ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

HEALTH INFRASTRUCTURE

ON

PRELIMINARY STAGE 2 ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED MULTI-STOREY STAFF CAR PARK

AT

CORNER OF LUCAS STREET AND CHURCH STREET (PART OF 67-81 MISSENDEN ROAD), CAMPERDOWN, NSW

1 JUNE 2016 **REF: E28939KB2rpt.rev2**

Postal Address: PO Box 976, North Ryde BC NSW 1670
Tel: 02 9888 5000 • Fax: 9888 5004
EIS is a division of Jeffery and Katauskas Pty Ltd • ABN 17 003 550 801

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Report prepared by:

Geoff Fletcher
Environmental Scientist

Report reviewed by:

Todd Hore
Associate Environmental Engineer

EXECUTIVE SUMMARY

Health Infrastructure ('the client') in consultation with APP Corporation commissioned Environmental Investigation Services (EIS) to undertake a Preliminary Stage 2 Environmental Site Assessment (ESA) for the proposed multi-storey staff car park at corner of Lucas Street and Church Street (part of 67-81 Missenden Road), Camperdown, NSW.

The proposed development includes the demolition of the existing buildings and the construction of a ten storey staff car park. The lowest level of the car park will be at RL27.575m, which will require excavation to depths of approximately 0.3m below the Church Street frontage, approximately 0.3m to 1m below the Lucas Street footpath and to a maximum of approximately 2.5m for the majority of the site. A new internal road, known as Brodie Street, will be constructed along the southern boundary of the site and will be close to the existing ground surface RL.

The scope of work included the following:

- Review of EIS 2016 Stage 1 ESA;
- A site inspection to identify Areas of Environmental Concern (AEC);
- Preparation of a Preliminary Conceptual Site Model (PCSM);
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment;
- Undertake a Tier 1 Risk Assessment and review of CSM; and
- Preparation of a report presenting the results of the assessment.

Samples for this investigation were obtained from 6 sampling points as shown on the attached Figure 2. This density is approximately 46% of the minimum sampling density recommended by the EPA.

An elevated concentration of B(a)P TEQ was detected above the human health SAC in one soil sample. EIS are of the opinion that the risk posed to human receptors is moderate and will require remediation and/or management.

The assessment has identified the following data gaps:

- The NSW EPA recommended minimum density for a Stage 2 ESA has not been met;
- A WorkCover NSW search for the licence of dangerous goods storage at the site has not been undertaken;
- The groundwater has not been assessed;
- The source of the low concentrations of PAHs in the natural soil has not been adequately assessed;
- Areas beneath the existing buildings have not been included in the assessment; and
- The presence of hazardous building materials in the existing buildings has not been assessed.

It is noted that EIS have been engaged to undertake additional works to address the above data gaps and the additional works are currently underway.

EIS consider that the site can be made suitable for the proposed development provided that the following recommendations are implemented to address the data gaps and to better characterise the risks:

1. Undertake an additional ESA to address the data gaps identified in **Section 9.3**. EIS have been engaged to undertake additional works in order to address the data gaps and the investigations are currently underway. Based on the additional scope of works the minimum sampling density recommended by the NSW EPA will be met;

2. Following the additional ESA prepare a Remediation Action Plan (RAP) to outline remedial measures for the site (if required);

3. Prepare a Validation Assessment (VA) report on completion of remediation; and

4. Undertake a Hazardous Materials Assessment (Hazmat) for the existing buildings prior to the commencement of demolition work. EIS have been engaged to undertake a Hazmat of the buildings to be demolished as part of the proposed development and the investigation is currently underway. EIS have been provided with copies of the relevant sections of an Asbestos Register for the buildings requiring demolition for the proposed development.

In the event unexpected conditions are encountered during development work or between sampling locations that may pose a contamination risk, all works should stop and an environmental consultant should be engaged to inspect the site and address the issue.

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

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES:

ABBREVIATIONS

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**
Asbestos Health Screening Levels	**ASL**
Acid Sulfate Soil	**ASS**
Above Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene	**BTEXN**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Construction Management Plan	**CMP**
Chain of Custody	**COC**
Contaminant of Primary Concern	**CoPC**
Conceptual Site Model	**CSM**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Assessment Criteria	**EAC**
Ecological Investigation Levels	**EILs**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environmental Protection Agency	**EPA**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
Fibre Cement Fragments	**FCF**
General Approvals of Immobilisation	**GAI**
General Solid Waste	**GSW**
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**
Local Government Authority	**LGA**
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**

ABBREVIATIONS

Potential Contaminants of Concern	**PCC**
Photo-ionisation Detector	**PID**
Practical Quantitation Limit	**PQL**
Preliminary Site Investigation	**PSI**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Restricted Solid Waste	**RSW**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Semi-Volatile Organic Compounds	**sVOC**
Standard Sampling Procedure	**SSP**
Standard Water Level	**SWL**
Standard Sampling Procedure	**SSP**
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**
Volatile Organic Chlorinated Compound	**VOCC**
Workplace, Health and Safety	**WHS**

1 INTRODUCTION

Health Infrastructure ('the client') in consultation with APP Corporation commissioned Environmental Investigation Services (EIS)[1] to undertake a Preliminary Stage 2 Environmental Site Assessment (ESA) for the proposed multi-storey staff car park at corner of Lucas Street and Church Street (part of 67-81 Missenden Road), Camperdown, NSW.

The site location is shown on Figure 1 and the assessment was confined to the proposed development area as shown on Figure 2. The proposed development area is referred to as 'the site' in this report.

A geotechnical investigation was undertaken in conjunction with this assessment by JK Geotechnics[2]. The results of the investigation are presented in a separate report (Ref. 28939SB2rpt, dated 19 April 2016[3]). This report should be read in conjunction with the JK report.

1.1 Proposed Development Details

The proposed development includes the demolition of the existing buildings and the construction of a ten storey car park. The lowest level of the car park will be at RL27.575m, which will require excavation to depths of approximately 0.3m below the Church Street frontage, approximately 0.3m to 1m below the Lucas Street footpath and to a maximum of approximately 2.5m for the majority of the site. A new internal road, known as Brodie Street, will be constructed along the southern boundary of the site and will be close to the existing ground surface RL.

1.2 Objectives

The assessment objectives are to:

- Assess the potential for site contamination;
- Assess the potential risk the contamination may pose to the site receptors;
- Provide a preliminary waste classification for the off-site disposal of soil; and
- Comment on the suitability of the site for the proposed development/landuse.

1.3 Scope of Work

The assessment was undertaken generally in accordance with JK proposal (Ref: P28939SB1) of 11 January 2016 and written acceptance from the client of 29 February 2016.

The scope of work included the following:

- Review of EIS 2016 Stage 1 ESA;
- A site inspection to identify Areas of Environmental Concern (AEC);

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)
[2] Geotechnical consulting division of J&K
[3] Referred to as JK 2016 Report

- Preparation of a Preliminary Conceptual Site Model (PCSM);
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment;
- Undertake a Tier 1 Risk Assessment and review of CSM; and
- Preparation of a report presenting the results of the assessment.

The report was prepared with reference to regulations/guidelines outlined in the table below. Individual guidelines are also referenced within the text of the report.

Table 1-1: Guidelines

Guidelines/Regulations
Contaminated Land Management Act 1997[4]
State Environmental Planning Policy No.55 – Remediation of Land 1998[5]
Guidelines for Consultants Reporting on Contaminated Sites 2011[6]
Guidelines for the NSW Site Auditor Scheme, 2nd Edition 2006[7]
National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013[8]

[4] NSW Government Legislation, (1997), *Contaminated Land Management Act 1997.* (referred to as CLM Act 1997)

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

[6] NSW Office of Environment and Heritage (OEH), (2011), *Guidelines for Consultants Reporting on Contaminated Sites.* (referred to as Reporting Guidelines 2011)

[7] NSW DEC, (2006), *Guidelines for the NSW Site Auditor Scheme, 2nd ed.* (referred to as Site Auditor Guidelines 2006)

[8] National Environment Protection Council (NEPC), (2013), *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

2 SITE INFORMATION

2.1 Background

2.1.1 Stage 1 Desktop Environmental Site Assessment (EIS, 2016[9])

EIS have previously undertaken a Stage 1 ESA for the proposed multi-storey car park at the site.

The scope of work included the following:

- Review of site information including background and site history information;
- A site inspection to identify AEC;
- Preparation of a PCSM; and
- Preparation of a report presenting the results of the assessment.

A review of the site history information indicated the following:

- The aerial photographs and land title records indicated that the site had been used for commercial purposes since prior to 1943;
- Delicensed activities still regulated by the NSW EPA were listed for the site. NSW EPA records did not indicate any notices for the site; and
- Business directories listed motor garages, panel beaters and printers as having been located within 100m of the site.

EIS considered that the site could be made suitable for the car park development provided the following additional work was undertaken to better assess the risks:

- Undertake a Stage 2 ESA to meet the sampling density outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995);
- Undertake a waste classification assessment for the off-site disposal of material excavated for the proposed development; and
- Undertake a Hazardous Materials Assessment (Hazmat) for the existing buildings prior to the commencement of demolition work.

2.2 Site Identification

Table 2-1: Site Identification

Site Address:	67-81 Missenden Road, Camperdown, NSW
Lot & Deposited Plan:	Part Lot 101 in DP1179349
Current Land Use:	Commercial (including Child care)

[9] EIS, (2016), *Report to Health Infrastructure on Stage 1 Desktop Environmental Site Assessment for Proposed Multi-Storey Car Park at corner of Lucas Street and Church Street (part of 67-81 Missenden Road), Camperdown, NSW.* (Report Ref: E28939KBrpt, dated 2 February 2016) (referred to as EIS 2016 Report)

Proposed Land Use:	Infrastructure/Commercial
Local Government Authority (LGA):	City of Sydney
Current Zoning:	SP2 Infrastructure, R1 General Residential & B4 Mixed Use
Area of Proposed Development (m^2):	4,800
RL (AHD in m) (approx.):	29
Geographical Location (MGA) (approx.):	N: 6248641 E: 331641
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.3 Site Location and Regional Setting

The site is located in a predominantly commercial area of Camperdown. The site is bounded by Lucas Street to the north, Church Street to the west and to the south east of the Lucas Street and Church Street junction. The site is located approximately 500m to the south-west of a covered stormwater channel shown as Orphan School Creek which flows into Johnstons Creek approximately 800m north of the site.

2.4 Topography

The site is located within gently undulating regional topography with the site itself located on the side of a hill that slopes down towards the west at approximately 1°.

2.5 Site Inspection

A walkover inspection of the site was undertaken by EIS on 1 December 2015. The inspection was limited to accessible areas of the site and immediate surrounds. An internal inspection of buildings was not undertaken.

At the western end of the site was a two storey brick building with its ground floor level at similar level as both Lucas and Church Streets. At the rear of this building on the Lucas Street frontage was a brick retaining wall supporting the subject site. The brick wall ranged in height from 1.5m at its western end to 1.1m at its eastern end. Behind this brick retaining wall was an inground swimming pool. The ground surface on the southern side of the building sloped down towards Lucas Street. A brick retaining wall on the southern boundary supported the subject site due to the slope.

Along the majority of the Lucas Street frontage was a concrete block retaining wall, which was about 2m high at its western end and about 1.8m high at its eastern end. This wall retained the subject site. Centrally located within the site was a single storey brick building that was being used as a preschool. On the eastern side of the preschool building was an asphaltic concrete paved car park, with an asphaltic concrete paved access road along the southern side of the building.

At the eastern end of the site was a single storey brick building at a similar level to that of Lucas Street. Vegetation was observed between this building and the car park. On the eastern side of the building was an asphaltic concrete roadway which formed a junction with Lucas Street.

To the south of the site was the Queen Mary building, which was a 13 storey brick building. To the east of the site was a seven storey brick and clad building, with a basement level.

2.6 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the assessment. A brief summary of the relevant information is present below:

Table 2-2: Summary of Relevant Services

Service	Location	Potential Migratory Pathway
Sewer	The Sydney Water plan indicates a sewer passing through the western section of the site in a north and south direction. The plan indicates a warning close to the sewer within Lucas Street (to the north of the site) regarding a discharge hazard from Royal Prince Alfred Hospital. A disused water main is shown to pass through the site along the southern boundary from Missenden Road to Church Street.	The backfill around the sewer and disused water main could act as a potential migratory pathway.

2.7 Regional Geology

A review of the regional geological map of Sydney (1983[10]) indicates that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

2.8 Soil Landscape and Dryland Salinity

The 1:100,000 Sydney soil landscape map indicates that the site is located in the Blacktown soil landscape area. The Blacktown soils are generally derived from residual processes.

The site is not located in an area impacted by dryland salinity.

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

2.9 Acid Sulfate Soil (ASS) Risk

The site is not located in an ASS risk area.

2.10 Hydrogeology

A review of groundwater bore records available on the NSW Office of Water (NOW) online database was undertaken for the EIS 2016 Stage 1 ESA. The search was limited to registered bores located within a radius of approximately 1km of the site.

The search indicated twelve (12) bores within the search area registered for monitoring purposes and one (1) bore registered for domestic purposes. The monitoring bores are not registered for beneficial use and hence not considered to be potential receptors. The domestic bore is located approximately 567m south east and up gradient of the site, hence not considered to be a potential receptor.

A review of the regional geology and groundwater bore information indicates that the subsurface condition at the site is expected to consist of residual soils overlying relatively shallow bedrock. The occurrence of groundwater that could be utilised as a resource for beneficial use is considered to be relatively low under such conditions. A perched aquifer in the subsurface may be present.

2.11 Receiving Water Bodies

The closest receiving water body in the vicinity of the site is a covered stormwater channel shown as Orphan School Creek located 500m to the south-west of the site which flows into Johnstons Creek approximately 800m north of the site. This is not considered to be a potential receptor.

3 PRELIMINARY CONCEPTUAL SITE MODEL (PCSM)

The AEC identified below are based on a review of the site and site history information outlined previously in this report. The AEC can either be a point source or widespread areas impacted by current or historical activities.

Table 3-1: PCSM

AEC / Extent	CoPC	Potential Exposure Pathway and Media	Potential Receptors
Fill Material – Entire Site The site appears to have been historically filled to achieve existing levels. The fill may have been imported from various sources and can contain elevated concentrations of contaminants.	Heavy metals, TRH, BTEXN, PAHs, OCPs, OPPs, PCB, VOCs and asbestos	Direct Contact – dermal contact; ingestion; and inhalation of dust, vapours and fibres. Media - soil, groundwater and vapour.	Human Receptors – Site occupants; visitors; development and maintenance workers; and off-site occupants. Environmental Receptors – Flora and fauna at the site and immediate surrounds; others identified in the above sections.
Commercial Use – The site has been used for commercial activities including manufacture and/or distribution of electrical items and white goods. Storage, leakage and spillage of petroleum hydrocarbon products could have resulted in site contamination.	Lead, TRH, BTEXN, PAHs and VOCs	Direct Contact – dermal contact; ingestion; and inhalation of dust and vapours. Media - soil, groundwater and vapour.	Human Receptors – As Above Environmental Receptors – As Above
Off-Site Commercial Use – The site is located within a commercial area. The business directories have indicated numerous land use activities (e.g dry cleaners, mechanical workshops etc) within 100 metres of the site. Part of the hospital, the area to the immediate east of the site, an underground storage tank/s (UST/s) was encountered in a previous EIS investigation. Migration	Lead, TRH, BTEXN, PAHs and VOCs	Direct Contact – dermal contact; ingestion; and inhalation of dust and vapours. Media- soil, groundwater and vapour.	Human Receptors – As Above Environmental Receptors – As Above

AEC / Extent	CoPC	Potential Exposure Pathway and Media	Potential Receptors
of spills and leaks from neighbouring properties could have resulted in site contamination.			
Hazardous Building Material – The buildings on the site have been constructed prior to 1990's. Hazardous building materials were used for construction purposes during this period. The material can pose a potential contamination source during demolition/development. The aerial photographs indicate that former buildings at the site were demolished. The use of hazardous building material in the former buildings could have resulted in potential contamination.	Asbestos, lead and PCBs	Direct Contact – dermal contact; ingestion; and inhalation of dust and fibres. Media – soil and air.	Human Receptors – As Above Environmental Receptors – As Above

4 SAMPLING, ANALYSIS AND QUALITY PLAN

4.1 Data Quality Objectives (DQO)

The NEPM 2013 defines the DQO process as a seven step iterative planning tool used to define the type, quantity and quality of data needed to inform decisions relating to the environmental condition of the site.

The DQO process is detailed in the US EPA document *Guidance on systematic planning using the data quality process (2006[11])* and the NSW DEC document *The Guidelines for the NSW Site Auditor Scheme, 2nd Edition (2006[12])*.

These seven steps are applicable to this assessment as summarised in the table below:

Table 4-1: DQOs – Seven Steps

Step	Input
State the Problem	The PCSM and EIS 2016 Stage 1 ESA has identified AEC at the site which may pose a risk to the site receptors. An intrusive investigation is required to assess the risk and comment on the suitability of the site for the proposed development or intended landuse. The EIS project team will include: project principal (PP) and/or project associate (PA); project engineer/scientist (PE); and field engineer/scientist (FE) as outlined in the quality recorded checklist maintained for the project in accordance with our ISO 9001 certification.
Identify the Decisions/ Goal of the Study	The data collection is project specific and has been designed based on the following information: • Review of the previous EIS 2016 Stage 1 ESA; • AEC, PCC, receptors, pathways and medium identified in the PCSM; • Development of Site Assessment Criteria (SAC) for each media; and • The use of decision statements outlined below: 1) Statistical analysis will be used to assess the laboratory data against the SAC. The following criteria will be adopted: ➢ The 95% Upper Confidence Limit (UCL) value of the arithmetic mean concentration of each contaminant should be less than the SAC; ➢ The standard deviation (SD) of the results must be less than 50% of the SAC; and ➢ No single value exceeds 250% of the relevant SAC. 2) Statistical calculations will not be undertaken if all results are below the SAC; and 3) Statistical calculations will not be undertaken on the following: ➢ Health Screening Levels (HSLs) – elevated point source contamination associated

[11] US EPA, (2006), *Guidance on Systematic Planning using the Data Quality Objectives Process.* (referred to as US EPA 2006)
[12] NSW DEC, (2006), *Guidelines for the NSW Site Auditor Scheme, 2nd ed.* (referred to as Site Auditor Guidelines 2006)

Step	Input
	with petroleum hydrocarbons can pose a vapour risk to receptors. The decisions to be addressed by the investigation are: 1. Do any of the soil samples contain contamination concentrations above the SAC? 2. Was asbestos detected in any of the samples? and 3. Is further investigation necessary?
Identify Information Inputs	The following information will be collected: • Soil samples based on subsurface conditions; • The SAC will be designed based on the criteria outlined in NEPM 2013. Other criteria will be used as required and detailed in this report; • The samples will be analysed in accordance with the analytical methods outlined in NEPM 2013; • Field screening information (i.e. PID data, presence of hydrocarbons etc.) will be taken into consideration in selecting the analytical schedule; and • Any additional information that may arise during the field work will also be used as data inputs.
Define the Study Boundary	The sampling will be confined to the proposed development area of the site as shown in Figure 2. Fill has been identified as an AEC. The source of fill has not been established. Fill is considered to be heterogeneous material with PCC occurring in random pockets or layers. The presence of PCC in between sampling points cannot be measured. The areas excluded from the investigation are outlined in the data gaps.
Develop the analytical approach (or decision rule)	The following acceptable limits will be adopted for the data quality assessment: • The following acceptance criteria will be used to assess the RPD results: ➢ results > 10 times the practical quantitation limit (PQL), RPDs < 50% are acceptable; ➢ results between 5 and 10 times PQL, RPDs < 75% are acceptable; ➢ results < 5 times PQL, RPDs < 100% are acceptable; and ➢ An explanation is provided if RPD results are outside the acceptance criteria. • Acceptable concentrations in Trip Blank (TB) samples. Non-compliance to be documented in the report; • The following acceptance criteria will be used to assess the primary laboratory QA/QC results. Non-compliance to be documented: ➢ <u>RPDs</u>: - Results that are < 5 times the PQL, any RPD is acceptable; and - Results > 5 times the PQL, RPDs between 0-50% are acceptable; ➢ <u>LCS recovery and matrix spikes</u>: - 70-130% recovery acceptable for metals and inorganics; - 60-140% recovery acceptable for organics; and

Step	Input
	- 10-140% recovery acceptable for VOCs; ➢ Surrogate spike recovery: - 60-140% recovery acceptable for general organics; and - 10-140% recovery acceptable for VOCs; ➢ Blanks: All less than PQL.
Specify the performance or acceptance criteria	NEPM 2013 defines decision errors as '*incorrect decisions caused by using data which is not representative of site conditions*'. This can arise from errors during sampling or analytical testing. A combination of these errors is referred to as '*total study error*'. The study error can be managed through the correct choice of sample design and measurement. 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. In this case, for example, the PCC identified in the PCSM is considered to pose a risk to receptors unless proven not to. The null hypothesis has been adopted for this assessment.
Optimise the design for obtaining data	The most resource-effective design will be used in an optimum manner to achieve the assessment objectives.

4.2 Soil Sampling Plan and Methodology

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

Table 4-2: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	The NSW EPA Contaminated Sites Sampling Design Guidelines (1995[13]) recommend a sampling density for an environmental assessment based on the size of the investigation area. The guideline provides a minimum number of sampling points required for the investigation on a systematic sampling pattern. The guidelines recommend sampling from a minimum of 13 evenly spaced sampling points for this site with an area of approximately 4,800m^2. Samples for this investigation were obtained from 6 sampling points as shown on the attached Figure 2. This density is approximately 46% of the minimum sampling density

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

Aspect	Input
	recommended by the EPA.
Sampling Plan	The sampling locations were relatively evenly spaced through accessible areas of the site. An evenly spaced plan was considered suitable to address potential contaminants associated with the fill material.
Exclusion Areas (Data Gaps)	Sampling was not undertaken in inaccessible areas of the site such as beneath existing buildings. These areas have been excluded from the investigation.
Sampling Equipment	Soil samples were obtained between 29 March 2016 and 31 March 2016 in accordance with the standard sampling procedure (SSP) attached in the appendices. 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. The sample locations were drilled using the following equipment as shown on the borehole logs attached in the appendices: • Hydraulically operated 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.
Sampling Collection and Field QA/QC	Soil samples were collected from the fill and natural profiles based on field observations. The sampling depths are shown on the logs attached in the appendices. Additional samples were obtained when relatively deep fill (>0.5m) was encountered. Samples were also obtained when there was a distinct change in lithology or based on the observations made during the investigation. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis. Samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. Sampling personnel used disposable nitrile gloves during sampling activities. The samples were labelled with the job number, sampling location, sampling depth and date in accordance with the SSP.
Field PID Screening for VOCs	A portable Photoionisation Detector (PID) was used to screen the samples for the presence of VOCs and to assist with selection of samples for hydrocarbon analysis. The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be

Aspect	Input
	undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source. The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents. PID field check records are maintained in the job file. 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.
Decontami-nation and Sample Preservation	The decontamination procedure adopted during sampling is outlined in the SSP. Where applicable, the sampling equipment was decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water. 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 delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

4.3 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 4-3: Analytical Schedule

CoPC	Fill Samples	Natural Soil Samples
Heavy Metals	8	4
TRH/BTEXN	8	4
PAHs	8	4
OCPs/OPPs	6	Na
PCBs	6	Na
Asbestos	6	Na
TCLP Metals	4	Na

CoPC	Fill Samples	Natural Soil Samples
TCLP PAHs	4	Na

4.3.1 Laboratory Analysis

The samples were analysed by the NATA Accredited laboratory/s 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 4-4: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates and trip blanks samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	144118 & 144118-A
Inter-laboratory duplicates	Envirolab Services Pty Ltd Perth, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	178997

5 SITE ASSESSMENT CRITERIA (SAC)

The SAC adopted for the assessment is outlined in the table below. The SAC has been derived from the NEPM 2013 and other guidelines as applicable. The guideline values for individual contaminants are presented in the attached report tables.

Table 5-1: SAC Adopted for this Investigation

Guideline	Applicability
Health Investigation Levels (HILs) (NEPM 2013)	The HIL-D criteria for 'Commercial/industrial' have been adopted for this assessment.
Health Screening Levels (HSLs) (NEPM 2013)	The HSL D criteria for 'Commercial/industrial' have been adopted for this assessment.
Management Limits for TRH	These guidelines have only been used after considering the relevant HSLs for adverse effects of TRH contamination where necessary.
Asbestos in Soil	The 'presence/absence' of asbestos in soil has been adopted as the assessment criterion for the Preliminary Site Investigation (PSI).
Waste Classification (WC) Criteria	The criteria outlined in the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014[14]) has been adopted to classify the material for off-site disposal. Waste classified as 'hazardous' in accordance with the Waste Classification Guidelines 2014 due to high levels of contaminants is generally not suitable for disposal to a landfill in NSW without treatment. However, if the contaminants are 'immobilised' so that they will not be released into the landfill leachate at levels of concern, then the EPA may grant an immobilisation approval to enable the waste to be landfilled. The immobilisation approvals are issued by the EPA under the Protection of the Environment Operations (Waste) Regulation 2014. A list of the GAI can be found on the NSW EPA website http://www.epa.nsw.gov.au/waste/listgenapprovals.htm Significant amounts of waste ash and gravely slag were available in the late nineteenth and early twentieth centuries as a result of the use of coal for industrial and domestic heating purposes. Widespread use of ash waste (either as ash or mixed with other soil and waste materials) as fill material was common in the suburbs of Sydney at this time. To account for the presence of ash and slag, the NSW EPA has published the table below.

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

Table 5-2: GAIs

Approval Number	Waste Stream	Contaminants	Waste Assessment Requirements
1999/05	Ash, Ash-contaminated natural excavated materials or coal-contaminated natural excavated material	Polycyclic Aromatic Hydrocarbons (PAHs) including Benzo(a)pyrene (B(a)P)	The SCC limits for PAHs and B(a)P outlined in the Waste Classification Guidelines 2014 do not apply for the assessment of this waste stream. The material can be classified according to the leachable concentration (TCLP) value of B(a)P alone. Disposal restrictions apply for material classified under this GAI.
2009/07	Metallurgical furnace slag or metallurgical furnace slag contaminated natural excavated materials	Beryllium, Chromium (VI), lead, nickel, PAHs and B(a)P	The SCC limits for these contaminants outlined in the Waste Classification Guidelines 2014 do not apply for the assessment of this waste stream. The material can be classified according to their leachable concentrations (TCLP) values alone.

6 INVESTIGATION RESULTS

6.1 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 6-1: Summary of Subsurface Conditions

Profile	Description (m in bgl)
Pavement	Asphaltic Concrete (AC) pavement, approximately 40mm thick, was encountered at the ground surface in BH103 to BH106. A concrete pavement, approximately 200mm thick, was encountered at a depth of 0.5m below ground level in BH101.
Fill	Fill material was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 0.4m to 1.1m. The fill typically comprised a mixture of gravel, sand and silty clay. The fill contained inclusions of: ash; slag; igneous; sandstone; and ironstone gravels.
Natural Soil	Residual silty clay was encountered beneath the fill material and extended to the underlying shale bedrock. The residual silty clay was assessed to be of medium to high plasticity and of very stiff to hard strength. The clays contained variable amounts of sand and ironstone gravel.
Bedrock	Weathered shale bedrock was encountered below the residual silty clays at depths ranging from 1.1m to 5.8m.
Groundwater	Groundwater seepage was encountered in BH106 at a depth of 9.0m during drilling. Standing water levels were measured within the boreholes at the completion of auger drilling at depths between 5.1m and 11.5m.

6.2 Field Screening

A summary of the field screening results are presented in the table below.

Table 6-2: Summary of Field Screening

Aspect	Details (m in bgl)
PID Screening of Soil Samples for VOCs	PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. All results were 0 ppm equivalent isobutylene which indicates a lack of PID detectable VOCs.

6.3 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.

Table 6-3: Summary of Soil Laboratory Results

Analyte	Results Compared to SAC
Heavy Metals	**HILs:** All heavy metal results were below the HIL-D criteria. **WC:** The lead results of 210mg/kg and 160mg/kg in the BH102 (0.9-1.0m) and BH104 (0.4-0.5m) samples, respectively, were above the CT1 criterion of 100mg/kg. The nickel results of 74mg/kg and 75mg/kg in the BH103 (0.05-0.2m) and BH105 (0.05-0.2m) samples respectively were above the CT1 criterion of 40mg/kg. The remaining heavy metal results were less than the CT1 criteria. TCLP leachates were prepared from the samples with elevated concentrations and analysed for the elevated analytes. The results were less than the TCLP1 criteria.
TRH	**HSLs:** All TRH results were below the HSL-D criteria. **WC:** All TRH results were less than the relevant CT1 criteria.
BTEXN	**HSLs:** All BTEXN results were below the HSL-D criteria. **WC:** All BTEX results were less than the relevant CT1 criteria.
PAHs	**HILs:** The B(a)P TEQ result of 41mg/kg was above the HIL-D criteria of 40mg/kg. All remaining PAH results were below the HIL-D criteria. **HSLs:** All naphthalene results were below the HSL-D criteria. **WC:** The B(a)P results of 1.5mg/kg, 5.4mg/kg and 1.7mg/kg in the BH102 (0.9-1.0m), BH104 (1.0-1.3m) and BH106 (0.05-0.2m) samples, respectively, were above the CT1 criterion of 0.8mg/kg. The B(a)P result of 29mg/kg in the BH104 (0.4-0.5m) sample was above the SCC2 criterion of 23mg/kg. The total PAHs result of 460mg/kg in the BH104 (0.4-0.5m) sample was above the SCC1 criterion of 200mg/kg. The remaining PAH results were less than the relevant CT1 criteria. TCLP leachates were prepared from the elevated samples and analysed for PAHs. The results were less than the TCLP1 criteria.

Analyte	Results Compared to SAC
OCPs & OPPs	**HILs:** All OCP and OPP results were below the HIL-D criteria. **WC:** All OCP and OPP results were less than the relevant CT1 criteria.
PCBs	**HILs:** All PCB results were below the HIL-D criterion. **WC:** All PCB results were less than the CT1 criteria.
Asbestos	Asbestos was not detected in the samples analysed for the investigation.

7 DATA QUALITY ASSESSMENT

As part of the data quality assessment the following data quality indicators (DQIs) were assessed: precision, accuracy, representativeness, completeness and comparability as outlined in the table below. Reference should be made to the appendices for an explanation of the individual DQI.

Table 7-1: Assessment of DQIs

Completeness

Field Considerations:

- The investigation was designed as a preliminary screening and sampling was confined to accessible areas of the site (see Figure 2);
- Samples were obtained from various depths based on the subsurface conditions encountered at the sampling locations. All samples were recorded on the borehole logs. All sampling points are shown on the attached Figure 2;
- The investigation was undertaken by trained staff in accordance with the SSP; and
- Documentation maintained during the field work is attached in the appendices where applicable.

Laboratory Considerations:

- Selected samples were analysed for a ranged of CoPC. For the preliminary screening samples were not analysed for VOCs;
- All samples were analysed by NATA registered laboratories in accordance with the analytical methods outlined in NEPM 2013;
- Appropriate analytical methods and PQLs were used by the laboratories; and
- Appropriate sample preservation, handling, holding time and COC procedures were adopted for the investigation.

Comparability

Field Considerations:

- The investigation was undertaken by trained staff in accordance with the SSP;
- The climate conditions encountered during the field work were noted on the site description record maintained in the job file; and
- Consistency was maintained during sampling in accordance with the SSP.

Laboratory Considerations:

- All samples were analysed in accordance with the analytical methods outlined in NEPM 2013;
- Appropriate PQLs were used by the laboratories for all analysis (other than those outlined above);
- All primary, intra-laboratory duplicates and other QA/QC samples were analysed by the same laboratory; and
- The same units were used by the laboratories for all of the analysis.

Representativeness

Field Considerations:

- The investigation was designed to obtain appropriate media encountered during the field work as outlined in the SAQP. Dust and/or vapour sampling was outside the scope of this assessment; and
- All media based on the subsurface conditions encountered during the field work was sampled.

Laboratory Considerations:

- All samples were analysed in accordance with the SAQP.

Precision

Field Considerations:

- The investigation was undertaken in accordance with the SSP.

Laboratory Considerations:

- Analysis of field QA/QC samples including inter and intra-laboratory duplicates and trip blanks (TB) as outlined below;
- The field QA/QC frequency adopted for the investigation is outlined below;
- Calculation of the Relative Percentage Difference (RPD) from the primary and duplicate results (the RPD calculation equation is outlined in the attached appendices);
- Assessment of RPD results against the acceptance criteria outlined in **Section 4.1.**

Intra-laboratory RPD Results:

Soil Samples at a frequency of 8% of the primary samples:

- Dup B1 is a soil duplicate of primary sample BH104 (0.4-0.5m).

The intra-laboratory results are presented in the attached report tables. The results indicated that field precision was acceptable.

The RPD values for a range of individual PAHs and heavy metals were outside the acceptance criteria. Values outside the acceptable limits have been attributed to sample heterogeneity and the difficulties associated with obtaining homogenous duplicate samples of heterogenous matrices.

Where applicable, the higher duplicate value has been adopted as a conservative measure (see attached report tables).

Inter-laboratory RPD Results:

Soil Samples at a frequency of 8% of the primary samples:

- Dup A1 is a soil duplicate of primary sample BH101 (1.0-1.1m).

The inter-laboratory results are presented in the attached report tables. The results indicated that field precision was acceptable.

The RPD values for a range of individual PAHs and heavy metals were outside the acceptance criteria. Values outside the acceptable limits have been attributed to sample heterogeneity and the difficulties associated

with obtaining homogenous duplicate samples of heterogenous matrices.

Where applicable, the higher duplicate value has been adopted as a conservative measure (see attached report tables).

Trip Blank (TB):
One soil TB was analysed for BTEX at a frequency of one blank per batch of volatiles. The results are presented in the attached report tables.

The results were all less than the PQLs.

Accuracy

Field Considerations:

- The investigation was undertaken in accordance with the SSP.

Laboratory Considerations:

- The analytical quality assessment adopted by the laboratories was in accordance with the NATA and NEPM 2013 requirements as outlined in the analytical reports;
- A review of the reports indicates that the analytical results were generally within the acceptance criteria adopted by the laboratories;

8 WASTE CLASSIFICATION OF SOIL FOR OFF-SITE DISPOSAL

The waste classification of soil for off-site disposal is summarised in the following table:

Table 8-1: Waste Classification

Site Extent / Material Type	Classification	Disposal Option
Fill material containing ash and slag over the site	Fill material containing ash and slag with contaminant concentrations above the SCC criteria[1] has been classified as General Solid Waste (non-putrescible) (GSW) based on the TCLP concentrations alone as outlined in the GAI 1999/05 and GAI 2009/07	The fill material classified under the GAI can only be disposed of to a NSW EPA licensed landfill capable of receive the waste stream. The landfill should be contacted to obtain the required approvals prior to commencement of excavation. Fill material containing ash contaminated material can only be disposed of to a NSW EPA licensed landfill with a leachate monitoring system. Treatment of this waste stream is not considered to be an economical option.

Elevated concentrations of contaminants (predominately PAHs) were detected in the natural silty clay soil in BH104 and detectable concentrations of PAHs in BH105. Based on the present data the natural silty clay soil would be classified as General Solid Waste (non-putrescible) (GSW). Should a Virgin excavated natural material (VENM) classification be required for the natural soils and bedrock EIS recommend that further testing of the natural soil is undertaken across the site including in the vicinity of BH104 and BH105.

9 TIER 1 RISK ASSESSMENT AND REVIEW OF PCSM

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.

The assessment has identified the following contamination issues at the site:

Table 9-1: Tier 1 Risk Assessment and Review of PCSM

Contaminant of Primary Concern (CoPC)	Receptor and Exposure Pathway	Discussion and Risk Rating
B(a)P TEQ	Human Receptors: Dermal Contact, ingestion and inhalation via dust	The CoPC were above the SAC adopted for this investigation and pose a risk to site receptors. EIS are of the opinion that the risk posed to human receptors is moderate and will require remediation and/or management. The groundwater at the site has not been analysed and it is unknown whether the groundwater has been impacted by B(a)P TEQ.

9.1 Source and Extent of Contamination

9.1.1 Sources

The source of the PAHs in the fill samples is considered to be associated with the ash, coal and slag inclusions encountered in the fill matrix.

A review of the site information indicates that the site is located in an area which has been historically filled to achieve existing levels. Fill material on site may have been imported from various sources.

9.1.2 Known Extent

Based on a review of the field logs and the laboratory data, EIS are of the opinion that the soil contamination is confined to the fill material at the site. The fill ranges in depth from approximately 0.4m to 1.1m bgl as shown on the attached Figure 2.

Some relatively minor concentrations of B(a)P TEQ were detected in natural soil samples in BH104 and BH105. Further investigation will be required to better assess the detections.

9.1.3 Unknown Extent

Sampling was not undertaken beneath the existing buildings. The extent of contamination beneath the buildings is currently unknown.

9.1.4 Hazardous Building Materials in Existing Buildings

There is a possibility of the presence of hazardous building materials in the existing buildings at the site. This is considered to pose a relatively low risk to the receptors provided that the demolition works are undertaken in accordance with the relevant codes and standards.

9.1.5 Groundwater

In the event that groundwater seepage management or dewatering is required as part of the construction, dewatering and/or groundwater disposal approvals should be sought from the relevant authorities.

9.2 Fate and Transport of Contaminants

The potential fate and transport of CoPC identified at the site is summarised in the following table:

Table 9-2: Fate and Transport of PCC/CoPC

PCC/CoPC	Fate and Transport
Non-volatile contaminants including: heavy fraction PAHs	With the exception of asbestos, non-volatile contaminants are predominantly confined to the soil and groundwater medium. The mobility of these contaminants varies depending on: the nature and type of contaminant present (e.g. leachability, viscosity etc.); soil type/porosity; surface water infiltration; groundwater levels; and the rate of groundwater movement. **Presence of Ash and Slag** Non-volatile contaminants associated with ash and slag waste (some heavy metals, heavy fraction PAHs, and sometimes heavy fraction TPHs) are bound within a relatively insoluble matrix. Slag and ash is usually formed as a by-product of combustion at high temperatures which 'locks in' the contaminants within the matrix.

9.3 Data Gaps

The assessment has identified the following data gaps:

- The NSW EPA recommended minimum density for a Stage 2 ESA has not been met;
- A WorkCover NSW search for the licence of dangerous goods storage at the site has not been undertaken;
- The groundwater has not been assessed;
- The source of the low concentrations of PAHs in the natural soil has not been adequately assessed;
- Areas beneath the existing buildings have not been included in the assessment; and
- The presence of hazardous building materials in the existing buildings has not been assessed.

It is noted that EIS have been engaged to undertake additional works to address the above data gaps and the additional works are currently underway.

10 CONCLUSION

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

The decision statements specified in Table 4.1 are addressed below:

Decision Statement	Decision Result
1. Do any of the soil samples contain contamination concentrations above the SAC?	Yes
2. Was asbestos detected in any of the samples?	No
3. Is further investigation necessary?	Yes. See below

Based on the scope of works undertaken, EIS are of the opinion that the CoPC identified at the site pose a risk to the receptors.

EIS consider that the site can be made suitable for the proposed development provided that the following recommendations are implemented to address the data gaps and to better characterise the risks:

1. Undertake an additional ESA to address the data gaps identified in **Section 9.3**. EIS have been engaged to undertake additional works in order to address the data gaps and the investigations are currently underway. Based on the additional scope of works the minimum sampling density recommended by the NSW EPA will be met;

2. Following the additional ESA prepare a Remediation Action Plan (RAP) to outline remedial measures for the site (if required);

3. Prepare a Validation Assessment (VA) report on completion of remediation; and

4. Undertake a Hazardous Materials Assessment (Hazmat) for the existing buildings prior to the commencement of demolition work. EIS have been engaged to undertake a Hazmat of the buildings to be demolished as part of the proposed development and the investigation is currently underway. EIS have been provided with copies of the relevant sections of an Asbestos Register for the buildings requiring demolition for the proposed development.

In the event unexpected conditions are encountered during development work or between sampling locations that may pose a contamination risk, all works should stop and an environmental consultant should be engaged to inspect the site and address the issue.

10.1 Regulatory Requirement

The regulatory requirements applicable for the site are outlined in the following table:

Table 10-1: Regulatory Requirement

Guideline	Applicability
Duty to Report Contamination 2015[15]	The requirement to notify the NSW EPA regarding site contamination should be assessed once the results of the additional investigation work have been reviewed and a remedial strategy (if necessary) has been selected.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.
Dewatering Consent	In the event groundwater is intercepted during excavation works, dewatering may be required. Council, NSW Office of Water (NOW) and other relevant approvals (from discharge authorities like Sydney Water etc.) should be obtained prior to the commencement of dewatering.

[15] NSW Department of Environment and Climate Change, (2009), *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997.* (referred to as Duty to Report Contamination 2015)

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

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

0 20 40 60 80 100
SCALE 1:2000 @A4 METRES

This plan should be read in conjunction with the EIS report.

Title: **SITE LOCATION PLAN**

Project: CNR LUCAS STREET & CHURCH STREET CAMPERDOWN, NSW

Report No: E28939SB2

Figure No: 1

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

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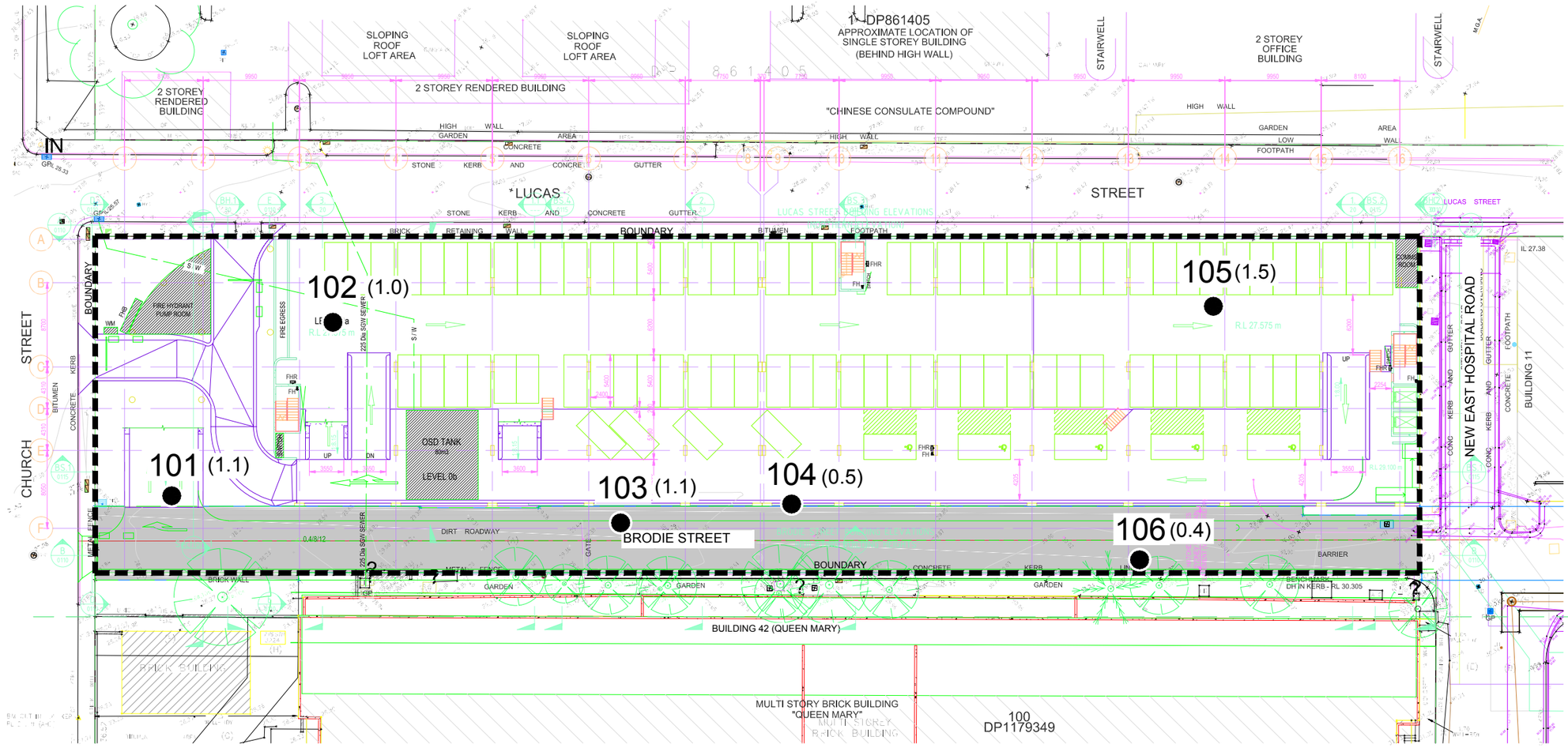

LEGEND

APPROXIMATE SITE BOUNDARY

101 (0.1) BOREHOLE LOCATIONS

SCALE 0 5 10 15 20 25 METRES
1:500 @A3

This plan should be read in conjunction with the EIS report.

Title: **BOREHOLE LOCATION PLAN**

Project: CNR LUCAS STREET & CHURCH STREET CAMPERDOWN, NSW

Report No: E28939SB2

Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

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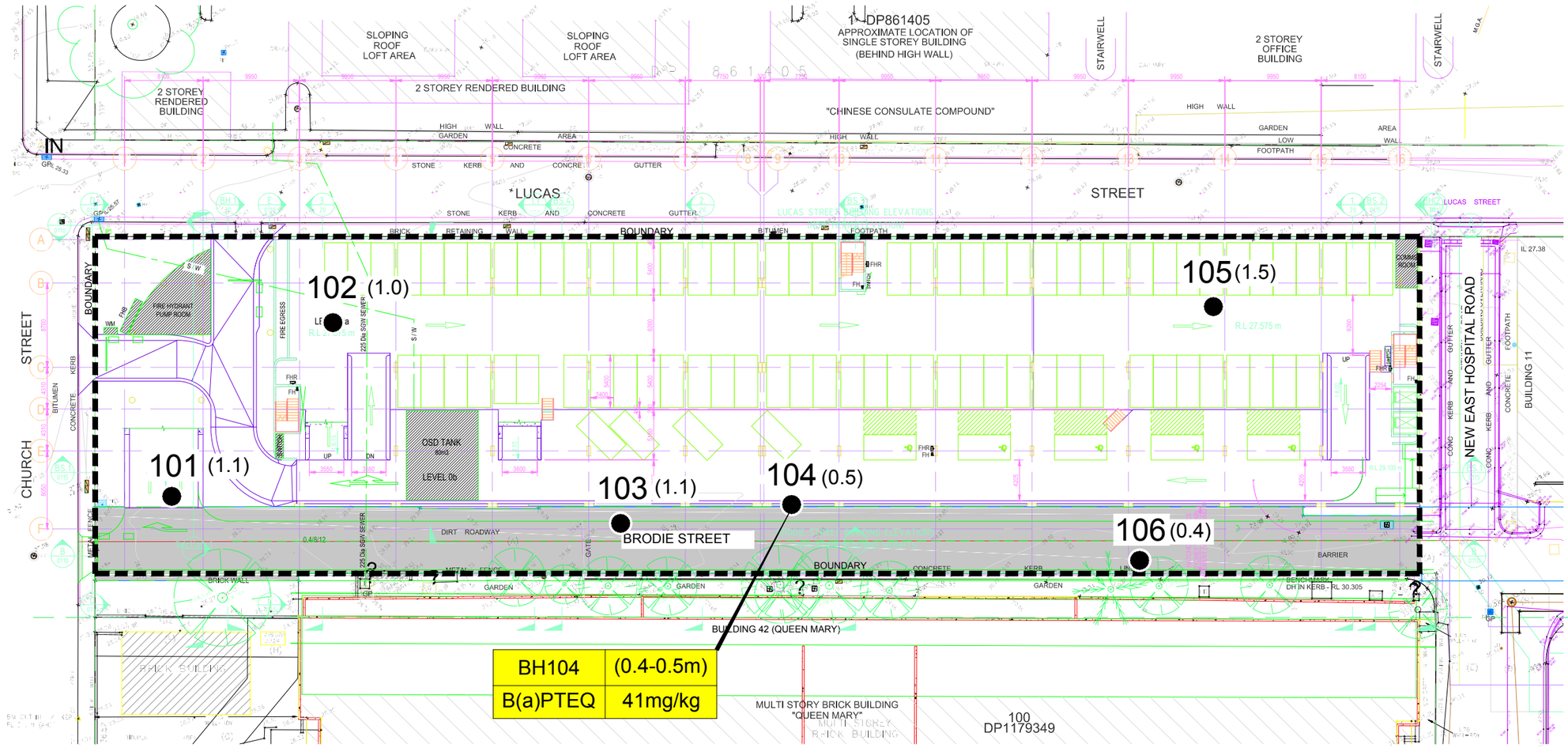

LEGEND

APPROXIMATE SITE BOUNDARY

101 (0.1)
BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)

BH (ID)	DEPTH (m)
CHEMICAL	CONCENTRATION (mg/kg)

SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK

0 5 10 15 20 25
SCALE 1:500 @A3 METRES

This plan should be read in conjunction with the EIS report.

Title: **SITE CONTAMINATION PLAN**

Project: CNR LUCAS STREET & CHURCH STREET CAMPERDOWN, NSW

Report No: E28939SB2

Figure No: 3

ENVIRONMENTAL INVESTIGATION SERVICES

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LABORATORY SUMMARY TABLES

TABLE A
SOIL LABORATORY RESULTS COMPARED TO HILs
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 [2]	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P TEQ [3]	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	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) [1]			3000	900	3600	240000	1500	730	6000	400000	4000	40	80	2000	2500	45	530	3600	50	2000	7	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH101	0.1-0.2	Fill: gravelly silty sand	LPQL	LPQL	4	80	11	LPQL	4	81	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH101	1.0-1.1	Fill sandy silty clay	LPQL	LPQL	7	19	28	LPQL	1	12	1.7	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH102	0.1-0.3	Fill: gravelly silty sand	5	LPQL	10	28	44	LPQL	6	50	1.6	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH102	0.9-1.0	Fill: gravelly silty sand	13	LPQL	8	70	210	0.1	4	120	16	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH103	0.05-0.2	Fill : silty clay	LPQL	LPQL	69	38	8	LPQL	74	49	0.59	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH103	1.1-1.2	Shale	7	LPQL	6	17	5	LPQL	LPQL	LPQL	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH104	0.4-0.5	Fill : silty clay	29	LPQL	17	59	160	0.4	11	150	460	**41**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH104	1.0-1.3	Silty clay	18	LPQL	18	36	77	0.2	11	82	70	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH105	0.05-0.2	Fill: gravelly silty clay	LPQL	LPQL	64	38	4	LPQL	75	40	0.37	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH105	2.0-2.7	Silty Clay	5	LPQL	26	3	36	LPQL	3	15	0.85	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH106	0.05-0.2	Fill: gravelly silty clay	9	LPQL	32	25	48	0.1	26	58	16	2.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH106	0.4-0.5	Silty Clay	8	LPQL	33	5	26	LPQL	9	20	1.9	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Number of Samples			12	12	12	12	12	12	12	12	12	12	6	6	6	6	6	6	6	6	6	6
Maximum Value			29	LPQL	69	80	210	0.4	75	150	460	41	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NC

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013, HIL-D: 'Commercial/Industrial'

2 - The 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.

3 - B(a)P TEQ - Benzo(a)pyrene Toxicity Equivalence Quotient has been calculated based on 8 carcinogenic PAHs and their Toxic Equivalence Factors (TEFs) outlined in NEPM 2013

Concentration above the SAC **VALUE**

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
OPP: Organophosphorus Pesticides
OCP: Organochlorine Pesticides
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
HILs: Health Investigation Levels
NA: Not Analysed
NC: Not Calculated
NSL: No Set Limit
SAC: Site Assessment Criteria
NEPM: National Environmental Protection Measure

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	PID [2]
PQL - Envirolab Services					25	50	0.2	0.5	1	3	1	
HSL Land Use Category [1]					**COMMERCIAL/INDUSTRIAL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH101	0.1-0.2	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH101	1.0-1.1	Fill sandy silty clay	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH102	0.1-0.3	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH102	0.9-1.0	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH103	0.05-0.2	Fill : silty clay	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH103	1.1-1.2	Shale	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH104	0.4-0.5	Fill : silty clay	0m to < 1m	Sand	LPQL	140	LPQL	LPQL	LPQL	LPQL	10	0
BH104	1.0-1.3	silty clay	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH105	0.05-0.2	Fill: gravelly silty clay	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH105	2.0-2.7	Silty Clay	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH106	0.05-0.2	Fill: gravelly silty clay	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH106	0.4-0.5	Silty Clay	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
Total Number of Samples					12	12	12	12	12	12	12	12
Maximum Value					LPQL	140	LPQL	LPQL	LPQL	LPQL	10	0

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013

2 - Field PID values obtained during the investigation

Concentration above the SAC **VALUE**

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

Abbreviations:

UCL: Upper Level Confidence Limit on Mean Value	NC: Not Calculated	PQL: Practical Quantitation Limit
HSLs: Health Screening Levels	NL: Not Limiting	LPQL: Less than PQL
NA: Not Analysed	SAC: Site Assessment Criteria	NEPM: National Environmental Protection Measure

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	3	1
HSL Land Use Category [1]					**COMMERCIAL/INDUSTRIAL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH101	0.1-0.2	Fill: gravelly silty sand	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH101	1.0-1.1	Fill sandy silty clay	1m to <2m	Sand	370	NL	3	NL	NL	NL	NL
BH102	0.1-0.3	Fill: gravelly silty sand	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH102	0.9-1.0	Fill: gravelly silty sand	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH103	0.05-0.2	Fill : silty clay	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH103	1.1-1.2	Shale	1m to <2m	Sand	370	NL	3	NL	NL	NL	NL
BH104	0.4-0.5	Fill : silty clay	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH104	1.0-1.3	silty clay	1m to <2m	Sand	370	NL	3	NL	NL	NL	NL
BH105	0.05-0.2	Fill: gravelly silty clay	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH105	2.0-2.7	Silty Clay	2m to <4m	Sand	630	NL	3	NL	NL	NL	NL
BH106	0.05-0.2	Fill: gravelly silty clay	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL
BH106	0.4-0.5	Silty Clay	0m to < 1m	Sand	260	NL	3	NL	NL	230	NL

EIS

TABLE C
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES (2014)
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful [2]	Total Scheduled [3]		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.2	0.5	1	3	100
General Solid Waste CT1 [1]			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	<50	<50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1 [1]			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	<50	<50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2 [1]			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	<50	<50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2 [1]			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	<50	<50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH101	0.1-0.2	Fill: gravelly silty sand	LPQL	LPQL	4	80	11	LPQL	4	81	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH101	1.0-1.2	Fill sandy silty clay	LPQL	LPQL	7	19	28	LPQL	1	12	1.7	0.1	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH102	0.1-0.3	Fill: gravelly silty sand	5	LPQL	10	28	44	LPQL	6	50	1.6	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH102	0.9-1.0	Fill: gravelly silty sand	13	LPQL	8	70	**210**	0.1	4	120	16	**1.5**	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH103	0.05-0.2	Fill : silty clay	LPQL	LPQL	69	38	8	LPQL	**74**	49	0.59	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH103	1.1-1.2	Shale	7	LPQL	6	17	5	LPQL	LPQL	LPQL	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH104	0.4-0.5	Fill : silty clay	29	LPQL	17	59	**160**	0.4	11	150	**460**	**29**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	50	1700	1000	2750	LPQL	LPQL	LPQL	LPQL	Not Detected
BH104	1.0-1.3	silty clay	18	LPQL	18	36	77	0.2	11	82	70	**5.4**	NA	NA	NA	NA	NA	LPQL	LPQL	290	270	560	LPQL	LPQL	LPQL	LPQL	NA
BH105	0.05-0.2	Fill: gravelly silty clay	LPQL	LPQL	64	38	4	LPQL	**75**	40	0.37	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	100	100	LPQL	LPQL	LPQL	LPQL	Not Detected
BH105	2.0-2.7	Silty Clay	5	LPQL	26	3	36	LPQL	3	15	0.85	0.09	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH106	0.05-0.2	Fill: gravelly silty clay	9	LPQL	32	25	48	0.1	26	58	16	**1.7**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH106	0.4-0.5	Silty Clay	8	LPQL	33	5	26	LPQL	9	20	1.9	0.2	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
Total Number of samples			12	12	12	12	12	12	12	12	12	12	6	6	6	6	6	12	12	12	12	12	12	12	12	12	6
Maximum Value			29	0	69	80	210	0.4	75	150	460	29	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	50	1700	1000	2750	LPQL	LPQL	LPQL	LPQL	NC

Explanation:

[1] - NSW EPA Waste Classification Guidelines (2014)

[2] - Assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion

[3] - Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde

Concentration above the CT1 — **VALUE**
Concentration above SCC1 — **VALUE**
Concentration above the SCC2 — **VALUE**

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
PID: Photoionisation Detector
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
NA: Not Analysed
NC: Not Calculated
NSL: No Set Limit
SAC: Site Assessment Criteria
TRH: Total Recoverable Hydrocarbons
CT: Contaminant Threshold
SCC: Specific Contaminant Concentration
HILs: Health Investigation Levels
NEPM: National Environmental Protection Measure
BTEX: Monocyclic Aromatic Hydrocarbons

TABLE D
SOIL LABORATORY TCLP RESULTS
All data in mg/L unless stated otherwise

			Arsenic	Cadmium	Chromium	Lead	Mercury	Nickel	B(a)P
PQL - Envirolab Services			0.05	0.01	0.01	0.03	0.0005	0.02	0.001
TCLP1 - General Solid Waste [1]			5	1	5	5	0.2	2	0.04
TCLP2 - Restricted Solid Waste [1]			20	4	20	20	0.8	8	0.16
TCLP3 - Hazardous Waste [1]			>20	>4	>20	>20	>0.8	>8	>0.16
Sample Reference	**Sample Depth**	**Sample Description**							
BH102	0.9-1.0	Fill: gravelly silty sand	NA	NA	NA	0.42	NA	NA	LPQL
BH103	0.05-0.2	Fill : silty clay	NA	NA	NA	NA	NA	0.06	NA
BH104	0.4-0.5	Fill : silty clay	NA	NA	NA	0.03	NA	NA	LPQL
BH104	1.0-1.3	silty clay	NA	NA	NA	NA	NA	NA	LPQL
BH105	0.05-0.2	Fill: gravelly silty clay	NA	NA	NA	NA	NA	0.08	NA
BH106	0.05-0.2	Fill: gravelly silty clay	NA	NA	NA	NA	NA	NA	LPQL
Total Number of samples			0	0	0	2	0	2	4
Maximum Value			NC	NC	NC	0.42	NC	0.08	LPQL

Explanation:

1 - NSW EPA Waste Classification Guidelines (2014)

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**

Abbreviations:

PQL: Practical Quantitation Limit

LPQL: Less than PQL

B(a)P: Benzo(a)pyrene

NC: Not Calculated

NA: Not Analysed

TCLP: Toxicity Characteristics Leaching Procedure

TABLE E
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 = BH 104 (0.4-0.5m)	Arsenic	4	29	15	22.0	64
Dup Ref = DUP B1	Cadmium	0.4	LPQL	LPQL	NC	NC
	Chromium	1	17	17	17.0	0
Envirolab Report: 144118	Copper	1	59	51	55.0	15
	Lead	1	160	94	127.0	52
	Mercury	0.1	0.4	0.3	0.4	29
	Nickel	1	11	8	9.5	32
	Zinc	1	150	83	116.5	58
	Naphthalene	0.1	12	2.9	7.5	122
	Acenaphthylene	0.1	0.8	0.4	0.6	67
	Acenaphthene	0.1	12	3	7.5	120
	Fluorene	0.1	11	3.1	7.1	112
	Phenanthrene	0.1	85	21	53.0	121
	Anthracene	0.1	21	6	13.5	111
	Fluoranthene	0.1	76	21	48.5	113
	Pyrene	0.1	73	20	46.5	114
	Benzo(a)anthracene	0.1	26	8.9	17.5	98
	Chrysene	0.1	31	11	21.0	95
	Benzo(b,j+k)fluoranthene	0.2	45	14	29.5	105
	Benzo(a)pyrene	0.05	29	11	20.0	90
	Indeno(123-cd)pyrene	0.1	16	7.1	11.6	77
	Dibenzo(ah)anthracene	0.1	3.6	1.1	2.4	106
	Benzo(ghi)perylene	0.1	16	7.4	11.7	74
	Benzo(a)pyrene TEQ	0.5	41	15	28.0	93
	TRH C_6-C_{10} (F1)	25	LPQL	LPQL	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	140	LPQL	82.5	139
	TRH >C_{16}-C_{34} (F3)	100	2400	1000	1700.0	82
	TRH >C_{34}-C_{40} (F4)	100	580	390	485.0	39
	Benzene	0.5	LPQL	LPQL	NC	NC
	Toluene	0.5	LPQL	LPQL	NC	NC
	Ethylbenzene	1	LPQL	LPQL	NC	NC
	m+p-xylene	2	LPQL	LPQL	NC	NC
	o-xylene	1	LPQL	LPQL	NC	NC

Explanation:

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

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

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

RPD Results Above the Acceptance Criteria VALUE

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PCBs: Polychlorinated Biphenyls
TRH: Total Recoverable Hydrocarbons

TABLE F

SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab Perth PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH101 (1.0-1.1m)	Arsenic	4	4	LPQL	3	2.5	40
Dup Ref = DUP A1	Cadmium	0.4	0.4	LPQL	LPQL	NC	NC
	Chromium	1	1	7	7	7.0	0
Envirolab Report: 144118	Copper	1	1	19	23	21.0	19
Envirolab Perth Report: 178997	Lead	1	1	28	16	22.0	55
	Mercury	0.1	0.1	LPQL	LPQL	NC	NC
	Nickel	1	1	1	LPQL	0.8	67
	Zinc	1	1	12	7	9.5	53
	Naphthalene	0.1	0.1	LPQL	LPQL	NC	NC
	Acenaphthylene	0.1	0.1	LPQL	LPQL	NC	NC
	Acenaphthene	0.1	0.1	LPQL	LPQL	NC	NC
	Fluorene	0.1	0.1	LPQL	LPQL	NC	NC
	Phenanthrene	0.1	0.1	0.2	0.4	0.3	67
	Anthracene	0.1	0.1	LPQL	0.1	0.1	67
	Fluoranthene	0.1	0.1	0.3	0.8	0.6	91
	Pyrene	0.1	0.1	0.3	0.8	0.6	91
	Benzo(a)anthracene	0.1	0.1	0.1	0.4	0.3	120
	Chrysene	0.1	0.1	0.1	0.3	0.2	100
	Benzo(b,j+k)fluoranthene	0.2	0.2	0.2	0.6	0.4	100
	Benzo(a)pyrene	0.05	0.05	0.1	0.44	0.3	126
	Indeno(123-cd)pyrene	0.1	0.1	0.1	0.2	0.2	67
	Dibenzo(ah)anthracene	0.1	0.1	LPQL	LPQL	NC	NC
	Benzo(ghi)perylene	0.1	0.1	0.1	0.2	0.2	67
	Benzo(a)pyrene TEQ	0.5	0.5	LPQL	0.6	0.4	82
	TRH C6-C10 (F1)	25	25	LPQL	LPQL	NC	NC
	TRH >C10-C16 (F2)	50	50	LPQL	LPQL	NC	NC
	TRH >C16-C34 (F3)	100	100	LPQL	LPQL	NC	NC
	TRH >C34-C40 (F4)	100	100	LPQL	LPQL	NC	NC
	Benzene	0.5	0.5	LPQL	LPQL	NC	NC
	Toluene	0.5	0.5	LPQL	LPQL	NC	NC
	Ethylbenzene	1	1	LPQL	LPQL	NC	NC
	m+p-xylene	2	2	LPQL	LPQL	NC	NC
	o-xylene	1	1	LPQL	LPQL	NC	NC

Explanation:

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

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

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

RPD Results Above the Acceptance Criteria VALUE

Abbreviations:

PQL: Practical Quantitation Limit

LPQL: Less than PQL

NA: Not Analysed

NC: Not Calculated

OCP: Organochlorine Pesticides

OPP: Organophosphorus Pesticides

PCBs: Polychlorinated Biphenyls

TRH: Total Recoverable Hydrocarbons

TABLE G
SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TBA1[S] 29/03/2016 144118 mg/kg
	mg/kg	µg/L	
Benzene	1	1	LPQL
Toluene	1	1	LPQL
Ethylbenzene	1	1	LPQL
m+p-xylene	2	2	LPQL
o-xylene	1	1	LPQL

Explanation:

[W] Sample type (water)

[S] Sample type (sand)

BTEX concentrations in trip spikes are presented as % recovery

Values above PQLs/Acceptance criteria **VALUE**

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated
TB: Trip Blank
TS: Trip Spike
RS: Rinsate Sample
TRH: Total Recoverable Hydrocarbons

Appendix A: Borehole Logs

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101
1 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~28.2 m

Date: 29/3/16 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						28				FILL: Gravelly silty sand, fine to medium grained, grey brown, fine to medium grained igneous gravel.	M			GRASS COVER
									-	CONCRETE: 200mm.t	-	-		
							1			FILL: Sandy silty clay, medium to high plasticity, grey, trace of fine to medium grained igneous gravel.	MC<PL	-		
						27			CL-CH	SILTY CLAY: medium to high plasticity, grey brown, trace of fine grained sand.	MC<PL	(VSt)		RESIDUAL
					N > 21 1,21/ 110mm REFUSAL		2		-	SHALE: grey, with light grey laminae and clay bands.	XW	EL		BANDED OF LOW 'TC' BIT RESISTANCE
						26					DW	VL		LOW RESISTANCE
							3				XW - DW	EL - VL		VERY LOW RESISTANCE WITH LOW BANDS
						25								
							4							
						24								
							5							
ON COMPLETION OF AUGERING						23								
							6							
						22								

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Borehole No. 101
2 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED MULTI STOREY CAR PARK
Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~28.2 m
Date: 29/3/16 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
				■		21				SHALE: grey, with light grey laminae and clay bands.	XW - DW / DW	EL - VL / L - M		LOW RESISTANCE WITH MODERATE BANDS
						20	8			REFER TO CORED BOREHOLE LOG				
						19	9							
						18	10							
						17	11							
						16	12							
						15	13							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101 3 / 3

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED MULTI STOREY CAR PARK
Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Core Size:** NMLC **R.L. Surface:** ~28.2 m
Date: 29/3/16 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK305 **Bearing:** N/A **Logged/Checked By:** M.S./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL 0.03 / VL 0.1 / L 0.3 / M 1 / H 3 / VH 10 / EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		21			START CORING AT 7.84m					
100% RETURN			8		CORE LOSS 0.20m					
		20			SHALE: dark grey.	FR	M - H			(8.04m) CS, 0°, 50 mm.t (8.16m) J, 90°, P, S
		19	9							(9.00m) XWS, 0°, 5 mm.t (9.30m) J, 90°, P, S
		18	10							(9.86m) J, 55°, P, S (10.37m) XWS, 0°, 40 mm.t
		17	11		END OF BOREHOLE AT 10.82 m					
		16	12							
		15	13							

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Borehole No.
102
1 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~29.3 m

Date: 29/3/16 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						29				FILL: Gravelly silty clay, medium to high plasticity, grey, fine grained igneous gravel.	MC>PL			GRASS COVER APPEARS MODERATELY COMPACTED
					N = 16 7,6,10						MC<PL		400 300 450	
						28	1		CL-CH	SILTY CLAY: medium to high plasticity, grey brown.	MC<PL	(VSt - H)		RESIDUAL
					N = 30 6,10,20	27	2			SHALE: grey, with light grey laminate and clay bands.	XW	EL		
											DW	EL - VL		VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
						26	3							
						25	4							
						24	5							
						23	6							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
102
2 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~29.3 m

Date: 29/3/16 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						22				SHALE: grey, with light grey laminate and clay bands.	DW	EL - VL		VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
							8					VL - L		LOW RESISTANCE WITH MODERATE BANDS
						21								
										REFER TO CORED BOREHOLE LOG				
						20	9							
						19	10							
						18	11							
						17	12							
						16	13							

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Borehole No.
102
3 / 3

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Core Size:** NMLC **R.L. Surface:** ~29.3 m

Date: 29/3/16 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK305 **Bearing:** N/A **Logged/Checked By:** M.S./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		22								
			8							
		21			START CORING AT 8.52m					
100% RETURN					SILTY CLAY: high plasticity, dark grey.	RS	(H)			
					SHALE: dark grey.	XW	EL			
						DW	VL - L			(9.06m) J, 50°, Un, S (9.28m) J, 85°, P, S (9.34m) CS, 0°, 5 mm.t (9.44m) CS, 0°, 10 mm.t (9.50m) CS, 0°, 10 mm.t (9.58m) CS, 0°, 10 mm.t (9.60m) CS, 0°, 5 mm.t (9.70m) CS, 0°, 20 mm.t (9.85m) XWS, 0°, 20 mm.t (9.95m) J, 25°, P, S (10.00m) XWS, 0°, 40 mm.t (10.20m) XWS, 0°, 20 mm.t (10.28m) XWS, 0°, 50 mm.t (10.60m) J, 75°, P, S (10.76m) XWS, 0°, 60 mm.t (10.80m) FRAGMENTED ZONE 200mm.t
		20	9							
		19	10							
			11		CORE LOSS 0.20m					
		18			SHALE: dark grey.	SW	L			(11.40m) J, 90°, P, S (11.53m) J, 85°, P, S
						FR	M			
		17	12							
					END OF BOREHOLE AT 12.52 m					
		16	13							

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Borehole No.
103
1 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~29.4 m

Date: 30/3/16 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						29	0			ASPHALTIC CONCRETE: 40mm.t:	MC>PL	-		APPEARS MODERATELY COMPACTED
					N > 2 3,2/ 10mm REFUSAL					FILL: Silty Clay, medium to high plasticity, brown grey, with fine medium grained igneous gravel.			240 230 280	
							1			FILL: Gravel, coarse gained, sandstone, light brown.				
						28			-	SHALE: grey, with light grey laminate.	DW	VL		VERY LOW 'TC' BIT RESISTANCE
							2							
						27								
							3					VL - L		VERY LOW TO LOW RESISTANCE
						26								
							4							
						25								
							5							
						24								
							6							
						23								

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Borehole No. 103
2 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED MULTI STOREY CAR PARK
Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~29.4 m
Date: 30/3/16 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
ON COMPLETION OF AUGERING						22	8		-	SHALE: grey, with light grey laminate. *(continued)*	DW	VL - L		VERY LOW TO LOW RESISTANCE
						21	9					L		LOW RESISTANCE
						20	10					VL		VERY LOW RESISTANCE
						19						L		LOW RESISTANCE
						18	11			REFER TO CORED BOREHOLE LOG				
						17	12							
						16	13							

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Borehole No. 103
3 / 3

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Core Size:** NMLC **R.L. Surface:** ~29.4 m

Date: 30/3/16 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** M.S./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL 0.03 / VL 0.1 / L 0.3 / M 1 / H 3 / VH 10 / EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
ON COMPLETION OF AUGERING		19			START CORING AT 10.93m					
100% RETURN		18	11		CORE LOSS 0.10m SHALE:: dark grey.	DW FR	VL L M			(11.35m) FRAGMENTED ZONE 200mm.t (11.57m) J, 30°, P, S (11.67m) Cr, 0°, 80 mm.t (12.15m) J, 70°, P, S (13.60m) J, 85°, P, S
		17	12							
		16	13							
		15	14		END OF BOREHOLE AT 13.73 m					
		14	15							
		13	16							

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Borehole No.
104
1 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~29.6 m

Date: 30/3/16 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										ASPHALTIC CONCRETE:: 40mm.t				
										FILL: Silty clay, medium to high plasticity, with fine to medium grained, igneous gravel, medium grained sandstone gravel and ash.	MC>PL			
					N = 7 7,3,4	29			CL-CH	SILTY CLAY: medium to high plasticity, light grey mottled yellow brown, trace of fine grained sand.	MC~PL	VSt	300 300 340	RESIDUAL
						28	1			SHALE: grey, interbedded with yellow brown, fine grained sandstone.	DW	L - M		LOW 'TC' BIT RESISTANCE
						27	2							
						26	3			SHALE: grey, with light grey laminate.		VL - L		VERY LOW TO LOW RESISTANCE
						25	4							
						24	5							
						23	6							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
104
2 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~29.6 m

Date: 30/3/16 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
ON COMPLETION OF AUGERING						22	8			SHALE: grey, with light grey laminate.	DW	VL - L		VERY LOW TO LOW RESISTANCE
						21	9							
						20	10					L		LOW RESISTANCE
						19	11							
						18	12			REFER TO CORED BOREHOLE LOG				
						17	13							
						16								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 104 3 / 3

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED MULTI STOREY CAR PARK
Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Core Size:** NMLC **R.L. Surface:** ~29.6 m
Date: 30/3/16 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** M.S./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL 0.03 / VL 0.1 / L 0.3 / M 1 / H 3 / VH 10 / EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		19	11		START CORING AT 11.13m					
100% RETURN		18 17 16	12 13 14		SHALE: grey, with light grey laminate.	FR	M - H			(11.24m) J, 45°, P, S (12.13m) J, 60°, P, S (12.20m) J, 45°, P, S (13.10m) Be, 0°, P, S (13.12m) XWS, 0°, 60 mm.t (13.42m) XWS, 0°, 40 mm.t
		15 14 13	15 16 17		END OF BOREHOLE AT 14.05 m					

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 105
1 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~30.0 m

Date: 31/3/16 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										ASPHALTIC CONCRETE: 40mm.t				
										FILL: Gravelly Silty Clay, medium to high plasticity, fine coarse grained, igneous gravel, trace of fine grained sand and slag.	MC<PL	-		
					N = 13 5,6,7								500 550 >600	APPEARS MODERATELY COMPACTED
						29	1							
					N = 21 0,10,11				CL-CH	SILTY CLAY: medium to high plasticity, light grey mottled red brown, trace of fine grained ironstone gravel.	MC<PL	H	570 >600 >600	RESIDUAL
						28	2							
					N = 17 5,6,11	27	3						570 >600 >600	
						26	4			SHALE: light grey, with clay and iron indurated bands.	XW	EL		
											XW - DW	EL - VL		VERY LOW 'TC' BIT RESISTANCE
						25	5							
						24	6							

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Borehole No. 105
2 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~30.0 m

Date: 31/3/16 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
▼ ON COMPLETION OF AUGERING										SHALE: light grey, with clay and iron indurated bands.	XW - DW	EL - VL		VERY LOW RESISTANCE
						22	8			SHALE: grey, with light grey laminate.	DW	VL - L		VERY LOW TO LOW RESISTANCE
						21	9							
						20	10							
						19	11							
						18	12							
										REFER TO CORED BOREHOLE LOG				
						17	13							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 105 3 / 3

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED MULTI STOREY CAR PARK
Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Core Size:** NMLC **R.L. Surface:** ~30.0 m
Date: 31/3/16 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** M.S./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL 0.03 / VL 0.1 / L 0.3 / M 1 / H 3 / VH 10 / EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		18	12		START CORING AT 12.06m					
100% RETURN					CORE LOSS 0.34m					
					SHALE: dark grey.	DW	L			(12.42m) CS, 0°, 20 mm.t (12.47m) CS, 0°, 5 mm.t (12.50m) CS, 0°, 5 mm.t (12.52m) XWS, 0°, 20 mm.t (12.57m) Cr, 0°, 20 mm.t
		17	13		SHALE: dark grey, with light grey laminate.	SW	M - H			(13.54m) J, 65°, P, S
		16	14							(13.90m) J, 80°, P, S (14.44m) XWS, 0°, 130 mm.t (14.65m) J, 90°, P, S
		15	15		END OF BOREHOLE AT 14.90 m					
		14	16							
		13	17							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 106
1 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE

Project: PROPOSED MULTI STOREY CAR PARK

Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~30.1 m

Date: 31/3/16 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						30				ASPHALTIC CONCRETE: 40mm.t	MC<PL			
										FILL: Gravelly silty clay, medium plasticity, brown, fine to medium grained igneous and sandstone gravel, trace of fine grained sand and slag.				
									CH		MC>PL	VSt		RESIDUAL
					N = 4 2,2,2					SILTY CLAY: high plasticity, light grey mottled red brown and yellow brown, trace of fine grained ironstone gravel and fine grained sand.			250 300 270	
						29	1							
					N = 9 3,3,6						MC~PL	VSt - H	380 470 370	
						28	2							
									-	SHALE: light grey, with clay and iron indurated bands.	XW - DW	EL - VL		VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
						27	3							
						26	4							
						25	5			as above, but dark grey, with light grey laminae.				
						24	6				DW	VL - L		LOW RESISTANCE WITH VERY LOW BANDS

ON COMPLETION OF AUGERING

JK_LIB_CURRENT - V7.3.GLB Log J & K AUGERHOLE - MASTER 28939SB2 CAMPERDOWN.GPJ <<DrawingFile>> 18/04/2016 15:48 Produced by gINT Professional. Developed by Datgel

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 106
2 / 3

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED MULTI STOREY CAR PARK
Location: RPA, CORNER OF LUCAS STREET AND CHURCH STREET, CAMPERDOWN, NSW

Job No.: 28939SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~30.1 m
Date: 31/3/16 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** M.S./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						23			-	SHALE: dark grey, with light grey laminae and clay bands.	DW	VL - L		VERY LOW RESISTANCE WITH LOW BANDS
												L		LOW RESISTANCE WITH VERY LOW BANDS
						22	8							
▶						21	9							
						20	10							
						19	11					L - M		LOW TO MODERATE RESISTANCE
						18	12			REFER TO CORED BOREHOLE LOG				
						17	13							

JK_LIB_CURRENT - V7.3.GLB Log J & K AUGERHOLE - MASTER 28939SB2 CAMPERDOWN.GPJ <<DrawingFile>> 18/04/2016 15:48 Produced by gINT Professional. Developed by Datgel

Appendix B: Laboratory Reports & COC Documents

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 144118

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Mitchell Delaney

Sample log in details:

Your Reference:	**E28939KB, Camperdown**		
No. of samples:	24 soil		
Date samples received / completed instructions received	01/04/2016	/	01/04/2016

This report replaces the previous R00 report due to changes in sample depth

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:	8/04/16	/	28/04/16
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:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	144118-1	144118-2	144118-4	144118-6	144118-8
Your Reference	---------- -	BH101	BH101	BH102	BH102	BH103
Depth	----------	0.1-0.2	1.0-1.1	0.1-0.3	0.9-1.0	0.05-0.2
Date Sampled		29/03/2016	29/03/2016	29/03/2016	29/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	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
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	76	83	82	78	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	144118-10	144118-12	144118-13	144118-15	144118-18
Your Reference	---------- -	BH103	BH104	BH104	BH105	BH105
Depth	----------	1.1-1.2	0.4-0.5	1.0-1.3	0.05-0.2	2.0-2.7
Date Sampled		30/03/2016	30/03/2016	30/03/2016	31/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	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
naphthalene	mg/kg	<1	10	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	84	91	88	85	86

vTRH(C6-C10)/BTEXN in Soil					
Our Reference:	UNITS	144118-19	144118-20	144118-22	144118-23
Your Reference	---------- -	BH106	BH106	DUPB1	TBA1
Depth	----------	0.05-0.2	0.4-0.5	-	-
Date Sampled		31/03/2016	31/03/2016	30/03/2016	29/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	[NA]
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	[NA]
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	2	[NA]
Surrogate aaa-Trifluorotoluene	%	93	84	92	94

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	144118-1	144118-2	144118-4	144118-6	144118-8
Your Reference	---------- -	BH101	BH101	BH102	BH102	BH103
Depth	----------	0.1-0.2	1.0-1.1	0.1-0.3	0.9-1.0	0.05-0.2
Date Sampled		29/03/2016	29/03/2016	29/03/2016	29/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	05/04/2016	05/04/2016	05/04/2016	05/04/2016	05/04/2016
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
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	120
Surrogate o-Terphenyl	%	90	94	92	89	91

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	144118-10	144118-12	144118-13	144118-15	144118-18
Your Reference	---------- -	BH103	BH104	BH104	BH105	BH105
Depth	----------	1.1-1.2	0.4-0.5	1.0-1.3	0.05-0.2	2.0-2.7
Date Sampled		30/03/2016	30/03/2016	30/03/2016	31/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	05/04/2016	05/04/2016	05/04/2016	05/04/2016	05/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	1,700	290	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	1,000	270	100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	150	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	140	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	2,400	490	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	580	240	140	<100
Surrogate o-Terphenyl	%	89	72	96	91	89

svTRH (C10-C40) in Soil				
Our Reference:	UNITS	144118-19	144118-20	144118-22
Your Reference	---------- -	BH106	BH106	DUPB1
Depth	----------	0.05-0.2	0.4-0.5	-
Date Sampled		31/03/2016	31/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	05/04/2016	05/04/2016	05/04/2016
$TRHC_{10}$ - C_{14}	mg/kg	<50	<50	<50
$TRHC_{15}$ - C_{28}	mg/kg	<100	<100	600
$TRHC_{29}$ - C_{36}	mg/kg	<100	<100	540
$TRH>C_{10}$-C_{16}	mg/kg	<50	<50	<50
$TRH>C_{10}$ - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
$TRH>C_{16}$-C_{34}	mg/kg	120	<100	1,000
$TRH>C_{34}$-C_{40}	mg/kg	<100	<100	390
Surrogate o-Terphenyl	%	90	90	106

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	144118-1 BH101 0.1-0.2 29/03/2016 SOIL	144118-2 BH101 1.0-1.1 29/03/2016 SOIL	144118-4 BH102 0.1-0.3 29/03/2016 SOIL	144118-6 BH102 0.9-1.0 29/03/2016 SOIL	144118-8 BH103 0.05-0.2 30/03/2016 SOIL
Date extracted	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	0.1	0.2
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.2	<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	0.2	0.2	1.4	0.4
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Fluoranthene	mg/kg	<0.1	0.3	0.3	2.7	<0.1
Pyrene	mg/kg	<0.1	0.3	0.3	2.7	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.1	0.1	1.2	<0.1
Chrysene	mg/kg	<0.1	0.1	0.2	1.6	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.2	0.2	2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.1	0.1	1.5	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.1	<0.1	0.9	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.3	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1	0.1	1.0	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	2.2	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	2.2	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	2.2	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	1.7	1.6	16	0.59
Surrogate p-Terphenyl-d14	%	83	90	85	85	86

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	144118-10 BH103 1.1-1.2 30/03/2016 SOIL	144118-12 BH104 0.4-0.5 30/03/2016 SOIL	144118-13 BH104 1.0-1.3 30/03/2016 SOIL	144118-15 BH105 0.05-0.2 31/03/2016 SOIL	144118-18 BH105 2.0-2.7 31/03/2016 SOIL
Date extracted	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Naphthalene	mg/kg	<0.1	12	1.2	0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.8	0.2	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	12	1.4	<0.1	<0.1
Fluorene	mg/kg	<0.1	11	1.5	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	85	11	0.2	0.2
Anthracene	mg/kg	<0.1	21	3.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	76	11	<0.1	0.2
Pyrene	mg/kg	<0.1	73	11	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	26	4.6	<0.1	<0.1
Chrysene	mg/kg	<0.1	31	5.6	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	45	6.0	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	29	5.4	<0.05	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	16	3.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	3.6	0.8	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	16	3.3	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	41	7.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	41	7.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	41	7.7	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	460	70	0.37	0.85
Surrogate p-Terphenyl-d14	%	90	86	84	89	86

PAHs in Soil				
Our Reference:	UNITS	144118-19	144118-20	144118-22
Your Reference	----------	BH106	BH106	DUPB1
	-			
Depth	----------	0.05-0.2	0.4-0.5	-
Date Sampled		31/03/2016	31/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	4/04/2016	4/04/2016	4/04/2016
Naphthalene	mg/kg	0.1	<0.1	2.9
Acenaphthylene	mg/kg	0.1	<0.1	0.4
Acenaphthene	mg/kg	<0.1	<0.1	3.0
Fluorene	mg/kg	<0.1	<0.1	3.1
Phenanthrene	mg/kg	1.3	0.1	21
Anthracene	mg/kg	0.4	<0.1	6.0
Fluoranthene	mg/kg	2.5	0.3	21
Pyrene	mg/kg	2.6	0.3	20
Benzo(a)anthracene	mg/kg	1.3	0.1	8.9
Chrysene	mg/kg	1.5	0.2	11
Benzo(b,j+k)fluoranthene	mg/kg	2	0.4	14
Benzo(a)pyrene	mg/kg	1.7	0.2	11
Indeno(1,2,3-c,d)pyrene	mg/kg	1.0	0.1	7.1
Dibenzo(a,h)anthracene	mg/kg	0.2	<0.1	1.1
Benzo(g,h,i)perylene	mg/kg	1.1	0.1	7.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.3	<0.5	15
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.3	<0.5	15
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.3	<0.5	15
Total Positive PAHs	mg/kg	16	1.9	140
Surrogate p-Terphenyl-d14	%	88	90	83

Organochlorine Pesticides in soil						
Our Reference:	UNITS	144118-1	144118-4	144118-8	144118-12	144118-15
Your Reference	----------	BH101	BH102	BH103	BH104	BH105
Depth	- ----------	0.1-0.2	0.1-0.3	0.05-0.2	0.4-0.5	0.05-0.2
Date Sampled		29/03/2016	29/03/2016	30/03/2016	30/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/05/2016	04/05/2016	04/05/2016	04/05/2016	04/05/2016
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 TCMX	%	100	98	97	92	100

Organochlorine Pesticides in soil		
Our Reference:	UNITS	144118-19
Your Reference	----------	BH106
	-	
Depth	----------	0.05-0.2
Date Sampled		31/03/2016
Type of sample		SOIL
Date extracted	-	04/04/2016
Date analysed	-	04/05/2016
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Surrogate TCMX	%	98

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	144118-1 BH101 0.1-0.2 29/03/2016 SOIL	144118-4 BH102 0.1-0.3 29/03/2016 SOIL	144118-8 BH103 0.05-0.2 30/03/2016 SOIL	144118-12 BH104 0.4-0.5 30/03/2016 SOIL	144118-15 BH105 0.05-0.2 31/03/2016 SOIL
Date extracted	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	05/04/2016	05/04/2016	05/04/2016	05/04/2016	05/04/2016
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	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
Ethion	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
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	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
Surrogate TCMX	%	100	98	97	92	100

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	144118-19 BH106 0.05-0.2 31/03/2016 SOIL
Date extracted	-	04/04/2016
Date analysed	-	05/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Ethion	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Surrogate TCMX	%	98

PCBs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	144118-1 BH101 0.1-0.2 29/03/2016 SOIL	144118-4 BH102 0.1-0.3 29/03/2016 SOIL	144118-8 BH103 0.05-0.2 30/03/2016 SOIL	144118-12 BH104 0.4-0.5 30/03/2016 SOIL	144118-15 BH105 0.05-0.2 31/03/2016 SOIL
Date extracted	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	05/04/2016	05/04/2016	05/04/2016	05/04/2016	05/04/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	100	98	97	92	100

PCBs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	144118-19 BH106 0.05-0.2 31/03/2016 SOIL
Date extracted	-	04/04/2016
Date analysed	-	05/04/2016
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Surrogate TCLMX	%	98

Acid Extractable metals in soil						
Our Reference:	UNITS	144118-1	144118-2	144118-4	144118-6	144118-8
Your Reference	---------- -	BH101	BH101	BH102	BH102	BH103
Depth	----------	0.1-0.2	1.0-1.1	0.1-0.3	0.9-1.0	0.05-0.2
Date Sampled		29/03/2016	29/03/2016	29/03/2016	29/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Arsenic	mg/kg	<4	<4	5	13	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	4	7	10	8	69
Copper	mg/kg	80	19	28	70	38
Lead	mg/kg	11	28	44	210	8
Mercury	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Nickel	mg/kg	4	1	6	4	74
Zinc	mg/kg	81	12	50	120	49

Acid Extractable metals in soil						
Our Reference:	UNITS	144118-10	144118-12	144118-13	144118-15	144118-18
Your Reference	---------- -	BH103	BH104	BH104	BH105	BH105
Depth	----------	1.1-1.2	0.4-0.5	1.0-1.3	0.05-0.2	2.0-2.7
Date Sampled		30/03/2016	30/03/2016	30/03/2016	31/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/04/2016	04/04/2016	04/04/2016	04/04/2016	04/04/2016
Arsenic	mg/kg	7	29	18	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	6	17	18	64	26
Copper	mg/kg	17	59	36	38	3
Lead	mg/kg	5	160	77	4	36
Mercury	mg/kg	<0.1	0.4	0.2	<0.1	<0.1
Nickel	mg/kg	<1	11	11	75	3
Zinc	mg/kg	<1	150	82	40	15

Acid Extractable metals in soil				
Our Reference:	UNITS	144118-19	144118-20	144118-22
Your Reference	----------	BH106	BH106	DUPB1
	-			
Depth	----------	0.05-0.2	0.4-0.5	-
Date Sampled		31/03/2016	31/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	04/04/2016	04/04/2016	04/04/2016
Date analysed	-	04/04/2016	04/04/2016	04/04/2016
Arsenic	mg/kg	9	8	15
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	32	33	17
Copper	mg/kg	25	5	51
Lead	mg/kg	48	26	94
Mercury	mg/kg	0.1	<0.1	0.3
Nickel	mg/kg	26	9	8
Zinc	mg/kg	58	20	83

Moisture						
Our Reference:	UNITS	144118-1	144118-2	144118-4	144118-6	144118-8
Your Reference	---------- -	BH101	BH101	BH102	BH102	BH103
Depth	----------	0.1-0.2	1.0-1.1	0.1-0.3	0.9-1.0	0.05-0.2
Date Sampled		29/03/2016	29/03/2016	29/03/2016	29/03/2016	30/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	5/04/2016	5/04/2016	5/04/2016	5/04/2016	5/04/2016
Moisture	%	5.4	14	17	13	5.3

Moisture						
Our Reference:	UNITS	144118-10	144118-12	144118-13	144118-15	144118-18
Your Reference	---------- -	BH103	BH104	BH104	BH105	BH105
Depth	----------	1.1-1.2	0.4-0.5	1.0-1.3	0.05-0.2	2.0-2.7
Date Sampled		30/03/2016	30/03/2016	30/03/2016	31/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	5/04/2016	5/04/2016	5/04/2016	5/04/2016	5/04/2016
Moisture	%	11	9.2	14	5.8	17

Moisture					
Our Reference:	UNITS	144118-19	144118-20	144118-22	144118-23
Your Reference	---------- -	BH106	BH106	DUPB1	TBA1
Depth	----------	0.05-0.2	0.4-0.5	-	-
Date Sampled		31/03/2016	31/03/2016	30/03/2016	29/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	4/04/2016	4/04/2016	4/04/2016	4/04/2016
Date analysed	-	5/04/2016	5/04/2016	5/04/2016	5/04/2016
Moisture	%	7.7	20	13	0.2

Asbestos ID - soils						
Our Reference:	UNITS	144118-1	144118-4	144118-8	144118-12	144118-15
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.3	0.05-0.2	0.4-0.5	0.05-0.2
Date Sampled		29/03/2016	29/03/2016	30/03/2016	30/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	5/04/2016	5/04/2016	5/04/2016	5/04/2016	5/04/2016
Sample mass tested	g	Approx. 40g	Approx. 25g	Approx. 55g	Approx. 50g	Approx. 35g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference:	UNITS	144118-19
Your Reference	---------- -	BH106
Depth	----------	0.05-0.2
Date Sampled		31/03/2016
Type of sample		SOIL
Date analysed	-	5/04/2016
Sample mass tested	g	Approx. 55g
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

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. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
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+/-5 deg C for a minimum of 12 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(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-5	04/04/2016
Date analysed	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-5	04/04/2016
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	144118-1	<25 || <25	LCS-5	85%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	144118-1	<25 || <25	LCS-5	85%
Benzene	mg/kg	0.2	Org-016	<0.2	144118-1	<0.2 || <0.2	LCS-5	92%
Toluene	mg/kg	0.5	Org-016	<0.5	144118-1	<0.5 || <0.5	LCS-5	80%
Ethylbenzene	mg/kg	1	Org-016	<1	144118-1	<1 || <1	LCS-5	83%
m+p-xylene	mg/kg	2	Org-016	<2	144118-1	<2 || <2	LCS-5	84%
o-Xylene	mg/kg	1	Org-016	<1	144118-1	<1 || <1	LCS-5	80%
naphthalene	mg/kg	1	Org-014	<1	144118-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	82	144118-1	76 || 80 || RPD: 5	LCS-5	77%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			04/04/2016	144118-1	4/04/2016 || 4/04/2016	LCS-5	04/04/2016
Date analysed	-			04/04/2016	144118-1	05/04/2016 || 05/04/2016	LCS-5	04/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	144118-1	<50 || <50	LCS-5	100%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	144118-1	<100 || <100	LCS-5	98%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	144118-1	<100 || 120	LCS-5	77%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	144118-1	<50 || <50	LCS-5	100%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	144118-1	<100 || 110	LCS-5	98%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	144118-1	<100 || <100	LCS-5	77%
Surrogate o-Terphenyl	%		Org-003	91	144118-1	90 || 90 || RPD: 0	LCS-5	79%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			4/04/2016	144118-1	4/04/2016 || 4/04/2016	LCS-5	4/04/2016
Date analysed	-			4/04/2016	144118-1	4/04/2016 || 4/04/2016	LCS-5	4/04/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	LCS-5	101%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	LCS-5	93%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	LCS-5	112%
Anthracene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	LCS-5	103%
Pyrene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	LCS-5	109%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	LCS-5	97%
Benzo(b,j +k)fluoranthene	mg/kg	0.2	Org-012	<0.2	144118-1	<0.2 || <0.2	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	144118-1	<0.05 || <0.05	LCS-5	101%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	96	144118-1	83 || 90 || RPD: 8	LCS-5	90%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-4	04/04/2016
Date analysed	-			05/04/2016	144118-1	04/05/2016 || 04/05/2016	LCS-4	05/04/2016
HCB	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	96%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	87%
Heptachlor	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	84%
delta-BHC	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	82%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	84%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	92%
Dieldrin	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	81%
Endrin	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	87%
pp-DDD	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	94%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	LCS-4	81%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	98	144118-1	100 || 99 || RPD: 1	LCS-4	116%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-4	04/04/2016
Date analysed	-			05/04/2016	144118-1	05/04/2016 || 05/04/2016	LCS-4	05/04/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	91%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	84%
Dimethoate	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	94%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	77%
Malathion	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	101%
Parathion	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	91%
Ronnel	mg/kg	0.1	Org-008	<0.1	144118-1	<0.1 || <0.1	LCS-4	97%
Surrogate TCMX	%		Org-008	98	144118-1	100 || 99 || RPD: 1	LCS-4	96%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-4	04/04/2016
Date analysed	-			05/04/2016	144118-1	05/04/2016 || 05/04/2016	LCS-4	05/04/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	LCS-4	102%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	144118-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	98	144118-1	100 || 99 || RPD: 1	LCS-4	99%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-6	04/04/2016
Date analysed	-			04/04/2016	144118-1	04/04/2016 || 04/04/2016	LCS-6	04/04/2016
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	144118-1	<4 || <4	LCS-6	108%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	144118-1	<0.4 || <0.4	LCS-6	99%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	144118-1	4 || 5 || RPD: 22	LCS-6	105%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	144118-1	80 || 120 || RPD: 40	LCS-6	110%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	144118-1	11 || 13 || RPD: 17	LCS-6	104%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	144118-1	<0.1 || <0.1	LCS-6	95%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	144118-1	4 || 4 || RPD: 0	LCS-6	101%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	144118-1	81 || 91 || RPD: 12	LCS-6	103%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	144118-22	04/04/2016 || 04/04/2016	144118-4	04/04/2016
Date analysed	-	144118-22	04/04/2016 || 04/04/2016	144118-4	04/04/2016
TRHC$_6$ - C$_9$	mg/kg	144118-22	<25 || <25	144118-4	96%
TRHC$_6$ - C$_{10}$	mg/kg	144118-22	<25 || <25	144118-4	96%
Benzene	mg/kg	144118-22	<0.2 || <0.2	144118-4	103%
Toluene	mg/kg	144118-22	<0.5 || <0.5	144118-4	90%
Ethylbenzene	mg/kg	144118-22	<1 || <1	144118-4	95%
m+p-xylene	mg/kg	144118-22	<2 || <2	144118-4	97%
o-Xylene	mg/kg	144118-22	<1 || <1	144118-4	91%
naphthalene	mg/kg	144118-22	2 || 3 || RPD: 40	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	144118-22	92 || 86 || RPD: 7	144118-4	83%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	144118-22	4/04/2016 || 4/04/2016	144118-4	4/04/2016
Date analysed	-	144118-22	05/04/2016 || 05/04/2016	144118-4	05/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	144118-22	<50 || <50	144118-4	97%
TRHC$_{15}$ - C$_{28}$	mg/kg	144118-22	600 || 590 || RPD: 2	144118-4	114%
TRHC$_{29}$ - C$_{36}$	mg/kg	144118-22	540 || 500 || RPD: 8	144118-4	83%
TRH>C$_{10}$-C$_{16}$	mg/kg	144118-22	<50 || <50	144118-4	97%
TRH>C$_{16}$-C$_{34}$	mg/kg	144118-22	1000 || 950 || RPD: 5	144118-4	114%
TRH>C$_{34}$-C$_{40}$	mg/kg	144118-22	390 || 360 || RPD: 8	144118-4	83%
Surrogate o-Terphenyl	%	144118-22	106 || 99 || RPD: 7	144118-4	92%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	144118-22	4/04/2016 || 4/04/2016	144118-4	4/04/2016
Date analysed	-	144118-22	4/04/2016 || 4/04/2016	144118-4	4/04/2016
Naphthalene	mg/kg	144118-22	2.9 || 2.0 || RPD: 37	144118-4	99%
Acenaphthylene	mg/kg	144118-22	0.4 || 0.4 || RPD: 0	[NR]	[NR]
Acenaphthene	mg/kg	144118-22	3.0 || 2.6 || RPD: 14	[NR]	[NR]
Fluorene	mg/kg	144118-22	3.1 || 2.7 || RPD: 14	144118-4	97%
Phenanthrene	mg/kg	144118-22	21 || 20 || RPD: 5	144118-4	128%
Anthracene	mg/kg	144118-22	6.0 || 5.5 || RPD: 9	[NR]	[NR]
Fluoranthene	mg/kg	144118-22	21 || 21 || RPD: 0	144118-4	111%
Pyrene	mg/kg	144118-22	20 || 21 || RPD: 5	144118-4	116%
Benzo(a)anthracene	mg/kg	144118-22	8.9 || 9.3 || RPD: 4	[NR]	[NR]
Chrysene	mg/kg	144118-22	11 || 11 || RPD: 0	144118-4	100%
Benzo(b,j+k)fluoranthene	mg/kg	144118-22	14 || 14 || RPD: 0	[NR]	[NR]
Benzo(a)pyrene	mg/kg	144118-22	11 || 11 || RPD: 0	144118-4	101%
Indeno(1,2,3-c,d)pyrene	mg/kg	144118-22	7.1 || 7.0 || RPD: 1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	144118-22	1.1 || 1.5 || RPD: 31	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	144118-22	7.4 || 7.4 || RPD: 0	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	144118-22	83 || 85 || RPD: 2	144118-4	89%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	144118-4	04/04/2016
Date analysed	-	[NT]	[NT]	144118-4	05/04/2016
HCB	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	[NT]	[NT]	144118-4	91%
gamma-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	[NT]	[NT]	144118-4	90%
Heptachlor	mg/kg	[NT]	[NT]	144118-4	89%
delta-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	[NT]	[NT]	144118-4	90%
Heptachlor Epoxide	mg/kg	[NT]	[NT]	144118-4	87%
gamma-Chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	[NT]	[NT]	144118-4	95%
Dieldrin	mg/kg	[NT]	[NT]	144118-4	89%
Endrin	mg/kg	[NT]	[NT]	144118-4	103%
pp-DDD	mg/kg	[NT]	[NT]	144118-4	96%
Endosulfan II	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	[NT]	[NT]	144118-4	81%
Methoxychlor	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%	[NT]	[NT]	144118-4	91%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	144118-4	04/04/2016
Date analysed	-	[NT]	[NT]	144118-4	05/04/2016
Azinphos-methyl (Guthion)	mg/kg	[NT]	[NT]	[NR]	[NR]
Bromophos-ethyl	mg/kg	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	[NT]	[NT]	144118-4	88%
Chlorpyriphos-methyl	mg/kg	[NT]	[NT]	[NR]	[NR]
Diazinon	mg/kg	[NT]	[NT]	[NR]	[NR]
Dichlorvos	mg/kg	[NT]	[NT]	144118-4	93%
Dimethoate	mg/kg	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	[NT]	[NT]	144118-4	102%
Fenitrothion	mg/kg	[NT]	[NT]	144118-4	86%
Malathion	mg/kg	[NT]	[NT]	144118-4	84%
Parathion	mg/kg	[NT]	[NT]	144118-4	90%
Ronnel	mg/kg	[NT]	[NT]	144118-4	99%
Surrogate TCMX	%	[NT]	[NT]	144118-4	93%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	144118-4	04/04/2016
Date analysed	-	[NT]	[NT]	144118-4	05/04/2016
Aroclor 1016	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1221	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1232	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1242	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1248	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1254	mg/kg	[NT]	[NT]	144118-4	101%
Aroclor 1260	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	144118-4	97%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	144118-22	04/04/2016 || 04/04/2016	144118-4	04/04/2016
Date analysed	-	144118-22	04/04/2016 || 04/04/2016	144118-4	04/04/2016
Arsenic	mg/kg	144118-22	15 || 12 || RPD: 22	144118-4	97%
Cadmium	mg/kg	144118-22	<0.4 || <0.4	144118-4	96%
Chromium	mg/kg	144118-22	17 || 15 || RPD: 12	144118-4	101%
Copper	mg/kg	144118-22	51 || 47 || RPD: 8	144118-4	112%
Lead	mg/kg	144118-22	94 || 87 || RPD: 8	144118-4	104%
Mercury	mg/kg	144118-22	0.3 || 0.3 || RPD: 0	144118-4	83%
Nickel	mg/kg	144118-22	8 || 6 || RPD: 29	144118-4	104%
Zinc	mg/kg	144118-22	83 || 75 || RPD: 10	144118-4	125%

Report Comments:

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.

Note: All samples tested for asbestos were sub-sampled from bags provided by the client.

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
NR: 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 batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

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 Details	
Client	Environmental Investigation Services
Attention	Mitchell Delaney

Sample Login Details	
Your Reference	E28939KB, Camperdown
Envirolab Reference	**144118**
Date Sample Received	01/04/2016
Date Instructions Received	01/04/2016
Date Results Expected to be Reported	**08/04/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	24 soil
Turnaround Time Requested	Standard
Temperature on receipt (°C)	12.0
Cooling Method	Ice Pack
Sampling Date Provided	YES

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

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

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
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Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Organochlorine Pesticides in soil*	*Organophosphorus Pesticides*	*PCBs in Soil*	*Acid Extractable metals in soil*	*Asbestos ID - soils*	*On Hold*
BH101-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH101-1.0-1.2	✓	✓	✓				✓		
BH101-1.8-2.1									✓
BH102-0.1-0.3	✓	✓	✓	✓	✓	✓	✓	✓	
BH102-0.5-0.95									✓
BH102-0.9-1.0	✓	✓	✓				✓		
BH102-2.0-2.2									✓
BH103-0.05-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH103-0.5-0.95									✓
BH103-1.1-1.2	✓	✓	✓				✓		
BH104-0.05-0.2									✓
BH104-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	
BH104-1.0-1.3	✓	✓	✓				✓		
BH104-2.0-2.5									✓
BH105-0.05-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH105-0.4-0.5									✓
BH105-1.0-1.5									✓
BH105-2.0-2.7	✓	✓	✓				✓		
BH106-0.05-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH106-0.4-0.5	✓	✓	✓				✓		
BH106-1.0-1.2									✓
DUPB1	✓	✓	✓				✓		
TBA1	✓								
BH101-1.1-1.2									✓

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD	EIS Job Number: E 28939KB	ENVIRONMENTAL INVESTIGATION SERVICES
12 ASHLEY STREET		REAR OF 115 WICKS ROAD
CHATSWOOD NSW 2067		MACQUARIE PARK, NSW 2113
P: (02) 99106200	Date Results Required: STANDARD	P: 02-9888 5000 F: 02-9888 5001
F: (02) 99106201		Attention: Mitchell Delaney / Vikkel Boggavarapu
Attention: Aileen	Page: 1/1	

Location: Camperdown
Sampler: MS.

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3a	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos			
29/3/16	1	BH101	0-0.1-0.2	G, A	0	Soil				X								
	2	BH101	1.0-1.2				X											
	3	BH101	1.8-2.1															
	4	BH102	0.1-0.3							X								
	5	BH102	0.5-0.95															
	6	BH102	0.9-1.20				X											
29/3/16	7	BH102	2.0-2.2															
30/3/16	8	BH103	0.05-0.2							X								
	9	BH103	0.5-0.95															
	10	BH103	1.1-1.2				X											
	11	BH104	0.05-0.2															
	12	BH104	0.4-0.5							X								
	13	BH104	1.0-1.3				X											
	14	BH104	2.0-2.5															
31/3/16	15	BH105	0.05-0.2							X								
	16	BH105	0.4-0.5															
	17	BH105	1.0-1.5															
	18	BH105	2.0-2.5				X											
	19	BH106	0.05-0.2							X								
	20	BH106	0.4-0.5				X											
	21	BH106	1.0-1.2															
29/3/16	—	DUP1	—	G			X											
29/3/16	22	DUP2	—	G			X											
21-31/3/16	23	TB1	—	G	—	Sand								X				
Extra 29/3/16	24	BH101	1.1-1.2	P.		soil.												

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

ENVIROLAB

Job No: 144118

Date Received: 01042016

Time Received: 1245 12.0°C

Received by: CB

Temp: Cool/Ambient

Cooling: Ice/Icepack

Security: Intact/Broken/None

Please send DUP1 to Enviroslab VIC.

Remarks (comments/detection limits required):	Sample Containers: G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag			
Relinquished By: MD	Date: 1/4/16	Time: 1245.	Received By: ELS. CB.	Date: 01042016

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 144118-A

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Mitchell Delaney

Sample log in details:

Your Reference:	**E28939KB, Camperdown**
No. of samples:	Additional Testing on 6 Soils
Date samples received / completed instructions received	01/04/2016 / 07/04/16

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:	14/04/16 / 12/04/16
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:

Jacinta Hurst
Laboratory Manager

Metals in TCLP USEPA1311						
Our Reference:	UNITS	144118-A-6	144118-A-8	144118-A-12	144118-A-13	144118-A-15
Your Reference	---------- -	BH102	BH103	BH104	BH104	BH105
Depth	----------	0.9-1.0	0.05-0.2	0.4-0.5	1.0-1.3	0.05-0.2
Date Sampled		29/03/2016	30/03/2016	30/03/2016	30/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	08/04/2016	08/04/2016	08/04/2016	08/04/2016	08/04/2016
Date analysed	-	08/04/2016	08/04/2016	08/04/2016	[NA]	08/04/2016
pH of soil for fluid# determ.	pH units	6.7	9.7	8.9	8.9	10.0
pH of soil TCLP (after HCl)	pH units	1.4	1.5	1.4	1.4	1.4
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.9	5.4	4.9	4.9	5.3
Lead in TCLP	mg/L	0.42	[NA]	0.03	[NA]	[NA]
Nickel in TCLP	mg/L	[NA]	0.06	[NA]	[NA]	0.08

Metals in TCLP USEPA1311		
Our Reference:	UNITS	144118-A-19
Your Reference	---------- -	BH106
Depth	----------	0.05-0.2
Date Sampled		31/03/2016
Type of sample		SOIL
Date extracted	-	08/04/2016
pH of soil for fluid# determ.	pH units	9.7
pH of soil TCLP (after HCl)	pH units	1.4
Extraction fluid used	-	1
pH of final Leachate	pH units	5.0

PAHs in TCLP (USEPA 1311)					
Our Reference:	UNITS	144118-A-6	144118-A-12	144118-A-13	144118-A-19
Your Reference	----------	BH102	BH104	BH104	BH106
Depth	----------	0.9-1.0	0.4-0.5	1.0-1.3	0.05-0.2
Date Sampled		29/03/2016	30/03/2016	30/03/2016	31/03/2016
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	08/04/2016	08/04/2016	08/04/2016	08/04/2016
Date analysed	-	08/04/2016	08/04/2016	08/04/2016	08/04/2016
Naphthalene in TCLP	mg/L	<0.001	0.052	0.008	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	0.013	0.003	<0.001
Fluorene in TCLP	mg/L	<0.001	0.015	0.003	<0.001
Phenanthrene in TCLP	mg/L	<0.001	0.023	0.003	<0.001
Anthracene in TCLP	mg/L	<0.001	0.005	0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	0.003	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	0.002	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	0.11	0.018	NIL (+)VE
Surrogate p-Terphenyl-d14	%	107	83	90	95

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			08/04/2016	[NT]	[NT]	LCS-W1	08/04/2016
Date analysed	-			08/04/2016	[NT]	[NT]	LCS-W1	08/04/2016
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	LCS-W1	102%
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	[NT]	[NT]	LCS-W1	105%
QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			08/04/2016	[NT]	[NT]	LCS-W1	08/04/2016
Date analysed	-			08/04/2016	[NT]	[NT]	LCS-W1	08/04/2016
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	80%
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	114%
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	96%
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	85%
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	88%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	83%
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	103%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	102	[NT]	[NT]	LCS-W1	79%

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
NR: 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 batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Aileen Hie

From: Geoff Fletcher <GFletcher@jkgroup.net.au>
Sent: Thursday, 7 April 2016 3:22 PM
To: Aileen Hie
Subject: Results for Registration 144118 E28939KB, Camperdown

Importance: High

Hi Aileen,

Could we please schedule the below additional TCLP testing from the above lab report on a standard turnaround:

6 • BH102, 0.9-1.0m, TCLP lead and B(a)P;
8 • BH103, 0.05-0.2m, TCLP nickel;
12 • BH104, 0.4-0.5m, TCLP lead and PAHs;
13 • BH104, 1.0-1.3m, TCLP B(a)P;
15 • BH105, 0.05-0.2m, TCLP nickel; and
19 • BH106, 0.05-0.2m, TCLP B(a)P.

Envirolab Ref. 144118 A
Due: 14/4/16
std T/A.

Regards,

Geoff Fletcher
Environmental Scientist
GFletcher@jkgroup.net.au
www.jkgroup.net.au

Environmental Investigation Services
CONSULTING ENVIRONMENTAL ENGINEERS AND SCIENTISTS
PO Box 976, North Ryde BC NSW 1670
115 Wicks Rd, Macquarie Park NSW 2113
T: +612 9888 5000 F: +612 9888 5001

16-18 Hayden Court, Myaree, Western Australia 6154
PO Box 4023 Myaree BC, Western Australia 6950
tel: +61 8 9317 2505
email: lab@mpl.com.au
envirolab.com.au
Envirolab Services (WA) Pty Ltd trading as
MPL Laboratories | ABN 53 140 099 207

CERTIFICATE OF ANALYSIS 178997

Client:
Environmental Investigation Services
115 Wicks Road
MACQUARIE PARK
NSW 2113

Attention: Mitchell Delaney

Sample log in details:

Your Reference:	**E28939KB**
No. of samples:	1 Soil
Date samples received:	05/04/2016
Date completed instructions received:	05/04/2016
Location:	Camperdown

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 pages of this report for any comments relating to the results.

Report Details:

Date results requested by:	11/04/16
Date of Preliminary Report:	Not issued
Issue Date:	11/04/16

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

Results Approved By:

Joshua Lim
Operations Manager

ACCREDITED FOR TECHNICAL COMPETENCE

svTRH(C10-C36) in soil		
Our Reference:	UNITS	178997-1
Your Reference	----------	DUPA1
Date Sampled	----------	29/03/2016
Type of sample		Soil
Date extracted	-	07/04/2016
Date analysed	-	09/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100
TRH>C$_{10}$ - C$_{16}$	mg/kg	<50
TRH>C$_{10}$-C$_{16}$ less N (F2)	mg/kg	<50
TRH>C$_{16}$ - C$_{34}$	mg/kg	<100
TRH>C$_{34}$ - C$_{40}$	mg/kg	<100
Surrogate o-Terphenyl	%	93

vTRH(C6-C10)/MBTEXN in soil		
Our Reference:	UNITS	178997-1
Your Reference	----------	DUPA1
Date Sampled	----------	29/03/2016
Type of sample		Soil
Date extracted	-	07/04/2016
Date analysed	-	08/04/2016
$TRHC_6$ - C_9	mg/kg	<25
$TRHC_6$ - C_{10}	mg/kg	<25
$TRHC_6$-C_{10} less BTEX (F1)	mg/kg	<25
MTBE	mg/kg	<0.5
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	104

PAHs in Soil		
Our Reference:	UNITS	178997-1
Your Reference	----------	DUPA1
Date Sampled	----------	29/03/2016
Type of sample		Soil
Date extracted	-	07/04/2016
Date analysed	-	08/04/2016
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.4
Anthracene	mg/kg	0.1
Fluoranthene	mg/kg	0.8
Pyrene	mg/kg	0.8
Benzo(a)anthracene	mg/kg	0.4
Chrysene	mg/kg	0.3
Benzo(b,j+k)fluoranthene	mg/kg	0.6
Benzo(a)pyrene	mg/kg	0.44
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.6
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.7
Total Positive PAHs	mg/kg	4.4
p-Terphenyl-D_{14}	%	123

Acid Extractable metals in soil		
Our Reference:	UNITS	178997-1
Your Reference	----------	DUPA1
Date Sampled	----------	29/03/2016
Type of sample		Soil
Date digested	-	07/04/2016
Date analysed	-	08/04/2016
Arsenic	mg/kg	3
Cadmium	mg/kg	<0.4
Chromium	mg/kg	7
Copper	mg/kg	23
Lead	mg/kg	16
Mercury	mg/kg	<0.1
Nickel	mg/kg	<1
Zinc	mg/kg	7

Moisture		
Our Reference:	UNITS	178997-1
Your Reference	----------	DUPA1
Date Sampled	----------	29/03/2016
Type of sample		Soil
Date prepared	-	7/04/2016
Date analysed	-	8/04/2016
Moisture	%	12

Method ID	Methodology Summary
ORG-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
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. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
ORG-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM draft B1 Guideline on Investigation Levels for Soil and Groundwater.
ORG-012	For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
ORG-004	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
METALS-020	Metals in soil and water by ICP-OES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
INORG-008	Moisture content determined by heating at 105 deg C for a minimum of 12 hours.

QUALITY CONTROL svTRH(C10-C36) in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			07/04/2016	[NT]	[NT]	LCS-1	07/04/2016
Date analysed	-			09/04/2016	[NT]	[NT]	LCS-1	09/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	50	ORG-003	<50	[NT]	[NT]	LCS-1	98%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	110%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	120%
TRH>C$_{10}$ - C$_{16}$	mg/kg	50	ORG-003	<50	[NT]	[NT]	LCS-1	107%
TRH>C$_{16}$ - C$_{34}$	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	107%
TRH>C$_{34}$ - C$_{40}$	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	107%
Surrogate o-Terphenyl	%		ORG-003	94	[NT]	[NT]	LCS-1	87%

QUALITY CONTROL vTRH(C6-C10)/MBTEXN in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			07/04/2016	[NT]	[NT]	LCS-1	07/04/2016
Date analysed	-			08/04/2016	[NT]	[NT]	LCS-1	08/04/2016
TRHC$_{6}$ - C$_{9}$	mg/kg	25	ORG-016	<25	[NT]	[NT]	LCS-1	88%
TRHC$_{6}$ - C$_{10}$	mg/kg	25	ORG-016	<25	[NT]	[NT]	LCS-1	88%
MTBE	mg/kg	0.5	ORG-016	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	mg/kg	0.2	ORG-016	<0.2	[NT]	[NT]	LCS-1	89%
Toluene	mg/kg	0.5	ORG-016	<0.5	[NT]	[NT]	LCS-1	88%
Ethylbenzene	mg/kg	1	ORG-016	<1	[NT]	[NT]	LCS-1	87%
m+p-xylene	mg/kg	2	ORG-016	<2	[NT]	[NT]	LCS-1	88%
o-xylene	mg/kg	1	ORG-016	<1	[NT]	[NT]	LCS-1	84%
Naphthalene	mg/kg	1	ORG-016	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		ORG-016	116	[NT]	[NT]	LCS-1	96%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			07/04/2016	[NT]	[NT]	LCS-1	07/04/2016
Date analysed	-			08/04/2016	[NT]	[NT]	LCS-1	08/04/2016
Naphthalene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	86%
Acenaphthylene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	88%
Phenanthrene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	84%
Anthracene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	93%
Pyrene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	97%
Benzo(a)anthracene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	95%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	ORG-012	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	ORG-012	<0.05	[NT]	[NT]	LCS-1	89%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
p-Terphenyl-D_{14}	%		ORG-012	106	[NT]	[NT]	LCS-1	112%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			07/04/2016	[NT]	[NT]	LCS-1	07/04/2016
Date analysed	-			08/04/2016	[NT]	[NT]	LCS-1	08/04/2016
Arsenic	mg/kg	2	METALS-020	<2	[NT]	[NT]	LCS-1	103%
Cadmium	mg/kg	0.4	METALS-020	<0.4	[NT]	[NT]	LCS-1	104%
Chromium	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	106%
Copper	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	106%
Lead	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	103%
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	LCS-1	99%
Nickel	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	106%
Zinc	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	107%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			07/04/2016
Date analysed	-			08/04/2016
Moisture	%	0.1	INORG-008	<0.10

Report Comments:

Asbestos Signatories:

Asbestos was analysed by Approved Identifier: Not applicable for this job
Airborne fibres were analysed by Approved Counter: Not applicable for this job

Definitions:

NT: Not tested NA: Test not required INS: Insufficient sample for this test PQL: Practical Quantitation Limit
<: Less than >: Greater than RPD: Relative Percent Difference LCS: Laboratory Control Sample
NS: Not Specified NEPM: National Environmental Protection Measure NR: Not Reported

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011

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 batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	EIS Job Number: E28939KB Date Results Required: STANDARD Page: 1/1	ENVIRONMENTAL INVESTIGATION SERVICES REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Mitchell Delaney / Vittal Boggaram

Location: Camperdown

Sampler: MS.

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 3	Combo 3a	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos			
14 4118 -																		
29/3/16	1	BH101	0-1-0.2	G, A	0	Soil				X								
	2	BH101	1.0-1.2				X											
	3	BH101	1.8-2.1															
	4	BH102	0.1-0.3							X								
	5	BH102	0.5-0.4															
	6	BH102	0.9-1.0				X											
29/3/16	7	BH102	2.0-2.2															
30/3/16	8	BH103	0.05-0.2							X								
	9	BH103	0.5-0.95															
	10	BH103	1.1-1.2				X											
	11	BH104	0.05-0.2															
	12	BH104	0.4-0.5							X								
	13	BH104	1.0-1.3				X											
	14	BH104	2.0-2.5															
31/3/16	15	BH105	0.05-0.2							X								
	16	BH105	0.4-0.5															
	17	BH105	1.0-1.5															
	18	BH105	2.0-2.5				X											
	19	BH106	0.05-0.2							X								
	20	BH106	0.4-0.5				X											
	21	BH106	1.0-1.2	↓														
29/3/16	—	DUP1	—	G			X											
30/3/16	22	DUP2	—	G	↓	↓	X											
21-31/3/16	23	TB1	—	G	—	Sand							X					

Email Laboratories ENVIROLAB group
Job No.- 178997
Date Rec - 5/4
Time Rec - 1510
Rec By - mc
TAT Req - SAME 1/2/3/STD
Temp - cool/ambient
Cooling - Ice / Ice Pack / None
Security Seal - Yes / No

Please Send DUP1 to Envirolabs VIC.

Remarks (comments/detection limits required):	Sample Containers: G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag

Relinquished By:	Date:	Time:	Received By:	Date:
MD	1/4/16			

Daniel Ford - EIS
4/4/16 @ 12:20

Appendix C: 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[16].
- 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. 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.

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

- 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.
- 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.
- Take the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
- 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:
  - Micropore filtration system or Stericup single-use filters (for heavy metals samples);
  - Filter paper for Micropore filtration system; Bucket with volume increments;
  - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles;
  - Bucket with volume increments;
  - Flow cell;
  - pH/EC/Eh/T meters;
  - Plastic drums used for transportation of purged water;
  - Esky and ice;
  - Nitrile gloves;
  - Distilled water (for cleaning);
  - Electronic dip meter;

- Low flow pump pack and associated tubing; and
- Groundwater sampling forms.

- If single-use stericup filtration is not used, clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.
- 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/micro-purge 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 detailed in the NEPM 2013 and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice as outlined in the report text.
- Record the sample on the appropriate log in accordance with AS1726:1993. At the end of each water sampling complete a chain of custody form.

Decontamination Procedures for Groundwater Sampling Equipment

- 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[17]) methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (H. Keith 1991[18]).

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 (MDL) for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations.

"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit" Keith 1991.

Precision

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

Accuracy

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

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

Representativeness

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

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

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

Completeness

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

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

Comparability

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

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

Blanks

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

Matrix Spikes

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

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

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:

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