p-xylene	mg/kg	75183-11	<2 || <2	75183-2	102%

QUALITY CONTROL vTRH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
o-Xylene	mg/kg	75183-11	<1 || <1	75183-2	107%
Surrogate aaa-Trifluorotoluene	%	75183-11	99 || 107 || RPD: 8	75183-2	108%

QUALITY CONTROL sTRH in Soil (C10-C36)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	75183-11	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-11	26/06/2012 || 26/06/2012	75183-2	26/06/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	75183-11	<50 || <50	75183-2	97%
TRHC$_{15}$ - C$_{28}$	mg/kg	75183-11	<100 || <100	75183-2	107%
TRHC$_{29}$ - C$_{36}$	mg/kg	75183-11	<100 || <100	75183-2	83%
Surrogate o-Terphenyl	%	75183-11	97 || 92 || RPD: 5	75183-2	107%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Naphthalene	mg/kg	75183-14	<0.1 || <0.1	75183-2	105%
Acenaphthylene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	75183-14	<0.1 || <0.1	75183-2	110%
Phenanthrene	mg/kg	75183-14	<0.1 || <0.1	75183-2	137%
Anthracene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	75183-14	<0.1 || 0.1	75183-2	115%
Pyrene	mg/kg	75183-14	<0.1 || <0.1	75183-2	123%
Benzo(a)anthracene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	75183-14	<0.1 || <0.1	75183-2	108%
Benzo(b+k)fluoranthene	mg/kg	75183-14	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	75183-14	<0.05 || <0.05	75183-2	118%
Indeno(1,2,3-c,d)pyrene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Surrogate *p*-Terphenyl-d$_{14}$	%	75183-14	107 || 97 || RPD: 10	75183-2	92%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-14	26/06/2012 || 26/06/2012	75183-2	26/06/2012
HCB	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	75183-14	<0.1 || <0.1	75183-2	104%
gamma-BHC	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	75183-14	<0.1 || <0.1	75183-2	104%
Heptachlor	mg/kg	75183-14	<0.1 || <0.1	75183-2	102%
delta-BHC	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	75183-14	<0.1 || <0.1	75183-2	109%
Heptachlor Epoxide	mg/kg	75183-14	<0.1 || <0.1	75183-2	113%
gamma-Chlordane	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	75183-14	<0.1 || <0.1	75183-2	110%
Dieldrin	mg/kg	75183-14	<0.1 || <0.1	75183-2	121%
Endrin	mg/kg	75183-14	<0.1 || <0.1	75183-2	114%
pp-DDD	mg/kg	75183-14	<0.1 || <0.1	75183-2	121%
Endosulfan II	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	75183-14	<0.1 || <0.1	75183-2	114%
Methoxychlor	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	75183-14	92 || 100 || RPD: 8	75183-2	89%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-14	26/06/2012 || 26/06/2012	75183-2	26/06/2012
Diazinon	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	75183-14	<0.1 || <0.1	75183-2	92%
Fenitrothion	mg/kg	75183-14	<0.1 || <0.1	75183-2	105%
Bromophos-ethyl	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	75183-14	<0.1 || <0.1	75183-2	102%
Surrogate TCLMX	%	75183-14	92 || 100 || RPD: 8	75183-2	90%

QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-14	26/06/2012 || 26/06/2012	75183-2	26/06/2012
Arochlor 1016	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	75183-14	<0.1 || <0.1	75183-2	105%
Arochlor 1260	mg/kg	75183-14	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	75183-14	92 || 100 || RPD: 8	75183-2	91%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Date analysed	-	75183-14	25/06/2012 || 25/06/2012	75183-2	25/06/2012
Arsenic	mg/kg	75183-14	7 || 7 || RPD: 0	75183-2	76%
Cadmium	mg/kg	75183-14	<0.5 || <0.5	75183-2	82%
Chromium	mg/kg	75183-14	22 || 23 || RPD: 4	75183-2	86%
Copper	mg/kg	75183-14	21 || 21 || RPD: 0	75183-2	94%
Lead	mg/kg	75183-14	190 || 210 || RPD: 10	75183-2	79%
Mercury	mg/kg	75183-14	0.6 || <0.1	75183-2	112%
Nickel	mg/kg	75183-14	3 || 5 || RPD: 50	75183-2	78%
Zinc	mg/kg	75183-14	390 || 170 || RPD: 79	75183-2	80%

Report Comments:

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteriae has been exceeded for 75183-14 for Ni, Zn and Hg. Therefore a triplicate result has been issued as laboratory sample number 75183-21.

Note: Samples 75183-1, 3, 5, 6, 8, 9 & 10 analysed as received. However, samples are below the recommended volume of 40-50g (50mL) as per AS4964-2004. This insufficient sample size may lead to inaccurate interpretation of the result as it may not be representative of the sampled area.

Asbestos ID was analysed by Approved Identifier:	Paul Ching
Asbestos ID was authorised by Approved Signatory:	Paul Ching

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Environmental Investigation Services	ph: 02 9888 5000
PO Box 976	Fax: 02 9888 5001
North Ryde BC NSW 1670	

Attention: Geoff Fletcher

Sample log in details:

Your reference:	**E25797K, Camperdown**
Envirolab Reference:	**75183**
Date received:	22/06/12
Date results expected to be reported:	**29/06/12**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	18 soils, 2 waters
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice Pack
Sampling Date Provided:	YES

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

SAMPLE AND CHAIN OF CUSTODY FORM

TO: **Envirolab Services Pty Ltd** **12 Ashley Street** **Chatswood NSW 2067** **Phone: (02) 99106200** **Fax: (02) 99106201** **Attention: Aileen**	**EIS Job Number: E25797K** **Date Results Required:** Standard TAT **Sheet** 1 / 2	**FROM:** **Environmental Investigation Services** **Rear 115 Wicks Road** **Macquarie Park NSW 2113** **Phone: (02) 9888 5000** **Fax: (02) 9888 5004** **Contact:** Geoff Fletcher

Project: Proposed Redevelopment
Location: Camperdown
Sampler: GF/DW

Sample Preservation:
In esky on ice

Tests Required

Date Sampled	Lab Ref:	Borehole/ Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	OPP	Combo 12a	8 Metals	TPH	BTEX	PAHs	OCP/OPP/ PCBs	Asbestos	TCLP 6 Metals	TCLP PAHs	
20/6/12		~~BH1~~	~~0.03–0.15~~	~~Glass jar + Asb Bag~~	~~0~~	~~f Soil~~												
			~~0.65~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
			~~0.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
			~~1.5–1.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
19/6/12	~~—~~	BH2	~~0.04–0.15~~	~~Glass jar + Asb Bag~~	~~1.5~~	~~f~~												
	1		0.5–0.9	Glass jar + Asb Bag	0	f		X	X									
	2		0.9–1.0	Glass jar + ~~Asb Bag~~	0	n	X											
			~~1.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
18/6/12	~~—~~	BH3	~~0.04–0.15~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
	3		0.5–0.95	Glass jar + Asb Bag	0	f		X	X									
			~~0.9–1.0~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
	4		1.5–1.95	Glass jar + ~~Asb Bag~~	0	n	X											
	~~—~~	BH4	~~0.05–0.3~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
	5		0.8–1.0	Glass jar + Asb Bag	0	f		X	X									
			~~1.5–1.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
15/6/12	~~—~~	BH5	~~0.03–0.15~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
	6		0.5–0.95	Glass jar + Asb Bag	0	f		X	X									
			~~0.9–1.0~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
	7		1.5–1.95	Glass jar + ~~Asb Bag~~	0	n	X											
21/6/12	8	BH7	0.1–0.3	Glass jar + Asb Bag	0	f		X	X									
		~~BH7~~	~~1.1~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
	9	BH8	0.15–0.4	Glass jar + Asb Bag	0	f		X	X									
			~~0.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
			~~1.5–1.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												
			~~3–3.45~~	~~Glass jar + Asb Bag~~	~~0~~	~~n~~												

Remarks (comments/detection limits required):

Relinquished By:	Date: 22/6/12	Time: 12:00pm	Received By: Dia Liu

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 75183
Date Received: 22-06-12
Time Received: 15.50
Received by: Dia Liu
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

SAMPLE AND CHAIN OF CUSTODY FORM

TO: **Envirolab Services Pty Ltd** **12 Ashley Street** **Chatswood NSW 2067** **Phone: (02) 99106200** **Fax: (02) 99106201** **Attention: Aileen**	**EIS Job Number: E25797K** **Date Results Required:** Standard TAT **Sheet** 2/2	**FROM:** **Environmental Investigation Services** **Rear 115 Wicks Road** **Macquarie Park NSW 2113** **Phone: (02) 9888 5000** **Fax: (02) 9888 5004** **Contact:** Geoff Fletcher

Project: Proposed Redevelopment
Location: Camperdown
Sampler: GF/DW

Sample Preservation:
In esky on ice

Tests Required

Date Sampled	Lab Ref:	Borehole/ Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	OPP	Combo 12a	8 Metals	TPH	BTEX	PAHs	OCP/OPP/ PCBs	Asbestos	TCLP 6 Metals	TCLP PAHs	
21/6/12		~~BH8~~	~~3.8–4~~	Glass jar + Asb Bag	~~0~~	~~Soil~~ n												
	10	BH9	0.2–0.3	Glass jar + Asb Bag	0	f		X	X									
			~~0.5–0.95~~	Glass jar + Asb Bag	~~0~~	~~f~~												
			~~1.3–1.5~~	Glass jar + Asb Bag	~~0~~	~~f~~												
	11		3–3.45	Glass jar + ~~Asb Bag~~	0.7	n					X	X						
	12		4.5–4.95	Glass jar + ~~Asb Bag~~	1.4	n					X	X						
	13		5.8–6	Glass jar + ~~Asb Bag~~	11.2	n					X	X						
	14	BH10	0.4–0.6	Glass jar + Asb Bag	0	f		X	X									
	15	BH10	0.6–1.0	Glass jar + ~~Asb Bag~~	0	n	X											
	16	Dup A		Glass jar + ~~Asb Bag~~	–		X											
		Dup B		Glass jar + ~~Asb Bag~~	–		X									← See notes		
		~~Dup C~~		Glass jar + Asb Bag														
		~~Dup D~~		Glass jar + Asb Bag														
18/6/12	17	RS1		Glass jar + Asb Bag	–	Water						X						
21/6/12	18	RS2		Glass jar + Asb Bag	–	Water						X						
18/6/12	19	TB1		Glass jar + Asb Bag	–	Soil						X						
~~18/6/12~~		~~TB2~~		Glass jar + Asb Bag								~~X~~						
19/6/12	20	TS1		Glass jar + Asb Bag	–	Soil						X						
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														

Remarks (comments/detection limits required): Please send Sample Dup B to NMI for analysis of Combo 6 (TPH, BTEX, HM, OPP, PAHs, PCB)

Relinquished By:	Date: 22/6/12	Time: 12:00pm	Received By:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 75183-A

Client:
Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Geoff Fletcher

Sample log in details:

Your Reference:	**E25797K, Camperdown**
No. of samples:	Additional tesing on 1 soil
Date samples received / completed instructions received	22/06/12 / 10/07/12

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	12/07/12 / 12/07/12
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jeremy Faircloth
Chemist

ACCREDITED FOR TECHNICAL COMPETENCE

PAHs in TCLP (USEPA 1311) Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------ ------------	75183-A-2 BH2 0.9-1.0 19/06/2012 Soil
pH of soil for fluid# determ.	pH units	6.6
pH of soil for fluid # determ. (acid)	pH units	1.6
Extraction fluid used	-	1
pH of final Leachate	pH units	4.9
Date extracted	-	11/07/2012
Date analysed	-	12/07/2012
Naphthalene in TCLP	mg/L	0.009
Acenaphthylene in TCLP	mg/L	<0.001
Acenaphthene in TCLP	mg/L	0.004
Fluorene in TCLP	mg/L	0.003
Phenanthrene in TCLP	mg/L	0.011
Anthracene in TCLP	mg/L	0.002
Fluoranthene in TCLP	mg/L	0.002
Pyrene in TCLP	mg/L	0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001
Chrysene in TCLP	mg/L	<0.001
Benzo(b+k)fluoranthene in TCLP	mg/L	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001
Surrogate p-Terphenyl-d_{14}	%	99

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439 and USEPA 1311.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
Org-012 subset	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/07/2012	[NT]	[NT]	LCS-W1	11/07/2012
Date analysed	-			12/07/2012	[NT]	[NT]	LCS-W1	12/07/2012
Naphthalene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	98%
Acenaphthylene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	100%
Phenanthrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	89%
Anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	99%
Pyrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	96%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	98%
Benzo(b+k)fluoranthene in TCLP	mg/L	0.002	Org-012 subset	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-W1	109%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012	106	[NT]	[NT]	LCS-W1	96%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

Aileen Hie

From: Geoff Fletcher [gfletcher@jkgroup.net.au]
Sent: Tuesday, 10 July 2012 2:17 PM
To: Aileen Hie
Subject: Additional Testing 75183-2

Importance: High

Aileen,

Can you please schedule TCLP analysis on a 48 hour TAT on the following sample:

- 75183-2, BH2 (0.9-1) B(a)P

75183A
48hrs ī CA
due 12/7/12

Regards,

Geoff Fletcher
Environmental Scientist

EIS Environmental Investigation Services
CONSULTING ENVIRONMENTAL ENGINEERS AND SCIENTISTS
Tel: 02 9888 5000 PO Box 976 115 Wicks Road
Fax: 02 9888 5001 North Ryde BC NSW 1670 Macquarie Park NSW 2113
gfletcher@jkgroup.net.au
www.jkgeotechnics.com.au

REPORT OF ANALYSIS

Report No. RN922455

Client	: Environmental Investigation Services 115 WICKS ROAD MACQUARIE PARK NSW 2113		Job No.	: ENVI78/120626/1
			Quote No.	: QT-01783
			Order No.	:
			Date Sampled	:
			Date Received	: 26-JUN-2012
Attention	: GEOFF FLETCHER		Sampled By	: CLIENT
Project Name	: PROPOSED REDEVELOPMENT			
Your Client Services Manager		: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N12/016891	DUPB	SOIL 21/6/12 CAMPERDOWN JOB E25797K

Lab Reg No.		N12/016891				
Sample Reference	Units	DUPB				Method
Polycyclic Aromatic Hydrocarbons						
Naphthalene	mg/kg	< 0.5				NGCMS_1111
Acenaphthylene	mg/kg	< 0.5				NGCMS_1111
Acenaphthene	mg/kg	< 0.5				NGCMS_1111
Fluorene	mg/kg	< 0.5				NGCMS_1111
Phenanthrene	mg/kg	< 0.5				NGCMS_1111
Anthracene	mg/kg	< 0.5				NGCMS_1111
Fluoranthene	mg/kg	0.70				NGCMS_1111
Pyrene	mg/kg	0.71				NGCMS_1111
Benz(a)anthracene	mg/kg	< 0.5				NGCMS_1111
Chrysene	mg/kg	< 0.5				NGCMS_1111
Benzo(b)&(k)fluoranthene	mg/kg	< 1				NGCMS_1111
Benzo(a)pyrene	mg/kg	< 0.5				NGCMS_1111
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5				NGCMS_1111
Dibenzo(a,h)anthracene	mg/kg	< 0.5				NGCMS_1111
Benzo(g,h,i)perylene	mg/kg	< 0.5				NGCMS_1111
Surrogate: TER-D14	%REC	111				NGCMS_1111
BTEX						
Benzene	mg/kg	< 0.5				NGCMS_1121
Toluene	mg/kg	< 0.5				NGCMS_1121
Ethyl Benzene	mg/kg	< 0.5				NGCMS_1121
m, p - Xylene	mg/kg	< 1				NGCMS_1121
o - Xylene	mg/kg	< 0.5				NGCMS_1121
Surrogate: TOL-D8	%REC	99				NGCMS_1121
PCB Aroclors						
Aroclor 1016	mg/kg	< 0.1				NR_19
Aroclor 1221	mg/kg	< 0.1				NR_19
Aroclor 1232	mg/kg	< 0.1				NR_19
Aroclor 1242	mg/kg	< 0.1				NR_19
Aroclor 1248	mg/kg	< 0.1				NR_19
Aroclor 1254	mg/kg	< 0.1				NR_19
Aroclor 1260	mg/kg	< 0.1				NR_19

REPORT OF ANALYSIS

Lab Reg No.		N12/016891				
Sample Reference	Units	DUPB				Method
PCB Aroclors						
Total PCB's (as above)	mg/kg	< 0.1				NR_19
Organophosphate (OP) Pesticides						
Dichlorvos	mg/kg	< 0.1				NR_19
Demeton-S-Methyl	mg/kg	< 0.1				NR_19
Diazinon	mg/kg	< 0.1				NR_19
Dimethoate	mg/kg	< 0.1				NR_19
Chlorpyrifos	mg/kg	< 0.1				NR_19
Chlorpyrifos Methyl	mg/kg	< 0.1				NR_19
Malathion	mg/kg	< 0.1				NR_19
Fenthion	mg/kg	< 0.1				NR_19
Ethion	mg/kg	< 0.1				NR_19
Fenitrothion	mg/kg	< 0.1				NR_19
Chlorfenvinphos (E)	mg/kg	< 0.1				NR_19
Chlorfenvinphos (Z)	mg/kg	< 0.1				NR_19
Parathion (Ethyl)	mg/kg	< 0.1				NR_19
Parathion Methyl	mg/kg	< 0.1				NR_19
Pirimiphos Methyl	mg/kg	< 0.1				NR_19
Pirimiphos Ethyl	mg/kg	< 0.1				NR_19
Azinphos Methyl	mg/kg	< 0.1				NR_19
Azinphos Ethyl	mg/kg	< 0.1				NR_19
Surrogate: TPP	%REC	109				NR_19
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	< 25				NGCMS_1121
TPH C10 - C14	mg/kg	< 50				NGCMS_1112
TPH C15 - C28	mg/kg	380				NGCMS_1112
TPH C29 - C36	mg/kg	170				NGCMS_1112
Surrogate: TOL-D8	%REC	99				NGCMS_1121
Dates						
Date extracted		29-JUN-2012				
Date analysed		2-JUL-2012				

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-JUL-2012

REPORT OF ANALYSIS

Report No. RN922455

Lab Reg No.	Units	N12/016891				Method
Sample Reference		DUPB				
Trace Elements						
Arsenic	mg/kg	33				NT2_49
Cadmium	mg/kg	<0.5				NT2_49
Chromium	mg/kg	32				NT2_49
Copper	mg/kg	26				NT2_49
Lead	mg/kg	230				NT2_49
Mercury	mg/kg	0.43				NT2_49
Nickel	mg/kg	8.5				NT2_49
Zinc	mg/kg	200				NT2_49
Total Solids	%	81.9				NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-JUL-2012

All results are expressed on a dry weight basis.

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Accreditated for compliance with ISO/IEC 17025.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: RN922406 RN922443

Australian Government
National Measurement Institute

SAMPLE RECEIPT NOTIFICATION

To: Environmental Investigation Services
Attn: GEOFF FLETCHER
From: Laboratory Services Unit
Date: 27-JUN-2012
Email:

If you have any queries or wish to make any adjustments to analyses requested, please contact Susanne Neuman immediately on 02 9449 0181

Project:	PROPOSED DEVELOPMENT
Order No.:	Not Provided
NMI Job No:	ENVI78/120626/1
Total Number of Samples:	1
Date received by NMI:	26-JUN-2012
Estimated Report Date:	4-JUL-2012

LRNs	Sample Ref	Description
N12/016891	DUPB	SOIL 21/6/12 CAMPERDOWN PROJECT; PROPOSED D

Comments:

ALL OK

Samples received	Chilled
NMI quotation number provided	Not Applicable
Complete documentation received	Yes

If NO please contact Susanne Neuman on 02 9449 0181 to clarify. Note: incomplete or unclear information about samples or required testing will delay the start of the analysis work

Unless advised otherwise sample analysis will commence regardless of integrity issues
Relevant non-conformances will be recorded on the final report.

ENV178/120626/1

Due ~~3/7/12~~ 4/7/12 [illegible] ✓

SAMPLE AND CHAIN OF CUSTODY FORM

TO:
Envirolab Services Pty Ltd
12 Ashley Street
Chatswood NSW 2067
Phone: (02) 99106200
Fax: (02) 99106201

Attention: Aileen

EIS Job Number: E25797K

Date Results Required: Standard TAT

Sheet 2/2

FROM:
Environmental Investigation Services
Rear 115 Wicks Road
Macquarie Park NSW 2113
Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Geoff Fletcher

Project: Proposed Redevelopment
Location: Camperdown
Sampler: GF/DW

Sample Preservation:
In esky on ice

Tests Required

Date Sampled	Lab Ref:	Borehole/ Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	OPP	Combo 12a	8 Metals	TPH	BTEX	PAHs	OCP/OPP/ PCBs	Asbestos	TCLP 6 Metals	TCLP PAHs	
21/6/12		~~BH8~~	~~3.8-4~~	~~Glass jar + Asb Bag~~	~~0~~	~~Soil~~												
		BH9	0.2-0.3	Glass jar + Asb Bag	0	f		X	X									
			~~0.5-0.95~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
			~~1.3-1.5~~	~~Glass jar + Asb Bag~~	~~0~~	~~f~~												
			3-3.45	Glass jar + ~~Asb Bag~~	0.7	n					X	X						
			4.5-4.95	Glass jar + ~~Asb Bag~~	1.4	n					X	X						
			5.8-6	Glass jar + ~~Asb Bag~~	11.2	n					X	X						
~~[illegible]~~		BH10	0.4-0.6	Glass jar + Asb Bag	0	f		X	X									
		BH10	0.6-1.0	Glass jar + ~~Asb Bag~~	0	n	X											
		Dup A		Glass jar + ~~Asb Bag~~	–		X											
		Dup B		Glass jar + ~~Asb Bag~~	–		X			N12/016891								← See notes
		~~Dup C~~		~~Glass jar + Asb Bag~~														
		~~Dup D~~		~~Glass jar + Asb Bag~~														
18/6/12		RS1		Glass jar + Asb Bag	–	Water						X						
21/6/12		RS2		Glass jar + Asb Bag	–	Water						X						
18/6/12		TB1		Glass jar + Asb Bag	–	Soil						X						
~~18/6/12~~		~~TB2~~		~~Glass jar + Asb Bag~~								~~X~~						
19/6/12		TS1		Glass jar + Asb Bag	–	Soil						X						
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														

Remarks (comments/detection limits required): Please send sample Dup B to NMI for analysis of Combo 6 (TPH, BTEX, HM, OPP, PAHs, PCB)

Relinquished By:	Date:	Time:	Received By:	
	22/6/12	12:00pm	[illegible] / EIS.	

Relinquished: Sophie
ELS
25/06
10:00

RECEIVED
26 JUN 2012
BY: AB 14:00

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: Environmental Investigation Services

NMI QA Report No: ENVI78/120626/1 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Organics Section								
BTEX								
Benzene	NGCMS_1121	0.5	<0.5	NA	NA	NA	89	NA
Toluene	NGCMS_1121	0.5	<0.5	NA	NA	NA	94	NA
Ethyl Benzene	NGCMS_1121	0.5	<0.5	NA	NA	NA	91	NA
m, p - Xylene	NGCMS_1121	1	<1	NA	NA	NA	94	NA
o-Xylene	NGCMS_1121	0.5	<0.5	NA	NA	NA	92	NA
TPH								
TPH C6-C9	NGCMS_1121	25	<25	NA	NA	NA	92	NA
TPH C10-C14	NGCMS_1112	50	<50	NA	NA	NA	105	NA
TPH C15-C28	NGCMS_1112	100	<100	NA	NA	NA	103	NA
TPH C29-C36	NGCMS_1112	100	<100	NA	NA	NA	-	NA
Surrogate: TOL-D8	NGCMS_1121	-	-	NA	NA	NA	101	NA
PAH								
Naphthalene	NGCMS_1111	0.5	<0.5	NA	NA	NA	94	NA
Acenaphthylene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Acenaphthene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Fluorene	NGCMS_1111	0.5	<0.5	NA	NA	NA	100	NA
Phenanthrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	94	NA
Anthracene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Fluoranthene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Pyrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Benz[a]anthracene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Chrysene	NGCMS_1111	0.5	<0.5	NA	NA	NA	100	NA
Benzo[b]&[k]fluoranthene	NGCMS_1111	1	<1	NA	NA	NA	-	NA
Benzo[a]pyrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	87	NA
Indeno[1_2_3-cd]pyrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Dibenz[ah]anthracene	NGCMS_1111	0.5	<0.5	NA	NA	NA	95	NA
Benzo[ghi]perylene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Surrogate: TER-D14	NGCMS_1111	-	-	NA	NA	NA	97	NA

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 70-130% (BTEX and TPH C6-C9); 50-150% (PAH and TPH C10-C36); 40-150% (Phenols)
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-Pymble

Date: **4/07/2012**

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 75372

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Geoff Fletcher

Sample log in details:

Your Reference:	**E25797K, Camperdown**
No. of samples:	5 Waters
Date samples received / completed instructions received	27/06/2012 / 27/06/2012

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	4/07/12 / 4/07/12
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Nick Sarlamis
Inorganics Supervisor

Giovanni Agosti
Technical Manager

Jeremy Faircloth
Chemist

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VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	75372-1 MW3 27/06/2012 Water	75372-2 MW4 27/06/2012 Water	75372-3 MW9 27/06/2012 Water	75372-4 Dup A 27/06/2012 Water
Date extracted	-	29/06/2012	29/06/2012	29/06/2012	29/06/2012
Date analysed	-	30/06/2012	30/06/2012	30/06/2012	30/06/2012
Dichlorodifluoromethane	µg/L	<10	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1	<1
Chloroform	µg/L	<1	<1	<1	<1
2,2-dichloropropane	µg/L	<1	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1	<1
Benzene	µg/L	<1	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1	<1
Toluene	µg/L	1	1	<1	1
1,3-dichloropropane	µg/L	<1	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1
Bromoform	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
Styrene	µg/L	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1	<1
o-xylene	µg/L	<1	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1	<1

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------ ------------	75372-1 MW3 27/06/2012 Water	75372-2 MW4 27/06/2012 Water	75372-3 MW9 27/06/2012 Water	75372-4 Dup A 27/06/2012 Water
Isopropylbenzene	µg/L	<1	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	103	104	98	102
Surrogate toluene-d8	%	100	101	98	99
Surrogate 4-BFB	%	95	94	102	96

vTRH & BTEX in Water						
Our Reference:	UNITS	75372-1	75372-2	75372-3	75372-4	75372-5
Your Reference	-------------	MW3	MW4	MW9	Dup A	TS1
Date Sampled	------------	27/06/2012	27/06/2012	27/06/2012	27/06/2012	27/06/2012
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	29/06/2012	29/06/2012	29/06/2012	29/06/2012	29/06/2012
Date analysed	-	30/06/2012	30/06/2012	30/06/2012	30/06/2012	30/06/2012
TRH C_6 - C_9	µg/L	<10	<10	150	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1	85%
Toluene	µg/L	1	1	<1	1	88%
Ethylbenzene	µg/L	<1	<1	<1	<1	93%
m+p-xylene	µg/L	<2	<2	<2	<2	93%
o-xylene	µg/L	<1	<1	<1	<1	94%
Surrogate Dibromofluoromethane	%	103	104	98	102	110
Surrogate toluene-d8	%	100	101	98	99	100
Surrogate 4-BFB	%	95	94	102	96	95

sTRH in Water (C10-C36) Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	75372-1 MW3 27/06/2012 Water	75372-2 MW4 27/06/2012 Water	75372-3 MW9 27/06/2012 Water	75372-4 Dup A 27/06/2012 Water
Date extracted	-	28/06/2012	28/06/2012	28/06/2012	28/06/2012
Date analysed	-	28/06/2012	28/06/2012	28/06/2012	28/06/2012
TRH C_{10} - C_{14}	µg/L	<50	<50	120	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100
Surrogate o-Terphenyl	%	93	87	114	88

PAHs in Water - Low Level Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	75372-1 MW3 27/06/2012 Water	75372-2 MW4 27/06/2012 Water	75372-3 MW9 27/06/2012 Water	75372-4 Dup A 27/06/2012 Water
Date extracted	-	28/06/2012	28/06/2012	28/06/2012	28/06/2012
Date analysed	-	29/06/2012	29/06/2012	29/06/2012	29/06/2012
Naphthalene	µg/L	<0.1	<0.1	1.0	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	0.3	<0.1
Fluorene	µg/L	<0.1	<0.1	0.4	<0.1
Phenanthrene	µg/L	<0.1	<0.1	0.7	<0.1
Anthracene	µg/L	<0.1	<0.1	0.3	<0.1
Fluoranthene	µg/L	<0.1	<0.1	0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	89	80	67	82

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	75372-1 MW3 27/06/2012 Water	75372-2 MW4 27/06/2012 Water	75372-3 MW9 27/06/2012 Water	75372-4 Dup A 27/06/2012 Water
Date prepared	-	28/06/2012	28/06/2012	28/06/2012	28/06/2012
Date analysed	-	28/06/2012	28/06/2012	28/06/2012	28/06/2012
Arsenic-Dissolved	µg/L	7	<1	1	<1
Cadmium-Dissolved	µg/L	0.3	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	6	<1
Copper-Dissolved	µg/L	11	4	2	4
Lead-Dissolved	µg/L	<1	<1	<1	1
Mercury-Dissolved	µg/L	<0.050	<0.050	<0.050	<0.050
Nickel-Dissolved	µg/L	16	3	<1	3
Zinc-Dissolved	µg/L	43	19	<1	18

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	75372-1 MW3 27/06/2012 Water	75372-2 MW4 27/06/2012 Water	75372-3 MW9 27/06/2012 Water
Date prepared	-	27/06/2012	27/06/2012	27/06/2012
Date analysed	-	27/06/2012	27/06/2012	27/06/2012
pH	pH Units	4.8	5.1	7.2
Electrical Conductivity	µS/cm	2,300	570	690
Hardness	mgCaCO3 /L	100	20	17
Calcium - Dissolved	mg/L	2.4	1.1	4.0
Magnesium - Dissolved	mg/L	23	4.2	1.6

Method ID	Methodology Summary
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			29/06/2012	[NT]	[NT]	LCS-W1	29/06/2012
Date analysed	-			30/06/2012	[NT]	[NT]	LCS-W1	30/06/2012
Dichlorodifluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Chloromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Vinyl Chloride	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Bromomethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Chloroethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	101%
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Chloroform	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	106%
2,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	96%
1,1,1-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	105%
1,1-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Cyclohexane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Carbon tetrachloride	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Dibromomethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Trichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	123%
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	108%
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Dibromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	118%
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	106%
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromoform	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
m+p-xylene	µg/L	2	Org-013	<2	[NT]	[NT]	[NR]	[NR]
Styrene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
o-xylene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
1,2,3-trichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Isopropylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
n-propyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
2-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
4-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3,5-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tert-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,4-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Sec-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
4-isopropyl toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
n-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Hexachlorobutadiene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-013	96	[NT]	[NT]	LCS-W1	103%
Surrogate toluene-d8	%		Org-013	98	[NT]	[NT]	LCS-W1	100%
Surrogate 4-BFB	%		Org-013	92	[NT]	[NT]	LCS-W1	94%

QUALITY CONTROL vTRH & BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			29/06/2012	[NT]	[NT]	LCS-W1	29/06/2012
Date analysed	-			30/06/2012	[NT]	[NT]	LCS-W1	30/06/2012
TRHC $_6$ - C $_9$	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	102%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	101%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	102%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	101%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	102%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	101%
Surrogate Dibromofluoromethane	%		Org-016	96	[NT]	[NT]	LCS-W1	91%
Surrogate toluene-d8	%		Org-016	98	[NT]	[NT]	LCS-W1	100%
Surrogate 4-BFB	%		Org-016	92	[NT]	[NT]	LCS-W1	99%

QUALITY CONTROL sTRH in Water (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/06/2012	[NT]	[NT]	LCS-W4	28/06/2012
Date analysed	-			28/06/2012	[NT]	[NT]	LCS-W4	28/06/2012
TRHC $_{10}$ - C $_{14}$	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W4	86%
TRHC $_{15}$ - C $_{28}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W4	106%
TRHC $_{29}$ - C $_{36}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W4	90%
Surrogate o-Terphenyl	%		Org-003	106	[NT]	[NT]	LCS-W4	130%

QUALITY CONTROL PAHs in Water - Low Level	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/06/2012	[NT]	[NT]	LCS-W1	28/06/2012
Date analysed	-			29/06/2012	[NT]	[NT]	LCS-W1	29/06/2012
Naphthalene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	106%
Acenaphthylene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	108%
Phenanthrene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	104%
Anthracene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	105%
Pyrene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	111%

QUALITY CONTROL PAHs in Water - Low Level	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)anthracene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	102%
Benzo(b+k)fluoranthene	µg/L	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	103%
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	74	[NT]	[NT]	LCS-W1	109%

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/06/2012	[NT]	[NT]	LCS-W1	28/06/2012
Date analysed	-			28/06/2012	[NT]	[NT]	LCS-W1	28/06/2012
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	89%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	89%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.050	[NT]	[NT]	LCS-W1	84%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	98%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	81%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/06/2012	75372-1	27/06/2012 || 27/06/2012	LCS-W1	27/06/2012
Date analysed	-			28/06/2012	75372-1	27/06/2012 || 27/06/2012	LCS-W1	27/06/2012
pH	pH Units		Inorg-001	[NT]	75372-1	4.8 || 4.8 || RPD: 0	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	75372-1	2300 || 2400 || RPD: 4	LCS-W1	102%
Hardness	mgCaCO3/L	3		[NT]	75372-1	100 || [N/T]	[NR]	[NR]
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	75372-1	2.4 || [N/T]	LCS-W1	90%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	75372-1	23 || [N/T]	LCS-W1	88%

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	75372-2	28/06/2012
Date analysed	-	[NT]	[NT]	75372-2	28/06/2012
Arsenic-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Cadmium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Chromium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Copper-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Lead-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Mercury-Dissolved	µg/L	[NT]	[NT]	75372-2	84%
Nickel-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Zinc-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Environmental Investigation Services	ph: 02 9888 5000
PO Box 976	Fax: 02 9888 5001
North Ryde BC NSW 1670	

Attention: Geoff Fletcher

Sample log in details:

Your reference:	**E25797K, Camperdown**
Envirolab Reference:	**75372**
Date received:	27/06/2012
Date results expected to be reported:	**4/07/12**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	5 Waters
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

TO:
Envirolab Services Pty Ltd
12 Ashley St, Chatswood 2067

Phone: (02) 9910 6200
Fax: (02) 9910 6201

Attention: Aileen

Date Results Required: Standard TAT

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E25797K

Sheet 1 / 1

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Geoff Fletcher

Project: Proposed Redevelopment
Location: Camperdown
Sampler: GF

Sample Preservation:
In esky on ice

	Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Sample Container	PID (ppm/ Odour)	Sample Description	Combo 3	Heavy metals	TPH/BTEX	VOCs	PAHs (low level)	pH / EC / Hardness	BTEX			Comments/Detection Limits Required
1	27/6/12			MW3	1L Amber Bottle 500mlL Amber Bottle 3 BTEX Vials 2 HDPE Plastic Bottles		Water		X	X	X	X	X				
2	27/6/12			MW4	1L Amber Bottle 500mlL Amber Bottle 3 BTEX Vials 2 HDPE Plastic Bottles		Water		X	X	X	X	X				ENVIROLAB Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200 Job No: 75372. Date Received: 27.06.12. Time Received: 15.00. Received by: Dia Liu. Temp: [✓ Cool]/Ambient Cooling: [✓ Ice]/Icepack Security: [✓ Intact]/Broken/None
3	27/6/12			MW9	1L Amber Bottle 500mlL Amber Bottle 3 BTEX Vials 2 HDPE Plastic Bottles		Water		X	X	X	X	X				
4	27/6/12			Dup A	1L Amber Bottle 500mlL Amber Bottle 3 BTEX Vials 1 HDPE Plastic Bottles		Water		X	X	X	X					
5	27/6/12			TS1	BTEX Vial		Water							X			

Relinquished By:
Date: 27/6/12
Time: 13:30
Received By: Dia Liu

Relinquished By:
Date:
Time:
Received By:

Remarks: Please filter samples for heavy metals analysis

All analysis PQLs to ANZECC (2000) Detection Limits Please

APPENDIX C

Site Photographs Obtained During the Inspection

Table 1: Selected Site Photos taken on 27 June 2012

	**Photograph 1:** Taken showing the suspected UST area near BH9, facing north.
	**Photograph 2:** Taken showing the above ground oxygen tank.
	**Photograph 3:** Taken showing the site looking from the western boundary.

APPENDIX D

(Sampling Protocols and QA/QC Definitions)

SOIL AND GROUNDWATER SAMPLING PROTOCOLS

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by EIS. The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

Soil Sampling

a) Prepare a test pit/borehole log.
b) Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill/rig excavator such that the drill rig/excavator can operate in a safe manner.
c) Ensure all sampling equipment has been decontaminated prior to use.
d) Remove any surface debris from the immediate area of the sampling location.
e) Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possibly to prevent the loss of volatiles. If possible, fill the glass jars completely.
f) Collect samples for asbestos analysis and place in a zip-lock plastic bag.
g) Label the jar and/or bag with the EIS job number, sample location (eg. BH1), sampling depth interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).
h) Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled zip-lock plastic bags. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.
i) Record the lithology of the sample and sample depth on the borehole/test pit log in accordance with AS1726-1993[26].
j) Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab. All samples are preserved in accordance with AS 4482.1:2005, AS 4482.2:1999 and AS/NZS 5667.1:1998.
k) Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.
l) Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

Decontamination Procedures for Soil Sampling Equipment

a) All of the equipment associated with the soil sampling procedure should be decontaminated between every sampling location.
b) The following equipment and materials are required for the decontamination procedure:
    - Phosphate free detergent (Decon 90)
    - Potable water
    - Stiff brushes
    - Plastic sheets
c) Ensure the decontamination materials are clean prior to proceeding with the decontamination.
d) Fill both buckets with clean potable water and add phosphate free detergent to one bucket.

---

[26] *Geotechnical Site Investigations*, Standards Australia 1993 (AS1726-1993)

e) In the bucket containing the detergent scrub the sampling equipment until all the material attached to the equipment has been removed.
f) Rinse sampling equipment in the bucket containing potable water.
g) Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes that equipment should not be used until it has been thoroughly cleaned.

Groundwater Sampling

Groundwater samples are more sensitive to contamination than soil samples and therefore adhesion to this protocol is particularly important to obtain reliable, reproducible results. The recommendations detailed in AS/NZS 5667.1:1998 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed groundwater monitoring wells.

a) After monitoring well installation, at least three bore volumes should be pumped from the monitoring wells (well development) to remove any water introduced during the drilling process and/or the water that is disturbed during installation of the monitoring well. This should be completed prior to purging and sampling.
b) Groundwater monitoring wells should then be left to recharge for at least three days before purging and sampling. Prior to purging or sampling the condition of each well should observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.
c) Take the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
d) Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or low flow) techniques. Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:
    - Micropore filtration system or Stericup single-use filters (for heavy metals samples).
    - Filter paper for Micropore filtration system.
    - Bucket with volume increments.
    - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles.
    - Bucket with volume increments.
    - Flow cell.
    - pH/EC/Eh/T meters.
    - Plastic drums used for transportation of purged water.
    - Esky and ice.
    - Nitrile gloves.
    - Distilled water (for cleaning).
    - Electronic dip meter.
    - Micro-purge pump pack and pump head.
    - Air and water tubing for Micro-purge.
    - Groundwater sampling forms.
e) If single-use stericup filtration is not being used, clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should

be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.

f) Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.

g) Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.

h) Groundwater samples are obtained from the monitoring wells using low flow/micro-purge sampling equipment to reduce the disturbance of the water column and loss of volatiles.

i) During pumping to purge the well, the pH, temperature, conductivity, dissolved oxygen, redox potential and groundwater levels are monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. Steady state conditions are generally considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%.

j) All measurements are recorded on specific data sheets.

k) Once steady state conditions are considered to have been achieved, groundwater samples are obtained directly from the pump tubing and placed in appropriate glass bottles, BTEX vials or plastic bottles.

l) All samples are preserved in accordance with water sampling requirements detailed in the NEPM 1999 and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice in accordance with AS/NZS 5667.1:1998.

m) Record the sample on the appropriate log in accordance with AS1726:1993. At the end of each water sampling complete a chain of custody form.

Decontamination Procedures for Groundwater Sampling Equipment

a) All of the equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.

b) The following equipment and materials are required for the decontamination procedure:
    - Phosphate free detergent.
    - Potable water.
    - Distilled water
    - Plastic Sheets or bulk bags (plastic bags)

c) Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.

d) Flush potable water and detergent through pump head. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.

e) Flush pump head with distilled water.

f) Change water and detergent solution after each sampling location.

g) Rinse sampling equipment in the bucket containing distilled water.

h) Place cleaned equipment on clean plastic sheets.

i) If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned

QA/QC DEFINITIONS

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994[27]) methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (H. Keith 1991[28]).

Practical Quantitation Limit (PQL), Limit of Reporting (LOR) and Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection limit (MDL) for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations.*"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit"* Keith 1991.

Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD). Acceptable targets for precision in this report will be less than 50% RPD for concentrations greater than ten times the PQL, less than 75% RPD for concentrations between five and ten times the PQL and less than 100% RPD for concentrations that are less than five times the PQL.

Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured. The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes.

The proximity of an averaged result to the true value, where all random errors have been statistically removed. Accuracy is measured by percent recovery. Acceptable limits for accuracy generally lie between 70% to 130% recoveries. Certain laboratory methods may allow for values that lie outside these limits.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handing and analysis protocols and use of proper chain-of-custody and documentation procedures.

---

[27] *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* US EPA, 1994 (US EPA SW-846)

[28] *Environmental Sampling and Analysis, A Practical Guide*, Keith, H, 1991 (Keith 1991)

Completeness

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;
- All blank data reported;
- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

Comparability

Comparability is the evaluation of the similarity of conditions (eg. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel;
- Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).

Blanks

The purpose of laboratory and field blanks is to check for artifacts and interferences that may arise during sampling and analysis.

Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula below. Acceptable recovery limits are 70% to 130%.

$$\frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Concentration of Spike Added}} \times 100$$

Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2)}{\{(D1 + D2)/2\}} \times 100$$

APPENDIX E

Hardness Modified Trigger Values Calculation Sheet

ADJUSTING THE TRIGGER VALUE TO TAKE ACCOUNT OF HARDNESS

CALCULATION:

Calculate the average hardness (H) value (mg/L as CaCO3) for the site and enter here 45.66

The original 95% trigger values (TV) and the hardness modified trigger values (HMTV) are shown in the Table below in µg/L

Metal	TV	Hardness algorithm	HMTV
Cadmium	0.2	$HMTV = TV(H/30)^{0.89}$	0.3
Chromium III	1	$HMTV = TV(H/30)^{0.82}$	1.4
Copper	1.4	$HMTV = TV(H/30)^{0.85}$	2.0
Lead	3.4	$HMTV = TV(H/30)^{1.27}$	5.8
Nickel	11	$HMTV = TV(H/30)^{0.85}$	15.7
Zinc	8	$HMTV = TV(H/30)^{0.85}$	11.4

DO NOT ALTER NUMBERS IN RED COLUMN

Explanatory Notes:
Australian and New Zealand Guidelines for Fresh and Marine Water Quality ANZECC 2000. (Chap 3, p3.4-21, Table 3.4.3)

Conductivity measurements are temperature dependent. The degree to which temp affects conductivity varies from solution to solution. The conductivity of of a solution increases with temperature. For salt solutions this is typically 2.2 to 3%/degree Centigrade, for fresh water it is typically 2%/degree centigrade.
www.emersonprocess.com/raihome/.../Liq_AppData_43-018.pdf

http://www.fivecreeks.org/monitor/sal.html
This website includes a conversion calculator for salinity to conductivity that also incudes a temperature compensation factor
Results are in ppt (1ppt equals 1000mg/L) - http://www.aquatext.com/tables/concconv.htm
This formula is valid for salt concentrations ranging from 2ppt to 42 ppt (ie 2000mg/L to 42000mg/L).
Recommend this one as it is easy, has temp adjustment and appears to give reasonable results.

Different salts have different abilities to conduct electricity most conversion factors appear to assume that the majjority of salt in a sample is sodium chloride (a reasonable assumption).
http://www.sa.waterwatch.org.au/sw_salinity.htm
The above website cites a conversion factor of 0.56 (ie multiply EC value uS/cm by 0.56)

Conversion factors seem to range from 0.52 to 0.56

The calculation allows you you to adjust the trigger value for some of the heavy metals

The calculation only applies to fresh waters with a salinty of 2500mg/L or less.
At 25°C a salinity value of 2500mg/L approximates to a conductivity reading of 4750 µS/cm. (assumes a conversion factor 0.52)

APPENDIX F

(Groundwater Monitoring Sheets & Equipment Calibration Records)

PID FIELD CALIBRATION SHEET

Make: MiniRAE	Model: 2000	Unit: 1	Date of last factory calibration: 4/5/2012
Date of calibration: 18/6/2012		Name of Calibrator: Katie McGrath	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 100 ppm		Error in measured reading: ± 0 ppm	

Make: MiniRAE	Model: 2000	Unit: 1	Date of last factory calibration: 4/5/2012
Date of calibration: 19/6/2012		Name of Calibrator: Katie McGrath	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 100 ppm		Error in measured reading: ± 0 ppm	

Make: MiniRAE	Model: 2000	Unit: 1	Date of last factory calibration: 4/5/2012
Date of calibration: 20/6/2012		Name of Calibrator: Katie McGrath	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 100 ppm		Error in measured reading: ± 0 ppm	

Make: MiniRAE	Model: 2000	Unit: 1	Date of last factory calibration: 4/5/2012:
Date of calibration: 21/6/2012		Name of Calibrator: Katie McGrath	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 100 ppm		Error in measured reading: ± 0 ppm	

```
----------------------------------
***** Calibrate: DO

Date            21/06/12 DD/MM/YY
Time            09:26:55 24-hour
User ID:         KM


Method           DO Air Calibrate
Cal Value:      100.000000 %
Sensor Value:     2.843083 uA
Sensor Type      Polarographic
Membrane Type       1.25 PE Yellow
Salinity Mode     2.843083 Auto
Temperature        9.900000 %C2%B0C
Barometer        760.099976 mmHg
Calibrate Status    Calibrated

----------------------------------
***** Calibrate: ORP

Date            21/06/12 DD/MM/YY
Time            09:25:48 24-hour
User ID:         KM

Cal Solution Value:   248.899994 ORP mV
Sensor Value:     245.100006 ORP mV
Temperature        12.100000 %C2%B0C
Calibrate Status    Calibrated

----------------------------------
***** Calibrate: pH

Date            21/06/12 DD/MM/YY
Time            09:25:09 24-hour
User ID:         KM

Buffer Value      7.054945 pH
Sensor Value:     -24.799999 pH mV
Temperature        12.749994 %C2%B0C

Buffer Value      4.000842 pH
Sensor Value:     142.199997 pH mV
Temperature        12.450006 %C2%B0C

Slope           57.082265 mV/pH
Slope           98.321581 % of Ideal pH Value
Calibrate Status    Calibrated

----------------------------------
```

```
***** Calibrate: Conductivity

Date              21/06/12 DD/MM/YY
Time              09:20:52 24-hour
User ID:           KM

Method             Conductance
Cal Value:         1122.000000 C-uS/cm
Sensor Value:        1123.000000 C-uS/cm
Temperature Ref.     25.000000 %C2%B0C
Temperature Comp.     1.910000 %/C
TDS Constant         0.650000
Temperature          12.400000 %C2%B0C
Cal Cell Constant:    5.281373
Calibrate Status     Calibrated

----------------------------------
```

```
----------------------------------
***** Calibrate: DO
Date                27/06/12 DD/MM/YY
Time                09:11:28 24-hour
User ID:             GF

Method               DO Air Calibrate
Cal Value:           100.000000 %
Sensor Value:          3.127034 uA
Sensor Type           Polarographic
Membrane Type          1.25 PE Yellow
Salinity Mode          3.127034 Auto
Temperature            11.500000 %C2%B0C
Barometer             771.700012 mmHg
Calibrate Status       Calibrated

----------------------------------
***** Calibrate: ORP
Date                27/06/12 DD/MM/YY
Time                09:11:01 24-hour
User ID:             GF

Cal Solution Value:    247.990005 ORP mV
Sensor Value:          241.000000 ORP mV
Temperature            12.700000 %C2%B0C
Calibrate Status       Calibrated

----------------------------------
***** Calibrate: pH
Date                27/06/12 DD/MM/YY
Time                09:10:29 24-hour
User ID:             GF

Buffer Value          7.053932 pH
Sensor Value:          -28.100000 pH mV
Temperature            12.950006 %C2%B0C

Buffer Value          4.000766 pH
Sensor Value:          140.899994 pH mV
Temperature            12.850000 %C2%B0C

Slope               57.703519 mV/pH
Slope               97.214964 % of Ideal pH Value
Calibrate Status       Calibrated

----------------------------------
***** Calibrate: Conductivity

Date                27/06/12 DD/MM/YY
```

Time	09:07:21 24-hour
User ID:	GF

Method	Conductance
Cal Value:	909.000000 C-uS/cm
Sensor Value:	909.000000 C-uS/cm
Temperature Ref.	25.000000 %C2%B0C
Temperature Comp.	1.910000 %/C
TDS Constant	0.650000
Temperature	13.100000 %C2%B0C
Cal Cell Constant:	4.166055
Calibrate Status	Calibrated

Timestamp	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	ORP_1 (mV)	pH_1 (Units)	Temperature (C)	Site	Folder	Unit ID
27/06/2012 9:25	469	2.2	204.9	6.97	18.1	E25797K	MW9	EIS YSI2
27/06/2012 9:26	479.5	1.9	191.6	6.97	18.1	E25797K	MW9	EIS YSI2
27/06/2012 9:26	478.7	1.8	179.4	6.98	18	E25797K	MW9	EIS YSI2
27/06/2012 9:27	478.4	1.7	173.1	6.99	17.8	E25797K	MW9	EIS YSI2
27/06/2012 9:27	477.6	1.7	167	7	17.8	E25797K	MW9	EIS YSI2
27/06/2012 10:03	405.8	1.2	185.7	4.89	18.9	E25797K	MW4	EIS YSI2
27/06/2012 10:04	406.3	1.2	192.2	4.84	18.9	E25797K	MW4	EIS YSI2
27/06/2012 10:04	408.7	1.3	197.1	4.82	18.9	E25797K	MW4	EIS YSI2
27/06/2012 10:05	409.8	1.3	201.3	4.8	19	E25797K	MW4	EIS YSI2
27/06/2012 10:05	410.6	1.2	205.4	4.78	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:06	410.8	1.2	208.4	4.77	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:06	410.8	1.1	211.6	4.77	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:07	410.8	1.1	213.9	4.77	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:07	410.8	1.1	216	4.76	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:08	410.7	1	217.8	4.75	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:08	410.9	1	218.9	4.75	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:09	410.8	1	220.2	4.74	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:09	410.6	0.9	221.9	4.73	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:10	410.5	0.9	223.5	4.72	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:10	410.4	0.9	225.3	4.72	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:11	410.3	0.9	226.7	4.72	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:11	410.3	0.9	227.9	4.71	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:12	410.3	0.9	228.8	4.71	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:12	410.3	0.9	230.1	4.7	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:13	410.2	0.8	231.1	4.71	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:13	410.3	0.8	232.2	4.7	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:14	410.1	0.8	233.2	4.7	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:14	410	0.8	233.8	4.7	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:15	409.8	0.8	234.7	4.71	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:15	409.6	0.8	235.7	4.69	19.1	E25797K	MW4	EIS YSI2
27/06/2012 10:16	409.4	0.8	236.4	4.69	19	E25797K	MW4	EIS YSI2
27/06/2012 10:16	409.3	0.8	237.4	4.69	19	E25797K	MW4	EIS YSI2

27/06/2012 10:17	409.3	0.8	237.9	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:17	409.1	0.7	238.6	4.69	19	E25797K	MW4	EIS YSI2
27/06/2012 10:18	409	0.7	239.2	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:18	408.9	0.7	240.1	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:19	408.8	0.8	240.8	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:19	408.8	0.7	241.5	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:20	408.6	0.7	242.1	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:20	408.4	0.7	243.1	4.68	19	E25797K	MW4	EIS YSI2
27/06/2012 10:21	408.3	0.7	243.7	4.67	19	E25797K	MW4	EIS YSI2
27/06/2012 10:21	408.2	0.7	244.4	4.67	19	E25797K	MW4	EIS YSI2
27/06/2012 10:22	408.3	0.7	245.2	4.67	19	E25797K	MW4	EIS YSI2
27/06/2012 10:22	408.3	0.7	246.2	4.67	19	E25797K	MW4	EIS YSI2
27/06/2012 10:23	408.3	0.7	246.5	4.67	19	E25797K	MW4	EIS YSI2
27/06/2012 10:23	408.2	0.7	247.3	4.67	19	E25797K	MW4	EIS YSI2
27/06/2012 11:34	1772	1.1	209.6	4.51	19.7	E25797K	MW3	EIS YSI2
27/06/2012 11:34	1784	1	208.4	4.5	19.7	E25797K	MW3	EIS YSI2
27/06/2012 11:35	1790	1	209.5	4.49	19.7	E25797K	MW3	EIS YSI2
27/06/2012 11:35	1794	0.9	209.2	4.48	19.7	E25797K	MW3	EIS YSI2
27/06/2012 11:36	1791	1	210.2	4.47	19.6	E25797K	MW3	EIS YSI2
27/06/2012 11:36	1788	1	211.2	4.45	19.6	E25797K	MW3	EIS YSI2
27/06/2012 11:37	1783	0.9	213.8	4.43	19.5	E25797K	MW3	EIS YSI2
27/06/2012 11:37	1775	0.9	215.8	4.41	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:38	1769	0.9	215.4	4.4	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:38	1768	0.9	215.8	4.39	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:39	1766	0.9	217.5	4.38	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:39	1769	0.9	216.9	4.38	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:40	1766	0.9	216.1	4.38	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:40	1762	0.9	217.9	4.38	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:41	1761	0.9	218.8	4.37	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:41	1763	0.9	219.2	4.36	19.5	E25797K	MW3	EIS YSI2
27/06/2012 11:42	1763	0.9	218	4.36	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:42	1761	0.9	219	4.36	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:43	1759	0.9	220.3	4.35	19.4	E25797K	MW3	EIS YSI2

27/06/2012 11:43	1757	0.9	220.8	4.35	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:44	1760	0.9	219.1	4.35	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:44	1762	0.9	219.3	4.35	19.4	E25797K	MW3	EIS YSI2
27/06/2012 11:45	1764	0.9	218	4.35	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:45	1762	0.8	217.1	4.36	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:46	1760	0.9	218.1	4.36	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:46	1758	0.9	219.3	4.35	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:47	1755	0.8	219.9	4.35	19.3	E25797K	MW3	EIS YSI2
27/06/2012 11:47	1749	0.8	219.2	4.34	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:48	1743	0.8	220.7	4.33	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:48	1741	0.8	220.7	4.32	19.2	E25797K	MW3	EIS YSI2
27/06/2012 11:49	1739	0.8	221.4	4.33	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:49	1736	0.8	222.6	4.33	19	E25797K	MW3	EIS YSI2
27/06/2012 11:50	1729	0.8	221.8	4.32	18.9	E25797K	MW3	EIS YSI2
27/06/2012 11:50	1727	0.8	220.9	4.31	18.9	E25797K	MW3	EIS YSI2
27/06/2012 11:51	1727	0.8	220.8	4.31	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:51	1731	0.8	220.8	4.32	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:52	1732	0.8	219.7	4.32	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:52	1728	0.9	219.3	4.33	19	E25797K	MW3	EIS YSI2
27/06/2012 11:53	1724	0.9	220.1	4.33	19	E25797K	MW3	EIS YSI2
27/06/2012 11:53	1722	1	219.3	4.33	19	E25797K	MW3	EIS YSI2
27/06/2012 11:54	1721	0.8	219.8	4.34	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:54	1722	0.8	220.1	4.34	19.1	E25797K	MW3	EIS YSI2
27/06/2012 11:55	1722	0.9	219.8	4.33	19.1	E25797K	MW3	EIS YSI2

Groundwater Monitoring Well Development Report

Client:	Health Infrastructure NSW	**Job No.:**	E25797K
Project:	Proposed RPA North West Precinct Redevelopment	**Well No.:**	MW 3
Location:	Cnr Missenden Road and Lucas Street, Camperdown, NSW	**Depth (m):**	15.00

WELL FINISH DETAILS

X	**Gatic Cover**		**Standpipe**		**PVC Pipe**

WELL DEVELOPMENT DETAILS

Method:	Pump	**SWL – Before: (m)**	4.57m
Date:	21/6/12	**Time – Before:**	—
Undertaken By:	GF	**SWL – After: (m)**	7.16
Total Vol. Removed:	35	**Time – After:**	—
PID Reading (ppm):	—		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	pH	EC (mS/m)	DO (mg/L)	Eh (mV)
See YSi	data Sheets.				

Comments: Pump Stopped Pumping Water very Sludgy.

Tested By:	GF
Date Tested:	21/6/12
Checked By:	VB
Date:	13/7/12

Remarks:

- All measurements are corrected to ground level
- All stated Volumes are in Litres
- SWL is an abbreviation for standing water level
- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%
- Minimum 3 monitoring well volumes are purged

EIS

Groundwater Monitoring Well Development Report

Client:	Health Infrastructure NSW	**Job No.:**	E25797K
Project:	Proposed RPA North West Precinct Redevelopment	**Well No.:**	MW4
Location:	Cnr Missenden Road and Lucas Street, Camperdown, NSW	**Depth (m):**	14.80

WELL FINISH DETAILS

X	**Gatic Cover**		**Standpipe**		**PVC Pipe**

WELL DEVELOPMENT DETAILS

Method:	Pump	**SWL – Before: (m)**	3.80
Date:	21/6/12	**Time – Before:**	1.45
Undertaken By:	GF	**SWL – After: (m)**	9.70
Total Vol. Removed:	45	**Time – After:**	—
PID Reading (ppm):	—		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	pH	EC (mS/m)	DO (mg/L)	Eh (mV)
See YSI data Sheets					

Comments:

Tested By:	GF
Date Tested:	21/6/12
Checked By:	VB
Date:	13/7/12

Remarks:
- All measurements are corrected to ground level
- All stated Volumes are in Litres
- SWL is an abbreviation for standing water level
- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%
- Minimum 3 monitoring well volumes are purged

EIS

Groundwater Monitoring Well Development Report

Client:	Health Infrastructure NSW	**Job No.:**	E25797K
Project:	Proposed RPA North West Precinct Redevelopment	**Well No.:**	~~[illegible]~~ MW19
Location:	Cnr Missenden Road and Lucas Street, Camperdown, NSW	**Depth (m):**	~~[illegible]~~ 3.00

WELL FINISH DETAILS

X	**Gatic Cover**	☐	**Standpipe**	☐	**PVC Pipe**

WELL DEVELOPMENT DETAILS

Method:	Pump	**SWL – Before: (m)**	~~[illegible]~~ 1.51
Date:	21/6/12	**Time – Before:**	–
Undertaken By:	GF	**SWL – After: (m)**	7.16
Total Vol. Removed:	~~[illegible]~~ 5	**Time – After:**	–
PID Reading (ppm):	–		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	pH	EC (mS/m)	DO (mg/L)	Eh (mV)
See YSI data sheets					

Comments: ~~Pump stopped pumping water very sludgy~~.

Tested By:	GF
Date Tested:	21/6/12
Checked By:	VB
Date:	13/7/12

Remarks:

- All measurements are corrected to ground level
- All stated Volumes are in Litres
- SWL is an abbreviation for standing water level
- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%
- Minimum 3 monitoring well volumes are purged

roundwater Sampling Report

Client:	**Health Infrastructure NSW**	**Job No.:**	E25797K
Project:	RPA North West Precinct Redevelopment	**Well No.:**	MW3
Location:	Cnr Lucas Street and Missenden Road, Camperdown	**Depth (m):**	15.00

WELL FINISH

X	**Gatic Cover**	☐	**Standpipe**	☐	**PVC Pipe**

WELL PURGE DETAILS:

Method:	Peristaltic Pump	**SWL – Before:**	4.65
Date:	27/6/12	**Time – Before:**	-
Undertaken By:	GF	**Total Vol Removed:**	1.5
Pump Program No:	2.27	**PID (ppm):**	-

PURGING / SAMPLING MEASUREMENTS

Time (min)	CMP	Vol (L)	SWL (m)	Temp (°C)	pH	EC (μS/cm)	Eh (mV)	DO ppm
11:29			4.64					
11:32	4.31		4.75					
11:33	2.85	~~Flowcell~~	4.85					
11:34	2.58	Flowcell	4.90	19.7	4.50	1781	208.9	1.0
11:35	2.27		4.91					
11:39	2.27		5.00	19.4	4.38	1766	217.6	0.9
11:45	2.27		5.10	19.4	4.35	1763	218.5	0.9
11:50	2.27		5.15	18.9	4.32	1728	220.9	0.8
1151	"		5.17	19.1	4.31	1730	221.0	0.8
1152	"		5.20	19.0	4.33	1728	219.4	0.9
1153	"		5.24	19.0	4.33	1724	220.1	0.8
1154	"		5.27	19.1	4.34	1724	220.2	0.8
1155	"	1.5	5.30	19.1	4.33	1722	219.7	1.0
→			Start Sampling					

Containers Used/Comments 1x1L Amber, 1x500ml Amber, 3x BTEX, 2x 125ml PVC.

Tested By: GF
Date Tested: 27/6/12
Checked By: VB
Date: 13/7/12

Remarks:

- All measurements are corrected to ground level
- SWL is an abbreviation for standing water level
- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%

roundwater Sampling Report

Client:	**Health Infrastructure NSW**	**Job No.:**	E25797K
Project:	RPA North West Precinct Redevelopment	**Well No.:**	MW4
Location:	Cnr Lucas Street and Missenden Road, Camperdown	**Depth (m):**	14.8

WELL FINISH

X	**Gatic Cover**	☐	**Standpipe**	☐	**PVC Pipe**

WELL PURGE DETAILS:

Method:	Peristaltic Pump	**SWL – Before:**	4.90
Date:	27/6/12	**Time – Before:**	–
Undertaken By:	GF	**Total Vol Removed:**	2
Pump Program No:	2.50	**PID (ppm):**	–

PURGING / SAMPLING MEASUREMENTS

Time (min)	CMP	Vol (L)	SWL (m)	Temp (°C)	pH	EC (μS/cm)	Eh (mV)	DO ppm
10:00			4.85					
10:03	4.01		5.00					
10:04	3.04	Flowcell	5.05	18.8	4.86	405.0	187.4	1.2
10:06	2.50		5.10	19.1	4.78	410.7	200.9	1.2
10:08	"		5.10	19.1	4.76	410.7	216.8	1.0
10:12	"	1	5.10	19.1	4.71	4109	229.2	0.9
10:18	"		5.10	19.0	4.68	409.0	239.4	0.7
10:19	"		5.10	19.0	4.68	409.1	241.9	0.7
10:20	"		5.10	19.0	4.68	409.0	242.5	0.7
1021	"		5.10	19.0	4.68	409.0	243.4	0.7
1022	"		5.10	19.0	4.67	4089	244.8	0.7
10:23	"	2	5.11	19.0	4.67	408.7	246.6	0.7
→			start sampling					

Containers Used/Comments 1x 1L Amber, 1x500ml Amber, 3x BTEX, 2x 125ml PVC
Dup A as above but only 1x 125ml PVC.

Tested By: GF	**Remarks:**
Date Tested: 27/6/12	- All measurements are corrected to ground level
Checked By: UB	- SWL is an abbreviation for standing water level
Date: 13/7/12	- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%

Groundwater Sampling Report

EIS

Client:	**Health Infrastructure NSW**	**Job No.:**	E25797K
Project:	RPA North West Precinct Redevelopment	**Well No.:**	MW9
Location:	Cnr Lucas Street and Missenden Road, Camperdown	**Depth (m):**	3.00

WELL FINISH

X	**Gatic Cover**		**Standpipe**		**PVC Pipe**

WELL PURGE DETAILS:

Method:	Peristaltic Pump	**SWL – Before:**	1.09
Date:	27/6/12	**Time – Before:**	—
Undertaken By:	GF	**Total Vol Removed:**	1
Pump Program No:	2.20	**PID (ppm):**	—

PURGING / SAMPLING MEASUREMENTS

Time (min)	CMP	Vol (L)	SWL (m)	Temp (°C)	pH	EC (μS/cm)	Eh (mV)	DO ppm
9.25	2.20	Flowcell	1.70	18.0	6.98	4786	1779	1.8
9:28	2.20		1.80	17.8	7.00	4779	1676	1.7
↳	→	Sampling started due to SWL drawdown lack of head of water.						*

Containers Used/Comments 1x500ml Amber 1x1L Amber.
3x BTEX, 2x 125ml PVC

Tested By: GF	**Remarks:**
Date Tested: 27/6/12	- All measurements are corrected to ground level
Checked By: VB	- SWL is an abbreviation for standing water level
Date: 13/7/12	- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%