ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

CROWN EASTLAKES DEVELOPMENTS PTY LTD

ON

ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED RETAIL DEVELOPMENT

AT

EASTLAKES SHOPPING CENTRE, NSW

21 MAY 2019 **REF: E25302Krpt Rev4**

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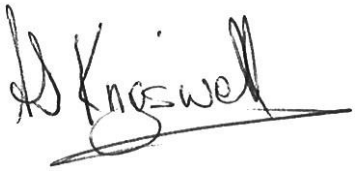

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EXECUTIVE SUMMARY

Crown Eastlakes Development Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS)[1] to update a Preliminary Environmental Site Assessment (PESA) prepared for the proposed retail development at Eastlakes Shopping Centre, Evans Avenue ('the site'). The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

EIS have previously undertaken a Preliminary Environmental Site Assessment (PESA) at the site in 2012. The findings were summarised in *"Report To Crown Prosha Joint Venture On Preliminary Environmental Site Assessment For Proposed Shopping Centre Re-Development At Eastlakes Shopping Centre Gardeners Road, Eastlakes. April 2012 Ref: E25302krpt Rev1[2]".* This report is an update of the original report taking into account changes in guidelines and legislation in the interim period. No additional investigation has been undertaken for this report.

The primary aim of this report is to re-assess the data collected for the original 2012 report in light of the current guidelines. The aims of the original assessment were to identify any past or present potentially contaminating activities at the site, identify the potential for site contamination, and make a preliminary assessment of the soil and groundwater contamination conditions. The assessment objectives were to:

- Provide an appraisal of the past site use(s) based on a review of historical records;
- Assess the current site conditions and use(s) via a site walkover inspection;
- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil and groundwater contamination conditions via implementation of a preliminary sampling and analysis program;
- Prepare a conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Asses for the potential presence of acid sulfate soil (ASS); and
- Assess whether further intrusive investigation and/or remediation is required.

The site is located in a predominantly residential/commercial area of Eastlakes. The site is located to the south of Gardeners Road and to the east of Racecourse Place / Eastlakes Reserve. The site is divided by Evans Avenue into two separate portions. The northern portion is bounded to the north by Gardeners Road, to the south by Evans Avenue, to the east and west by three and four storey residential unit blocks. The southern portion of the site is bounded by Evans Avenue to the north, Barber Avenue to the east and south, and Eastlakes Reserve to the west.

In 2012 the section of the site to the south of Evans Avenue was occupied by a shopping centre with some on-grade car parking. The section to the north of Evans Avenue was occupied by on grade car parking with some retail outlets along the north boundary. In 2017 the south section of the site was similar to 2012 but the north section of the site had been excavated to approximately 10m below ground level.

Prior to the construction of the Eastlakes shopping centre and associated car parking in approximately 1978 the site had been part of a racecourse. There were a number of records on the NSW EPA web-site relating to remediation of a former Shell Service Station to the west of the site.

Some limited sampling was undertaken from boreholes drilled for a geotechnical investigation in 2012. One fill sample BH107 (0.3-0.5) contained an elevated copper result above the ecological SAC. This is no longer considered to an issue as this area of the site has been excavated. One fill sample BH109(0.1-0.2) contained an elevated carcinogenic PAH above the health based SAC. Although the elevation is relatively minor there is not enough data to assess whether the detected elevation is significant.

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[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[2] Referred to as EIS 2012

Potential Acid Sulfate Soil (PASS) conditions were not considered to be present at the site to a maximum depth of approximately 3.0m below existing site levels.

When the site becomes accessible a detailed Stage 2 assessment should be undertaken to address the data gaps identified in Section 9.3

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

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ABBREVIATIONS

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Ambient Background Concentrations	**ABC**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Environmental Investigation Services	**EIS**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
Fibre Cement Fragment(s)	**FCF**
General Approval of Immobilisation	**GAI**
Health Investigation Level	**HILs**
Hardness Modified Trigger Values	**HMTV**
Health Screening Level	**HSLs**
International Organisation of Standardisation	**ISO**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Potential ASS	**PASS**
Polychlorinated Biphenyls	**PCBs**

ABBREVIATIONS

Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standard Sampling Procedure	**SSP**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

Crown Eastlakes Development Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS)[3] to update a Preliminary Environmental Site Assessment (PESA) prepared for the proposed retail development at Eastlakes Shopping Centre, Evans Avenue ('the site'). The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

EIS have previously undertaken a Preliminary Environmental Site Assessment (PESA) at the site in 2012. The findings were summarised in *"Report To Crown Prosha Joint Venture On Preliminary Environmental Site Assessment For Proposed Shopping Centre Re-Development At Eastlakes Shopping Centre Gardeners Road, Eastlakes. April 2012 Ref: E25302krpt Rev1[4]".* This report is an update of the original report taking into account changes in guidelines and legislation in the interim period. No additional investigation has been undertaken for this report.

A geotechnical investigation was undertaken in conjunction with the original environmental site screening by J&K and the results are presented in a separate report (Ref. Ref: 25302Vrpt-EASTLAKES, dated 14 November 2011[5]).

1.1 Proposed Development Details

EIS understand that the proposed development on the south section of the site (i.e. south of Evans Avenue) includes demolition of the existing shopping centre, and construction of a multi-storey buildings with residential apartments above a new shopping centre. The proposed development also includes construction of basement levels. A review of the latest development plans indicates the following:

- The multi-storey building (DJ) will include 11 storeys and will be split into 2 separate buildings;
- An overall decrease (by 69) in the number of residential apartments; and
- Reduced basement footprint from B2 and extends to B4.

1.2 Aims and Objectives

The primary aim of this report is to re-assess the data collected for the original 2012 report in light of the current guidelines. The aims of the original assessment were to identify any past or present potentially contaminating activities at the site, identify the potential for site contamination, and make a preliminary assessment of the soil and groundwater contamination conditions. The assessment objectives were to:

- Provide an appraisal of the past site use(s) based on a review of historical records;
- Assess the current site conditions and use(s) via a site walkover inspection;

[3] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[4] Referred to as EIS 2012

[5] Referred to as JK 2011

- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil and groundwater contamination conditions via implementation of a preliminary sampling and analysis program;
- Prepare a conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Asses for the potential presence of acid sulfate soil (ASS); and
- Assess whether further intrusive investigation and/or remediation is required.

1.3 Scope of Work

The original assessment was undertaken generally in accordance with an EIS proposal (Ref: EP5501K) of 22 March 2011 and written acceptance from Crown Group of 13 October 2011.
The scope of work included the following:

- Limited review of site information, including aerial photographs;
- Site Inspection;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC); and
- Preparation of a report.

The updating of the report was undertaken in accordance with EIS proposal (Ref: EP47664K) dated 16 July 2018 and written acceptance for Crown Eastlakes Developments Pty dated 19 July 2018.

The report update was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[6], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[7] and State Environmental Planning Policy No.55 – Remediation of Land (1998)[8]. A list of reference documents/guidelines is included in the appendices.

[6] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)
[7] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)
[8] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

2 SITE INFORMATION

2.1 Site Identification

Table 2-1: Site Identification

Current Site Owner:	Crown Group
Site Address:	19 Evans Avenue, Eastlakes
Lot & Deposited Plan:	Lots 3 and 5 DP 248832 (Eastlakes Shopping Centre and car park north of Evans Avenue); Lot 41 and lot 42 DP 601517; and Lot 100 DP 700822 (193 Gardeners Rd, Eastlakes, car park north of Evans Ave and shops fronting Gardeners Rd).
Current Land Use:	Shopping centre
Proposed Land Use:	Mixed use – commercial and residential
Local Government Authority:	City of Botany Bay
Current Zoning:	B2 Local Centre under Botany Bay Local Environmental Plan 2013
Site Area (m^2):	Approximately 24,000
RL (AHD in m) (approx.):	17
Geographical Location (decimal degrees) (approx.):	Latitude: -33.924771 Longitude: 151.211647
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.2 Site Location and Regional Setting

The site is located in a predominantly residential/commercial area of Eastlakes. The site is located to the south of Gardeners Road and to the east of Racecourse Place / Eastlakes Reserve. The site is divided by Evans Avenue into two separate portions. The northern portion is bounded to the north by Gardeners Road, to the south by Evans Avenue, to the east and west by three and four storey residential unit blocks. The southern portion of the site is bounded by Evans Avenue to the north, Barber Avenue to the east and south, and Eastlakes Reserve to the west.

2.3 Topography

The site is situated in gently sloping topography of Botany Basin that gradually falls towards the south-west at approximately 2-3° towards Lachlan swamps/Mill Pond, a tributary to Botany Bay.

2.4 Site Inspection

A walkover inspection of the site was undertaken by EIS on 26 July 2018. The inspection was limited to accessible areas of the site and immediate surrounds. An internal inspection of buildings was not undertaken. Selected site photographs obtained during the inspection are attached in the appendices.

A summary of the other inspection findings are outlined in the following subsections:

2.4.1 Current Site Use and/or Indicators of Former Site Use

Southern Section

At the time of the inspection, the southern portion of the site was occupied by a single level retail complex and a three level structure with an Aldi supermarket on the middle level and car parking on the ground and upper levels. The retailers were the standard shopping center outlets including Aldi, Woolworths and BWS. Grease traps were identified on the east and west sides of the southern portion of the site. An electrical substation was situated at the south section of the site adjacent to the concrete ramp and the south-west corner of Woolworths. A medical center and events center were located in the north-west section.

Northern Section

The north section of the site had been excavated to approximately 10m below ground level. In 2013 this area had been occupied by an on-grade carpark with some single storey retail outlets along the north boundary.

2.4.2 Buildings, Structures and Roads

The single storey retail complex appeared to be predominately constructed of brick and occupied the majority of the site. A two level above ground concrete carpark occupied the south-west section of the site.

2.4.3 Boundary Conditions, Soil Stability and Erosion

The south section of the site was paved and there were no s signs of erosion

The north section of the site had been excavated to a depth of approximately 10m. The walls of the excavation appeared to be supported by a sheet wall with ground anchors. The northern section of the site was surrounded by a timber hoarding.

2.4.4 Visible or Olfactory Indicators of Contamination

There were no obvious signs of contamination in the external areas of the site inspected. No inspection was undertaken beneath the buildings.

2.4.5 Presence of Drums/Chemicals, Waste and Fill Material

There are likely to small quantities of household cleaning chemicals associated with the sale of these products in some of the retail outlets.

2.4.6 Drainage and Services

Surface water would be expected to either drain into onsite drains or run off into the surrounding streets and be captured by the local stormwater system.

2.4.7 Sensitive Environments

No obvious sensitive environments were observed in the immediate vicinity of the site.

2.4.8 Landscaped Areas and Visible Signs of Plant Stress

The majority of the site was paved, trees were located along the east and south boundaries. Trees had also been planted in the sidewalk outside the north boundary of the site.

Eastlakes Reserve was located to the west of the site. This was a grassed park with trees around the perimeter. The grass cover in the north-east section of the reserve appeared to be patchy.

2.5 Surrounding Land Use

During the site inspection, EIS observed the following land uses in the immediate surrounds:

- North – Residential;
- South – Residential;
- East – Residential; and
- West – Eastlakes Reserve beyond which was residential

EIS noted the presence of two groundwater monitoring well gatic covers in the sidewalk on the north-east corner of the junction of Evans Lane and Evans Avenue (to the west of site). The gatic covers are most likely associated with the groundwater monitoring program associated with a former Shell Service Station that was located to the on the south-west corner of the junction of Gardeners Road and Racecourse Place (See Section 4.2).

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

A review of the regional geological map of Sydney (1983)[9] indicates that the site is underlain Holocene aged deposits of medium to fine-grained marine sands with podsols (alluvial) found within the Botany Basin.

3.2 Acid Sulfate Soil (ASS) Risk and Planning

The ASS risk map for the Eastlakes area prepared by Department of Land and Soil Conservation (1997[10]) indicates that the site is located within an area of "no known occurrence of acid sulfate soil materials".

ASS information presented in Botany Bay local Environmental Plan 2013 indicated that the site is not located within an Acid Sulfate Soil Risk area.

3.3 Hydrogeology

The WaterNSW records[11] were researched for the investigation. The records indicated that approximately 38 licensed monitoring well were located within 500 metres of the site.

The five closest wells were registered for monitoring purposes and appeared to be associated with a former Shell service station located approximately 50m to the west of the site. The maximum depth drilled for the monitoring bores was 6m and all of the drillers logs encountered sand throughout the profile. Standing water levels (SWL) were not recorded on the records.

A domestic bore (GW 104981) was located approximately 220m to the south-east and down gradient of the site. The bore was drilled to a depth of 6m and indicated a SWL of 3m.

The stratigraphy of the site consists of relatively high permeability alluvial sandy soil overlying deep bedrock. Based on these conditions groundwater may be considered to be a potential resource in the area, although contamination by industry may have occurred rendering use of the resource questionable.

3.4 Groundwater Management

The site is located within Botany Sand Beds Shortage Zone. No further applications for a licence under Part 5 of the Water Act 1912 relating to the Water Shortage Zone may be made except as specified in the Order[12].

[9] Department of Mineral Resources, (1983). *1:100,000 Geological Map of Sydney (Series 9130)*

[10] *1:25,000 Botany Bay Acid Sulfate Soil Risk Map (Series 9130S3, Ed 2),* Department of Land and Soil Conservation (1997)

[11] https://realtimedata.waternsw.com.au/water.stm accessed 25 July 2018

[12] *http://www.water.nsw.gov.au/__data/assets/pdf_file/0011/548066/quality_government_gazette_8_june_2007_p3698.pdf*

3.5 Receiving Water Bodies

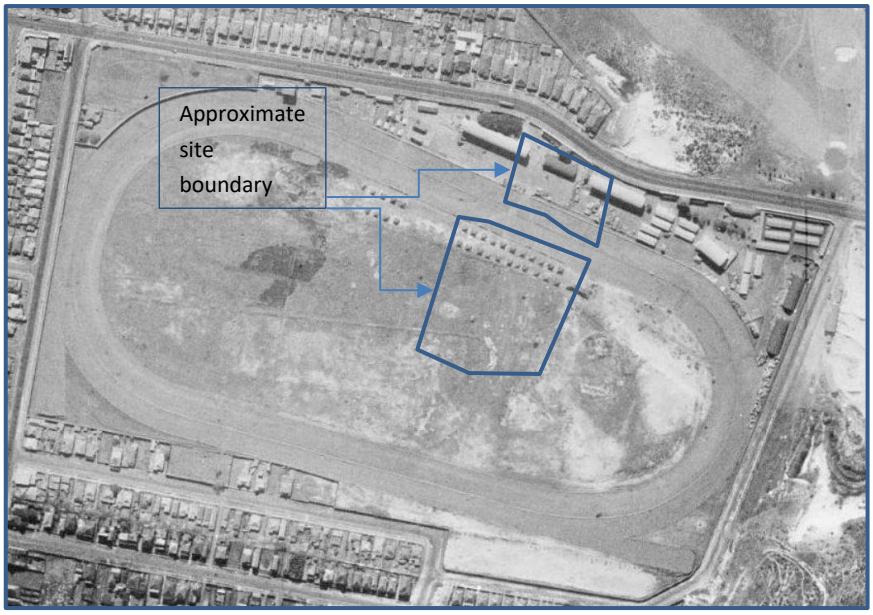
The closest surface water body is the Mill Pond. This body of water is located 1.2km to the south and 650m to the east of the site. Taking into the site location and regional topography into account this water body could be a potential receptor.

4 SITE HISTORY INFORMATION

4.1 Review of Historical Aerial Photographs

Historical aerial photographs were reviewed by EIS. A summary of the information is provided in the following table:

Table 4-1: Summary of Historical Aerial Photographs

Year	Details
1930	The central section of the site (in the vicinity of the existing Evans Ave and open-air car park) appeared to be a road/track which formed the north-central section of a large oval shaped track (presumed to be a racecourse as the road to the east is called Racecourse Place). The racecourse extended from Maloney Street in the west to Florence Avenue in the east. The south section of the site was in the centre of the racecourse. Significant earthworks had been undertaken within the inner ring of the racecourse. The north section of the site, adjacent to Gardeners Rd, appeared to be occupied by a large building (surrounded by hardstand) possibly utilised as a stable or other building associated with the racecourse. The surrounding areas to the south, east and west of the site appeared to be part of the racecourse. Areas to the north of the site were occupied by Gardeners Road and low density residential developments beyond.
1943	The site generally appeared similar to the 1930 aerial photograph which showed the racetrack and associated facilities. In addition, three large buildings (one of which was possibly a tram station) and numerous small structures (possibly stored materials and vehicles) occupied the north section of the site. Construction works had ceased at the south section. Small structures (possibly tents) had been placed along the south side of the existing Evans Avenue in the central section of the site. The immediate surrounds were generally similar to the 1930 aerial photograph with the exception that the central area of the racecourse appeared levelled and grass covered. 

Year	Details
1951	The racecourse and associated facilities continued to occupy the site. One of the large building structures had been removed (possibly demolished). The majority of the smaller structures and all of the temporary structures had been removed from the north section of the site. The surrounding land use was generally similar to the 1943 aerial photograph.
1961	The site and surrounding land use generally appeared similar to the 1951 aerial photograph.
1978	The site had undergone significant change since the 1961 aerial photograph with the former racecourse and associated facilities demolished. The north section of the site south of Gardeners Rd was occupied by an open air car park. Evans Road divided the north and south sections of the site. The central and south section of the site was occupied by a large building complex and open air car park. The large building complex appeared similar to the existing site layout. The surrounding land use to the north appeared similar to the 1961 photograph with the addition of commercial properties along Gardeners Rd. The surrounding land use to the east and south had undergone significant change since 1961 and was occupied by medium density residential buildings generally similar to existing land use. Off-site land use to the west had been developed into parkland which was consistent with the existing Eastlakes Reserve.
1986	The site layout appeared similar to the 1978 aerial photograph with the exception of additional buildings at the north section of the site, adjacent to Gardeners Road and extensions to the south and west sides of the main building complex at the site south and central.
2000 (Google Earth)	The site and surrounding areas appeared similar to the 1986 photograph with the exception of a commercial property located to the west of the site on Gardeners Road. This commercial property has been identified as a former Shell Service Station (see Section 4.2).
2005 (Google Earth)	The site and surrounding area appeared similar to the 2000 photograph with the exception that the former Shell service station that appeared to have been demolished and the site cleared.
2011 (Google Earth)	The site and surrounding area appeared similar to the 2005 photograph.
2016 (Google Earth)	The site and surrounding area appeared similar to the 2011 photograph with the exception that the site of the former Shell Service station was being excavated.
2017 (Google Earth)	A new building had been constructed on the site of the former Shell service station. The north section of the site (on the north side of Evans Avenue) had been cleared and the appeared to be a construction site.

4.2 NSW EPA Records

The NSW EPA record the following data:

- Records maintained in relation to contaminated land under Section 58 of the CLM Act 1997;
- Records of sites notified in accordance with the Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997 (2015)[13]; and
- Licensed activities under the Protection of the Environment Operations (POEO) Act (1997)[14].

There are no records for the site in relation to contaminated land under Section 58 of the CLM Act 1997. However, there a number of notices relating to the former Shell Service Station (to the west of the site) and properties directly to the south of the Shell Service Station summarised below;

Site	Notice	Issued	Completed
275 -279 Gardeners Road Eastlakes and adjacent land	Agreed Voluntary Remediation Proposal 26060	26 May 2004	9 June 2009
275 -279 Gardeners Road Eastlakes and adjacent land	Agreed Voluntary Remediation Proposal 26015	30 October 2001	9 June 2009
Eastlake Reserve	Agreed Voluntary Remediation Proposal 26015	30 October 2001	9 June 2009
Eastlakes Reserve	Agreed Voluntary Remediation Proposal 26060	26 May 2004	9 June 2009
Eastlakes Reserve	Agreed Voluntary Remediation Proposal 26115	3 April 2009	18 March 2013
Eastlakes Reserve	Amendment or Repeal of Notice 20134405	18 March 2013	-

The notices were associated with groundwater contamination that extended southwards from the former service station located on Gardeners Rd, Eastlakes. The area affected included the properties to the west of Racecourse Place, Evans Avenue and Eastlakes Reserve. Eastlakes Reserve is located directly adjacent to the west boundary of the site. The contamination identified in the groundwater included elevated levels of total petroleum hydrocarbons (TPH), volatile organic compounds including benzene, toluene, ethyl benzene and xylenes (BTEX) polycyclic aromatic hydrocarbons (PAHs) and lead. The records indicated that remediation works had been completed.

[13] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997.* (referred to as Duty to Report Contamination)

[14] Protection of the Environment Operations Act 1997 (NSW) (referred to as POEO Act 1997)

The former Shell service station and Eastlakes reserve also appear on the register of sites notified in accordance with the Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997.

There are no records of licenses, applications or notices for the subject site issued under the POEO Act

4.3 Summary of Site History Information

A time line summary of the historical land uses and activities is presented in the table below. The information presented in the table is based on a weight of evidence assessment of the site history documentation and observations made by EIS.

Table 4-2: Summary of Historical Land Uses

Year(s)	Potential Land Use / Activities
1930s	The site was part of a racecourse.
1943	Tents on the racecourse and the date of the photograph suggest that there may have been a temporary military camp on the site
1978 to 2017	A large building complex had been constructed in the south section of the site and the north section of the site appeared to be a car park.
2017	As above except the north section of the site had been excavated.

A former Shell Service Station was located to the west of the site on Gardeners Road (see Figure 2) in the 1990s (and possibly earlier). The service station has subsequently been demolished and a residential development with basement car parking constructed.

4.4 Integrity of Site History Information

The majority of the site history information was obtained from government organisations as outlined in the relevant sections of this report. The veracity of the information from these sources is considered to be relatively high. A certain degree of information loss can be expected given the lack of specific land use details over time. EIS have relied upon the Lotsearch report and have not independently verified any information contained within. However, it is noted that the Lotsearch report is generated based on databases maintained by various government agencies and is expected to be reliable.

5 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 9.

5.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 5-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/ structures on site.	Asbestos, lead and PCBs
On site transformer	PCBs
Off-site area – A service station was located to the west that is known to have had an impact on Eastlakes Reserve to the west of the site	Heavy metals (lead), PAHs, TRH and BTEX

5.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 5-2: CSM

Potential mechanism for contamination	Potential mechanisms for contamination include: • Fill material – importation of impacted material, 'top-down' impacts (e.g. placement of fill, leaching from surficial material etc), or sub-surface release (e.g. impacts from buried material); • Hazardous building materials – 'top-down' (e.g. demolition resulting in surficial impacts in unpaved areas); • Off-site land uses – 'top-down', spill or sub-surface release. Impacts to the site could occur via migration of contaminated groundwater.
Affected media	Soil/soil vapour and groundwater are potentially affected media.
Receptor identification	Human receptors include site occupants/users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users, groundwater users. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and freshwater ecology in Mill Ponds.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into the proposed basement and/or building (either from soil contamination or volatilisation of contaminants from groundwater); • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas; • Migration of groundwater off-site and into nearby water bodies, including aquatic ecosystems and those being used for recreation; and • Migration of groundwater off-site into areas where groundwater is being utilised as a resource (i.e. for irrigation).

6 SAMPLING, ANALYSIS AND QUALITY PLAN

6.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013) and the Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[15]. The seven-step DQO approach for this project is outlined in the following sub-sections.

The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 8.5 and the detailed evaluation is provided in the appendices.

6.1.1 Step 1 - State the Problem

A preliminary environmental assessment was requested by the client to obtain an initial overview of the potential contamination status of the site. The assessment was limited to a limited review of desktop data and sampling from boreholes drilled in accessible locations for a geotechnical investigation.

6.1.2 Step 2 - Identify the Decisions of the Study

The objectives of the assessment are outlined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?
- Are any results above the SAC?
- What additional investigation is required to better characterise the site?

6.1.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Site information, including site observations and site history documentation;
- Sampling of potentially affected media, including soil and groundwater;
- Observations of sub-surface variables such as soil type, photo-ionisation detector (PID) concentrations;
- Laboratory analysis of soils and groundwater for the CoPC identified in the CSM; and
- Field and laboratory QA/QC data.

[15] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

6.1.4 Step 4 - Define the Study Boundary

The sampling will be confined to the site boundaries as shown in Figure 2 (spatial boundary). The sampling was completed between 20 October 2011 and 21 October 2011 (temporal boundary). The assessment of potential risk to adjacent land users has been made based on data collected within the site boundary.

Sampling was not undertaken within the existing building footprint due to access constraints.

6.1.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

6.1.5.1 Tier 1 Screening Criteria

The laboratory data will be assessed against relevant Tier 1 screening criteria (referred to as SAC), as outlined in Section 7. Exceedances of the SAC do not necessarily indicate a requirement for remediation or a risk to human health and/or the environment. Exceedances are considered in the context of the CSM and valid SPR-linkages.

For this assessment, the individual results have been assessed as either above or below the SAC. Statistical evaluation of the dataset via calculation of mean values and/or 95% upper confidence limit (UCL) values has not been undertaken due to the spatial distribution of the data and the number of samples submitted for analysis.

6.1.5.2 Field and Laboratory QA/QC

Field QA/QC included analysis of intra-laboratory duplicates and rinsate samples. Further details regarding the sampling and analysis undertaken, and the acceptable limits adopted, is provided in the Data Quality (QA/QC) Evaluation in the appendices.

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the attached laboratory reports. These criteria were developed and implemented in accordance with the laboratory's National Association of Testing Authorities, Australia (NATA) accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, EIS typically adopt the most conservative concentration reported (or in some cases, consider the data from the affected sample as an estimate).

6.1.5.3 Appropriateness of Practical Quantitation Limits (PQLs)

The PQLs of the analytical methods are considered in relation to the SAC to confirm that the PQLs are less than the SAC. In cases where the PQLs are greater than the SAC, a discussion of this is provided.

6.1.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For this assessment, the null hypothesis has been adopted which is that, there is considered to be a complete SPR linkage for the CoPC identified in the CSM unless this linkage can be proven not to (or unlikely to) exist. The null hypothesis has been adopted for this assessment.

6.1.7 Step 7 - Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the assessment objectives. Adjustment of the assessment design can occur following consultation or feedback from project stakeholders. For this investigation, the design was optimised via consideration of the various lines of evidence used to select the sample locations, the media being sampled, and also by the way in which the data were collected.

The sampling plan and methodology are outlined in the following sub-sections.

6.2 Soil Sampling Plan and Methodology

The soil sampling plan and methodology adopted for this assessment is outlined in the table below:

Table 6-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	Samples were collected from five locations as shown on the attached Figure 2. Based on the site area (24,000m^2), this number of locations corresponded to a sampling density of approximately one sample per 4,800m^2. The sampling plan was not designed to meet the minimum sampling density for hotspot identification, as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)[16].

[16] NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines.* (referred to as EPA Sampling Design Guidelines 1995)

Aspect	Input
Sampling Plan	The sampling locations were placed on a judgemental sampling plan and were broadly positioned for site coverage, taking into consideration areas that were not easily accessible. This sampling plan was considered suitable to make a preliminary assessment of potential widespread risks associated with the AEC and CoPC identified in the CSM, and assess whether further investigation is warranted.
Set-out and Sampling Equipment	Sampling locations were set out using a tape measure. In-situ sampling locations were cleared for underground services by an external contractor prior to sampling as outlined in the SSP. Samples were collected using a drill rig equipped with spiral flight augers. Soil samples were obtained from a Standard Penetration Test (SPT) sampler or directly from the auger when conditions did not allow use of the SPT sampler.
Sample Collection and Field QA/QC	Soil samples were obtained on 20 and 21 October 2011. Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. 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. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis.
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for 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. PID calibration records are maintained on file by EIS.
Decontami-nation and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with the SSP. On completion of the fieldwork, the samples were stored temporarily in fridges in the EIS warehouse before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

6.3 Groundwater Sampling Plan and Methodology

The groundwater sampling plan and methodology is outlined in the table below:

Table 6-2: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells were installed in BH1 and BH4 in 2004 during a previous geotechnical investigation. Additional groundwater well were installed in BH109 and BH110 in 2011. The wells were positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, BH109 and BH4 were considered to be in the up-gradient area of the site and would be expected to provide an indication of groundwater flowing onto (beneath) the site from the north. BH1 and BH110 were considered to be in the down-gradient area of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and beyond the down-gradient site boundary.
Monitoring Well Installation Procedure	The monitoring wells were installed to depths of approximately 4.5 to 6.0m below ground level. The wells were generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed); • A 2mm sand filter pack was used around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and • A gatic cover was installed at the surface with a concrete plug to limit the inflow of surface water.
Monitoring Well Development	The monitoring wells were developed on using a submersible electrical pump in accordance with the SSP.
Groundwater Sampling	The monitoring wells were allowed to recharge for approximately five to seven days after development. Samples were obtained using either a disposable bailer or micro-purge sampling equipment. A groundwater sample was obtained from MW110 on the 26 October 2011. Groundwater samples were obtained from BH1 and BH109 on 2 December 2011. During sampling, the following parameters were monitored using calibrated field instruments (see SSP): • Standing water level (SWL) using an electronic dip meter; and • pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) using a YSI Multi-probe water quality meter. 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%. Groundwater samples were obtained directly from the single use PVC tubing or disposable bailers and placed in the sample containers.

Aspect	Input
	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. Groundwater removed from the wells during development and sampling was transported to EIS in jerry cans and stored in holding drums prior to collection by a licensed waste water contractor for off-site disposal.
Decontaminant and Sample Preservation	No decontamination procedure was adopted during sampling as sampling was undertaken using either disposable bailers or disposable tubing attached to the micro-purge pump. During development, the pump and hose were flushed between monitoring wells with potable water followed by a pulse of demineralised water. The samples were preserved with reference to the analytical requirements and placed in an insulated container with ice in accordance with the SSP. On completion of the fieldwork, the samples were temporarily stored in a fridge at the EIS office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

6.4 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 6-3: Analytical Schedule

Analyte/CoPC	Fill Samples	Natural Soil Samples	Groundwater Samples
Heavy Metals	5	3	1
TRH	5	3	2
BTEX	5	3	3
PAHs	5	3	1
OCPs/OPPs	5	3	-
PCBs	5	3	-
Asbestos	5	3	-
ASS (sPOCAS)	1	3	-

Analyte/CoPC	Fill Samples	Natural Soil Samples	Groundwater Samples
Volatile Organic Compounds	-	-	1
pH/EC	-	-	1

6.4.1 Laboratory Analysis

Samples were analysed by an appropriate, NATA Accredited laboratory using the analytical methods detailed in Schedule B(3) of NEPM 2013. Reference should be made to the laboratory reports attached in the appendices for further details.

Table 6-4: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	64045, 64046, 64047, 65939

7 SITE ASSESSMENT CRITERIA (SAC)

The SAC were derived from the NEPM 2013 and other guidelines as discussed in the following sub-sections. The guideline values for individual contaminants are presented in the attached report tables and further explanation of the various criteria adopted is provided in the appendices.

7.1 Soil

Soil data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below.

The original data was obtained in 2011 prior to the introduction of the NEPM 2013. The 2011 data has been re-assessed using the new NEPM guidelines. We note the following assumptions have been made when assessing this data:

- The NEPM 2013 requires the calculation of a benzo[a]pyrene (BaP) toxicity equivalence quotient (TEQ) in order to assess the results. This involves applying a weighting factor to other Polycyclic Aromatic Hydrocarbons (PAHs) that is relative to the most toxic PAH compound ie BaP. The sum of these weighted factors is referred to as the BaP TEQ. To assess this data assessment we have multiplied the BaP results by 1.5 to obtain an approximate BaP TEQ value for data screening purposes. The BaP TEQ is referenced as "Carcinogenic PAHs" in the attached summary results table; and
- Assessment of the Total recoverable hydrocarbon (TRH) results was restricted by the fact that the guidelines for the Health Screening Level (HSL) TRH fractions specified in Schedule B1 of the NEPM 2013 are slightly different to the TRH fractions presented in the 2004 laboratory reports. For this assessment we have simply assessed the old TRH fractions against the slightly different TRH fractions specified in the NEPM 2013.

7.1.1 Human Health

- Health Investigation Levels (HILs) for a 'Residential with limited soil access' exposure scenario (HIL-B). EIS understand that the proposed development is for a mixed retail/ residential development with the retail development on the ground floor. HIL-B has been adopted to take account of any landscaping;
- Health Screening Levels (HSLs) for a 'Residential' exposure scenario (HSL-a/B). HSLs were calculated based on the soil type and the most conservative depth interval of 0m to 1m; and
- Asbestos was assessed on the basis of presence/absence. Asbestos HSLs were not adopted as detailed asbestos quantification was not undertaken.

7.1.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for an 'urban residential and public open space' (URPOS) exposure scenario. These have only been applied to the top 2m of soil as outlined in NEPM (2013). The criteria for benzo(a)pyrene has been increased from the value presented in NEPM (2013) based on the information presented in the

CRC Care Technical Report No. 39 – Risk-based management and guidance for benzo(a)pyrene (2017)[17]; and

- ESLs were calculated based on the soil type. EILs for selected metals were calculated based on the most conservative added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) and published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[18]). This method is considered to be adequate for the Tier 1 screening.

7.1.3 Waste Classification

Data for the waste classification assessment were assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)[19] as outlined in the following table:

Table 7-1: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	• If Specific Contaminant Concentration (SCC) ≤ Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as general solid waste; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as restricted solid waste.
Hazardous Waste	• If SCC > CT2 then TCLP not needed to classify the soil as hazardous waste; and • If TCLP > TCLP2 and/or SCC > SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

[17] CRC Care, (2011). *Technical Report No. 39 - Risk-based management and guidance for benzo(a)pyrene*

[18] Olszowy, H., Torr, P., and Imray, P., (1995), *Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4*. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission.

[19] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

7.1.4 Acid Sulfate Soil

Soil data for the ASS assessment were compared to the action criteria for presented in the Acid Sulfate Soil Manual (1998)[20] as summarised below. The action criteria for 'coarse textured soils' were adopted.

Table 7-2: ASS Action Criteria

Category	Description	Criteria
Coarse Textured Soils	Sands to loamy sands	• pH - less than 5; • Total Actual Acidity (TAA)/Total Sulfide Acidity (TSA)/ Total Potential Acidity (TPA) (pH5.5) – greater than 18mol H^+/tonne; and • S_{pos} – greater than 0.03% sulfur oxidisable.
Medium Textured Soils	Sandy loams to light clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 36mol H^+/tonne; and • S_{pos} – greater than 0.06% sulfur oxidisable.
Fine Textured Soils	Medium to heavy clays and silty clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 62mol H^+/tonne; and • S_{pos} – greater than 0.1% sulfur oxidisable.

It is noted that where disturbance of greater than 1,000 tonnes of ASS is proposed, the action criteria for 'coarse textured soils' apply to all soil types.

7.2 Groundwater

Groundwater data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013), following an assessment of environmental values in accordance with the Guidelines for the Assessment and Management of Groundwater Contamination (2007)[21]. Environmental values for this assessment include aquatic ecosystems, human uses, and human-health risks in non-use scenarios.

7.2.1 Human Health

- The NEPM (2013) HSLs were not applicable for this project as the proposed basement will intersect groundwater. On this basis, EIS have undertaken a site specific assessment (SSA) for the Tier 1 screening of human health risks posed by volatile contaminants in groundwater. The assessment included selection of alternative Tier 1 criteria that were considered suitably protective of human health. These criteria are based on drinking water guidelines and have been

[20] Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). *Acid Sulfate Soils Manual* (referred to as ASS Manual 1998)

[21] NSW Department of Environment and Conservation, (2007). *Guidelines for the Assessment and Management of Groundwater Contamination*

referred to as HSL-SSA. The criteria were based on the following (as shown in the attached report tables):

- Australian Drinking Water Guidelines (2011)[22] for BTEX compounds and selected VOCs;
- World Health Organisation (WHO) document titled Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality (2008)[23] for petroleum hydrocarbons;
- USEPA Region 9 screening levels for naphthalene (threshold value for tap water); and
- The use of the laboratory PQLs for other contaminants where there were no Australian guidelines.

- The Australian Drinking Water Guidelines (2011)[24] were adopted as screening criteria for consumption of groundwater; and
- The guidelines for recreational water quality (primary and secondary contact) presented in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)[25] were adopted as screening criteria to assess potential human-health risks with water extracted form down gradient bores and to assess risks associated with incidental contact with groundwater in the proposed basement.

7.2.2 Environment (Ecological - aquatic ecosystems)

- Groundwater Investigation Levels (GILs) for 95% trigger values for protection of freshwater species presented in ANZECC 2000 [26] The 99% trigger values were adopted where required to account for bioaccumulation. Low and moderate reliability trigger values were also adopted for some contaminants where high-reliability trigger values don't exist.

[22] National Health and Medical Research Council (NHMRC), (2011). *National Water Quality Management Strategy, Australian Drinking Water Guidelines* (referred to as ADWG 2011)

[23] World Health Organisation (WHO), (2008). *Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality* (referred to as WHO 2008)

[24] National Health and Medical Research Council (NHMRC), (2011). *National Water Quality Management Strategy, Australian Drinking Water Guidelines* (referred to as ADWG 2011)

[25] ANZECC, (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* (referred to as ANZECC 2000)

[26] ANZECC, (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* (referred to as ANZECC 2000)

8 RESULTS

8.1 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the table below. Reference should be made to the borehole logs attached in the appendices for further details.

Table 8-1: Summary of Subsurface Conditions

Profile	Description
Pavement	Asphaltic concrete was identified at all five boreholes drilled for this investigation. The asphalt was approximately 50mm thick in all of the boreholes.
Fill	Fill material was encountered at all five borehole locations to a depth range of 0.5m to 1.8m below existing site levels. The fill consisted of gravelly sand and silty sand containing igneous gravel, brick, concrete, plastic and metal fragments.
Natural Soil	The natural soil was present beneath the fill at all five borehole locations and continued to depths of approximately 10m at the termination of the boreholes. The natural soil consisted of residual fine to medium grained silty sand.
Groundwater	In monitoring wells 109 and 110, groundwater levels were measured at depths of 1.5m and 3.0m, respectively, on 21 October 2011. Groundwater levels were also measured on 19 October 2011 in standpipes BHs 1 and 4, which had been installed during the 2004 investigation, at depths of 2.25m and 3.1m

8.2 Field Screening

PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. All results were 0ppm isobutylene equivalents which indicates a lack of PID detectable VOCs.

8.3 Soil Laboratory Results

The soil laboratory results are compared to the relevant SAC in the attached report tables. A summary of the results assessed against the SAC is presented below:

8.3.1 Human Health and Environmental (Ecological) Assessment

Table 8-2: Summary of Soil Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	Sample BH107 0.3-0.5 contained a copper concentration (220mg/kg) above the ecological SAC. The remaining heavy metals results were below the SAC.

Analyte	Results Compared to SAC
TRH	All TRH results were below the SAC.
BTEX	All BTEX results were below the SAC.
PAHs	The carcinogenic PAH result for sample BH109(0.1-0.2) was 4.5mg/kg and was greater than the health based SAC of 4mg/kg. All the remaining PAH results were below the SAC.
OCPs and OPPs	All OCP and OPP results were below the SAC. All pesticide concentrations were below the laboratory PQLs.
PCBs	All PCB results were below the SAC. All PCB concentrations were below the laboratory PQLs.
Asbestos	All asbestos results were below the SAC (i.e. asbestos was absent in the samples analysed for the investigation).

8.3.2 Acid Sulfate Soil Assessment

The soil laboratory results were assessed against the action criteria adopted for the assessment. The results are presented in the attached report tables and summarised below.

Table 8-3: Summary of ASS Results

Analyte	Results Compared to ASS Guidelines
pH_{kcl} and pH_{ox}	The pH_{KCl} results ranged from 5.0 to 6.0. None of the pH_{KCl} results exceeded (i.e. were below) the action criterion of pH 5. One result BH108 1.0-1.3 was pH 5.0. Following oxidation, the pH_{ox} results for the samples ranged from 3.4 to 5.4. One of the pH_{KCl} results exceeded (i.e. was below) the action criterion of pH 5. The pH of the samples typically dropped by 0.4 or more units following oxidation.
Acid Trail	• All the TAA results were less than the PQL; • All the TPA results were less than the PQL; and • All the TSA results were less than the PQL.
Sulfur Trail	The S_{pos}% results were are less than the PQL and the action criterion of 0.03%.

8.4 Groundwater Laboratory Results

The groundwater laboratory results are compared to the relevant SAC in the attached report tables. A summary of the results assessed against the SAC is presented below:

Table 8-4: Summary of Groundwater Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	All heavy metals results were below the SAC.
TRH	All TRH results were below the SAC.
BTEX	All BTEX results were below the SAC.
PAHs	All PAH results were below the SAC.
VOCs	All VOC results were below the SAC.
Other Parameters	The results for pH, EC and hardness are summarised below: • pH in sample MW110 was 6.6; • EC in sample MW110µS/cm; and • Hardness in sample BH109 was 81mg$CaCO_3$/L.

8.5 Summary of Data (QA/QC) Evaluation

The data evaluation is presented in the appendices. In summary, EIS are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

9 DISCUSSION AND CONCLUSIONS

9.1 Tier 1 Risk Assessment and Review of CSM

For a contaminant to represent a risk to a receptor, the following three conditions must be present:

1. Source – The presence of a contaminant;
2. Pathway – A mechanism or action by which a receptor can become exposed to the contaminant; and
3. Receptor – The human or ecological entity which may be adversely impacted following exposure to contamination.

If one of the above components is missing, the potential for adverse risks is relatively low.

9.1.1 Soil

One fill sample BH107 (0.3-0.5) contained an elevated copper result above the ecological SAC. This is no longer considered to an issue as this area of the site has been excavated.

One fill sample BH109(0.1-0.2) contained an elevated carcinogenic PAH above the health based SAC. Although the elevation is relatively minor there is not enough data to assess whether the detected elevation is significant.

9.2 Decision Statements

The decision statements are addressed below:

Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?

The site has been filled and the boreholes encountered fill up to 1.8m deep. Uncontrolled fill could be a potential source of contamination. The NSW EPA records indicated that a former service station located to the south-west of the site had leaked fuel and that there were off-site impacts associated with contaminated groundwater. Eastlakes Reserve, directly to the west of the site, was identified as being impacted by the contaminated groundwater. There is the potential for hydrocarbon impacts along the south western site boundary.

Are any results above the SAC?

One soil result contained an elevated concentration of copper above the ecological SAC and one soil result was above the health based SAC.

What additional investigation is required to better characterise the site?

A detailed Stage 2 investigation would be required to fully characterise the site.

9.3 Data Gaps

The assessment has identified the following data gaps:

- The site history was limited to aerial photographs and NSW EPA notices. More detailed research may provide information on potential site use prior to 1930 and historical site use in the surrounding area;
- The investigation was confined to a small number of boreholes in accessible areas of the site. The NSW EPA Sampling Design Guidelines recommends a minimum of 34 evenly spaced sampling points for a site of this size;
- The existing data set is old and requires updating; and
- The former service station located to the west of the site could be a potential off-site source of hydrocarbons. Additional ground water wells should be installed in the west section of the southern portion of the site.

9.4 Acid Sulfate Soil

The assessment included soil sampling from four boreholes and the analysis of four samples for ASS characteristics.

The sPOCAS results for the four samples identified one result with acidic conditions greater than the assessment criteria. This result, however, was considered to be indicative of mildly acidic soils associated with organic/humic material rather than potential ASS (PASS) as no significant concentrations of oxidisable sulfur were encountered in the samples.

As such, PASS conditions are not considered to be present at the site to a maximum depth of approximately 3.0m below existing site levels. In the event that excavation works including piling below this level are required additional sPOCAS testing will be required.

10 CONCLUSIONS AND RECOMMENDATIONS

The site had been part of a racecourse from at least 1930 to 1961. The site appears to have been subsequently re-developed for Eastlakes Shopping Centre. The investigation include sampling and analysis for five boreholes drilled for the geotechnical investigation. Although there were some minor elevated concentrations of contaminants encountered in the soil samples the data set is considered too small to provide a detailed comment on the contamination status of the site.

When the site becomes accessible a detailed Stage 2 assessment should be undertaken to address the data gaps identified in Section 9.3

EIS consider that the report objectives outlined in Section 1.2 have been addressed.

11 LIMITATIONS

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- 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;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- 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;
- The investigation 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 in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- 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;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- 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.

LIST OF IN-TEXT TABLES

IMPORTANT INFORMATION ABOUT THIS 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 or landscaped areas 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 (e.g. 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.

Assessment Limitations
Although information provided by a 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 Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an 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 Assessment Report

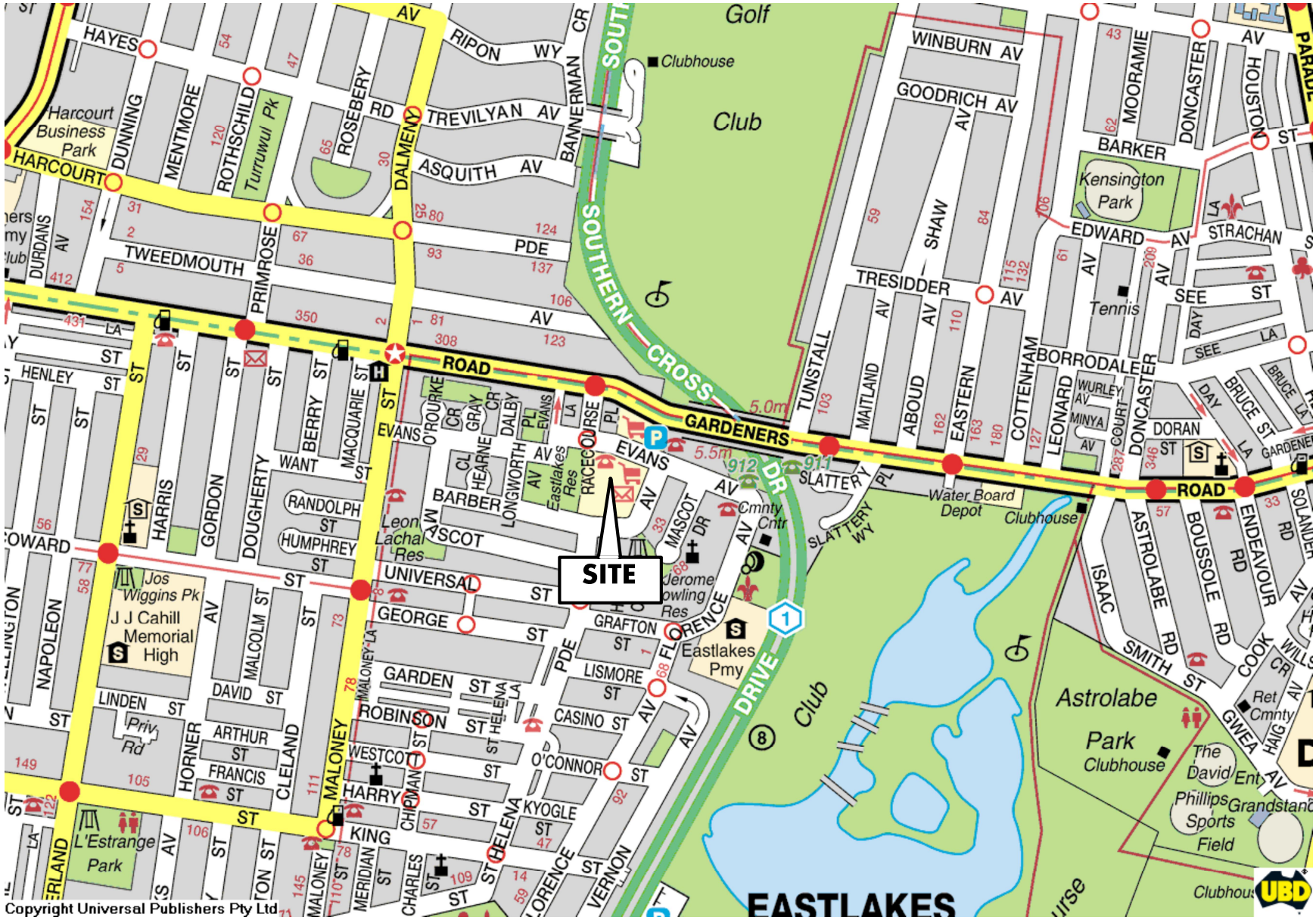
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, 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 rest 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 FIGURES



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

UBD Map ref: 276 F2

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

ENVIRONMENTAL INVESTIGATION SERVICES	Project Number: E25302K	Title: SITE LOCATION PLAN
	Figure: 1	Address: EASTLAKES SHOPPING CENTRE GARDENERS RD, EASTLAKES

NOTES:
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.

Location of former Shell Service station

N

GARDENERS ROAD

RACECOURSE PLACE

EVANS

EVANS AVENUE

LONGWORTH AVENUE

BARBER

"EASTLAKES SHOPPING CENTRE"
SINGLE STOREY BRICK AND CONCRETE SHOPPING CENTRE WITH PARKING BENEATH
SEE OUR SURVEY DATED 18-2-2000 FOR LEVELS WITHIN THIS SITE

"EASTLAKES RESERVE"

SCALE (m)
0 50

Approximate Scale (m)

LEGEND

- BOREHOLE
- BOREHOLE AND STANDPIPE
- ELECTRICAL FRICTION CONE PENETRATION TEST
- BOREHOLE FROM PREVIOUS INVESTIGATION
- BOREHOLE AND STANDPIPE FROM PREVIOUS INVESTIGATION
- APPROXIMATE SITE BOUNDARY

EIS ENVIRONMENTAL INVESTIGATION SERVICES	Project Number: E25302K	Title: BOREHOLE LOCATION PLAN
	Figure: 2	Address: EASTLAKES SHOPPING CENTRE GARDENERS RD, EASTLAKES

LABORATORY SUMMARY TABLES

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC: Ambient Background Concentration
ACM: Asbestos Containing Material
ADWG: AustralianDrinking Water Guidelines
AF: Asbestos Fines
ANZECC: Australian and New Zealand Environment Conservation Council
B(a)P: Benzo(a)pyrene
CEC: Cation Exchange Capacity
CRC: Cooperative Research Centre
CT: Contaminant Threshold
EILs: Ecological Investigation Levels
ESLs: Ecological Screening Levels
FA: Fibrous Asbestos
GIL: Groundwater Investigation Levels
HILs: Health Investigation Levels
HSLs: Health Screening Levels
HSL-SSA: Health Screening Level-SiteSpecific Assessment
NA: Not Analysed
NC: Not Calculated
NEPM: National Environmental Protection Measure
NHMRC: National Health and Medical Research Council
NL: Not Limiting
NSL: No Set Limit
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PAHs: Polycyclic Aromatic Hydrocarbons
ppm: Parts per million
PCBs: Polychlorinated Biphenyls
PCE: Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
pH_{KCL} : pH of filtered 1:20, 1M KCL extract, shaken overnight
pH_{ox} : pH of filtered 1:20 1M KCl after peroxide digestion
PQL: Practical Quantitation Limit
RS: Rinsate Sample
RSL: Regional Screening Levels
SAC: Site Assessment Criteria
SCC: Specific Contaminant Concentration
S_{Cr}: Chromium reducible sulfur
S_{POS}: Peroxide oxidisable Sulfur
SSA: Site Specific Assessment
SSHSLs: Site Specific Health Screening Levels
TAA: Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB: Trip Blank
TCA: 1,1,1 Trichloroethane (methyl chloroform)
TCE: Trichloroethylene (Trichloroethene)
TCLP: Toxicity Characteristics Leaching Procedure
TPA: Total Potential Acidity, 1M KCL peroxide digest
TS: Trip Spike
TRH: Total Recoverable Hydrocarbons
TSA: Total Sulfide Acidity (TPA-TAA)
UCL: Upper Level Confidence Limit on Mean Value
USEPA United States Environmental Protection Age
VOCC: Volatile Organic Chlorinated Compounds
WHO: World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

Commerical Development
Eastlakes Shopping Centre, Gardeners Road, Eastlakes
E25302Krev3

TABLE A

SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.

HIL-B: 'Residential with minimal opportunities for soil access; including dwellings with fully/permanently paved yards like high-rise buildings'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs#	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.5	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			500	150	500	30000	1200	120	1200	60000	400	4	15	400	500	10	90	600	10	340	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH106	0.3-0.5	Fill:Gravelly Sand	<PQL	<PQL	1	3	14	<PQL	<PQL	29	0.62	0.18	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH106	0.8-1.0	Silty Sand	<PQL	<PQL	2	4	16	<PQL	<PQL	11	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH107	0.3-0.5	Fill:Silty Sand	<PQL	<PQL	35	220	52	<PQL	35	160	6.87	1.005	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH108	1.3-1.5	Fill:Silty Sand	<PQL	<PQL	1	9	34	<PQL	<PQL	6	1.28	0.27	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH108	1.8-2.0	Silty Sand	<PQL	<PQL	2	<PQL	1	<PQL	2	13	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH109	0.1-0.2	Fill:Gravelly Sand	<PQL	<PQL	9	41	76	0.3	8	82	29.1	4.5	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH109	1.9-2.0	Silty Sand	<PQL	<PQL	2	<PQL	1	<PQL	1	1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
BH110	0.3-0.5	Fill:Silty Sand	<PQL	<PQL	9	12	1	<PQL	36	16	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
Total Number of Samples			8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Maximum Value			<PQL	<PQL	35	220	76	0.3	36	160	29.1	4.5	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	NC

Concentration above the SAC **VALUE**

Carcinogenic PAHs calculated by multiplying the original result by 1.5

TABLE B
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	0.1	ppm
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH106	0.3-0.5	Fill:Gravelly Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
BH106	0.8-1.0	Silty Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
BH107	0.3-0.5	Fill:Silty Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
BH108	1.3-1.5	Fill:Silty Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
BH108	1.8-2.0	Silty Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
BH109	0.1-0.2	Fill:Gravelly Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.1	0
BH109	1.9-2.0	Silty Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
BH110	0.3-0.5	Fill:Silty Sand	0m to < 1m	Sand	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0
Total Number of Samples					8	8	8	8	8	8	8	8
Maximum Value					<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.1	<PQL

Concentration above the SAC **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	1	0.1
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH106	0.3-0.5	Fill:Gravelly Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH106	0.8-1.0	Silty Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH107	0.3-0.5	Fill:Silty Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH108	1.3-1.5	Fill:Silty Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH108	1.8-2.0	Silty Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH109	0.1-0.2	Fill:Gravelly Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH109	1.9-2.0	Silty Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH110	0.3-0.5	Fill:Silty Sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3

TABLE C
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				COMMERCIAL/INDUSTRIAL																	
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs							
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH106	0.3-0.5	Fill:Gravelly Sand	Coarse	NA	NA	NA	<PQL	1	3	14	<PQL	29	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.12
BH106	0.8-1.0	Silty Sand	Coarse	NA	NA	NA	<PQL	2	4	16	<PQL	11	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
BH107	0.3-0.5	Fill:Silty Sand	Coarse	NA	NA	NA	<PQL	35	220	52	35	160	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.67
BH108	1.3-1.5	Fill:Silty Sand	Coarse	NA	NA	NA	<PQL	1	9	34	<PQL	6	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.18
BH108	1.8-2.0	Silty Sand	Coarse	NA	NA	NA	<PQL	2	<PQL	1	2	13	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
BH109	0.1-0.2	Fill:Gravelly Sand	Coarse	NA	NA	NA	<PQL	9	41	76	8	82	0.1	<PQL	<PQL	<PQL	150	250	<PQL	<PQL	<PQL	<PQL	3
BH109	1.9-2.0	Silty Sand	Coarse	NA	NA	NA	<PQL	2	<PQL	1	1	1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
BH110	0.3-0.5	Fill:Silty Sand	Coarse	NA	NA	NA	<PQL	9	12	1	36	16	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Total Number of Samples				0	0	0	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Raw Max				0	0	0	0	35	220	76	36	160	0.1	0	0	0	150	250	0	0	0	0	3
Maximum Value				<PQL	<PQL	<PQL	<PQL	35	220	76	36	160	0.1	<PQL	<PQL	<PQL	150	250	<PQL	<PQL	<PQL	<PQL	3

Concentration above the SAC VALUE

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

Land Use Category				COMMERCIAL/INDUSTRIAL																	
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs							
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH106	0.3-0.5	Fill:Gravelly Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH106	0.8-1.0	Silty Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH107	0.3-0.5	Fill:Silty Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH108	1.3-1.5	Fill:Silty Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH108	1.8-2.0	Silty Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH109	0.1-0.2	Fill:Gravelly Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH109	1.9-2.0	Silty Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172
BH110	0.3-0.5	Fill:Silty Sand	Coarse	NA	NA	NA	160	323	113	1963	60	232	370	640	215	170	1700	3300	75	135	165	180	172

TABLE D
SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOIL ANALYSIS (sPOCAS)

		Analysis	pH_{KCL}	TAA	pH_{ox}	TPA	TSA	S_{POS}	Liming Rate
				pH 6.5		pH 6.5	pH 6.5	%w/w	0.75kg $CaCO_3$/tonne
Acid Sulfate Soil Manual (1998) -Action Criteria		Coarse Textured Soil	pH 5.0	18molH+/ tonne	pH 5.0	18molH+/ tonne	18molH+/ tonne	0.03% w/w	0.03% w/w
Sample Reference	**Sample Depth (m)**	**Sample Description**							
BH106	3.8-4.0	Silty sand	5.9	<PQL	5.4	<PQL	<PQL	<PQL	<PQL
BH108	1.0-1.3	Fill: silty sand	5.0	<PQL	3.4	<PQL	<PQL	<PQL	<PQL
BH109	1.5-1.95	Silty sand	5.5	<PQL	5.1	<PQL	<PQL	<PQL	<PQL
BH110	2.8-3.0	Silty sand	6.0	<PQL	5.3	<PQL	<PQL	<PQL	<PQL
Total Number of Samples			4	4	4	4	4	4	4
Minimum Value			5.0	<PQL	3.4	<PQL	<PQL	<PQL	<PQL
Maximum Value			6.0	<PQL	5.4	<PQL	<PQL	<PQL	<PQL

Values Exceeding Action Criteria **VALUE**

TABLE E
SUMMARY OF GROUNDAWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILs
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZECC 2000 Recreational	NHMRC ADWG 2011	SAMPLES		
				BH1	BH109	MW110
Inorganic Compounds and Parameters						
pH	0.1	6.5 - 8.5	6.5 - 8.5	NA	NA	6.6
Electrical Conductivity (µS/cm)	1	NSL	NSL	NA	NA	250
Hardness (mgCaCO3/L)	3	500	200	NA	81	NA
Metals and Metalloids						
Arsenic (As III)	1	50	10	NA	NA	<1
Cadmium	0.1	5	2	NA	NA	0.1
Chromium (total)	1	50	50	NA	NA	<1
Copper	1	1000	2000	NA	NA	<1
Lead	1	50	10	NA	<1	<1
Total Mercury (inorganic)	0.05	1	1	NA	NA	<0.1
Nickel	1	100	20	NA	NA	<1
Zinc	1	5000	3000	NA	NA	<1
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)						
Benzene	1	10	1	<20	<1	<1
Toluene	1	NSL	800	<20	<1	<1
Ethylbenzene	1	NSL	300	<20	<1	<1
m+p-xylene	2	NSL	NSL	<40	<2	<2
o-xylene	1	NSL	NSL	<20	<1	<1
Total xylenes	2	NSL	600	<60	<3	<3
Volatile Organic Compounds (VOCs), including chlorinated VOCs						
Dichlorodifluoromethane	10	NSL	NSL	NA	NA	<10
Chloromethane	10	NSL	NSL	NA	NA	<10
Vinyl Chloride	10	NSL	0.3	NA	NA	<10
Bromomethane	10	NSL	NSL	NA	NA	<10
Chloroethane	10	NSL	NSL	NA	NA	<10
Trichlorofluoromethane	10	NSL	NSL	NA	NA	<10
1,1-Dichloroethene	**1**	0.3	30	NA	NA	<1
Trans-1,2-dichloroethene	1	NSL	NSL	NA	NA	<1
1,1-dichloroethane	1	NSL	NSL	NA	NA	<1
Cis-1,2-dichloroethene	1	NSL	NSL	NA	NA	<1
Bromochloromethane	1	NSL	250	NA	NA	<1
Chloroform	1	NSL		NA	NA	<1
2,2-dichloropropane	1	NSL	NSL	NA	NA	<1
1,2-dichloroethane	1	10	3	NA	NA	<1
1,1,1-trichloroethane	1	NSL	NSL	NA	NA	<1
1,1-dichloropropene	1	NSL	NSL	NA	NA	<1
Cyclohexane	1	NSL	NSL	NA	NA	<1
Carbon tetrachloride	1	3	NSL	NA	NA	<1
Benzene	1	NSL	see BTEX	NA	NA	<1
Dibromomethane	1	NSL	NSL	NA	NA	<1
1,2-dichloropropane	1	NSL	NSL	NA	NA	<1
Trichloroethene	1	30	NSL	NA	NA	<1
Bromodichloromethane	1	NSL	NSL	NA	NA	<1
trans-1,3-dichloropropene	1	NSL	NSL	NA	NA	<1
cis-1,3-dichloropropene	1	NSL	NSL	NA	NA	<1
1,1,2-trichloroethane	1	NSL	NSL	NA	NA	<1
Toluene	1	NSL	see BTEX	NA	NA	<1
1,3-dichloropropane	1	NSL	NSL	NA	NA	<1
Dibromochloromethane	1	NSL	NSL	NA	NA	<1
1,2-dibromoethane	1	NSL	NSL	NA	NA	<1
Tetrachloroethene	1	10	NSL	NA	NA	<1
1,1,1,2-tetrachloroethane	1	NSL	NSL	NA	NA	<1
Chlorobenzene	1	NSL	300	NA	NA	<1
Ethylbenzene	1	NSL	see BTEX	NA	NA	<1
Bromoform	1	NSL	NSL	NA	NA	<1
m+p-xylene	2	NSL	see BTEX	NA	NA	<2
Styrene	1	NSL	NSL	NA	NA	<1
1,1,2,2-tetrachloroethane	1	NSL	NSL	NA	NA	<1
o-xylene	1	NSL	see BTEX	NA	NA	<1
1,2,3-trichloropropane	1	NSL	NSL	NA	NA	<1
Isopropylbenzene	1	NSL	NSL	NA	NA	<1
Bromobenzene	1	NSL	NSL	NA	NA	<1
n-propyl benzene	1	NSL	NSL	NA	NA	<1
2-chlorotoluene	1	NSL	NSL	NA	NA	<1
4-chlorotoluene	1	NSL	NSL	NA	NA	<1
1,3,5-trimethyl benzene	1	NSL	NSL	NA	NA	<1
Tert-butyl benzene	1	NSL	NSL	NA	NA	<1
1,2,4-trimethyl benzene	1	NSL	NSL	NA	NA	<1
1,3-dichlorobenzene	1	NSL	300	NA	NA	<1
Sec-butyl benzene	1	NSL	NSL	NA	NA	<1
1,4-dichlorobenzene	1	NSL	40	NA	NA	<1
4-isopropyl toluene	1	NSL	NSL	NA	NA	<1
1,2-dichlorobenzene	1	NSL	1500	NA	NA	<1
n-butyl benzene	1	NSL	NSL	NA	NA	<1
1,2-dibromo-3-chloropropane	1	NSL	NSL	NA	NA	<1
1,2,4-trichlorobenzene	1	NSL	NSL	NA	NA	<1
Hexachlorobutadiene	1	NSL	NSL	NA	NA	<1
1,2,3-trichlorobenzene	1	NSL	NSL	NA	NA	<1
Polycyclic Aromatic Hydrocarbons (PAHs)						
Naphthalene	0.2	NSL	NSL	NA	<0.1	NA
Acenaphthylene	0.1	NSL	NSL	NA	<0.1	NA
Acenaphthene	0.1	NSL	NSL	NA	<0.1	NA
Fluorene	0.1	NSL	NSL	NA	<0.1	NA
Phenanthrene	0.1	NSL	NSL	NA	<0.1	NA
Anthracene	0.1	NSL	NSL	NA	<0.1	NA
Fluoranthene	0.1	NSL	NSL	NA	<0.1	NA
Pyrene	0.1	NSL	NSL	NA	<0.1	NA
Benzo(a)anthracene	0.1	NSL	NSL	NA	<0.1	NA
Chrysene	0.1	NSL	NSL	NA	<0.1	NA
Benzo(b,j+k)fluoranthene	0.2	NSL	NSL	NA	<0.2	NA
Benzo(a)pyrene	**0.1**	0.01	0.01	NA	<0.1	NA
Indeno(1,2,3-c,d)pyrene	0.1	NSL	NSL	NA	<0.1	NA
Dibenzo(a,h)anthracene	0.1	NSL	NSL	NA	<0.1	NA
Benzo(g,h,i)perylene	0.1	NSL	NSL	NA	<0.1	NA

Concentration above the GIL — VALUE
PQL exceeds GIL — **BOLD/RED**

TABLE F

GROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMENT

All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NHMRC ADWG 2011	WHO 2008	USEPA RSL Tapwater 2017	SAMPLES		
					BH1	BH109	MW110
Total Recoverable Hydrocarbons (TRH)							
C_6-C_9 Aliphatics	10	NSL	15000	-	NA	<10	<10
>C_9-C_{14} Aliphatics	50	NSL	100	-	NA	<50	<50
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)							
Benzene	1	1	-	-	<20	<1	<1
Toluene	1	800	-	-	<20	<1	<1
Ethylbenzene	1	300	-	-	<20	<1	<1
Total xylenes	2	600	-	-	<60	<3	<3
Polycyclic Aromatic Hydrocarbons (PAHs)							
Naphthalene	0.1	-	-	6.1	NA	<0.1	NA
Volatile Organic Compounds (VOCs), including chlorinated VOCs							
Vinyl Chloride	**10**	0.3	-	-	NA	NA	<10
1,1-Dichloroethene	1	30	-	-	NA	NA	<1
Chloroform	1	250	-	-	NA	NA	<1
Bromodichloromethane	1		-	-	NA	NA	<1
1,2-dichloroethane	1	3	-	-	NA	NA	<1
Chlorobenzene	1	300	-	-	NA	NA	<1
1,3-dichlorobenzene	1	300	-	-	NA	NA	<1
1,4-dichlorobenzene	1	40	-	-	NA	NA	<1
1,2-dichlorobenzene	1	1500	-	-	NA	NA	<1

Concentration above the HSL -SSA — VALUE
PQL exceeds GIL — **BOLD/RED**

TABLE G
SUMMARY OF GROUNDAWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZECC 2000 Fresh Waters	SAMPLES		
			BH1	BH109	MW110
Inorganic Compounds and Parameters					
pH	0.1	6.5 - 8.5	NA	NA	6.6
Electrical Conductivity (µS/cm)	1	NSL	NA	NA	250
Hardness ($mgCaCO_3/L$)	3	NSL	NA	81	NA
Metals and Metalloids					
Arsenic (As lll)	1	24	NA	NA	<1
Cadmium	0.1	0.2	NA	NA	0.1
Chromium (VI)	1	1	NA	NA	<1
Copper	1	1.4	NA	NA	<1
Lead	1	3.4	NA	<1	<1
Total Mercury (inorganic)	0.05	0.06	NA	NA	<0.1
Nickel	1	11	NA	NA	<1
Zinc	1	8	NA	NA	<1
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)					
Benzene	1	950	<20	<1	<1
Toluene	1	180	<20	<1	<1
Ethylbenzene	1	80	<20	<1	<1
m+p-xylene	2	75	<40	<2	<2
o-xylene	1	350	<20	<1	<1
Total xylenes	2	NSL	<60	<3	<3
Volatile Organic Compounds (VOCs), including chlorinated VOCs					
Dichlorodifluoromethane	10	NSL	NA	NA	<10
Chloromethane	10	NSL	NA	NA	<10
Vinyl Chloride	10	100	NA	NA	<10
Bromomethane	10	NSL	NA	NA	<10
Chloroethane	10	NSL	NA	NA	<10
Trichlorofluoromethane	10	NSL	NA	NA	<10
1,1-Dichloroethene	1	700	NA	NA	<1
Trans-1,2-dichloroethene	1	NSL	NA	NA	<1
1,1-dichloroethane	1	90	NA	NA	<1
Cis-1,2-dichloroethene	1	NSL	NA	NA	<1
Bromochloromethane	1	NSL	NA	NA	<1
Chloroform	1	370	NA	NA	<1
2,2-dichloropropane	1	NSL	NA	NA	<1
1,2-dichloroethane	1	1900	NA	NA	<1
1,1,1-trichloroethane	1	270	NA	NA	<1
1,1-dichloropropene	1	NSL	NA	NA	<1
Cyclohexane	1	NSL	NA	NA	<1
Carbon tetrachloride	1	240	NA	NA	<1
Benzene	1	see BTEX	NA	NA	<1
Dibromomethane	1	NSL	NA	NA	<1
1,2-dichloropropane	1	900	NA	NA	<1
Trichloroethene	1	NSL	NA	NA	<1
Bromodichloromethane	1	NSL	NA	NA	<1
trans-1,3-dichloropropene	1	NSL	NA	NA	<1
cis-1,3-dichloropropene	1	NSL	NA	NA	<1
1,1,2-trichloroethane	1	6500	NA	NA	<1
Toluene	1	see BTEX	NA	NA	<1
1,3-dichloropropane	1	1100	NA	NA	<1
Dibromochloromethane	1	NSL	NA	NA	<1
1,2-dibromoethane	1	NSL	NA	NA	<1
Tetrachloroethene	1	70	NA	NA	<1
1,1,1,2-tetrachloroethane	1	NSL	NA	NA	<1
Chlorobenzene	1	55	NA	NA	<1
Ethylbenzene	1	see BTEX	NA	NA	<1
Bromoform	1	NSL	NA	NA	<1
m+p-xylene	2	see BTEX	NA	NA	<2
Styrene	1	NSL	NA	NA	<1
1,1,2,2-tetrachloroethane	1	400	NA	NA	<1
o-xylene	1	see BTEX	NA	NA	<1
1,2,3-trichloropropane	1	NSL	NA	NA	<1
Isopropylbenzene	1	30	NA	NA	<1
Bromobenzene	1	NSL	NA	NA	<1
n-propyl benzene	1	NSL	NA	NA	<1
2-chlorotoluene	1	NSL	NA	NA	<1
4-chlorotoluene	1	NSL	NA	NA	<1
1,3,5-trimethyl benzene	1	NSL	NA	NA	<1
Tert-butyl benzene	1	NSL	NA	NA	<1
1,2,4-trimethyl benzene	1	NSL	NA	NA	<1
1,3-dichlorobenzene	1	260	NA	NA	<1
Sec-butyl benzene	1	NSL	NA	NA	<1
1,4-dichlorobenzene	1	60	NA	NA	<1
4-isopropyl toluene	1	NSL	NA	NA	<1
1,2-dichlorobenzene	1	160	NA	NA	<1
n-butyl benzene	1	NSL	NA	NA	<1
1,2-dibromo-3-chloropropane	1	NSL	NA	NA	<1
1,2,4-trichlorobenzene	1	85	NA	NA	<1
Hexachlorobutadiene	1	NSL	NA	NA	<1
1,2,3-trichlorobenzene	1	3	NA	NA	<1
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	0.1	16	NA	<0.1	NA
Acenaphthylene	0.1	NSL	NA	<0.1	NA
Acenaphthene	0.1	NSL	NA	<0.1	NA
Fluorene	0.1	NSL	NA	<0.1	NA
Phenanthrene	0.1	0.6	NA	<0.1	NA
Anthracene	**0.1**	0.01	NA	<0.1	NA
Fluoranthene	0.1	1	NA	<0.1	NA
Pyrene	0.1	NSL	NA	<0.1	NA
Benzo(a)anthracene	0.1	NSL	NA	<0.1	NA
Chrysene	0.1	NSL	NA	<0.1	NA
Benzo(b,j+k)fluoranthene	0.2	NSL	NA	<0.2	NA
Benzo(a)pyrene	0.1	0.1	NA	<0.1	NA
Indeno(1,2,3-c,d)pyrene	0.1	NSL	NA	<0.1	NA
Dibenzo(a,h)anthracene	0.1	NSL	NA	<0.1	NA
Benzo(g,h,i)perylene	0.1	NSL	NA	<0.1	NA

Concentration above the GIL — VALUE
PQL exceeds GIL — **BOLD/RED**

TABLE H
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH106 (0.8-1.0m)	Arsenic	4	<PQL	<PQL	NC	NC
Dup Ref = Dup01	Cadmium	0.4	<PQL	<PQL	NC	NC
	Chromium	1	2	2	2.0	0
Envirolab Report: 64047	Copper	1	4	3	3.5	29
	Lead	1	16	13	14.5	21
	Mercury	0.1	<PQL	<PQL	NC	NC
	Nickel	1	<PQL	1	0.8	67
	Zinc	1	11	8	9.5	32
	Naphthalene	0.1	<PQL	<PQL	NC	NC
	Acenaphthylene	0.1	<PQL	<PQL	NC	NC
	Acenaphthene	0.1	<PQL	<PQL	NC	NC
	Fluorene	0.1	<PQL	<PQL	NC	NC
	Phenanthrene	0.1	<PQL	<PQL	NC	NC
	Anthracene	0.1	<PQL	<PQL	NC	NC
	Fluoranthene	0.1	<PQL	<PQL	NC	NC
	Pyrene	0.1	<PQL	<PQL	NC	NC
	Benzo(a)anthracene	0.1	<PQL	<PQL	NC	NC
	Chrysene	0.1	<PQL	<PQL	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<PQL	<PQL	NC	NC
	Benzo(a)pyrene	0.05	<PQL	<PQL	NC	NC
	Indeno(123-cd)pyrene	0.1	<PQL	<PQL	NC	NC
	Dibenzo(ah)anthracene	0.1	<PQL	<PQL	NC	NC
	Benzo(ghi)perylene	0.1	<PQL	<PQL	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

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

Commerical Development
Eastlakes Shopping Centre, Gardeners Road, Eastlakes
E25302Krev3

TABLE I
GROUNDWATER INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in µg/L unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW10	Dichlorodifluoromethane	10	<10	<10	NC	NC
Dup Ref = Dup 1	Chloromethane	10	<10	<10	NC	NC
	Vinyl Chloride	10	<10	<10	NC	NC
Envirolab Report: 64045	Bromomethane	10	<10	<10	NC	NC
	Chloroethane	10	<10	<10	NC	NC
	Trichlorofluoromethane	10	<10	<10	NC	NC
	1,1-Dichloroethene	1	<1	<1	NC	NC
	Trans-1,2-dichloroethene	1	<1	<1	NC	NC
	1,1-dichloroethane	1	<1	<1	NC	NC
	Cis-1,2-dichloroethene	1	<1	<1	NC	NC
	Bromochloromethane	1	<1	<1	NC	NC
	Chloroform	1	<1	<1	NC	NC
	2,2-dichloropropane	1	<1	<1	NC	NC
	1,2-dichloroethane	1	<1	<1	NC	NC
	1,1,1-trichloroethane	1	<1	<1	NC	NC
	1,1-dichloropropene	1	<1	<1	NC	NC
	Cyclohexane	1	<1	<1	NC	NC
	Carbon tetrachloride	1	<1	<1	NC	NC
	Benzene	1	<1	<1	NC	NC
	Dibromomethane	1	<1	<1	NC	NC
	1,2-dichloropropane	1	<1	<1	NC	NC
	Trichloroethene	1	<1	<1	NC	NC
	Bromodichloromethane	1	<1	<1	NC	NC
	trans-1,3-dichloropropene	1	<1	<1	NC	NC
	cis-1,3-dichloropropene	1	<1	<1	NC	NC
	1,1,2-trichloroethane	1	<1	<1	NC	NC
	Toluene	1	<1	<1	NC	NC
	1,3-dichloropropane	1	<1	<1	NC	NC
	Dibromochloromethane	1	<1	<1	NC	NC
	1,2-dibromoethane	1	<1	<1	NC	NC
	Tetrachloroethene	1	<1	<1	NC	NC
	1,1,1,2-tetrachloroethane	1	<1	<1	NC	NC
	Chlorobenzene	1	<1	<1	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	Bromoform	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	Styrene	1	<1	<1	NC	NC
	1,1,2,2-tetrachloroethane	1	<1	<1	NC	NC
	o-xylene	1	<1	<1	NC	NC
	1,2,3-trichloropropane	1	<1	<1	NC	NC
	Isopropylbenzene	1	<1	<1	NC	NC
	Bromobenzene	1	<1	<1	NC	NC
	n-propyl benzene	1	<1	<1	NC	NC
	2-chlorotoluene	1	<1	<1	NC	NC
	4-chlorotoluene	1	<1	<1	NC	NC
	1,3,5-trimethyl benzene	1	<1	<1	NC	NC
	Tert-butyl benzene	1	<1	<1	NC	NC
	1,2,4-trimethyl benzene	1	<1	<1	NC	NC
	1,3-dichlorobenzene	1	<1	<1	NC	NC
	Sec-butyl benzene	1	<1	<1	NC	NC
	1,4-dichlorobenzene	1	<1	<1	NC	NC
	4-isopropyl toluene	1	<1	<1	NC	NC
	1,2-dichlorobenzene	1	<1	<1	NC	NC
	n-butyl benzene	1	<1	<1	NC	NC
	1,2-dibromo-3-chloropropa	1	<1	<1	NC	NC
	1,2,4-trichlorobenzene	1	<1	<1	NC	NC
	Hexachlorobutadiene	1	<1	<1	NC	NC
	1,2,3-trichlorobenzene	1	<1	<1	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
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE J
SUMMARY OF FIELD QA/QC RESULTS

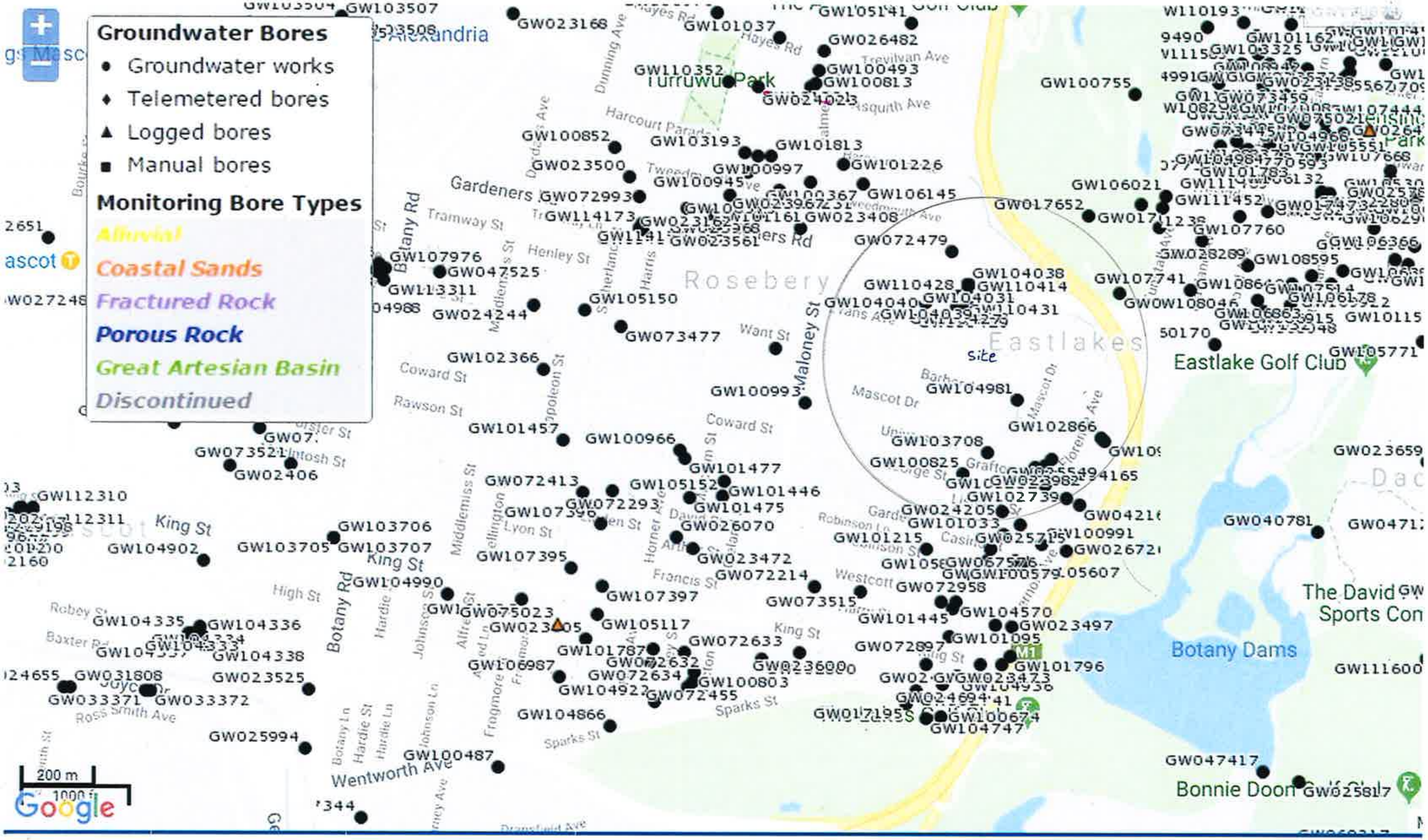
ANALYSIS	Envirolab PQL		RS1[S]
			Date
	mg/kg	µg/L	mg/kg
Benzene	1	0.2	<PQL
Toluene	1	0.5	<PQL
Ethylbenzene	1	1	<PQL
m+p-xylene	2	2	<PQL
o-xylene	1	1	<PQL

Explanation:
[W] Sample type (water)
[S] Sample type (sand)

Values above PQLs/Acceptance criteria **VALUE**

Appendix A: Site Information including Site History

Groundwater bore Licences


Groundwater Bores
Groundwater works
Telemetered bores
Logged bores
Manual bores
Monitoring Bore Types
Alluvial
Coastal Sands
Fractured Rock
Porous Rock
Great Artesian Basin
Discontinued
Rosebery
Eastlakes
Site
Eastlake Golf Club
Botany Dams
The David
Sports Con
Bonnie Doon
Mascot
Botany Rd
Maloney St
Gardeners
Tramway St
Henley St
Harcourt Parade
Hayes Rd
Asquith Ave
Trevilvan Ave
Coward St
Rawson St
Want St
Mascot Dr
King St
High St
Robey St
Baxter Rd
Ross Smith Ave
Wentworth Ave
Sparks St
Francis St
Westcott
Lyon St
Middlemiss St
Dunning Ave
Robinson Ln
200 m
1000 ft
Google

NSW Office of Water
Work Summary

GW100993

Licence: 10BL156957
Licence Status: CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: Supply Obtained
Construct.Method: Hand Dug
Owner Type: Private

Commenced Date:
Completion Date: 29/08/1995
Final Depth: 5.49 m
Drilled Depth: 5.49 m

Contractor Name:
Driller: Arthur Korkidas
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level: 2.130
Salinity: Good
Yield: 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.5	2//332025
Licensed:	CUMBERLAND	BOTANY	Whole Lot 2//332025

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6244560.0
Easting: 334227.0
Latitude: 33°55'34.9"S
Longitude: 151°12'23.6"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure

Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.49	100			Hand Dug
1	1	Opening	Screen	0.00	0.00	50		1	PVC, Screwed, A: 0.01mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.13	5.49	3.36	Unknown	2.13		1.00			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	5.49	5.49	UNCONSOLIDATED ALL SANDS	Sand	

Remarks

10/01/2013: Nat Carling, 10-Jan-2013; Added rock type codes to driller's log & added missing information (based on existing data).

***** End of GW100993 *****

NSW Office of Water
Work Summary

GW104981

Licence: 10BL160365
Licence Status: CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status: Supply Obtained
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 05/12/2001
Final Depth: 6.00 m
Drilled Depth: 6.00 m

Contractor Name:
Driller: Rosario Fedele
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level: 3.000
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.005	LT 11 DP 6386
Licensed:	CUMBERLAND	BOTANY	Whole Lot 11//6386

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:
CMA Map: 9130-3S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6244577.0
Easting: 334741.0
Latitude: 33°55'34.7"S
Longitude: 151°12'43.7"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	100			Auger
1	1	Casing	Lining	0.00	0.00				
1	1	Casing	Pvc Class 12	0.00	6.00	113			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
0.00	6.00	6.00	Unknown	3.00					

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	SAND	Sand	

Remarks

***** End of GW104981 *****

NSW Office of Water
Work Summary

GW110414

Licence: 10BL160571
Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Auger - Solid Flight
Owner Type: Private

Commenced Date:
Completion Date: 13/02/2002
Final Depth: 4.00 m
Drilled Depth: 4.00 m

Contractor Name: ENGINEERING EXPLORATIONS PTY LTD
Driller: Mark Robert Norman
Assistant Driller:

Property: SHELL 14 EVANS AVE ROSEBERY 2019 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.44	3818
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6244819.0
Easting: 334626.0
Latitude: 33°55'26.7"S
Longitude: 151°12'39.3"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.00	200			Auger - Solid Flight
1	1	Casing	Pvc Class 18	0.00	1.00	50			
1	1	Opening	Screen	0.00	3.00	50		1	PVC Class 18

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	GRASS	Granite	
0.10	1.00	0.90	SAND,ORANGE,BROWN,M/GRAINED,DRY	Sand	
1.00	2.00	1.00	SAND, AS ABOVE	Sand	
2.00	3.00	1.00	SAND,LIGHT BROWN,M/GRAINED,WELL SORTED	Sand	
3.00	4.00	1.00	SAND AS ABOVE,SATURATED	Sand Grains (Lithic)	

Remarks

***** End of GW110414 *****

NSW Office of Water
Work Summary

GW110427

Licence: 10BL160571
Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Auger - Solid Flight
Owner Type: Private

Commenced Date:
Completion Date: 13/02/2002
Final Depth: 7.00 m
Drilled Depth: 7.00 m

Contractor Name: ENGINEERING EXPLORATIONS PTY LTD
Driller: Mark Robert Norman
Assistant Driller:

Property: SHELL 14 EVANS AVE ROSEBERY 2019 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.44	1//3818
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6244801.0
Easting: 334587.0
Latitude: 33°55'27.3"S
Longitude: 151°12'37.8"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	200			Auger - Solid Flight
1	1	Casing	Pvc Class 18	0.00	4.00	50			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	GRASS	Granite	
0.10	1.00	0.90	SAND,YELLOW ORANGE,M/GRAINED	Sand	
1.00	2.00	1.00	SAND GREY BROWN,M/GRAINED,DRY	Sand	
2.00	3.00	1.00	SAND AS ABOVE ,WET	Sand	
3.00	4.00	1.00	SAND AS ABOVE ,WET	Sand Grains (Lithic)	
4.00	5.00	1.00	SAND LIGHT BROWN,M/GRAINED,SATURATED	Sand Grains (Lithic)	
5.00	6.00	1.00	SAND AS ABOVE ,SATURATED	Sand Grains (Lithic)	
6.00	7.00	1.00	SAND AS ABOVE	Sand Grains (Lithic)	

Remarks

***** End of GW110427 *****

NSW Office of Water
Work Summary

GW110429

Licence: 10BL160571
Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Auger - Hollow Flight
Owner Type: Private

Commenced Date:
Completion Date: 12/02/2002
Final Depth: 4.00 m
Drilled Depth: 4.00 m

Contractor Name: ENGINEERING EXPLORATIONS PTY LTD
Driller: Mark Robert Norman
Assistant Driller:

Property: SHELL 14 EVANS AVE ROSEBERY 2019 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.5	//3818
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6244793.0
Easting: 334605.0
Latitude: 33°55'27.6"S
Longitude: 151°12'38.5"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.00	200			Auger - Hollow Flight
1	1	Casing	Pvc Class 18	0.00	1.00	50			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	BITUMEN	Biotite	
0.10	1.00	0.90	SAND,GREY/BROWN,FINE,M/GRAINED	Sand	
1.00	2.00	1.00	SAND AS ABOVE	Sand Grains (Lithic)	
2.00	3.00	1.00	SAND L/BROWN,M/GRAINED,WET,M/DENSE	Sand Grains (Lithic)	
3.00	3.80	0.80	SAND AS ABOVE	Sand Grains (Lithic)	
3.80	4.00	0.20	SAND AS ABOVE ,SATURATED	Sand Grains (Lithic)	

Remarks

***** End of GW110429 *****

NSW Office of Water
Work Summary

GW110430

Licence: 10BL160571
Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Auger - Hollow Flight
Owner Type: Private

Commenced Date:
Completion Date: 12/02/2002
Final Depth: 4.00 m
Drilled Depth: 4.00 m

Contractor Name: ENGINEERING EXPLORATIONS PTY LTD
Driller: Mark Robert Norman
Assistant Driller:

Property: SHELL 14 EVANS AVE ROSEBERY 2019 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.5	//3818
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6244805.0
Easting: 334601.0
Latitude: 33°55'27.2"S
Longitude: 151°12'38.4"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.00	200			Auger - Hollow Flight
1	1	Casing	Pvc Class 18	0.00	1.00	50			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	BITUMEN	Biotite	
0.10	1.00	0.90	SAND, ORANGE/BROWN,FINE M/GRAINED	Sand	
1.00	2.00	1.00	SAND,WHITE/GREY,WELL SORTED F/M/GRAINED	Sand	
2.00	3.00	1.00	SAND,BROWN/GREY,WET,M/GRAINED	Sand	
3.00	3.80	0.80	SAND,AS ABOVE	Sand	
3.80	4.00	0.20	SAND AS ABOVE ,SATURATED	Sand Grains (Lithic)	

Remarks

***** End of GW110430 *****

NSW Office of Water
Work Summary

GW110431

Licence: 10BL160571
Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Auger - Hollow Flight
Owner Type: Private

Commenced Date:
Completion Date: 12/02/2002
Final Depth: 5.00 m
Drilled Depth: 5.00 m

Contractor Name: ENGINEERING EXPLORATIONS PTY LTD
Driller: Mark Robert Norman
Assistant Driller:

Property: SHELL 14 EVANS AVE ROSEBERY 2019 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.5	//3818
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6244817.0
Easting: 334607.0
Latitude: 33°55'26.8"S
Longitude: 151°12'38.6"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.00	200			Auger - Hollow Flight
1	1	Casing	Pvc Class 18	0.00	1.00	50			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	BITUMEN	Biotite	
0.10	1.00	0.90	SAND,GREY BROWN	Sand	
1.00	2.00	1.00	SAND,GREY BROWN,M/GRAINED,DRY	Sand	
2.00	3.00	1.00	SAND,L/BROWN,DAMP,WELL SORTED	Sand	
3.00	4.00	1.00	SAND AS ABOVE,WET	Sand Grains (Lithic)	
4.00	4.80	0.80	SAND,L/BROWN,WET,M/GRAINED	Sand	
4.80	5.00	0.20	SAND AS ABOVE	Sand Grains (Lithic)	

Remarks

***** End of GW110431 *****

NSW EPA Records for the former Shell Service Station

Environment Protection Authority

Notice of completion of approved voluntary management proposal

(Section 44 of the Contaminated Land Management Act 1997)

Notice Number 20134405; Area Number 3263

The Proper Officer
The Shell Company of Australia Limited (ACN: 004 610 459)
PO Box 63
Parramatta NSW 2124

Background

The Environment Protection Authority (EPA) approved (approval no. 26115) a voluntary management proposal from The Shell Company of Australia Limited (the proponent) in relation to the land to which this notice applies. The proponent carried out management actions under the approved proposal and the results have been made available to the EPA.

Completion of approved VMP

Having reviewed the results of the management actions, the EPA is satisfied that it no longer has reason to believe that contamination of the land to which this notice applies is significant enough to warrant regulation under the *Contaminated Land Management Act 1997* (CLM Act).

Pursuant to sections 44 and 17(7) of the CLM Act, voluntary management proposal No. 26115, approval date 3 April 2009, ceases to be an approved proposal. The EPA is satisfied that the terms of the proposal have been carried out, noting that the oxygen-enhanced bioremediation program was discontinued based on the results of the pilot trial.

Land to which this notice applies

Description	Address
SP3818	14 Evans Avenue, Eastlakes
Lot 1 in DP565621	Eastlakes Reserve, Eastlakes
The section of Evans Avenue between Racecourse Place and Longworth Avenue	
The section of Evans Lane between SP45459 and SP3818	

[Signed]

ERWIN BENKER

Acting Manager Contaminated Sites
Environment Protection Authority

Date: 18 March 2013

NOTE:

Information recorded by the EPA

Section 58 of the CLM Act requires the EPA to maintain a public record. A copy of this notice will be included in the public record.

Information recorded by councils

Section 59 of the CLM Act requires the EPA to give a copy of this notice to the relevant local council. The council may then make appropriate consequential modifications to the planning certificate issued in relation to the land to which this notice applies pursuant to s149 of the *Environmental Planning and Assessment Act 1979*.

Relationship to other regulatory instrument

This repeal notice does not affect the provisions of any relevant environmental planning instruments which apply to the land or provisions of any other environmental protection legislation administered by the EPA.

Previous regulatory instrument

As of 1 July 2009, all current declarations of investigation area and declarations of remediation site are taken to be declarations of significantly contaminated land, all current investigation orders and remediation orders are taken to be management orders and all current agreed voluntary investigation proposals and agreed voluntary remediation proposals are taken to be approved voluntary management proposals.

Environment Protection Authority

Notice of completion of agreed voluntary remediation proposal

(Section 26 of the Contaminated Land Management Act 1997)

Notice Number 26C015; Area Numbers 3168 and 3263

Adam Speers
Senior Project Manager (Environment)
The Shell Company of Australia Limited (ACN 46 004 610 459)
PO Box 63
Parramatta NSW 2124

cc. City of Botany Bay Council

Background

A. The Environment Protection Authority ("the EPA")* agreed (agreement no. 26015) to a voluntary remediation proposal ("the proposal") from The Shell Company of Australia Limited ("the proponent") in relation to the land to which this notice applies.

B. Remediation works have been conducted at the former Shell Select service station site (described as Lot 4 in DP221796), including excavation of contaminated soil and landfarming of the excavated material to reduce contaminant concentrations. Consequently, the former service station site is no longer considered to be a significant source of groundwater contamination.

C. On 5 June 2008 the accredited site auditor Chris Jewell issued Site Audit Statement No. SA099/2, concluding that the former service station site is suitable for the following uses:

- Residential with minimal opportunity for soil access, including units;
- Secondary School;
- Park, recreational open space, playing field;
- Commercial/industrial.

D. Despite the works outlined at B, residual groundwater contamination is present beneath land adjacent to the former service station site. Shell has committed to conduct additional remediation works to address the residual petroleum hydrocarbon contamination and conduct an assessment of risks to human health and the environment. The works will be conducted under Voluntary Remediation Agreement (VRA) No. 26115.

Completion of Notice

Pursuant to section 26(5) of the *Contaminated Land Management Act 1997* the EPA gives the proponent notice that it is satisfied that the terms of the agreed proposal have in general been carried out, noting that outstanding issues will be addressed under VRA No. 26115.

Land to which this notice applies

Description	Address
Lot 4 in DP221796;	279 Gardeners Road, Eastlakes NSW;

SP4496; Lots 6 in DP230264; Lots 1 to 18 in SP 45459; Lot 5 in DP237132 (correct title SP3818); Lots 1 to 8 in SP1857; Lots 1 to 12 in SP1858; Lots 1 to 12 in SP1862; Lot 1 in DP565621; Lot 7 in DP230264; and the public roads consisting of the section of Evans Avenue between Evans Lane and D'Alby Place, Evans Lane which adjoins lot 5 in DP237132 (correct title SP3818) and Lot 4 in DP221796, and Longworth Avenue which adjoins Lot 1 in DP565621.	281 Gardeners Road, Eastlakes; 10 Evans Avenue, Eastlakes; 12 Evans Avenue, Eastlakes; 14 Evans Avenue, Eastlakes; 3 Longworth Avenue, Eastlakes; 5 Longworth Avenue, Eastlakes; 4 Hearn Close, Eastlakes; Eastlakes Reserve; Bridgett Tight Reserve.

-

[Signed]

NIALL JOHNSTON
Manager Contaminated Sites
Department of Environment and Climate Change

Date: 9 June 2009

NOTE:

Information recorded by councils

Section 59 of the *Contaminated Land Management Act 1997* requires the EPA to inform the relevant local council of the completion of voluntary remediation proposals to which the EPA agreed under section 26 of the Act. The council may then make appropriate modifications to the planning certificate issued in relation to the land concerned pursuant to section 149 of the *Environmental Planning and Assessment Act 1979*.

*The EPA is part of the Department of Environment and Climate Change (NSW)

Environment Protection Authority

Notice of completion of agreed voluntary remediation proposal

(Section 26 of the Contaminated Land Management Act 1997)

Notice Number 26C060; Area Numbers 3168 and 3263

Adam Speers
Senior Project Manager (Environment)
The Shell Company of Australia Limited (ACN 46 004 610 459)
PO Box 63
Parramatta NSW 2124

cc. City of Botany Bay Council

Background

A. The Environment Protection Authority ("the EPA")* agreed (agreement no. 26060) to a voluntary remediation proposal ("the proposal") from The Shell Company of Australia Limited ("the proponent") in relation to the land to which this notice applies.

B. Remediation works have been conducted at the former Shell Select service station site (described as Lot 4 in DP221796), including excavation of contaminated soil and landfarming of the excavated material to reduce contaminant concentrations. Consequently, the former service station site is no longer considered to be a significant source of groundwater contamination.

C. On 5 June 2008 the accredited site auditor Chris Jewell issued Site Audit Statement No. SA099/2, concluding that the former service station site is suitable for the following uses:

- Residential with minimal opportunity for soil access, including units;
- Secondary School;
- Park, recreational open space, playing field;
- Commercial/industrial.

D. Despite the works outlined at B, residual groundwater contamination is present beneath land adjacent to the former service station site. Shell has committed to conduct additional remediation works to address the residual petroleum hydrocarbon contamination and conduct an assessment of risks to human health and the environment. The works will be conducted under Voluntary Remediation Agreement (VRA) No. 26115.

Completion of Notice

Pursuant to section 26(5) of the *Contaminated Land Management Act 1997* the EPA gives the proponent notice that it is satisfied that the terms of the agreed proposal have in general been carried out, noting that outstanding issues will be addressed under VRA No. 26115.

Land to which this notice applies

Description	Address

Lot 4 DP 221796	279 Gardeners Road, Eastlakes NSW
SP 4496	281 Gardeners Road
Lot 6 DP 230264	10 Evans Avenue (corner Evans Lane)
SP 45459	12 Evans Avenue
SP 3818	14 Evans Avenue (corner Racecourse Place) (also referred to as Lot 5 Evans Avenue)
Lot 7 DP 230264	Park at corner of Evans Avenue and Dalby Place
Lot 1 DP 565621	Park at corner of Evans Avenue and Longworth Avenue
SP 1219	1 Longworth Avenue (corner Barber Avenue)
SP 1857	3 Longworth Avenue
SP 1858	5 Longworth Avenue (corner Evans Avenue)
	The section of Evans Avenue between Racecourse Place and Dalby Place
	The entire length of Evans Lane
	The entire length of Longworth Avenue

-

[Signed]

NIALL JOHNSTON
Manager Contaminated Sites
Department of Environment and Climate Change

Date: 9 June 2009

NOTE:

Information recorded by councils

Section 59 of the *Contaminated Land Management Act 1997* requires the EPA to inform the relevant local council of the completion of voluntary remediation proposals to which the EPA agreed under section 26 of the Act. The council may then make appropriate modifications to the planning certificate issued in relation to the land concerned pursuant to section 149 of the *Environmental Planning and Assessment Act 1979*.

*The EPA is part of the Department of Environment and Climate Change (NSW)

Our Reference : Agreement No. 26015#3168
File No. HO954

ENVIRONMENT PROTECTION AUTHORITY (EPA)

VOLUNTARY REMEDIATION PROPOSAL: EPA AGREEMENT

SECTION 26 CONTAMINATED LAND MANAGEMENT ACT 1997

Service: By Registered Mail to Place of Business

To: **Shell Company of Australia Limited (ACN 46 004 610 459)**
Durham Street
ROSEHILL NSW 2142

(referred to in this agreement as "the proponent").

Date:

Land:

The land to which this voluntary proposal relates, is described as:

Land located at 279 Gardeners Road ROSEBERY NSW and neighbouring land consisting of:

Lot 4 in Deposited Plan (DP) 221796;
Lot 5 in DP237132;
Lots 1 to 18 in SP 45459;
Lots 6 and 7 in DP230264;
Lot 1 in DP565621;
Lots 1 to 12 in SP1858;
SP4496;
Lots 1 to 12 in SP1862;
Lots 1 to 8 in SP1857 and
the public roads consisting of the section of Evans Avenue between Evans Lane and D'Alby Place; Evans Lane which adjoins lot 5 in DP237132 and Lot 4 in DP221796 and Longworth Avenue which adjoins Lot 1 in DP565621, as shown on the attached map.

(referred to in this agreement as "the land")

Contamination:

The contamination consists of:

- Total petroleum hydrocarbons, mainly (C_6-C_9) fraction, with large proportions of benzene, toluene, ethyl benzene and xylene (BTEX) and lead in both soils and groundwater.

Background:

The proponent has furnished the Environment Protection Authority (EPA) with a proposal to remediate the land according to the *Contaminated Land Management Act 1997* ("the Act").

"The proposal" is set out in detail in the following documents:

Remedial Action Plan Former for Former Shell Select Rosebery 279 Gardeners Road, Rosebery NSW, November 2000, prepared by Shell Engineering Pty Ltd.

A letter from Shell to the EPA dated 17 January 2001 with an addendum to the above document that provides further detail for groundwater monitoring and remediation.

A letter from Shell to the EPA dated 31 July 2001 with revised dates for reporting.

A fax from Shell to the EPA dated 28 September 2001 with revised dates for reporting.

Copies of these letters and the cover and contents pages of the RAP are attached to this document.

Lifetime of the Proposal

This proposal commences from the date upon which it is signed on behalf of the EPA and will run until 31 December 2001. A further agreement with Shell Australia Ltd for the remediation works will be considered at that time.

Objectives

The objectives of this agreement are to achieve the following outcomes within the timeframes specified in the proposal:

- removal of free phase hydrocarbons from the soils and groundwaters.
- remediation of contamination in soils so as to eliminate the significant risk of harm to human health and the environment for the current land use zoning;
- remediation of the hydrocarbon and lead contamination in the groundwater so that the groundwater, at a minimum, complies with the relevant drinking water standard for benzene, ethyl benzene, toluene, xylene and lead.
- containment of the existing off-site contaminant plume within it's current boundaries.

Another objective is that Shell provide a forum to notify and advise affected property owners of this agreement and the progress towards achieving the remediation.

Principal Features of the Proposal

The principal features of this proposal are:

- removal of the free phase hydrocarbons from the soil and groundwaters.
- treatment of contaminants at the site to reduce their concentrations to levels which no longer pose a significant risk of harm to human health in respect of the current land zoning.
- remediation of groundwater to meet drinking water standards.
- achievement of the above objectives within the timeframes set out in the RAP and the attached investigation and remediation schedule and revised reporting dates detailed in Shell's letter dated 31 July 2001 and fax dated 28 September 2001.
- quarterly groundwater monitoring of monitoring wells MW-1, MW-29, MW-30, MW-15, MW-19 and MW-23 to quantify reductions in hydrocarbon concentrations and to provide a three dimensional picture of the contaminant plume.
- Shell will demonstrate within 1 year that the contaminant plume is stable or diminishing and if this cannot be demonstrated, Shell will initiate a program of placement of oxygen releasing agents to stimulate the reduction in hydrocarbon concentrations.
- provide the Department of Land and Water Conservation with a copy of the groundwater monitoring results within four weeks of receiving the report.
- a community consultation strategy to involve all relevant stakeholders as set out in the proposal.
- validation of the site as suitable for its current land use zoning.

The proponent will need to engage a Site Auditor (accredited under Part 4 of the CLM Act) to provide the necessary validation for the site.

The EPA is satisfied that:

(i) the terms of the proposal are appropriate, and

(ii) the proponent has undertaken the requirements set out in section 26 (b) and (c) of the Act which relates to identifying owners, notional owners and all parties responsible for the contamination and giving those parties the opportunity to participate in the formulation and carrying out of the proposal on reasonable terms.

EPA Agreement:

The EPA agrees with the voluntary remediation proposal, and will not issue a remediation order against the proponent in accordance with the provisions of Part 3 of the Contaminated Land Management Act if the remediation is carried out in accordance with the voluntary remediation proposal.

signed 30/10/01

JILL GALLAGHER
A/Director Contaminated Sites
ENVIRONMENT PROTECTION AUTHORITY
(by Delegation)

NOTE:

1. The EPA is not prevented by this agreement from making a remediation order against persons (including public authorities) with whom it has made no such agreement (whether or not they were originally parties to the proposal).

2. The EPA is not prevented by this agreement from making a remediation order against the proponent as an appropriate person (as defined in the Act) if, in the opinion of the EPA, the terms of the proposal are not carried out.

3. Section 58 of the Act requires the EPA to maintain a public record of certain matters. Notification of the making of this agreement will be included in the public record.

4. Section 59 of the Act requires the EPA to notify the relevant local council of the making of this agreement and when the terms of the agreement have been fulfilled. The council is required to note on any certificate issued pursuant to section 149(2) Environmental Planning and Assessment Act 1979 with respect to the land that the land is subject to a voluntary agreement until the council receives EPA notification that the terms have been fulfilled.

Our Reference : Agreement No. 26015#3168
File No. HO954

ENVIRONMENT PROTECTION AUTHORITY (EPA)

VOLUNTARY REMEDIATION PROPOSAL: EPA AGREEMENT

SECTION 26 CONTAMINATED LAND MANAGEMENT ACT 1997

Service: By Registered Mail to Place of Business

To: **Shell Company of Australia Limited (ACN 46 004 610 459)**
Durham Street
ROSEHILL NSW 2142

(referred to in this agreement as "the proponent").

Date:

Land:

The land to which this voluntary proposal relates, is described as:

Land located at 279 Gardeners Road ROSEBERY NSW and neighbouring land consisting of:

Lot 4 in Deposited Plan (DP) 221796;
Lot 5 in DP237132;
Lots 1 to 18 in SP 45459;
Lots 6 and 7 in DP230264;
Lot 1 in DP565621;
Lots 1 to 12 in SP1858;
SP4496;
Lots 1 to 12 in SP1862;
Lots 1 to 8 in SP1857 and
the public roads consisting of the section of Evans Avenue between Evans Lane and D'Alby Place; Evans Lane which adjoins lot 5 in DP237132 and Lot 4 in DP221796 and Longworth Avenue which adjoins Lot 1 in DP565621, as shown on the attached map.

(referred to in this agreement as "the land")

Contamination:

The contamination consists of:

- Total petroleum hydrocarbons, mainly (C_6-C_9) fraction, with large proportions of benzene, toluene, ethyl benzene and xylene (BTEX) and lead in both soils and groundwater.

Background:

The proponent has furnished the Environment Protection Authority (EPA) with a proposal to remediate the land according to the *Contaminated Land Management Act 1997* ("the Act").

"The proposal" is set out in detail in the following documents:

Remedial Action Plan Former for Former Shell Select Rosebery 279 Gardeners Road, Rosebery NSW, November 2000, prepared by Shell Engineering Pty Ltd.

A letter from Shell to the EPA dated 17 January 2001 with an addendum to the above document that provides further detail for groundwater monitoring and remediation.

A letter from Shell to the EPA dated 31 July 2001 with revised dates for reporting.

A fax from Shell to the EPA dated 28 September 2001 with revised dates for reporting.

Copies of these letters and the cover and contents pages of the RAP are attached to this document.

Lifetime of the Proposal

This proposal commences from the date upon which it is signed on behalf of the EPA and will run until 31 December 2001. A further agreement with Shell Australia Ltd for the remediation works will be considered at that time.

Objectives

The objectives of this agreement are to achieve the following outcomes within the timeframes specified in the proposal:

- removal of free phase hydrocarbons from the soils and groundwaters.
- remediation of contamination in soils so as to eliminate the significant risk of harm to human health and the environment for the current land use zoning;
- remediation of the hydrocarbon and lead contamination in the groundwater so that the groundwater, at a minimum, complies with the relevant drinking water standard for benzene, ethyl benzene, toluene, xylene and lead.
- containment of the existing off-site contaminant plume within it's current boundaries.

Another objective is that Shell provide a forum to notify and advise affected property owners of this agreement and the progress towards achieving the remediation.

Principal Features of the Proposal

The principal features of this proposal are:

- removal of the free phase hydrocarbons from the soil and groundwaters.
- treatment of contaminants at the site to reduce their concentrations to levels which no longer pose a significant risk of harm to human health in respect of the current land zoning.
- remediation of groundwater to meet drinking water standards.
- achievement of the above objectives within the timeframes set out in the RAP and the attached investigation and remediation schedule and revised reporting dates detailed in Shell's letter dated 31 July 2001 and fax dated 28 September 2001.
- quarterly groundwater monitoring of monitoring wells MW-1, MW-29, MW-30, MW-15, MW-19 and MW-23 to quantify reductions in hydrocarbon concentrations and to provide a three dimensional picture of the contaminant plume.
- Shell will demonstrate within 1 year that the contaminant plume is stable or diminishing and if this cannot be demonstrated, Shell will initiate a program of placement of oxygen releasing agents to stimulate the reduction in hydrocarbon concentrations.
- provide the Department of Land and Water Conservation with a copy of the groundwater monitoring results within four weeks of receiving the report.
- a community consultation strategy to involve all relevant stakeholders as set out in the proposal.
- validation of the site as suitable for its current land use zoning.

The proponent will need to engage a Site Auditor (accredited under Part 4 of the CLM Act) to provide the necessary validation for the site.

The EPA is satisfied that:

(i) the terms of the proposal are appropriate, and

(ii) the proponent has undertaken the requirements set out in section 26 (b) and (c) of the Act which relates to identifying owners, notional owners and all parties responsible for the contamination and giving those parties the opportunity to participate in the formulation and carrying out of the proposal on reasonable terms.

EPA Agreement:

The EPA agrees with the voluntary remediation proposal, and will not issue a remediation order against the proponent in accordance with the provisions of Part 3 of the Contaminated Land Management Act if the remediation is carried out in accordance with the voluntary remediation proposal.

signed 30/10/01

JILL GALLAGHER
A/Director Contaminated Sites
ENVIRONMENT PROTECTION AUTHORITY
(by Delegation)

NOTE:

1. The EPA is not prevented by this agreement from making a remediation order against persons (including public authorities) with whom it has made no such agreement (whether or not they were originally parties to the proposal).

2. The EPA is not prevented by this agreement from making a remediation order against the proponent as an appropriate person (as defined in the Act) if, in the opinion of the EPA, the terms of the proposal are not carried out.

3. Section 58 of the Act requires the EPA to maintain a public record of certain matters. Notification of the making of this agreement will be included in the public record.

4. Section 59 of the Act requires the EPA to notify the relevant local council of the making of this agreement and when the terms of the agreement have been fulfilled. The council is required to note on any certificate issued pursuant to section 149(2) Environmental Planning and Assessment Act 1979 with respect to the land that the land is subject to a voluntary agreement until the council receives EPA notification that the terms have been fulfilled.

COPY

Our Reference : Agreement No. 26060
Area No. 3168
File No. HO954

ENVIRONMENT PROTECTION AUTHORITY (EPA)

VOLUNTARY REMEDIATION PROPOSAL: EPA AGREEMENT

SECTION 26 CONTAMINATED LAND MANAGEMENT ACT 1997

Service: By Registered Mail to registered office of company

To: **Shell Company of Australia Limited**
(ACN 46 004 610 459)
Durham Street
ROSEHILL NSW 2142
(referred to in this agreement as "the proponent").

Date: 26 May 2004

Land:

The land to which this agreement relates is land known as:

Description	Address
Lot 4 DP 221796	279 Gardeners Road, Eastlakes NSW

(the "site")

and

Description	Address
SP 4496	281 Gardeners Road
Lot 6 DP 230264	10 Evans Avenue (corner Evans Lane)
SP 45459	12 Evans Avenue
SP 3818	14 Evans Avenue (corner Racecourse Place) (also referred to as Lot 5 Evans Avenue)
Lot 7 DP 230264	Park at corner of Evans Avenue and Dalby Place
Lot 1 DP 565621	Park at corner of Evans Avenue and Longworth Avenue
SP 1219	1 Longworth Avenue (corner Barber Avenue)
SP 1857	3 Longworth Avenue
SP 1858	5 Longworth Avenue (corner Evans Avenue)
	The section of Evans Avenue between Racecourse Place and Dalby Place
	The entire length of Evans Lane
	The entire length of Longworth Avenue

(the "adjacent sites", all of which are located in Eastlakes NSW)
as shown on the attached map.

The site and the adjacent sites are together referred to in this agreement as "the land".

Contamination:

The Environment Protection Authority ("EPA") has determined that the soils (including fill material) and groundwater at the site are contaminated by the following substances in such a way as to present a significant risk of harm:

- Volatile aromatic compounds including benzene, toluene, ethyl benzene and xylenes (BTEX).
- Total petroleum hydrocarbons, mainly in the C_6-C_9 fraction (TPH).
- Lead.

(referred to in this agreement as "the contaminants".)

Background:

The contaminants are sourced from a Shell Service Station that operated at the site and has since been decommissioned.

The EPA agreed to a voluntary remediation proposal from Shell under s.26 of the Act on 30 October 2001. Decommissioning works, soil validation and extensive groundwater monitoring were undertaken. However contamination remains at the site and is associated with the groundwater plume. Following the first stage of remediation it has been shown that the plume is not increasing in size but the residual contamination at the site may be acting as a secondary source of contamination, the plume is probably not decreasing, and contamination remains below the adjacent sites.

The proponent has provided the EPA with a second Voluntary Remediation Proposal to remediate the site, in accordance with section 26 of the Contaminated Land Management Act 1997 ("the CLM Act").

The Voluntary Remediation Proposal ("Proposal") is set out in the following documents as modified by this agreement:

- a report titled *Remedial Action Plan for Former Shell Select Rosebery – 279 Gardeners Road, Rosebery NSW* ("RAP") prepared by Shell Engineering Pty Ltd ("SEL"), dated May 2002, (a copy of front page and index are included at Attachment 2);
- a summary site audit report titled *Audit of Remedial Action Plan – 279 Gardeners Road, Rosebery* ("SSAR") prepared by CM Jewell and Associates dated August 2002, (a copy of front page and index are included at Attachment 3);
- a letter from the proponent dated 4 December 2000 stating that the proponent has provided parties it considers to be potential polluters with an opportunity to participate in the remediation of the site; and
- a letter from the proponent dated 27 April 2004 indicating that the proponent agrees with this draft agreement.

Objectives:

The objectives of the proposal are to achieve the following:

O1 Removal of free phase hydrocarbons from the soil and groundwater at the land.

O2 Removal of the source of ongoing groundwater contamination.

O3 Demonstration that natural attenuation of the dissolved hydrocarbon plume is occurring and will result in drinking water guidelines for benzene, toluene, ethyl benzene, xylene and lead being met at the adjacent sites within 10 years. The drinking water guidelines to be achieved

are those specified in the RAP as referenced from the NHMRC (1996) Drinking Water Guidelines.

O4 Demonstration that vapours from the groundwater plume are not impacting on the adjacent sites.

Principal Features of the Proposal:

The principal features of the proposal include the following:

P1 Excavate and landfarm contaminated soil at the site. The soil remediation must be managed so as to minimise the production of odours or dust. If unacceptable levels of dust or odours are generated then an alternative remediation method must be used.

P2 Identify and delineate contamination on the adjoining property at 14 Evans Avenue (SP 3818). These works have been completed as at the time of this agreement.

P3 Conduct a program of soil vapour monitoring at the land, particularly in the vicinity of residential properties and compare these results with those of previous monitoring events to assess any changes in vapour emissions. Two rounds of soil vapour monitoring have been completed as at the time of this agreement.

P4 Conduct a program of six-monthly groundwater monitoring at the land to assess whether the plume is reducing in size and whether natural attenuation is occurring. The program will commence within two months of the date of this agreement and will continue until the EPA advises in writing that it is no longer required. The monitoring program must implement the recommendations of the SSAR and must include monitoring of sufficient wells to assess the longitudinal and lateral extent of the plume.

P5 All works and sampling undertaken, and reports prepared must be consistent with Guidelines made or approved by the EPA under section 105 of the CLM Act (a list of these Guidelines is appended at Attachment 4).

EPA requirements in addition to those contained in the proposal:

P6 Conduct another round of vapour monitoring following a period of dry weather that targets residential exposure to the contaminants. This is to include a soil gas survey, soil flux vapour emission monitoring, and vapour monitoring of ground level and below ground structures (including services and buildings) in the vicinity of the known groundwater contaminant plume.

P7 If groundwater monitoring carried out following the soil remediation P1 identifies the presence of benzene, toluene, ethyl-benzene or xylenes above levels detected in 2002 in two consecutive monitoring events in monitoring wells on or adjacent to residential properties then the EPA must be notified and prompt and appropriate action must be taken by the proponent to reduce the contaminant concentrations in these wells.

P8 Conduct community consultation by informing affected landowners about the contamination and the remediation, assessing whether the residents of the adjacent sites have any complaints regarding unusual odours or seepage, placing signage at the former service station site, and reporting to the EPA on the outcomes of the consultation.

Reporting

R1 The proponent must prepare and provide to the Contaminated Sites Section of the Department of Environment and Conservation the following reports by the date shown:

R1.1 Comprehensive soil vapour monitoring report in accordance with P6 by 30 September 2004.

R1.2 Reports on groundwater monitoring and natural attenuation in accordance with P4 and P7 within 8 weeks of each monitoring event.

R2 Validation report for 279 Gardeners Road in accordance with P1 and P8 within 12 weeks of completion of the landfarming program and in any event prior to 31 March 2005. During the remediation concise bimonthly update reports must be provided.

R3 The proponent must engage a site auditor, accredited under the CLM Act, to review, together with any relevant material from previous environmental reports which have been commissioned in relation to the land, the reports listed above and provide comments on whether or not the objectives of this agreement under clauses O1 and O2 have been met to the EPA by 31 July 2005.

R4 In addition, the proponent must ensure that the site auditor provides the following reports to the EPA by 31 March 2006:

R4.1 A summary site audit report ("SSAR") which reviews the reports provided by the proponent in relation to the agreement and comments on the adequacy of the investigation undertaken and the conclusions drawn; and

R4.2 A site audit statement that states whether or not the land is suitable for its approved use, and if not, what action would be required to render the land suitable.

Duration of this Agreement

This agreement commences on the date upon which it is signed on behalf of the EPA, (which is the date set out on the first page of the agreement). Implementation of the proposal must be completed within the specified time periods as set out in this Agreement or within such timeframes as the EPA agrees in writing. This agreement will end when the EPA receives the SSAR or on **31 March 2006**, whichever is sooner.

The EPA will review the groundwater monitoring results, prior to 31 March 2006. This may result in the EPA either requiring further active remediation to address the contamination issue, particularly its potential off-site impacts, or issuing a maintenance of remediation notice under section 28 of the CLM Act as a way to regulate the long-term monitored natural attenuation remediation process.

EPA Agreement

The EPA is satisfied that the terms of the proposal are appropriate and, notes for the purposes of section 26(3) of the Act, that the proponent has provided in writing to the EPA evidence that parties it considers to be potential polluters have been provided with an opportunity to participate in the remediation of the site.

The EPA agrees with the terms of the proposal, and will not issue a remediation order against the proponent in accordance with the provisions of Part 3 of the Act if the remediation is carried out in accordance with the proposal.

Carange 26/5/04

CAROLYN STRANGE
Director Contaminated Sites
Department of Environment and Conservation
(by Delegation)

Attachment 1	location map
Attachment 2	copy of front page and index from RAP
Attachment 3	copy of front page and index from SSAR
Attachment 4	list of Guidelines made or approved under s.105 of the CLM Act
Attachment 5	letter from Shell stating that the proponent has provided parties it considers to be potential polluters with an opportunity to participate in the remediation of the site
Attachment 6	letter from Shell indicating agreement with the draft VRA

NOTE:

1. The EPA is not prevented by this agreement from making a remediation order against persons (including public authorities) with whom it has made no such agreement (whether or not they were originally parties to the proposal).

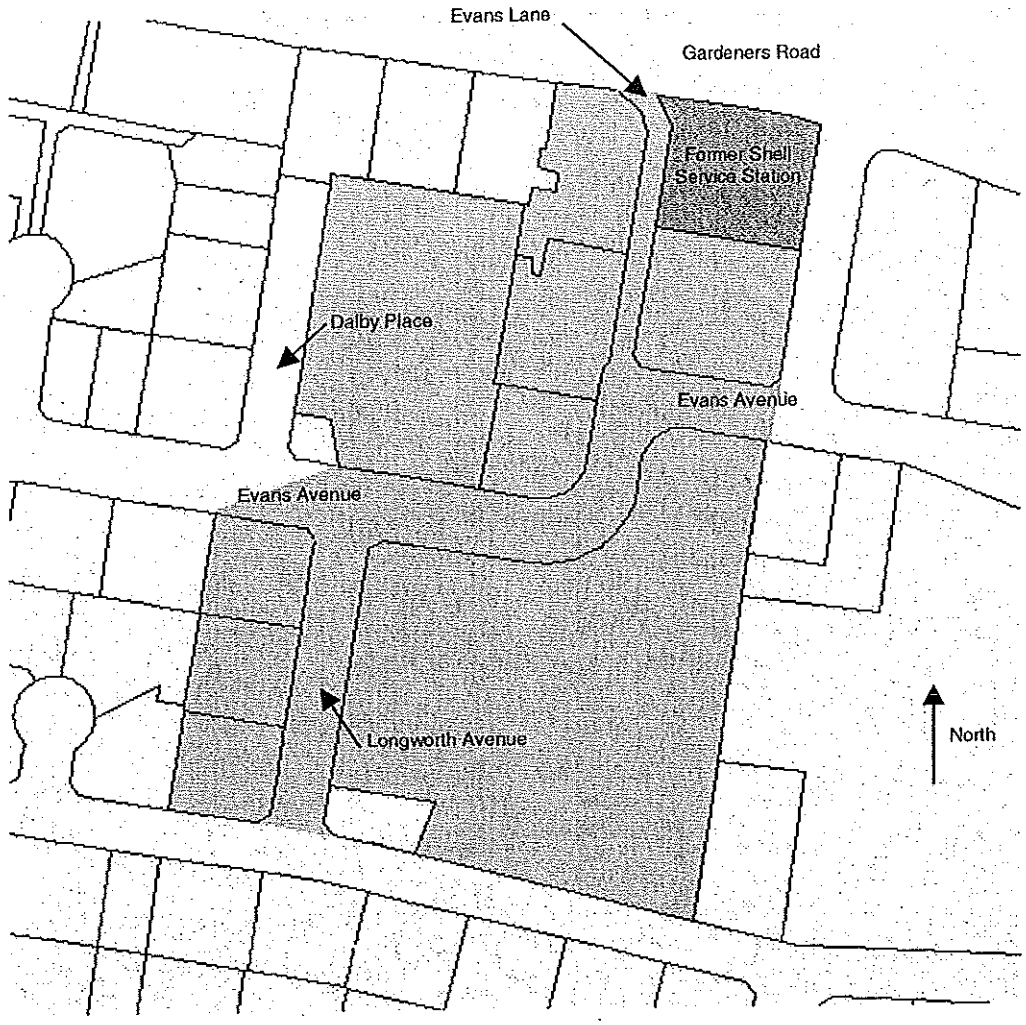
2. The EPA is not prevented by this agreement from making a remediation order against the proponent as an appropriate person (as defined in the Act) if, in the opinion of the EPA, the terms of the proposal are not carried out.

3. Section 58 of the Act requires the EPA to maintain a public record of certain matters. Notification of the making of this agreement will be included in the public record.

4. Section 59 of the Act requires the EPA to notify the relevant local council of the making of this agreement and when the terms of the agreement have been fulfilled. The council is required to note on any certificate issued pursuant to section 149(2) Environmental Planning and Assessment Act 1979 with respect to the land that the land is subject to a voluntary agreement until the council receives EPA notification that the terms have been fulfilled.

5. The entering into an agreement does not confer a defence for the purposes of section 122 of the Protection of the Environment Operations Act 1997.

Attachment 1



Map showing the area covered by the EPA's agreement to a voluntary remediation proposal number 26060.

COPY

Our Reference : Agreement No. 26060
Area No. 3168
File No. HO954

ENVIRONMENT PROTECTION AUTHORITY (EPA)

VOLUNTARY REMEDIATION PROPOSAL: EPA AGREEMENT

SECTION 26 CONTAMINATED LAND MANAGEMENT ACT 1997

Service: By Registered Mail to registered office of company

To: **Shell Company of Australia Limited**
(ACN 46 004 610 459)
Durham Street
ROSEHILL NSW 2142
(referred to in this agreement as "the proponent").

Date: 26 May 2004

Land:

The land to which this agreement relates is land known as:

Description	Address
Lot 4 DP 221796	279 Gardeners Road, Eastlakes NSW

(the "site")

and

Description	Address
SP 4496	281 Gardeners Road
Lot 6 DP 230264	10 Evans Avenue (corner Evans Lane)
SP 45459	12 Evans Avenue
SP 3818	14 Evans Avenue (corner Racecourse Place) (also referred to as Lot 5 Evans Avenue)
Lot 7 DP 230264	Park at corner of Evans Avenue and Dalby Place
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SP 1858	5 Longworth Avenue (corner Evans Avenue)
	The section of Evans Avenue between Racecourse Place and Dalby Place
	The entire length of Evans Lane
	The entire length of Longworth Avenue

(the "adjacent sites", all of which are located in Eastlakes NSW)
as shown on the attached map.

The site and the adjacent sites are together referred to in this agreement as "the land".

Contamination:

The Environment Protection Authority ("EPA") has determined that the soils (including fill material) and groundwater at the site are contaminated by the following substances in such a way as to present a significant risk of harm:

- Volatile aromatic compounds including benzene, toluene, ethyl benzene and xylenes (BTEX).
- Total petroleum hydrocarbons, mainly in the C_6-C_9 fraction (TPH).
- Lead.

(referred to in this agreement as "the contaminants".)

Background:

The contaminants are sourced from a Shell Service Station that operated at the site and has since been decommissioned.

The EPA agreed to a voluntary remediation proposal from Shell under s.26 of the Act on 30 October 2001. Decommissioning works, soil validation and extensive groundwater monitoring were undertaken. However contamination remains at the site and is associated with the groundwater plume. Following the first stage of remediation it has been shown that the plume is not increasing in size but the residual contamination at the site may be acting as a secondary source of contamination, the plume is probably not decreasing, and contamination remains below the adjacent sites.

The proponent has provided the EPA with a second Voluntary Remediation Proposal to remediate the site, in accordance with section 26 of the Contaminated Land Management Act 1997 ("the CLM Act").

The Voluntary Remediation Proposal ("Proposal") is set out in the following documents as modified by this agreement:

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- a letter from the proponent dated 27 April 2004 indicating that the proponent agrees with this draft agreement.

Objectives:

The objectives of the proposal are to achieve the following:

O1 Removal of free phase hydrocarbons from the soil and groundwater at the land.

O2 Removal of the source of ongoing groundwater contamination.

O3 Demonstration that natural attenuation of the dissolved hydrocarbon plume is occurring and will result in drinking water guidelines for benzene, toluene, ethyl benzene, xylene and lead being met at the adjacent sites within 10 years. The drinking water guidelines to be achieved

are those specified in the RAP as referenced from the NHMRC (1996) Drinking Water Guidelines.

O4 Demonstration that vapours from the groundwater plume are not impacting on the adjacent sites.

Principal Features of the Proposal:

The principal features of the proposal include the following:

P1 Excavate and landfarm contaminated soil at the site. The soil remediation must be managed so as to minimise the production of odours or dust. If unacceptable levels of dust or odours are generated then an alternative remediation method must be used.

P2 Identify and delineate contamination on the adjoining property at 14 Evans Avenue (SP 3818). These works have been completed as at the time of this agreement.

P3 Conduct a program of soil vapour monitoring at the land, particularly in the vicinity of residential properties and compare these results with those of previous monitoring events to assess any changes in vapour emissions. Two rounds of soil vapour monitoring have been completed as at the time of this agreement.

P4 Conduct a program of six-monthly groundwater monitoring at the land to assess whether the plume is reducing in size and whether natural attenuation is occurring. The program will commence within two months of the date of this agreement and will continue until the EPA advises in writing that it is no longer required. The monitoring program must implement the recommendations of the SSAR and must include monitoring of sufficient wells to assess the longitudinal and lateral extent of the plume.

P5 All works and sampling undertaken, and reports prepared must be consistent with Guidelines made or approved by the EPA under section 105 of the CLM Act (a list of these Guidelines is appended at Attachment 4).

EPA requirements in addition to those contained in the proposal:

P6 Conduct another round of vapour monitoring following a period of dry weather that targets residential exposure to the contaminants. This is to include a soil gas survey, soil flux vapour emission monitoring, and vapour monitoring of ground level and below ground structures (including services and buildings) in the vicinity of the known groundwater contaminant plume.

P7 If groundwater monitoring carried out following the soil remediation P1 identifies the presence of benzene, toluene, ethyl-benzene or xylenes above levels detected in 2002 in two consecutive monitoring events in monitoring wells on or adjacent to residential properties then the EPA must be notified and prompt and appropriate action must be taken by the proponent to reduce the contaminant concentrations in these wells.

P8 Conduct community consultation by informing affected landowners about the contamination and the remediation, assessing whether the residents of the adjacent sites have any complaints regarding unusual odours or seepage, placing signage at the former service station site, and reporting to the EPA on the outcomes of the consultation.

Reporting

R1 The proponent must prepare and provide to the Contaminated Sites Section of the Department of Environment and Conservation the following reports by the date shown:

R1.1 Comprehensive soil vapour monitoring report in accordance with P6 by 30 September 2004.

R1.2 Reports on groundwater monitoring and natural attenuation in accordance with P4 and P7 within 8 weeks of each monitoring event.

R2 Validation report for 279 Gardeners Road in accordance with P1 and P8 within 12 weeks of completion of the landfarming program and in any event prior to 31 March 2005. During the remediation concise bimonthly update reports must be provided.

R3 The proponent must engage a site auditor, accredited under the CLM Act, to review, together with any relevant material from previous environmental reports which have been commissioned in relation to the land, the reports listed above and provide comments on whether or not the objectives of this agreement under clauses O1 and O2 have been met to the EPA by 31 July 2005.

R4 In addition, the proponent must ensure that the site auditor provides the following reports to the EPA by 31 March 2006:

R4.1 A summary site audit report ("SSAR") which reviews the reports provided by the proponent in relation to the agreement and comments on the adequacy of the investigation undertaken and the conclusions drawn; and

R4.2 A site audit statement that states whether or not the land is suitable for its approved use, and if not, what action would be required to render the land suitable.

Duration of this Agreement

This agreement commences on the date upon which it is signed on behalf of the EPA, (which is the date set out on the first page of the agreement). Implementation of the proposal must be completed within the specified time periods as set out in this Agreement or within such timeframes as the EPA agrees in writing. This agreement will end when the EPA receives the SSAR or on **31 March 2006**, whichever is sooner.

The EPA will review the groundwater monitoring results, prior to 31 March 2006. This may result in the EPA either requiring further active remediation to address the contamination issue, particularly its potential off-site impacts, or issuing a maintenance of remediation notice under section 28 of the CLM Act as a way to regulate the long-term monitored natural attenuation remediation process.

EPA Agreement

The EPA is satisfied that the terms of the proposal are appropriate and, notes for the purposes of section 26(3) of the Act, that the proponent has provided in writing to the EPA evidence that parties it considers to be potential polluters have been provided with an opportunity to participate in the remediation of the site.

The EPA agrees with the terms of the proposal, and will not issue a remediation order against the proponent in accordance with the provisions of Part 3 of the Act if the remediation is carried out in accordance with the proposal.

Carolyn Strange 26/5/04

CAROLYN STRANGE
Director Contaminated Sites
Department of Environment and Conservation
(by Delegation)

Attachment 1	location map
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NOTE:

1. The EPA is not prevented by this agreement from making a remediation order against persons (including public authorities) with whom it has made no such agreement (whether or not they were originally parties to the proposal).

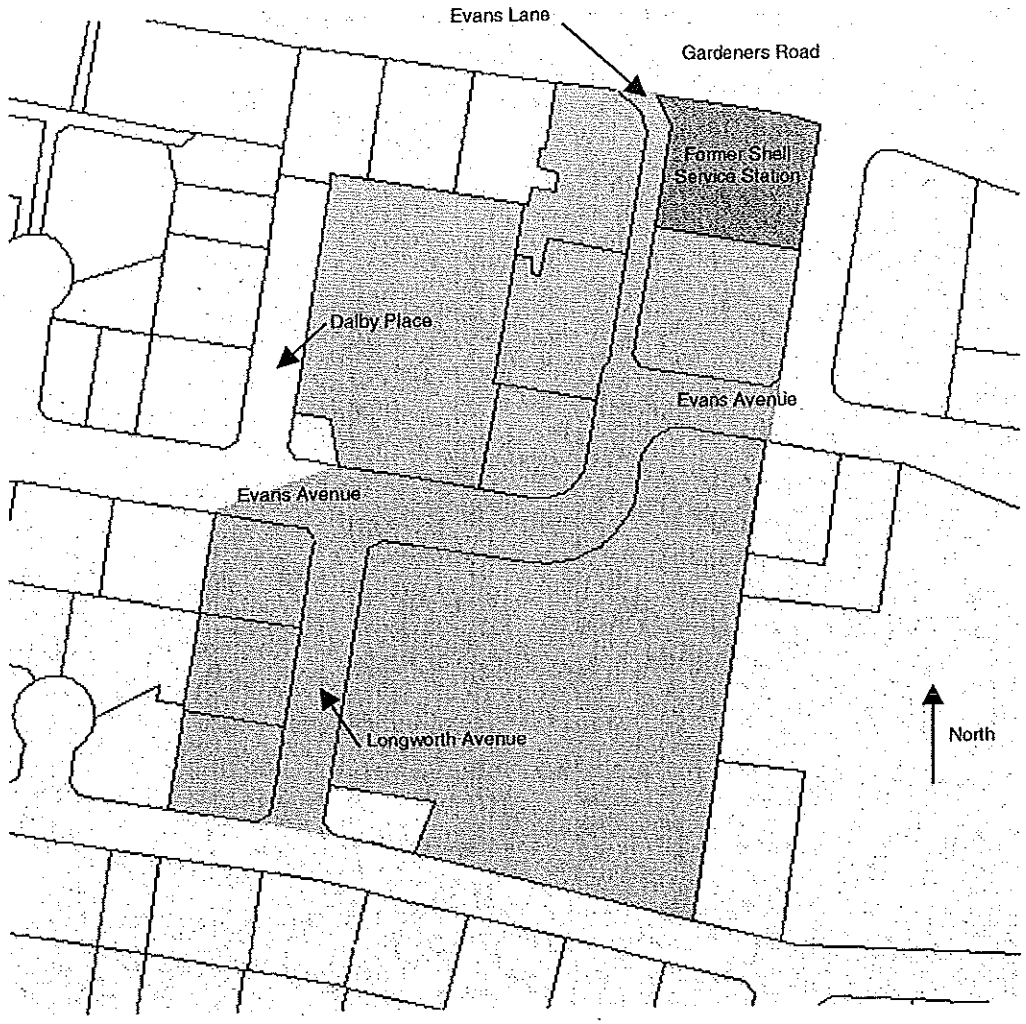
2. The EPA is not prevented by this agreement from making a remediation order against the proponent as an appropriate person (as defined in the Act) if, in the opinion of the EPA, the terms of the proposal are not carried out.

3. Section 58 of the Act requires the EPA to maintain a public record of certain matters. Notification of the making of this agreement will be included in the public record.

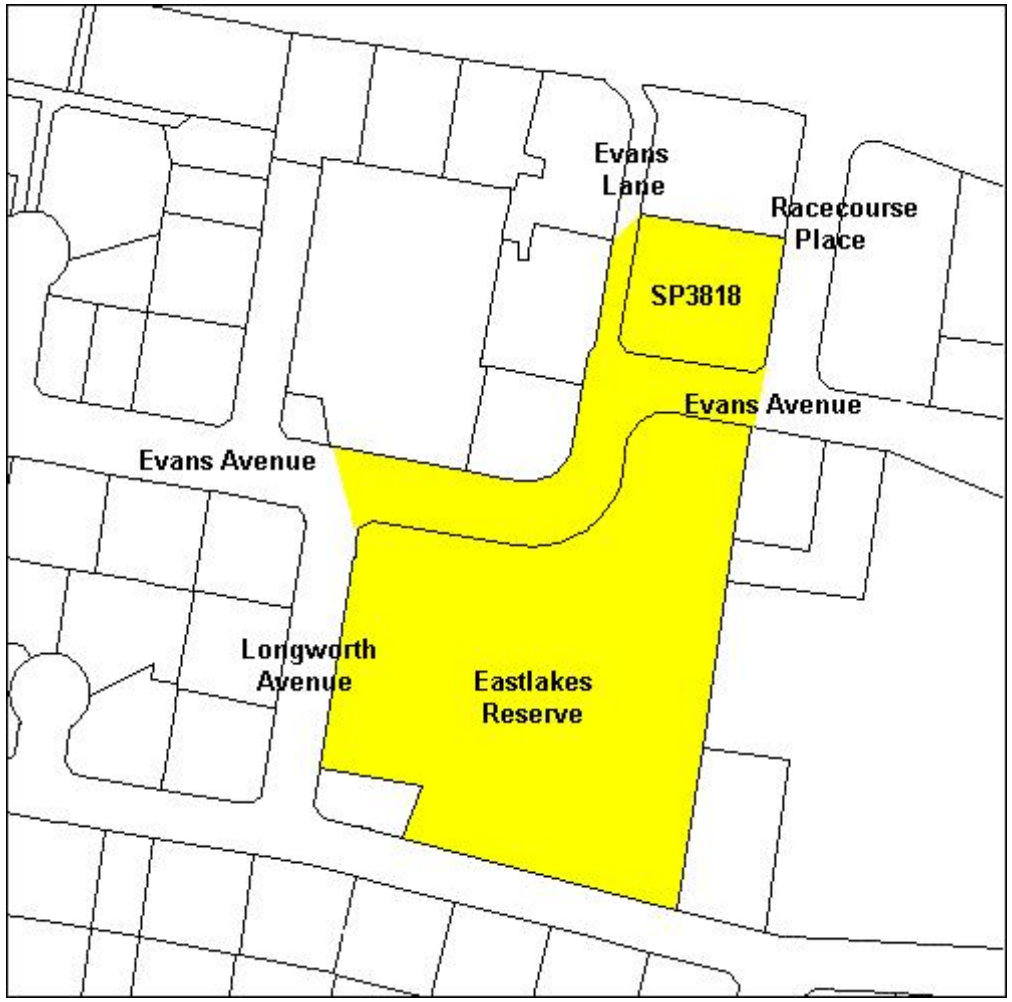
4. Section 59 of the Act requires the EPA to notify the relevant local council of the making of this agreement and when the terms of the agreement have been fulfilled. The council is required to note on any certificate issued pursuant to section 149(2) Environmental Planning and Assessment Act 1979 with respect to the land that the land is subject to a voluntary agreement until the council receives EPA notification that the terms have been fulfilled.

5. The entering into an agreement does not confer a defence for the purposes of section 122 of the Protection of the Environment Operations Act 1997.

Attachment 1



Map showing the area covered by the EPA's agreement to a voluntary remediation proposal number 26060.


Evans
Lane
Racecourse
Place
SP3818
Evans Avenue
Evans Avenue
Longworth
Avenue
Eastlakes
Reserve

Environment Protection Authority (EPA)

AGREEMENT NOT TO ISSUE ORDER DURING COMPLIANCE WITH A VOLUNTARY PROPOSAL

(Section 26 of the Contaminated Land Management Act 1997)

Agreement No.: 26115

Agreement Date: 3/4/2009

Area No.: 3263

This agreement relates to the attached proposal, which comprises three Parts: Part 1 – Preliminary Details; Part 2 – Undertakings; and Part 3 – Performance Schedule.

Proponent: The Shell Company of Australia Limited (ACN 46 004 610 459)

Site: The site comprises 14 Evans Avenue (SP3818), Eastlakes Reserve (Lot 1 DP565621), the section of Evans Avenue between Racecourse Place and Longworth Avenue, and the section of Evans Lane between SP45459 and SP3818.

Proposal Date: 26 March 2009

1. The EPA is satisfied that the terms of the proposal are appropriate.
2. The EPA notes for the purposes of section 26 of the *Contaminated Land Management Act 1997* (CLM Act) that the proponent has undertaken in writing to the EPA not to recover contributions under Part 3, Division 6 of the CLM Act in respect of implementation of the proposal.
3. The EPA agrees, in accordance with the provisions of Part 3 of the CLM Act, that it will not issue a remediation order against the proponent if and for so long as the proposal is complied with.
4. The EPA may issue a remediation order against the proponent in accordance with the CLM Act if the EPA is not satisfied that the proposal is being or has been complied with.
5. The EPA is not prevented by this agreement from making a remediation order against persons (whether or not they were originally parties to the proposal and including public authorities) other than the proponent.
6. The EPA is not prevented by this agreement from exercising its powers under the *Protection of the Environment Operations Act 1997* in relation to activities conducted in association with or under the proposal.
7. Each component of the proposal, as described in the proposal is to be completed by the date specified in the proposal. Failure to satisfactorily complete any component by the due date for that component may be taken as a failure to carry out the terms of the proposal for the purposes of section 27 of the CLM Act.
8. This agreement takes effect on the "Agreement Date" specified above and continues in effect subject to satisfactory performance and progress with implementation of the proposal.

Signed: 3/4/2009

NIALL JOHNSTON
Manager Contaminated Sites
Department of Environment and Climate Change (NSW)

VOLUNTARY REMEDIATION PROPOSAL UNDER CONTAMINATED LAND MANAGEMENT ACT 1997

Part 1

Preliminary Details

1. Proponent's Details

(a) Name and contact details

THE SHELL COMPANY OF AUSTRALIA LIMITED
ABN: 46004610459

Phone: 02 9897 8566
Fax: 02 9897 8373
Postal address: PO Box 63, Parramatta, NSW
Postcode: 2124
EPA licence number: NOT APPLICABLE

(b) Who the EPA should contact with technical enquiries about the proposal

The Shell Company of Australia Limited
Phone (business): (02) 9897 8566
Fax: (02) 9897 8373
Postal address: PO Box 63, Parramatta, NSW
Postcode: 2124

2. Land to which proposal applies

The land to which the proposal applies ("the site") is land to the south and southwest of the former Shell Rosebery Self Select Service Station located at 275-279 Gardeners Road, Rosebery. The site is known as:

Site Description	Address
SP3818	14 Evans Avenue (corner Racecourse place) (also referred to as Lot 5 Evans Avenue)
Lot 1 DP 565621	Eastlakes Reserve, corner of Evans Avenue and Longworth Avenue
	The section of Evans Avenue between Racecourse Place and Longworth Avenue
	The section of Evans Lane between SP45459 and SP3818

Remediation works and groundwater monitoring will be conducted at SP3818. Groundwater monitoring only will be conducted at the other land parcels listed above (as described in Part 3 of this document). The site and adjacent area are shown in the attached plan (Attachment 1).

3. The contamination

Data from the previous investigations completed in connection with the Shell Select Service Station site during the period 1995 to 2008 indicate that soil and groundwater contamination is present at the site. The substances of concern ("the contaminants") include:

- Total petroleum hydrocarbons (TPHs);
- Volatile aromatic compounds including benzene, toluene, ethylbenzene and xylenes (BTEX);
- Polycyclic aromatic hydrocarbons (PAHs); and
- Lead.

4. The remediation proposal

The remediation proposal ("the proposal") comprises:

a) the information set out above;
b) the actions, works and other components recommended in the following documents:
    - Site Audit Report, C.M. Jewell & Associates, May 2008;
c) the scope and activities set out in Part 2 of this document; and
d) the performance schedule set out in Part 3 of this document.

Signed by the propponent 26 March 2009

Part 2

Undertakings Included in Voluntary Remediation Proposal

THE PROPOSAL INCLUDES THE FOLLOWING UNDERTAKINGS:

General

1. All activities carried out in connection with the proposal including sampling and preparation of associated reports ("the activities") will be carried out in accordance with applicable guidelines made or approved under section 105 of the Contaminated Land Management Act 1997 (CLM Act). (See http://www.environment.nsw.gov.au/clm/guidelines.htm)
2. All remedial works will comply with relevant provisions of *State Environmental Planning Policy 55 – Remediation of Land, City of Botany Bay Development Control Plan No. 34, Contaminated Land* and any requirements imposed by these instruments in relation to the works.
3. All activities will be carried out in compliance with applicable NSW environmental legislation, and in particular:
    i) All the activities, including:
        (1) the processing, handling, movement and storage of materials and substances used to carry out the activities; and
        (2) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activities

        will be carried out in a competent manner;
    ii) All plant and equipment installed at the site or used in connection with the activities:
        (1) will be maintained in a proper and efficient condition; and
        (2) will be operated in a proper and efficient manner.
4. All the activities at the site will be carried out in a manner that prevents or minimises the emission of dust, odour and noise from the site.
5. Waste generated or stored at the site will be assessed and classified in accordance with the DECC's *Waste Classification Guidelines Part 1: Classifying Waste.*

    (See http://www.environment.nsw.gov.au/waste/envguidlns/index.htm)
6. All waste transported from the site that is required by the *Protection of the Environment (Waste) Regulation 2005* to be tracked must be tracked using the DECCs on-line tracking system or an alternative tracking system approved in writing by the DECC.

    (See http://www.environment.nsw.gov.au/waste/wastetracking.htm)

7. The proponent will, and acknowledges that the EPA may, make all documents and information relating to the activities available to the public free of charge.

8. The proponent will:

   i) prior to the implementation of the proposal provide for the EPA's approval a strategy for communicating about that implementation, particularly the actual remediation works, with members of the public who are likely to have a real interest in or be affected by that implementation and

   ii) implement the strategy as approved by the EPA.

Monitoring, Record Keeping & Reporting

9. At least until the EPA has notified the proponent that the EPA no longer considers that the contamination poses a significant risk of harm, record and retain all monitoring data and information and provide this record to the EPA at any reasonable time if so requested by the EPA and as specifically provided under the proposal.

10. The EPA will be informed in writing within 7 days of the proponent becoming aware of information or data indicating a material change in conditions at the site or in its surrounding environment which could adversely affect the prospects of successful investigation or remediation of the site or result in harm to the environment.

11. The EPA will be informed in writing within 7 days of the proponent becoming aware of any failure, either by the proponent or any other person, to comply with any component or aspect of the proposal.

12. The EPA will be informed in writing as soon as practicable of any notification by the proponent, its employees or its agents to an appropriate regulatory authority other than the EPA of any pollution incident at the site within the meaning of the *Protection of the Environment Operations Act 1997*.

    (See http://www.environment.nsw.gov.au/licensing/dutytonotify.htm)

Performance Schedule

13. The performance schedule which is in Part 3 of this document will be adhered to.

Signed by the proponent 26 March 2009

Part 3

Performance Schedule

1. Objectives of the proposal

The general objective of the proposal is:

O1 To take a course of actions that will facilitate remediation of the contaminants in soil and groundwater such that the residual petroleum hydrocarbon contamination in groundwater underlying the site does not pose an unacceptable risk of harm to human health or the environment.

The specific objectives of this proposal are to:

O2 Undertake pilot testing and remediation via in-situ oxygen-enhanced bioremediation in the areas subject to this proposal to reduce contaminant concentrations in the subsurface;

O3 Conduct groundwater monitoring to demonstrate a downward trend in contaminant concentrations; and

O4 Assess the risks to human health and the environment posed by any residual contamination detected at the completion of the remediation works and monitoring outlined in this proposal.

2. Principal features of the proposal

For reference, we note that the NSW Accredited Site Auditor (Chris Jewell) reported in May 2008 to the NSW Department of Environment and Climate Change (DECC) that, except as noted in the report, investigations, remediation, validation and plume monitoring on the former Service Station and "the site" were carried out in an adequate manner, and in accordance with appropriate guidelines. He also reported that the Service Station property had been validated to the required standard for residential land use and that there are no unacceptable risks associated with the remaining contamination. However, as he noted that residual off-site groundwater contamination remains, the Auditor could not exclude the possibility that unacceptable risks may be present at down-gradient receptors. The Auditor therefore recommended remedial actions and two years of additional groundwater monitoring activities.

In response to these recommendations, the proponent has agreed to provide the DECC with this Voluntary Remediation Proposal (VRP) to conduct remedial actions and monitoring at the site, in accordance with section 26 of the *Contaminated Land Management Act 1997* ("the CLM Act").

The principal features of the proposal include, but are not limited to the following:

P1 Communication strategy and consultation

Community consultations by informing the affected landowners and occupiers of the proposed remediation works. Updates on the progress of the remediation works are to be communicated with relevant authorities.

P2 Remediation

Pilot Trial

Conduct an initial groundwater monitoring event of select monitoring wells in order to establish baseline conditions. The monitoring event will be followed by an initial injection of in-situ oxygen-enhanced bioremediation compounds at three locations to be defined in the work plan and three additional rounds of monthly groundwater monitoring events at select wells. It is currently anticipated that monitoring wells MW12, MW14, MW15, MW16, MW17, MW40, MW43, MW44, MW46 and MW47 will be sampled during all groundwater monitoring events associated with the pilot trial.

Full Scale Remediation

It is anticipated that three additional injection events will be scheduled on a quarterly basis following the pilot trial. Based on the results of the pilot trial, additional injection locations may be added to expand the bioremediation program. Should the monthly groundwater monitoring events conducted as part of the pilot trail demonstrate a reduction of hydrocarbon concentrations, it may not be required to continue or expand the bioremediation program.

P3 Monitoring

Conduct eight quarterly groundwater monitoring events beginning with the final event of the pilot trial. This will ensure that at least four events are conducted following the bioremediation program to monitor for any potential rebound effects. Each monitoring event will consist of: (a) collecting samples from relevant monitoring wells (as per P2) and, (b) laboratory analysis for TPH, BTEX, lead, phenol, PAHs and natural attenuation parameters.

P4 Reporting

A Groundwater Remediation Pilot Trial Report will be prepared, detailing the results of the remediation trial and any recommendations for expanding the remediation program.

The two proposed Annual Validation Reports will outline what remedial and validation activities have been performed in that year, present results and discuss data trends and findings of the remediation and post remediation groundwater monitoring results with discussion that the objectives stated in this proposal have been achieved. The final validation report will include an assessment of the risks to human health and the environment posed by any residual contamination.

The proponent will engage an accredited Site Auditor to prepare a Site Audit Report (SAR) and accompanying Site Audit Statement (SAS) commenting on whether the objectives of this proposal have been met, including whether any residual contamination presents an unacceptable risk (including vapour risks) to human health or the environment.

3. Action requirements and reporting schedule

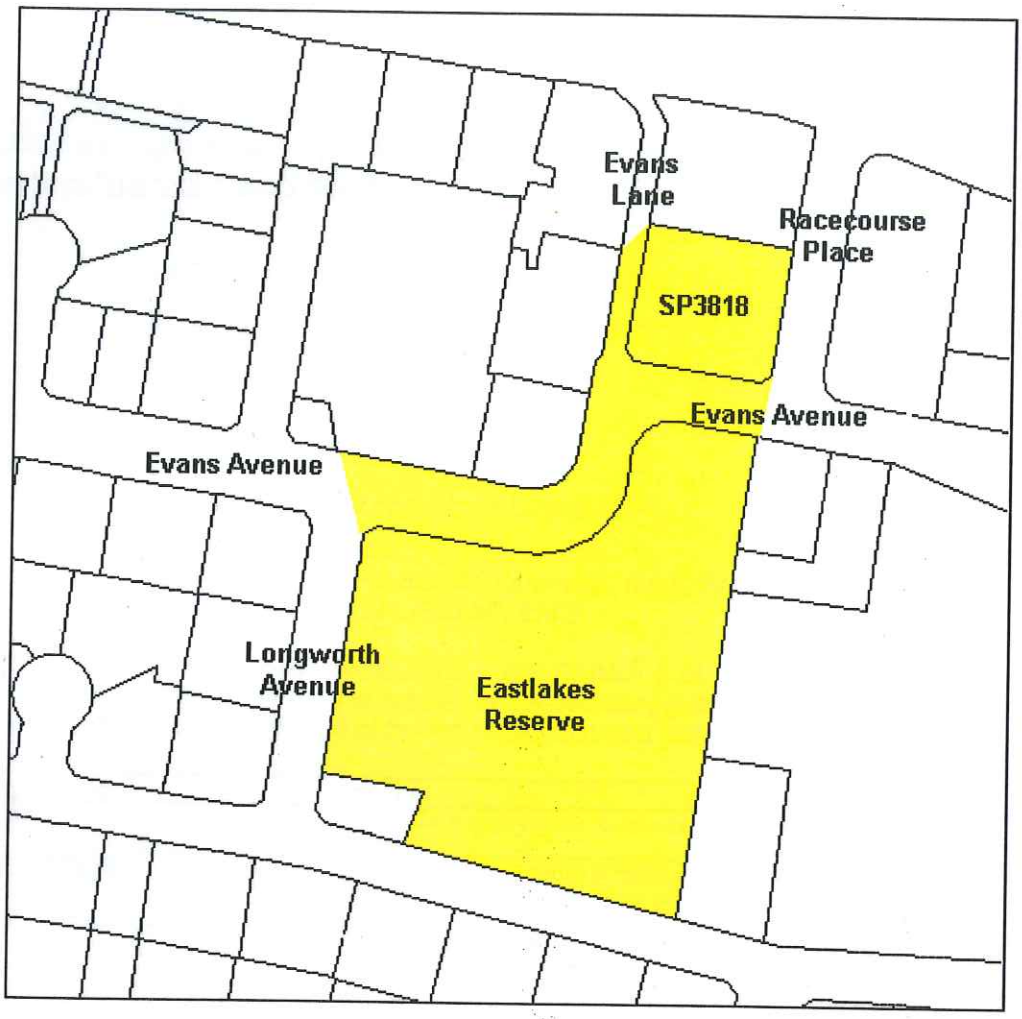
Action	*Deliverable*	*Date Estimate*
Communication strategy and consultation (P1)	None	As warranted throughout the proposed works
Prepare a detailed work plan for the proposed activities	Remedial Action Plan	Completed
Proponent to engage a Site Auditor to review the work plan, Pilot Trial Report, and Validation Reports, and to prepare a SAR and SAS.	Review letters forwarded to DECC	
Initial groundwater monitoring of select monitoring wells (P2 – Pilot Trial).	None	October 2008
SEPP55 Notification	Letter to Botany Bay City Council	
Injection of in-situ oxygen-enhanced bioremediation compounds at three locations (P2 - Pilot Trial).	None	April 2009
Three subsequent monthly groundwater monitoring events of select downgradient monitoring wells (P2 – Pilot Trial).	None	May, June and July 2009
Review pilot trial and expand the bioremediation program at additional locations as warranted (P2 - Full Scale Remediation).	None	September - October 2009
Groundwater Remediation Pilot Trial Report, detailing the results of the trial and any recommendations for expanding the remediation program.	Pilot Trial Report	October 2009
Continue quarterly (approximate) in-situ oxygen-enhanced bioremediation injection (P2 - Full Scale Remediation) and groundwater monitoring (P3) for one year (three events).	None	Injection: October 2009, January and April 2010 Monitoring: October 2009, January and April 2010 (prior to injection events)
Annual groundwater monitoring and remedial progress report (P4).	Annual Validation Report (Year 1)	June 2010
Conduct quarterly rebound groundwater monitoring for one year (four events) (P3).	None	July and October 2010, January and April 2011
Final Validation Report (P4), including an assessment of risks to human health and the environment.	Annual Validation Report (Year 2)	June 2011
Site Auditor to prepare a SAR and SAS.	SAR and SAS	September 2011

4. Key milestones for investigation, remediation and other actions

The key milestones for the project, including anticipated timelines and end points that are expected, are outlined in the table below.

Key Milestone	*Deadline*
Community Consultation (P1): Shell actively maintains the relationship with residents on an ongoing basis to facilitate discussion and access during sampling rounds.	Ongoing throughout the project
Endpoint of Pilot Trial (P2): Initial trial of remedial system will be undertaken from November 2008 to February 2009.	July 2009
Pilot Trial Report	October 2009
Endpoint of Full Scale Remediation (P2): Should results of ongoing groundwater monitoring show plume reduction, the requirement for ongoing remedial action may cease.	April 2010
Annual Groundwater Monitoring and Remedial Progress Report (P4):	June 2010
Endpoint of groundwater monitoring (P3): Quarterly groundwater monitoring will continue for an additional year (4 events) beyond the remediation program to assess the potential for rebound. Should it be demonstrated that contaminant concentrations exhibit a decreasing trend over that time, it is expected that regular monitoring may cease.	April 2011
Final Validation Report (P4)	June 2011
Site Audit Report and Site Audit Statement	September 2011

Signed by the proponent 26 March 2009



Land Subject to Voluntary Remediation Agreement No. 26115

Appendix B: Borehole Logs

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **106** 1/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V
Date: 20-10-11
Method: SPIRAL AUGER JK350
Logged/Checked by: D.F./MJ
R.L. Surface: ≈ 18.8m
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		-	ASHPHALTIC CONCRETE: 50mm.t/ FILL: Gravelly sand, fine to medium grained, grey and dark brown, fine to coarse grained igneous gravel, trace of silt.	M	-	-	APPEARS WELL COMPACTED
					Nc = 13, 14, 15	1		SM	FILL: silty sand, fine to medium grained, brown and light brown. SILTY SAND: fine to medium grained, light brown.	M	MD-D	-	RESIDUAL
					Nc = 9, 17, 21	2					D-VD		
					Nc = 20, 21, 25	3				W			
					Nc = 10, 14, 18	4							
						5							
					Nc = 15, 24	6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **106** 2/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 18.8m

Date: 20-10-11 **Datum:** AHD

Logged/Checked by: D.F./

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
					Nc = 31/100 mm	8		SM	SILTY SAND: fine to medium grianed, light brown.	W	D-VD		
					REFUSAL	9							
						10			END OF BOREHOLE AT 10.0m				
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **107** 1/1

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 19.3m

Date: 20-10-11 **Datum:** AHD

Logged/Checked by: D.F./ 4

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
DRY ON COMPLE -TION					N>22 12,10/ 50mm REFUSAL	0		-	ASHPHALTIC CONCRETE: 50mm.t/ FILL: Gravelly sand roadbase, fine to medium grained, grey and dark brown, fine to coarse grained igneous gravel, trace of silt.	D	-	-	APPEARS MODERATELY COMPACTED
										M			
						1			FILL: Silty sand, fine to meidum grained, light brown and brown. FILL: Silty sand, fine to medium grained, with brick, concrete fragments, plastic conduit, copper wire, metal. END OF BOREHOLE AT 1.0m					
						2							
						3							
						4							
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **107A** 1/1

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 19.3m

Date: 20-10-11 **Datum:** AHD

Logged/Checked by: D.F./ ?

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		-	ASHPHALTIC CONCRETE: 50mm.t FILL: Gravelly sand, roadbase, fine to medium grained, fine to coarse grained igneous gravel.	M	-	-	APPEARS MODERATELY COMPACTED
					SPT 10/50mm REFUSAL	1			FILL: Silty sand, fine to medium grained, brown and light brown, with brick, concrete fragments.				
					N = 12 6,6,6	2		SM	SILTY SAND: fine to medium grained, light brown.	M	MD-D	-	RESIDUAL
					Nc = 7 16 14	3							
						4			END OF BOREHOLE AT 4.0m				
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **108** 1/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V
Date: 20-10-11
Method: SPIRAL AUGER JK350
Logged/Checked by: D.F./
R.L. Surface: ≈ 16.5m
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		-	ASHPHALTIC CONCRETE: 50mm.t FILL: Gravelly sand, roadbase, fine to medium grained, dark grey, fine to medium grained igneous gravel.	M	MD-D	-	APPEARS MODERATLY TO WELL COMPACTED
					N = 33 12,17,16	1			FILL: Silty sand, fine to medium grained, light grey. As above, but dark brown and brown.				
					N = 11 6,6,5	2		SM	SILTY SAND: fine to medium grained, light brown.	- W	MD-D	-	RESIDUAL
					Nc = 8 10 15 Nc = 17	3							
					Nc = 5 16 16	4					D-VD		
					Nc = 20/100mm R	5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **108** 2/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V
Date: 20-10-11
Method: SPIRAL AUGER JK350
Logged/Checked by: D.F./
R.L. Surface: ≈ 16.5m
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
					Nc = 20/ 100mm R	8		SM	SILTY SAND: fine to medium grained, light brown.	W	D-VD		
						9							
						10			END OF BOREHOLE AT 10.0m				
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **109** 1/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 16.5m

Date: 21-10-11 **Datum:** AHD

Logged/Checked by: D.F./

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		-	ASHPHALTIC CONCRETE:	M	-	-	APPEARS WELL COMPACTED
									FILL: Gravelly sand, fine yo medium grained, brown, with fine to coarse grained, igneous, sandstone, concrete gravel, trace of silt.	M	MD	-	
					N = 18 6,10,8				FILL: Silty sand, fine to medium grained, light grey.				POSSIBLY FILL
						1		SM	SILTY SAND: fine to coarse grained, orange brown.				
▼					N = 9 3,4,5				As above, but light grey.	W			
						2					MD		
					Nc = 8 12 19	3					D-VD		
						4			As above, but light grey, light brown and brown.				
					Nc = 20/80 mm R	5							
					Nc = 22/70 mm R	6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **109** 2/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 16.5m

Date: 21-10-11 **Datum:** AHD

Logged/Checked by: D.F./

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
					Nc = 22/50 mm R	8		SM	SILTY SAND: fine to coarse grained, light grey, light brown and brown.	W	D-VD		
						9							
						10							
									END OF BOREHOLE AT 10.5m				Machine slotted monitoring well installed to 4.5m depth. Backfilled with filter sand and sealed with bentonite.
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **110** 1/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 17.5m

Date: 21-10-11 **Datum:** AHD

Logged/Checked by: D.F./

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		-	ASHPHALTIC CONCRETE: 50mm.t	D	MD	-	APPEARS WELL COMPACTED
					N = 18 10,9,9				FILL: Silty sand, fine to medium grained, dark brown with fine to coarse grained igneous gravel.				
						1			FILL: Silty sand, fine grained light grey and brown.				
									As above, but light grey only.				
									as above, but orange brown.				
					Nc = 6 8 7	2		SM	SILTY SAND: fine to medium grained, light grey and brown.	W	D-VD	-	RESIDUAL
▼					Nc = 15 20	3				W	D-VD		
					Nc = 6 12 22	5							
					Nc = 6 28	6							
						7							

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Borehole No. **110** 2/2

BOREHOLE LOG

Client: CROWN GROUP

Project: PROPOSED REDEVELOPMENT

Location: EASTLAKES SHOPPING CENTRE, CNR EVANS AND BARBER AVE, EASTLAKES

Job No. 25302V
Date: 21-10-11
Method: SPIRAL AUGER JK350
Logged/Checked by: D.F./
R.L. Surface: ≈ 17.5m
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
						8		SM	SILTY SAND: fine to medium grained, light grey and brown.	W	D-VD		
						9							
						10							
						10			END OF BOREHOLE AT 10.5m				MACHINE SLOTTED MONITORING WELL INSTALLED TO 5.0m DEPTH, BACKFILLED WITH FILTER SAND AND SEALED WITH BENTONITE
						11							
						12							
						13							
						14							

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ABN 17 003 550 801

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 or where only a limited investigation has been completed or 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.

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GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL


FILL


TOPSOIL


CLAY (CL, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CH)


SILTY CLAY (CL, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML)


PEAT AND ORGANIC SOILS

ROCK


CONGLOMERATE


SANDSTONE


SHALE


SILTSTONE, MUDSTONE, CLAYSTONE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

DEFECTS AND INCLUSIONS


CLAY SEAM


SHEARED OR CRUSHED SEAM


BRECCIATED OR SHATTERED SEAM/ZONE


IRONSTONE GRAVEL


ORGANIC MATERIAL

OTHER MATERIALS


CONCRETE


BITUMINOUS CONCRETE, COAL


COLLUVIUM

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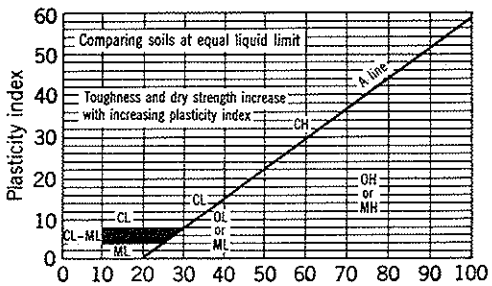
UNIFIED SOIL CLASSIFICATION TABLE

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 Not meeting all gradation requirements for *GW* 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 Atterberg limits above "A" line, with *PI* greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing			*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)			*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)			*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	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 Not meeting all gradation requirements for *SW* 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 Atterberg limits below "A" line with *PI* greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing			*SP*	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)			*SM*	Silty sands, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)			*SC*	Clayey sands, poorly graded sand-clay mixtures		
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								
	Silts and clays: liquid limit less than 50		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)				
			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 (e.g. 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.

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LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record		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	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos screening.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	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	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils)	MC > PL	Moisture content estimated to be greater than plastic limit.
	MC ≈ PL	Moisture content estimated to be approximately equal to plastic limit.
	MC < PL	Moisture content estimated to be less than plastic limit.
(Cohesionless Soils)	D	DRY - runs freely through fingers.
	M	MOIST - does not run freely but no free water visible on soil surface.
	W	WET - free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT - Unconfined compressive strength less than 25kPa
	S	SOFT - Unconfined compressive strength 25-50kPa
	F	FIRM - Unconfined compressive strength 50-100kPa
	St	STIFF - Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF - Unconfined compressive strength 200-400kPa
	H	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)		**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)**
	VL	Very Loose: <15 / 0-4
	L	Loose: 15-35 / 4-10
	MD	Medium Dense: 35-65 / 10-30
	D	Dense: 65-85 / 30-50
	VD	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	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T 60	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

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LOG SYMBOLS

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	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	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.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	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.
Very High:	VH	10	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.
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 C: Laboratory Report/s & COC 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 64045

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

Attention: Cameron Hollands

Sample log in details:

Your Reference:	**E25302K, Eastlakes**		
No. of samples:	2 waters		
Date samples received / completed instructions received	27/10/11	/	27/10/11

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:	3/11/11	/	3/11/11
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:

Tania Notaras
Manager

Giovanni Agosti
Technical Manager

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	64045-1 MW10 26/10/2011 WATER	64045-2 DUP1 26/10/2011 WATER
Date extracted	-	28/10/2011	28/10/2011
Date analysed	-	29/10/2011	29/10/2011
Dichlorodifluoromethane	µg/L	<10	<10
Chloromethane	µg/L	<10	<10
Vinyl Chloride	µg/L	<10	<10
Bromomethane	µg/L	<10	<10
Chloroethane	µg/L	<10	<10
Trichlorofluoromethane	µg/L	<10	<10
1,1-Dichloroethene	µg/L	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1
1,1-dichloroethane	µg/L	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1
Bromochloromethane	µg/L	<1	<1
Chloroform	µg/L	<1	<1
2,2-dichloropropane	µg/L	<1	<1
1,2-dichloroethane	µg/L	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1
1,1-dichloropropene	µg/L	<1	<1
Cyclohexane	µg/L	<1	<1
Carbon tetrachloride	µg/L	<1	<1
Benzene	µg/L	<1	<1
Dibromomethane	µg/L	<1	<1
1,2-dichloropropane	µg/L	<1	<1
Trichloroethene	µg/L	<1	<1
Bromodichloromethane	µg/L	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1
Toluene	µg/L	<1	<1
1,3-dichloropropane	µg/L	<1	<1
Dibromochloromethane	µg/L	<1	<1
1,2-dibromoethane	µg/L	<1	<1
Tetrachloroethene	µg/L	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1
Chlorobenzene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
Bromoform	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
Styrene	µg/L	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1
o-xylene	µg/L	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	64045-1 MW10 26/10/2011 WATER	64045-2 DUP1 26/10/2011 WATER
Isopropylbenzene	µg/L	<1	<1
Bromobenzene	µg/L	<1	<1
n-propyl benzene	µg/L	<1	<1
2-chlorotoluene	µg/L	<1	<1
4-chlorotoluene	µg/L	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1
Tert-butyl benzene	µg/L	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1
Sec-butyl benzene	µg/L	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1
4-isopropyl toluene	µg/L	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1
n-butyl benzene	µg/L	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1
Hexachlorobutadiene	µg/L	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	95	113
Surrogate toluene-d8	%	98	103
Surrogate 4-BFB	%	88	111

vTRH & BTEX in Water		
Our Reference:	UNITS	64045-1
Your Reference	----------	MW10
Date Sampled	----------	26/10/2011
Type of sample		WATER
Date extracted	-	28/10/11
Date analysed	-	31/10/11
TRHC6 - C9	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	95
Surrogate toluene-d8	%	98
Surrogate 4-BFB	%	88

sTRH in Water (C10-C36)		
Our Reference:	UNITS	64045-1
Your Reference	----------	MW10
Date Sampled	----------	26/10/2011
Type of sample		WATER
Date extracted	-	28/10/11
Date analysed	-	31/10/11
$TRHC_{10}$ - C_{14}	µg/L	<50
$TRHC_{15}$ - C_{28}	µg/L	<100
$TRHC_{29}$ - C_{36}	µg/L	<100
Surrogate o-Terphenyl	%	94

HM in water - dissolved		
Our Reference:	UNITS	64045-1
Your Reference	----------	MW10
Date Sampled	----------	26/10/2011
Type of sample		WATER
Date prepared	-	28/10/2011
Date analysed	-	28/10/2011
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	<1
Lead-Dissolved	µg/L	<1
Mercury-Dissolved	µg/L	<0.1
Nickel-Dissolved	µg/L	<1
Zinc-Dissolved	µg/L	<1

Miscellaneous Inorganics		
Our Reference:	UNITS	64045-1
Your Reference	----------	MW10
Date Sampled	----------	26/10/2011
Type of sample		WATER
Date prepared	-	28/10/2011
Date analysed	-	28/10/2011
pH	pH Units	6.6
Electrical Conductivity	µS/cm	250
Oil & Grease (LLE)	mg/L	<5

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.
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.
Inorg-003	Oil & Grease - determine gravimetrically following extraction with Hexane, in accordance with APHA 21st ED, 5220-B.

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/10/2011	[NT]	[NT]	LCS-W1	28/10/2011
Date analysed	-			29/10/2011	[NT]	[NT]	LCS-W1	29/10/2011
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	116%
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	116%
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	117%
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	106%
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	107%
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	109%
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	109%
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]

Client Reference: E25302K, Eastlakes

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %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	100	[NT]	[NT]	LCS-W1	100%
Surrogate toluene-d8	%		Org-013	99	[NT]	[NT]	LCS-W1	103%
Surrogate 4-BFB	%		Org-013	110	[NT]	[NT]	LCS-W1	102%

Client Reference: E25302K, Eastlakes

QUALITY CONTROL vTRH & BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/10/11	[NT]	[NT]	LCS-W1	28/10/11
Date analysed	-			31/10/11	[NT]	[NT]	LCS-W1	31/10/11
$TRHC_6$ - C_9	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	108%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	105%
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	110%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	111%
Surrogate Dibromofluoromethane	%		Org-016	109	[NT]	[NT]	LCS-W1	118%
Surrogate toluene-d8	%		Org-016	102	[NT]	[NT]	LCS-W1	98%
Surrogate 4-BFB	%		Org-016	88	[NT]	[NT]	LCS-W1	106%
QUALITY CONTROL sTRH in Water (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/10/11	[NT]	[NT]	LCS-W1	28/10/11
Date analysed	-			28/10/11	[NT]	[NT]	LCS-W1	28/10/11
$TRHC_{10}$ - C_{14}	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	68%
$TRHC_{15}$ - C_{28}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	110%
$TRHC_{29}$ - C_{36}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	85%
Surrogate o-Terphenyl	%		Org-003	95	[NT]	[NT]	LCS-W1	101%
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/10/2011	[NT]	[NT]	LCS-W1	28/10/2011
Date analysed	-			28/10/2011	[NT]	[NT]	LCS-W1	28/10/2011
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	91%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	91%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	89%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	94%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	93%
Mercury-Dissolved	µg/L	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-W1	96%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	90%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	89%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/10/2011	[NT]	[NT]	LCS-W1	28/10/2011
Date analysed	-			28/10/2011	[NT]	[NT]	LCS-W1	28/10/2011
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	[NT]	[NT]	LCS-W1	102%
Oil & Grease (LLE)	mg/L	5	Inorg-003	<5	[NT]	[NT]	LCS-W1	89%

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.

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

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

Attention: Aileen

Date Results Required:

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E 25302 K

Sheet 1 / 3

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

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

Contact:

Project: Proposed Shopping Centre Re-development
Location: Eastlakes
Sampler: C. H.

Sample Preservation:
In esky on ice

	Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Sample Container	PID (ppm/ Odour)	Sample Description	Tests Required: Combo 3	Heavy metals	TPH/BTEX	VOCs	PAHs	pH / EC	Oil & grease			Comments/Detection Limits Required
1	26/10/11	AM	—	MW 110	1L Amber Bottle 3 BTEX Vials ~~HDPE Plastic Bottle~~	—	groundwater		X	X	X		X	X			* please filter water for heavy metal analysis.
2	"	"	"	—	Dup 1	3 x BTEX vials	—	"				X						

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 64045
Date Received: 27/10/11
Time Received: 2:45pm
Received by: ZL
Temp: Cool/Ambient
Cooling: Ice/Gelpack
Security: Intact/Broken/None

Relinquished By:	Date:	Received By:	Remarks:
Cameron Hollands	Date: 27/10/11 Time: AM	ZL 27/10/11 2:45pm	All analysis PQLs to ANZECC (2000) Detection Limits Please
Relinquished By:	Date: Time:	Received By:	* heavy metals at low level

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
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CERTIFICATE OF ANALYSIS 64046

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

Attention: Cameron Hollands

Sample log in details:

Your Reference:	**E25302K, Eastlakes**
No. of samples:	4 soils
Date samples received / completed instructions received	27/10/11 / 27/10/11

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:	3/11/11 / 3/11/11
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:

M. Mansfield
Matt Mansfield
Approved Signatory

NATA

sPOCAS Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ---------- 	64046-1 BH106 3.8-4.0 26/10/2011 SOIL	64046-2 BH110 2.8-3.0 26/10/2011 SOIL	64046-3 BH108 1-1.3 26/10/2011 SOIL	64046-4 BH109 1.5-1.95 26/10/2011 SOIL
Date prepared	-	01/11/11	01/11/11	01/11/11	01/11/11
Date analysed	-	01/11/11	01/11/11	01/11/11	01/11/11
pH $_{kcl}$	pH units	5.9	6.0	5.0	5.5
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01
pH $_{Ox}$	pH units	5.4	5.3	3.4	5.1
TPA pH6.5	moles H^+/t	<5	<5	<5	<5
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+/t	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01
ANCE	% $CaCO_3$	<0.05	<0.05	<0.05	<0.05
a-ANCE	moles H^+/t	<5	<5	<5	<5
s-ANCE	%w/w S	<0.05	<0.05	<0.05	<0.05
SKCl	%w/w S	<0.005	<0.005	<0.005	<0.005
SP	%w/w	<0.005	<0.005	<0.005	<0.005
SPOS	%w/w	<0.005	<0.005	<0.005	<0.005
a-SPOS	moles H^+/t	<5	<5	<5	<5
CaKCl	%w/w	0.005	0.005	<0.005	0.01
CaP	%w/w	0.006	0.005	<0.005	0.01
CaA	%w/w	<0.005	<0.005	<0.005	<0.005
MgKCl	%w/w	<0.005	<0.005	<0.005	<0.005
MgP	%w/w	<0.005	<0.005	<0.005	<0.005
MgA	%w/w	<0.005	<0.005	<0.005	<0.005
a-Net Acidity	moles H^+/t	<10	<10	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	NA	NA	NA	NA
Liming rate without ANCE	kg $CaCO_3$/t	NA	NA	NA	NA

Method ID	Methodology Summary
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

Client Reference: E25302K, Eastlakes

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			01/11/11	[NT]	[NT]	LCS	01/11/11
Date analysed	-			01/11/11	[NT]	[NT]	LCS	01/11/11
pH kcl	pH units		Inorg-064	[NT]	[NT]	[NT]	LCS	103%
TAA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	LCS	76%
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	LCS	74%
pH ox	pH units		Inorg-064	[NT]	[NT]	[NT]	LCS	98%
TPA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	LCS	107%
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	LCS	107%
TSA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	LCS	110%
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	LCS	110%
ANCE	% $CaCO_3$	0.05	Inorg-064	<0.05	[NT]	[NT]	[NR]	[NR]
a-ANCE	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NR]	[NR]
s-ANCE	%w/w S	0.05	Inorg-064	<0.05	[NT]	[NT]	[NR]	[NR]
SKCl	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	107%
SP	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	95%
SPOS	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	92%
a-SPOS	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	LCS	92%
CaKCl	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	95%
CaP	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	77%
CaA	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
MgKCl	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	103%
MgP	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	LCS	110%
MgA	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
SRAS	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
SHCl	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
SNAS	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
a-SNAS	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NR]	[NR]
s-SNAS	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NR]	[NR]
a-Net Acidity	moles H^+/t	10	Inorg-064	<10	[NT]	[NT]	LCS	89%
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-064	<0.75	[NT]	[NT]	LCS	89%

Client Reference: E25302K, Eastlakes

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
a-Net Acidity without ANCE	moles H^+/t	10	Inorg-064	<10	[NT]	[NT]	[NR]	[NR]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[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
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SAMPLE RECEIPT ADVICE

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC NSW 1670

ph: 02 9888 5000
Fax: 02 9888 5001

Attention: Cameron Hollands

Sample log in details:

Your reference:	**E25302K, Eastlakes**
Envirolab Reference:	**64046**
Date received:	27/10/11
Date results expected to be reported:	**3/11/11**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	4 soils
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice Pack

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 Street, 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: E 25302 K

Sheet 2 / 3

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

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

Contact:

Project: Proposed Shopping Centre Re-development
Location: Eastlakes
Sampler: C. H / D.F.

Tests Required: sPOCAS

Sample Preservation:
In esky on ice

	Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Depth (m)	Sample Container	PID (ppm/ Odour)	Sample Description	sPOCAS	Comments/Detection Limits Required
1	26/10/11	–	–	BH106	3.8 – 4.0	Plastic Bag	–	Sand	X	
2				BH110	2.8 – 3.0	Plastic Bag	–	" " –	X	
3				BH108	1 – 1.3	Plastic Bag	–	" "	X	
4				BH109	1.5 – 1.95	Plastic Bag		" "	X*	
						Plastic Bag				
						Plastic Bag				

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 5200

Job No: 44046
Date Received: 27/10/11
Time Received: 2:55pm
Received by: ZL
Temp: Cool / Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished By:	Date:	Received By:
Cameron Hollands	27/10/11	ZL
	Time: AM	27/10/11
Relinquished By:	Date:	Received By:
	Time:	

Remarks:

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 64047

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

Attention: Cameron Hollands

Sample log in details:

Your Reference:	**E25302K, Eastlakes**
No. of samples:	20 Soils, 1 Water
Date samples received / completed instructions received	27/10/11 / 27/10/11

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:	3/11/11 / 3/11/11
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:

Nancy Zhang
Chemist

Rhian Morgan
Reporting Supervisor

Hinoko Miyazaki
Chemist

Paul Ching
Approved Signatory

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

vTRH & BTEX in Soil						
Our Reference:	UNITS	64047-4	64047-5	64047-7	64047-10	64047-11
Your Reference	----------	BH106	BH106	BH107	BH108	BH108
Depth	----------	0.3-0.5	0.8-1.0	0.3-0.5	1.3-1.5	1.8-2.0
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	01/11/2011	01/11/2011	01/11/2011	01/11/2011	01/11/2011
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	%	95	105	85	109	119

vTRH & BTEX in Soil				
Our Reference:	UNITS	64047-13	64047-16	64047-18
Your Reference	----------	BH109	BH109	BH110
Depth	----------	0.1-0.2	1.9-2.0	0.3-0.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	01/11/2011	01/11/2011	01/11/2011
vTRH C_6 - C_9	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	84	90	101

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	64047-4	64047-5	64047-7	64047-10	64047-11
Your Reference	----------	BH106	BH106	BH107	BH108	BH108
Depth	----------	0.3-0.5	0.8-1.0	0.3-0.5	1.3-1.5	1.8-2.0
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	01/11/2011	01/11/2011	01/11/2011	01/11/2011	01/11/2011
$TRHC_{10}$ - 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	%	82	79	82	83	85

sTRH in Soil (C10-C36)				
Our Reference:	UNITS	64047-13	64047-16	64047-18
Your Reference	----------	BH109	BH109	BH110
Depth	----------	0.1-0.2	1.9-2.0	0.3-0.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	01/11/2011	01/11/2011	01/11/2011
$TRHC_{10}$ - C_{14}	mg/kg	<50	<50	<50
$TRHC_{15}$ - C_{28}	mg/kg	150	<100	<100
$TRHC_{29}$ - C_{36}	mg/kg	250	<100	<100
Surrogate o-Terphenyl	%	89	86	82

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-1 Dup 01 - 26/10/2011 Soil	64047-4 BH106 0.3-0.5 26/10/2011 Soil	64047-5 BH106 0.8-1.0 26/10/2011 Soil	64047-7 BH107 0.3-0.5 26/10/2011 Soil	64047-10 BH108 1.3-1.5 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	02/11/2011	02/11/2011	02/11/2011	02/11/2011	02/11/2011
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<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	<0.1	0.9	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	<0.1	0.1	<0.1	1.3	0.2
Pyrene	mg/kg	<0.1	0.2	<0.1	1.2	0.2
Benzo(a)anthracene	mg/kg	<0.1	0.1	<0.1	0.4	0.1
Chrysene	mg/kg	<0.1	0.1	<0.1	0.5	0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.9	0.3
Benzo(a)pyrene	mg/kg	<0.05	0.12	<0.05	0.67	0.18
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.4	0.1
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	<0.1	<0.1	0.4	0.1
Surrogate p-Terphenyl-d14	%	116	120	116	120	124

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-11 BH108 1.8-2.0 26/10/2011 Soil	64047-13 BH109 0.1-0.2 26/10/2011 Soil	64047-16 BH109 1.9-2.0 26/10/2011 Soil	64047-18 BH110 0.3-0.5 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	02/11/2011	02/11/2011	02/11/2011	02/11/2011
Naphthalene	mg/kg	<0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.3	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.3	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	1.8	<0.1	<0.1
Anthracene	mg/kg	<0.1	0.6	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	5.4	<0.1	<0.1
Pyrene	mg/kg	<0.1	5.3	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	2.3	<0.1	<0.1
Chrysene	mg/kg	<0.1	2.2	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	4.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	3.0	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	1.7	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.3	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	1.5	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	116	121	126	128

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-4 BH106 0.3-0.5 26/10/2011 Soil	64047-5 BH106 0.8-1.0 26/10/2011 Soil	64047-7 BH107 0.3-0.5 26/10/2011 Soil	64047-10 BH108 1.3-1.5 26/10/2011 Soil	64047-11 BH108 1.8-2.0 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	03/11/2011	03/11/2011	03/11/2011	03/11/2011	03/11/2011
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	%	104	83	104	102	106

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-13 BH109 0.1-0.2 26/10/2011 Soil	64047-16 BH109 1.9-2.0 26/10/2011 Soil	64047-18 BH110 0.3-0.5 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	03/11/2011	03/11/2011	03/11/2011
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	%	103	106	109

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-4 BH106 0.3-0.5 26/10/2011 Soil	64047-5 BH106 0.8-1.0 26/10/2011 Soil	64047-7 BH107 0.3-0.5 26/10/2011 Soil	64047-10 BH108 1.3-1.5 26/10/2011 Soil	64047-11 BH108 1.8-2.0 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	03/11/2011	03/11/2011	03/11/2011	03/11/2011	03/11/2011
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	%	104	83	104	102	106

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-13 BH109 0.1-0.2 26/10/2011 Soil	64047-16 BH109 1.9-2.0 26/10/2011 Soil	64047-18 BH110 0.3-0.5 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	03/11/2011	03/11/2011	03/11/2011
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	%	103	106	109

PCBs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-4 BH106 0.3-0.5 26/10/2011 Soil	64047-5 BH106 0.8-1.0 26/10/2011 Soil	64047-7 BH107 0.3-0.5 26/10/2011 Soil	64047-10 BH108 1.3-1.5 26/10/2011 Soil	64047-11 BH108 1.8-2.0 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	03/11/2011	03/11/2011	03/11/2011	03/11/2011	03/11/2011
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	%	104	83	104	102	106

PCBs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	64047-13 BH109 0.1-0.2 26/10/2011 Soil	64047-16 BH109 1.9-2.0 26/10/2011 Soil	64047-18 BH110 0.3-0.5 26/10/2011 Soil
Date extracted	-	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	03/11/2011	03/11/2011	03/11/2011
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	%	103	106	109

Acid Extractable metals in soil						
Our Reference:	UNITS	64047-1	64047-4	64047-5	64047-7	64047-10
Your Reference	----------	Dup 01	BH106	BH106	BH107	BH108
Depth	----------	-	0.3-0.5	0.8-1.0	0.3-0.5	1.3-1.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	01/11/2011	01/11/2011	01/11/2011	01/11/2011	01/11/2011
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	2	1	2	35	1
Copper	mg/kg	3	3	4	220	9
Lead	mg/kg	13	14	16	52	34
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	1	<1	<1	35	<1
Zinc	mg/kg	8	29	11	160	6

Acid Extractable metals in soil					
Our Reference:	UNITS	64047-11	64047-13	64047-16	64047-18
Your Reference	----------	BH108	BH109	BH109	BH110
Depth	----------	1.8-2.0	0.1-0.2	1.9-2.0	0.3-0.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil
Date digested	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	01/11/2011	01/11/2011	01/11/2011	01/11/2011
Arsenic	mg/kg	<4	<4	<4	<4
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	2	9	2	9
Copper	mg/kg	<1	41	<1	12
Lead	mg/kg	1	76	1	1
Mercury	mg/kg	<0.1	0.3	<0.1	<0.1
Nickel	mg/kg	2	8	1	36
Zinc	mg/kg	13	82	1	16

Moisture						
Our Reference:	UNITS	64047-1	64047-4	64047-5	64047-7	64047-10
Your Reference	----------	Dup 01	BH106	BH106	BH107	BH108
Depth	----------	-	0.3-0.5	0.8-1.0	0.3-0.5	1.3-1.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Moisture	%	1.8	1.9	4.4	5.3	4.8

Moisture					
Our Reference:	UNITS	64047-11	64047-13	64047-16	64047-18
Your Reference	----------	BH108	BH109	BH109	BH110
Depth	----------	1.8-2.0	0.1-0.2	1.9-2.0	0.3-0.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	31/10/2011	31/10/2011	31/10/2011	31/10/2011
Date analysed	-	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Moisture	%	12	8.1	18	1.9

Asbestos ID - soils						
Our Reference:	UNITS	64047-4	64047-5	64047-7	64047-10	64047-11
Your Reference	----------	BH106	BH106	BH107	BH108	BH108
Depth	----------	0.3-0.5	0.8-1.0	0.3-0.5	1.3-1.5	1.8-2.0
Date Sampled		26/10/2011	26/10/2011	26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample mass tested	g	Approx 40g	Approx 35g	Approx 25g	Approx 40g	Approx 20g
Sample Description	-	Brown sandy soil	Brown sandy soil	Brown sandy soil	Brown sandy soil	Beige sandy 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	64047-13	64047-16	64047-18
Your Reference	----------	BH109	BH109	BH110
Depth	----------	0.1-0.2	1.9-2.0	0.3-0.5
Date Sampled		26/10/2011	26/10/2011	26/10/2011
Type of sample		Soil	Soil	Soil
Date analysed	-	1/11/2011	1/11/2011	1/11/2011
Sample mass tested	g	Approx 20g	Approx 25g	Approx 10g
Sample Description	-	Brown sandy soil & rocks	Yellow sandy soil	Grey sandy 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

BTEX in Water		
Our Reference:	UNITS	64047-2
Your Reference	----------	R1
Depth	----------	-
Date Sampled		26/10/2011
Type of sample		Soil
Date extracted	-	28/10/2011
Date analysed	-	29/10/2011
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	105
Surrogate toluene-d8	%	96
Surrogate 4-BFB	%	103

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.

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	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-4	31/10/2011
Date analysed	-			01/11/2011	64047-4	01/11/2011 || 01/11/2011	LCS-4	01/11/2011
vTRH C_6 - C_9	mg/kg	25	Org-016	<25	64047-4	<25 || <25	LCS-4	109%
Benzene	mg/kg	0.2	Org-016	<0.2	64047-4	<0.2 || <0.2	LCS-4	113%
Toluene	mg/kg	0.5	Org-016	<0.5	64047-4	<0.5 || <0.5	LCS-4	108%
Ethylbenzene	mg/kg	1	Org-016	<1	64047-4	<1 || <1	LCS-4	106%
m+p-xylene	mg/kg	2	Org-016	<2	64047-4	<2 || <2	LCS-4	108%
o-Xylene	mg/kg	1	Org-016	<1	64047-4	<1 || <1	LCS-4	109%
Surrogate aaa-Trifluorotoluene	%		Org-016	104	64047-4	95% || 95 || RPD: 0	LCS-4	101%
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	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-4	31/10/2011
Date analysed	-			01/11/2011	64047-4	01/11/2011 || 01/11/2011	LCS-4	01/11/2011
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	64047-4	<50 || <50	LCS-4	85%
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	64047-4	<100 || <100	LCS-4	91%
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	64047-4	<100 || <100	LCS-4	91%
Surrogate o-Terphenyl	%		Org-003	83	64047-4	82 || 83 || RPD: 1	LCS-4	81%
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-4	31/10/2011
Date analysed	-			02/11/2011	64047-4	02/11/2011 || 02/11/2011	LCS-4	02/11/2011
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	LCS-4	107%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	LCS-4	111%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	LCS-4	110%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	0.1 || <0.1	LCS-4	107%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	0.2 || <0.1	LCS-4	108%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	0.1 || <0.1	LCS-4	119%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	64047-4	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	64047-4	0.12 || 0.07 || RPD: 53	LCS-4	113%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	115	64047-4	120 || 120 || RPD: 0	LCS-4	113%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-3	31/10/2011
Date analysed	-			03/11/2011	64047-4	03/11/2011 || 03/11/2011	LCS-3	03/11/2011
HCB	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	99%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	106%
Heptachlor	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	97%
delta-BHC	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	95%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	98%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	103%
Dieldrin	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	100%
Endrin	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	98%
pp-DDD	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	115%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	LCS-3	100%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-005	102	64047-4	104 || 101 || RPD: 3	LCS-3	100%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-3	31/10/2011
Date analysed	-			03/11/2011	64047-4	03/11/2011 || 03/11/2011	LCS-3	03/11/2011
Diazinon	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	LCS-3	93%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	LCS-3	108%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	64047-4	<0.1 || <0.1	LCS-3	119%
Surrogate TCLMX	%		Org-008	102	64047-4	104 || 101 || RPD: 3	LCS-3	100%
QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-3	31/10/2011
Date analysed	-			03/11/2011	64047-4	03/11/2011 || 03/11/2011	LCS-3	03/11/2011
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221*	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	LCS-3	100%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	64047-4	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	102	64047-4	104 || 101 || RPD: 3	LCS-3	139%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date digested	-			31/10/2011	64047-4	31/10/2011 || 31/10/2011	LCS-2	31/10/2011
Date analysed	-			31/10/2011	64047-4	01/11/2011 || 01/11/2011	LCS-2	01/11/2011
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	64047-4	<4 || <4	LCS-2	106%
Cadmium	mg/kg	0.5	Metals-020 ICP-AES	<0.5	64047-4	<0.5 || <0.5	LCS-2	110%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	64047-4	1 || 2 || RPD: 67	LCS-2	110%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	64047-4	3 || 4 || RPD: 29	LCS-2	108%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	64047-4	14 || 16 || RPD: 13	LCS-2	104%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	64047-4	<0.1 || <0.1	LCS-2	109%

Client Reference: E25302K, Eastlakes

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	64047-4	<1 || 1	LCS-2	108%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	64047-4	29 || 29 || RPD: 0	LCS-2	105%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			31/10/2011
Date analysed	-			01/11/2011
Moisture	%	0.1	Inorg-008	[NT]

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

QUALITY CONTROL BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/10/2011	[NT]	[NT]	LCS-W1	28/10/2011
Date analysed	-			29/10/2011	[NT]	[NT]	LCS-W1	29/10/2011
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	103%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	110%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	108%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	112%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	112%
Surrogate Dibromofluoromethane	%		Org-016	100	[NT]	[NT]	LCS-W1	99%
Surrogate toluene-d8	%		Org-016	99	[NT]	[NT]	LCS-W1	108%
Surrogate 4-BFB	%		Org-016	110	[NT]	[NT]	LCS-W1	101%

QUALITY CONTROL vTRH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	64047-7	31/10/2011
Date analysed	-	[NT]	[NT]	64047-7	01/11/2011
vTRH C6 - C9	mg/kg	[NT]	[NT]	64047-7	95%
Benzene	mg/kg	[NT]	[NT]	64047-7	98%
Toluene	mg/kg	[NT]	[NT]	64047-7	95%
Ethylbenzene	mg/kg	[NT]	[NT]	64047-7	92%
m+p-xylene	mg/kg	[NT]	[NT]	64047-7	95%
o-Xylene	mg/kg	[NT]	[NT]	64047-7	95%
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	64047-7	102%

QUALITY CONTROL sTRH in Soil (C10-C36)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	64047-7	31/10/2011
Date analysed	-	[NT]	[NT]	64047-7	01/11/2011
$TRHC_{10}$ - C_{14}	mg/kg	[NT]	[NT]	64047-7	84%
$TRHC_{15}$ - C_{28}	mg/kg	[NT]	[NT]	64047-7	89%
$TRHC_{29}$ - C_{36}	mg/kg	[NT]	[NT]	64047-7	86%
Surrogate o-Terphenyl	%	[NT]	[NT]	64047-7	77%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	64047-7	31/10/2011
Date analysed	-	[NT]	[NT]	64047-7	02/11/2011
Naphthalene	mg/kg	[NT]	[NT]	64047-7	99%
Acenaphthylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	[NT]	[NT]	64047-7	102%
Phenanthrene	mg/kg	[NT]	[NT]	64047-7	98%
Anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	[NT]	[NT]	64047-7	99%
Pyrene	mg/kg	[NT]	[NT]	64047-7	97%
Benzo(a)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	[NT]	[NT]	64047-7	98%
Benzo(b+k)fluoranthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	[NT]	[NT]	64047-7	94%
Indeno(1,2,3-c,d)pyrene	mg/kg	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%	[NT]	[NT]	64047-7	108%

Client Reference: E25302K, Eastlakes

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	[NT]	[NT]	64047-7	31/10/2011
Date analysed	-	[NT]	[NT]	64047-7	01/11/2011
Arsenic	mg/kg	[NT]	[NT]	64047-7	100%
Cadmium	mg/kg	[NT]	[NT]	64047-7	93%
Chromium	mg/kg	[NT]	[NT]	64047-7	107%
Copper	mg/kg	[NT]	[NT]	64047-7	116%
Lead	mg/kg	[NT]	[NT]	64047-7	110%
Mercury	mg/kg	[NT]	[NT]	64047-7	119%
Nickel	mg/kg	[NT]	[NT]	64047-7	88%
Zinc	mg/kg	[NT]	[NT]	64047-7	#

Report Comments:

Acid Extractable Metals in Soil:# Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

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
PO Box 976
North Ryde BC NSW 1670

ph: 02 9888 5000
Fax: 02 9888 5001

Attention: Cameron Hollands

Sample log in details:

Your reference:	**E25302K, Eastlakes**
Envirolab Reference:	**64047**
Date received:	27/10/11
Date results expected to be reported:	**3/11/11**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	20 Soils, 1 Water
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice Pack

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: E 25302K

Date Results Required: Standard TAT

Sheet 3 / 3

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

Contact:

Project: Proposed Shopping Centre Re-development
Location: East Lakes
Sampler: C.H

Sample Preservation: In esky on ice

Tests Required

Date Sampled	Lab Ref:	Borehole/ Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 6a	Combo 13	8 Metals	TPH	BTEX	PAHs	OCP/OPP/ PCBs	Asbestos	TCLP 6 Metals	TCLP PAHs	
20/10/11	1	DUP01	—	Glass jar + ~~Asb Bag~~	0	—				X			X					
	2	RI	—	Glass jar + ~~Asb Bag~~	0							X						
	3	BH106	0.1 – 0.2	Glass jar + Asb Bag	0													
	4	" "	0.3 – 0.5	Glass jar + Asb Bag	0			X										
	5	" "	0.8 – 1.0	Glass jar + Asb Bag	0	Silty sand		X										
	6	BH107	0.1 – 0.2	Glass jar + Asb Bag	0.1	Fill												
	7	" "	0.3 – 0.5	Glass jar + Asb Bag	0	Fill		X										
	8	" "	0.8 – 1.0	Glass jar + Asb Bag	0	Fill												
	9	BH108	0.3 – 0.5	Glass jar + Asb Bag	0	Fill												
	10	" "	1.3 – 1.5	Glass jar + Asb Bag	0	" "		X										
	11	" "	1.8 – 2.0	Glass jar + Asb Bag	0	Silty sand		X										
	12	" "	2.8 – 3.0	Glass jar + Asb Bag	0.1	Silty sand												
	13	BH109	0.1 – 0.2	Glass jar + Asb Bag	0	Fill		X										
	14	" "	0.4 – 0.5	Glass jar + Asb Bag	0	Fill												
	15	" "	0.9 – 1.0	Glass jar + Asb Bag	0.2	Fill												
	16	" "	1.5 – 2.0	Glass jar + Asb Bag	0	Silty sand		X										
	17	BH110	0.1 – 0.2	Glass jar + Asb Bag	0													
	18		0.3 – 0.5	Glass jar + Asb Bag	0			X										
	19		0.8 – 1.0	Glass jar + Asb Bag	0													
	20		1.8 – 2.0	Glass jar + Asb Bag	0													
↓	21	↓	1.3 – 1.5	Glass jar + Asb Bag	0													
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 64047
Date Received: 27/10/11
Time Received: 2:30pm
Received by: ZL
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Remarks (comments/detection limits required):

Relinquished By:	Date:	Time:	Received By:	
Cameron Hollands	27/10/11 AM	27/10 2:30pm	ZL	

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 65939

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

Attention: Cameron Hollands

Sample log in details:

Your Reference:	**E25302K, Eastlakes**
No. of samples:	2 Waters
Date samples received / completed instructions received	05/12/11 / 05/12/11

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:	12/12/11 / 12/12/11
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:

Nancy Zhang
Chemist

Hinoko Miyazaki
Chemist

Giovanni Agosti
Technical Manager

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

vTRH & BTEX in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	65939-1 BH109 2/12/2011 Water	65939-2 BH1 2/12/2011 Water
Date extracted	-	05/12/2011	05/12/2011
Date analysed	-	05/12/2011	05/12/2011
TRHC6 - C9	µg/L	<10	[NA]
Benzene	µg/L	<1	<20
Toluene	µg/L	<1	<20
Ethylbenzene	µg/L	<1	<20
m+p-xylene	µg/L	<2	<40
o-xylene	µg/L	<1	<20
Surrogate Dibromofluoromethane	%	94	92
Surrogate toluene-d8	%	101	100
Surrogate 4-BFB	%	100	100

sTRH in Water (C10-C36)		
Our Reference:	UNITS	65939-1
Your Reference	----------	BH109
Date Sampled	----------	2/12/2011
Type of sample		Water
Date extracted	-	06/12/2011
Date analysed	-	06/12/2011
$TRHC_{10}$ - C_{14}	µg/L	<50
$TRHC_{15}$ - C_{28}	µg/L	<100
$TRHC_{29}$ - C_{36}	µg/L	<100
Surrogate o-Terphenyl	%	87

PAHs in Water - Low Level		
Our Reference:	UNITS	65939-1
Your Reference	----------	BH109
Date Sampled	----------	2/12/2011
Type of sample		Water
Date extracted	-	06/12/2011
Date analysed	-	06/12/2011
Naphthalene	µg/L	<0.1
Acenaphthylene	µg/L	<0.1
Acenaphthene	µg/L	<0.1
Fluorene	µg/L	<0.1
Phenanthrene	µg/L	<0.1
Anthracene	µg/L	<0.1
Fluoranthene	µg/L	<0.1
Pyrene	µg/L	<0.1
Benzo(a)anthracene	µg/L	<0.1
Chrysene	µg/L	<0.1
Benzo(b+k)fluoranthene	µg/L	<0.2
Benzo(a)pyrene	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1
Surrogate p-Terphenyl-d_{14}	%	78

HM in water - dissolved		
Our Reference:	UNITS	65939-1
Your Reference	----------	BH109
Date Sampled	----------	2/12/2011
Type of sample		Water
Date prepared	-	6/12/2011
Date analysed	-	6/12/2011
Lead-Dissolved	µg/L	<1

Miscellaneous Inorganics		
Our Reference:	UNITS	65939-1
Your Reference	----------	BH109
Date Sampled	----------	2/12/2011
Type of sample		Water
Date prepared	-	06/12/2011
Date analysed	-	06/12/2011
Calcium - Dissolved	mg/L	26
Magnesium - Dissolved	mg/L	3.8
Hardness	mgCaCO3 /L	81

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.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

Client Reference: E25302K, Eastlakes

QUALITY CONTROL vTRH & BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			05/12/2011	[NT]	[NT]	LCS-W1	05/12/2011
Date analysed	-			05/12/2011	[NT]	[NT]	LCS-W1	05/12/2011
TRHC6 - C9	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	91%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	90%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	92%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	89%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	92%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	91%
Surrogate Dibromofluoromethane	%		Org-016	93	[NT]	[NT]	LCS-W1	95%
Surrogate toluene-d8	%		Org-016	100	[NT]	[NT]	LCS-W1	101%
Surrogate 4-BFB	%		Org-016	103	[NT]	[NT]	LCS-W1	101%

QUALITY CONTROL sTRH in Water (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/12/2011	[NT]	[NT]	LCS-W1	06/12/2011
Date analysed	-			06/12/2011	[NT]	[NT]	LCS-W1	06/12/2011
TRHC10 - C14	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	94%
TRHC15 - C28	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	127%
TRHC29 - C36	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	117%
Surrogate o-Terphenyl	%		Org-003	103	[NT]	[NT]	LCS-W1	136%

QUALITY CONTROL PAHs in Water - Low Level	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/12/2011	[NT]	[NT]	LCS-W1	06/12/2011
Date analysed	-			06/12/2011	[NT]	[NT]	LCS-W1	06/12/2011
Naphthalene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	68%
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	69%
Phenanthrene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	69%
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	72%
Pyrene	µg/L	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-W1	72%

Client Reference: E25302K, Eastlakes

QUALITY CONTROL PAHs in Water - Low Level	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %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	75%
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	83%
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	76	[NT]	[NT]	LCS-W1	75%
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			6/12/2011	[NT]	[NT]	LCS-W1	6/12/2011
Date analysed	-			6/12/2011	[NT]	[NT]	LCS-W1	6/12/2011
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	88%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			06/12/2011	[NT]	[NT]	LCS-W1	06/12/2011
Date analysed	-			06/12/2011	[NT]	[NT]	LCS-W1	06/12/2011
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-W1	93%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-W1	99%
Hardness	mgCaCO3/L	3		3.0	[NT]	[NT]	[NR]	[NR]

Report Comments:

Total Recoverable Hydrocarbons/BTEX in water:PQL has been raised due to the sample matrix requiring dilution.

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
PO Box 976
North Ryde BC NSW 1670

ph: 02 9888 5000
Fax: 02 9888 5001

Attention: Cameron Hollands

Sample log in details:

Your reference:	**E25302K, Eastlakes**
Envirolab Reference:	**65939**
Date received:	05/12/11
Date results expected to be reported:	**12/12/11**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	2 Waters
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice

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

Chatswood NSW 2067
Ph: (02) 9910 6200

SAMPLE AND CHAIN OF CUSTODY FORM

Job No: 65939
Date Received: 5/12/11
Time Received: 10:20
Received by: KB
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

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

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

Attention: Aileen

Date Results Required:

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

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

Contact:

EIS Job Number: E 25302K

Sheet 1 / 1

Project: Shopping Centre Re-development
Location: East Lakes
Sampler: Cameron Hollands

Sample Preservation:
In esky on ice

	Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Sample Container	PID (ppm/ Odour)	Sample Description	Tests Required: Combo 3	Heavy metals	TPH/BTEX	VOCs	PAHs (low level)	Hardness	BTEX	Lead		Comments/Detection Limits Required
1	2/12/11	AM	-	BH109	3x1L Amber Bottle 2x BTEX Vials HDPE Plastic Bottle	-	groundwater			X		X	X		X		
2	2/12/11	AM	-	BH1	2 x BTEX vials	-	" "							X			

Relinquished By: Cameron Hollands
Date: 5/12/11
Time: AM
Received By: K Bouzoglis 5/12/11 10:20

Relinquished By:
Date:
Time:
Received By:

Remarks:
All analysis PQLs to ANZECC (2000) Detection Limits Please

Appendix D: Report Explanatory Notes

STANDARD SAMPLING PROCEDURE

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

- Prepare a borehole/test pit log or made a note of the sample description for stockpiles.
- 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 machine can operate in a safe manner.
- Ensure all sampling equipment has been decontaminated prior to use.
- Remove any surface debris from the immediate area of the sampling location.
- Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possible to prevent the loss of any volatiles. If possible, fill the glass jars completely.
- Collect samples for asbestos analysis and place in a zip-lock plastic bag.
- Label the sampling containers 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).
- 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.
- Record the lithology of the sample and sample depth on the borehole/test pit log generally in accordance with AS1726-1993[27].
- 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 the standards outlined in the report.
- 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 where it is safe to do so. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.
- Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

Decontamination Procedures for Soil Sampling Equipment

- All sampling equipment should be decontaminated between every sampling location. This excludes single use PVC tubing used for push tubes etc. Equipment and materials required for the decontamination include:
  - Phosphate free detergent (Decon 90);
  - Potable water;
  - Stiff brushes; and
  - Plastic sheets.
- Ensure the decontamination materials are clean prior to proceeding with the decontamination.
- Fill both buckets with clean potable water and add phosphate free detergent to one bucket.

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

- In the bucket containing the detergent, scrub the sampling equipment until all the material attached to the equipment has been removed.
- Rinse sampling equipment in the bucket containing potable water.
- 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, then the 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.

- 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.
- 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.
- Measure 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.
- Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or other 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:
  - Stericup single-use filters (for heavy metals samples);
  - 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/Temperature meters;
  - Plastic drums used for transportation of purged water;
  - Esky and ice;
  - Nitrile gloves;
  - Distilled water (for cleaning);
  - Electronic dip meter;
  - Low flow peristaltic pump and associated tubing; and
  - Groundwater sampling forms.

- 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.
- Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.
- Groundwater samples are obtained from the monitoring wells using low flow sampling equipment to reduce the disturbance of the water column and loss of volatiles.
- 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%.
- All measurements are recorded on specific data sheets.
- 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.
- All samples are preserved in accordance with water sampling requirements specified by the laboratory and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice.
- At the end of each water sampling complete a chain of custody form for samples being sent to the laboratory.

Decontamination Procedures for Groundwater Sampling Equipment

- All equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.
- The following equipment and materials are required for the decontamination procedure:
  - Phosphate free detergent;
  - Potable water;
  - Distilled water; and
  - Plastic Sheets or bulk bags (plastic bags).
- Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.
- 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.
- Flush pump head with distilled water.
- Change water and detergent solution after each sampling location.
- Rinse sampling equipment in the bucket containing distilled water.
- Place cleaned equipment on clean plastic sheets.
- 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)[28] methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (1991)[29].

Practical Quantitation Limit (PQL), Limit of Reporting (LOR) & 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 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).

Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured (i.e. the proximity of an averaged result to the true value, where all random errors have been statistically removed). 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. Accuracy is typically reported as percent recovery.

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.

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;

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

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

- 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 (e.g. 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 artefacts and interferences that may arise during sampling, transport 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%.

$$\frac{\text{(Spike Sample Result – Sample Result) x 100}}{\text{Concentration of Spike Added}}$$

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:

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

SCREENING CRITERIA DEFINITIONS

The following definitions have been adopted based on Schedule B(1) of NEPM (2013) and are relevant to Tier 1 screening criteria adopted for contamination assessments.

Health investigation levels (HILs) have been developed for a broad range of metals and organic substances. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use. Site-specific conditions should determine the depth to which HILs apply for other land uses.

Health screening levels (HSLs) have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. The HSLs depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 m. HSLs have also been developed for asbestos and apply to the top 3m of soil.

Ecological investigation levels (EILs) have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2 m of soil.

Ecological screening levels (ESLs) have been developed for selected petroleum hydrocarbon compounds and total petroleum/recoverable hydrocarbon (TPH/TRH) fractions and are applicable for assessing risk to terrestrial ecosystems. ESLs broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil.

Groundwater investigation levels (GILs) are the concentrations of a contaminant in groundwater above which further investigation (point of extraction) or a response (point of use) is required. GILs are based on Australian water quality guidelines and drinking water guidelines and are applicable for assessing human health risk and ecological risk from direct contact (including consumption) with groundwater.

Management Limits for Petroleum hydrocarbons are applicable to petroleum hydrocarbon compounds only. They are applicable as screening levels following evaluation of human health and ecological risks and risks to groundwater resources. They are relevant for operating sites where significant sub-surface leakage of petroleum compounds has occurred and when decommissioning industrial and commercial sites.

Interim soil vapour health investigation levels (interim HILs) have been developed for selected volatile organic chlorinated compounds (VOCCs) and are applicable to assessing human health risk by the inhalational pathway. They have interim status pending further scientific work on volatile gas modelling from the sub-surface to building interiors for chlorinated compounds.

Appendix E: Data (QA/QC) Evaluation

DATA (QA/QC) EVALUATION

INTRODUCTION

This Data (QA/QC) Evaluation forms part of the validation process for the DQOs documented in Section 6.1 of this report. Checks were made to assess the data in terms of precision, accuracy, representativeness, comparability and completeness. These 'PARCC' parameters are referred to collectively as DQIs and are defined in the Report Explanatory Notes attached in the report appendices.

Field and Laboratory Considerations

The quality of the analytical data produced for this project has been considered in relation to the following:

- Sample collection, storage, transport and analysis;
- Laboratory PQLs;
- Field QA/QC results; and
- Laboratory QA/QC results.

Field QA/QC Samples and Analysis

A summary of the field QA/QC samples collected and analysed for this assessment is provided in the following table:

Sample Type	Sample Identification	Frequency (of Sample Type)	Analysis Performed
Intra-laboratory duplicate (soil)	Dup 01 (primary sample BH1 0-0.1m)	Approximately 10% of primary samples	Heavy metals, PAHs
Intra-laboratory duplicate (water)	Dup 1 (primary sample MW110)	Approximately 30% of primary samples	VOCs
Rinsate (water SPT)	R1 (20 October 2011)	One for the assessment to demonstrate adequacy of decontamination methods	BTEX

The results for the field QA/QC samples are detailed in the laboratory summary tables (Table H to Table J inclusive) attached to the assessment report and are discussed in the subsequent sections of this Data (QA/QC) Evaluation report.

Data Assessment Criteria

EIS adopted the following criteria for assessing the field and laboratory QA/QC analytical results:

Field Duplicates

Acceptable targets for precision of field duplicates in this report will be less than 50% RPD for concentrations greater than 10 times the PQL, less than 75% RPD for concentrations between five

and 10 times the PQL and less than 100% RPD for concentrations that are less than five times the PQL. RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Rinsates

Acceptable targets for field blank and rinsate samples in this report will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to typical background concentrations in soils and published drinking water guidelines for waters.

Laboratory QA/QC

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the laboratory reports. These criteria were developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the acceptable limits adopted by the primary laboratory (Envirolab) is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics;
- 60-140% recovery acceptable for organics; and
- 10-140% recovery acceptable for VOCs.

Surrogate Spikes

- 60-140% recovery acceptable for general organics; and
- 10-140% recovery acceptable for VOCs.

Method Blanks

- All results less than PQL.

DATA EVALUATION

Sample Collection, Storage, Transport and Analysis

Samples were collected by trained field staff in accordance with the EIS SSP. The SSP was developed to be consistent with relevant guidelines at the time of the investigation (2011) and other guidelines made under the CLM Act 1997.

Appropriate sample preservation, handling and storage procedures were adopted. Laboratory analysis was undertaken within specified holding times in accordance with the laboratory NATA accredited methodologies.

Review of the project data also indicated that:

- COC documentation was adequately maintained;
- Sample receipt advice documentation was provided for all sample batches except 64045. However EIS note that the COC for 64045 is stamped with the date and time of receipt by the lab and records that the samples were cool and unbroken;
- All analytical results were reported; and
- Consistent units were used to report the analysis results.

EIS note that sample MW110 in report 64045 is referenced as sample MW10 on the laboratory report. This is a transcription error that occurred during booking in of the sample at the laboratory.

EIS note that not all groundwater samples were analysed for the CoPC. The original proposal only included an allowance for the analysis of one water sample.

Laboratory PQLs

With the exception of the following appropriate PQLs were adopted for the analysis and all PQLs were below the SAC:

- The PQLs for BTEX for the groundwater analysis of sample BH1 were raised as the sample required dilution prior to analysis. This resulted in the PQL for benzene exceeding the groundwater SAC for Human contact;
- The anthracene PQL for groundwater analysis which was 10 times greater than the ecological SAC; and
- The PQL for vinyl chloride was above the Drinking Water Guideline.

In light of the BTEX and PAH concentrations reported for soil and groundwater, EIS are of the opinion that these are not significant, and do not affect the quality of the dataset as a whole or the outcome of the assessment.

Field QA/QC Sample Results

Field Duplicates

The results indicated that field precision was acceptable.

Rinsates

All results were below the PQL. This indicated that cross-contamination artefacts associated with sampling equipment were not present and the potential for cross-contamination to have occurred was low.

Laboratory QA/QC

The analytical methods implemented by the laboratory were performed in accordance with their NATA accreditation and were consistent with Schedule B(3) of NEPM (2013). The frequency of data

reported for the laboratory QA/QC (i.e. duplicates, spikes, blanks, LCS) was considered to be acceptable for the purpose of this assessment.

A review of the laboratory QA/QC data identified the following minor non-conformances:

- Report 64047 – Matrix spike for acid extractable metals (zinc) in soil: percent recovery not possible due to the high concentration of the element in the sample. However an acceptable recovery was obtained for the Laboratory Control Sample (LCS).

DATA QUALITY SUMMARY

EIS are of the opinion that the data is precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

Non-conformances were reported for some laboratory QA/QC analysis. These non-conformances were considered to be sporadic and minor, and were not considered to be indicative of systematic sampling or analytical errors. On this basis, these non-conformances are not considered to materially impact the report findings.

There was only one groundwater monitoring event undertaken for the assessment. On this basis there is some uncertainty around the representativeness of the groundwater data, particularly during different climatic conditions and after wet/dry periods. However, given the low contaminant concentrations reported, the site history and the surrounding land uses, this is not considered to alter the conclusions of the assessment.

Appendix F: Guidelines and Reference Documents

Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). Acid Sulfate Soils Manual

Australian and New Zealand Environment Conservation Council (ANZECC), (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

CRC Care, (2011). Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document

CRC Care, (2017). Technical Report No. 39 – Risk-based management and guidance for benzo(a)pyrene

Contaminated Land Management Act 1997 (NSW)

Department of Land and Water Conservation, (1997). 1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

National Health and Medical Research Council (NHMRC), (2011). National Water Quality Management Strategy, Australian Drinking Water Guidelines

NSW Department of Environment and Conservation, (2007). Guidelines for the Assessment and Management of Groundwater Contamination

NSW EPA, (1995). Contaminated Sites Sampling Design Guidelines

NSW EPA, (2014). Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Olszowy, H., Torr, P., and Imray, P., (1995). Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission

Protection of the Environment Operations Act 1997 (NSW)

State Environmental Planning Policy No.55 – Remediation of Land 1998 (NSW)

World Health Organisation (WHO), (2008). Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality

Western Australia Department of Health, (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia

Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). Acid Sulfate Soils Manual (ASS Manual 1998)

Appendix G: Site Photographs

	**Photograph 1: The shopfronts along Evans Avenue**
	**Photograph 2: The south section of the site looking east with barber Avenue on the left**
	**Photograph 3: The excavated north section of the site.**

	**Photograph 4: the south west section of the site.**