ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

WATERMARK CHATSWOOD PTY LTD

ON

PRELIMINARY STAGE 2 ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED CHATSWOOD GOLF CLUB RE-DEVELOPMENT

AT

BEACONSFIELD ROAD, CHATSWOOD, NSW

16 MARCH 2017 **REF: E27168KFrpt**

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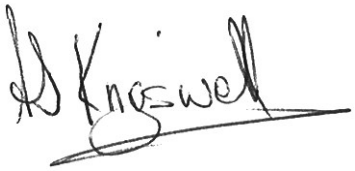

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EXECUTIVE SUMMARY

Watermark Chatswood Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS) to undertake a Preliminary Stage 2 Environmental Site Assessment (ESA) for the proposed redevelopment at Chatswood Golf Club, Beaconsfield Road, Chatswood, 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.

The assessment objectives were to:

- Provide an appraisal of the past site use(s) based on a review of EIS 2016 Stage 1 ESA;
- Assess the current site conditions and use via a site walkover inspection;
- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil contamination conditions via implementation of a preliminary sampling and analysis program;
- Prepare a conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Provide a preliminary waste classification for off-site disposal of soil;
- Assess whether further intrusive investigation and/or remediation is required; and
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint).

The scope of work included the following:

- Review of previous investigation reports prepared by EIS;
- A walkover site inspection;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted site assessment criteria (SAC);
- Assessment of data quality; and
- Preparation of an ESA report presenting the results of the assessment, including a CSM and Tier 1 risk assessment.

Samples for this investigation were obtained from 15 sampling points as shown on the attached Figure 2. This density is approximately 60% of the minimum sampling density recommended by the EPA.

An elevated lead concentration was encountered in one of the samples above the SAC. EIS are of the opinion that the risk posed to human receptors is low to moderate and will require remediation and/or management.

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 characterise the risks:

- Undertake an additional ESA to address the data gaps identified in **Section 10.3;**
- Prepare a Remediation Action Plan (RAP) to outline remedial measures for the site;
- Prepare a Validation Assessment (VA) report on completion of remediation; and
- Undertake a Hazardous Materials Assessment (Hazmat) for the existing buildings prior to the commencement of demolition work.

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.

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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	**BTEX**
Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene	**BTEXN**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Construction Management Plan	**CMP**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
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

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**
Work Health and Safety	**WHS**

1 INTRODUCTION

Watermark Chatswood Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS)[1] to undertake a Preliminary Stage 2 Environmental Site Assessment (ESA) for the proposed redevelopment at Chatswood Golf Club, Beaconsfield Road, Chatswood, 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. 27168Zrpt, dated 8 March 2017[3]). This report should be read in conjunction with the JK report.

1.1 Proposed Development Details

Based on the supplied information, EIS understand that the redevelopment will include a new club over the south-western portion of the site and Independent Living Units (ILU) over the north. The proposed new club will comprise a three to four storey clubhouse and adjacent single level ancillary facilities both over two basement carpark levels. The ILU building will be a four to five story buildings including Basement 1. The Basement 2 level of the club is indurated with a finished floor reduced level (RL) at RL27.5m and the ILU Basement 1 level at RL33.7m. The proposed development will be excavated into the hillside and a maximum vertical excavation depth up to approximately 15m has been estimated.

1.2 Aim and Objectives

The primary aims of the assessment were to make a preliminary assessment of the soil contamination conditions. The assessment objectives were to:

- Provide an appraisal of the past site use(s) based on a review of EIS 2016 Stage 1 ESA;
- Assess the current site conditions and use via a site walkover inspection;
- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil contamination conditions via implementation of a preliminary sampling and analysis program;
- Prepare a conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Provide a preliminary waste classification for off-site disposal of soil;
- Assess whether further intrusive investigation and/or remediation is required; and
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint).

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)
[2] Geotechnical consulting division of J&K
[3] Referred to as JK 2017 Report

1.3 Scope of Work

The assessment was undertaken generally in accordance with an EIS proposal (Ref: EP43884KF) of 23 November 2016 and written acceptance from the client of 23 November 2016. The scope of work included the following:

- Review of previous investigation reports prepared by EIS;
- A walkover site inspection;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted site assessment criteria (SAC);
- Assessment of data quality; and
- Preparation of an ESA report presenting the results of the assessment, including a CSM and Tier 1 risk 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/Documents
Contaminated Land Management Act (1997)[4]
State Environmental Planning Policy No.55 – Remediation of Land (1998)[5]
Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)[6]
Guidelines for Consultants Reporting on Contaminated Sites (2011)[7]
Guidelines for the NSW Site Auditor Scheme, 2nd Edition (2006)[8]
National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)[9]

[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] Department of Urban Affairs and Planning, and Environment Protection Authority, (1998). *Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land*. (SEPP55 Planning Guidelines)

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

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

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

2 SITE INFORMATION

2.1 Background

2.1.1 Preliminary Environmental Site Assessment (EIS, 2014[10])

EIS have undertaken a Preliminary Soil Screening and Waste Classification Assessment for a previous proposed subdivision in the south section of the site.

The site inspection was undertaken on 17 January 2014. Samples for the investigation were obtained from four (4) evenly spaced sampling points as shown on the attached Figure 2. The sample locations were drilled using hand equipment due to access restrictions.

Subsurface conditions encountered generally consisted of fill material to the termination depths of the boreholes between 0.3m and 0.8m. With the exception of BH4, all boreholes were inferred to have refused on bedrock. The fill material typically consisted of silty sand or silty clay with inclusions of sandstone, shale, ironstone and igneous gravels, root fibres, ash, slag, concrete and brick fragments.

Fragments of fibre cement sheeting (containing asbestos) were observed on the surface in the south section of the site (see Figure 2). The asbestos fragments appeared to be confined to the surface and could have been associated with potential illegal dumping or level filling of the south section of the site.

The fill material was classified General Solid Waste (non-putrescible) (GSW) containing asbestos in accordance with the NSW EPA Waste Classification Guidelines 2014.

EIS recommended that further investigation was required to better assess the extent of the contamination.

2.1.2 Preliminary Stage 1 Environmental Site Assessment (EIS, 2016[11])

Watermark Chatswood Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS) to undertake a Preliminary Stage 1 Environmental Site Assessment (PESA) for the proposed redevelopment at Chatswood Golf Club, Beaconsfield Road, Chatswood, NSW.

A review of the site history information has indicated the following:

[10] EIS, (2014), *Report to Chatswood on Preliminary Soil Screening & Waste Classification Assessment for Proposed Subdivision at Chatswood Golf Club, Beaconsfield Road, Chatswood, NSW.* (Report Ref: E27168Klet, dated 12 February 2014) (referred to as EIS 2014 Report)

[11] EIS, (2016), *Report to Watermark Chatswood on Preliminary Stage 1 Environmental Site Assessment for Proposed Chatswood Golf Club Re-development at 126 Beaconsfield Road, Chatswood, NSW.* (Report Ref: E27168KDrpt, dated 30 August 2016) (referred to as EIS 2016 Report)

- The land title records indicated that the site had been owned by a grazier between 1916 and 1918. The site has been owned by the Chatswood Golf Club since approximately 1945 to date;
- The aerial photographs indicated that the Chatswood Golf Club was constructed between 1965 and 1970;
- Council records indicate that a building application for the storage of flammable liquids was submitted in 1985 and building applications for alterations and additions to the club house building were submitted to council in 1965 and 1994;
- WorkCover records indicated that a current licence is held by Chatswood Golf Club. The licence relates to the storage of petroleum and pesticide liquids. The hazardous goods storage areas are located within associated green keepers sheds off-site; and
- NSW EPA records did not indicate any notices for the site.

EIS considered the site could be made suitable for the Chatswood Golf Club redevelopment provided the following additional work was undertaken to better assess the risks:

1. Undertake a Stage 2 ESA to meet the sampling density outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995);
2. Undertake a waste classification assessment for the off-site disposal of material excavated for the proposed development; and
3. If any contamination is encountered prepare and implement a Remediation Action Plan (RAP).

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner:	Chatswood Golf Club Limited
Site Address:	Beaconsfield Road, Chatswood, NSW
Lot & Deposited Plan:	• Part of Lot 1 DP1124646; • Part of Lot 1 DP651667; • Part of Lot 163 DP752067; and • Part of Lot 22 DP626634.
Current Land Use:	Commercial/Recreational
Proposed Land Use:	Commercial/Recreational/Residential
Local Government Authority (LGA):	Willoughby Council
Current Zoning:	Private Recreation (RE2)
Area of Proposed Development (m^2):	15,000
RL (AHD in m) (approx.):	29-45
Geographical Location (decimal degrees) (approx.):	Latitude: -33.801081 Longitude: 151.16382

2.3 Site Location and Regional Setting

The site is located in a predominantly residential area of Chatswood. The site is located at the west end of Beaconsfield road. The site is bounded by Chatswood Golf Course on the north, west and southern sides. Residential premises are located to the east of the site. The site is located approximately 500m to the east of Lane Cove River.

2.4 Topography

The site is located within an undulating topographic setting. The site itself is located on the side of a west facing hillside slope which appears to fall to the west at approximately 7-10° towards the Lane Cove River. Significantly steeper slopes are present (up to about 30^{o}) particularly at the southern end of the site. The site levels appeared to have been altered to accommodate on grade car parking levels and the existing club house building.

2.5 Site Inspection

A walkover inspection of the site was undertaken by EIS on 15 August 2016 and 30 January 2017. The inspection was limited to accessible areas of the site and immediate surrounds. An internal inspection of buildings was not undertaken. Selected site photographs obtained during the inspection are attached in the appendices.

At the time of the investigation, the site contained a two tiered asphaltic concrete (AC) surfaced carpark (large open area near the crest of the hill, and thin strip mid-slope). The site contained a two storey brick and concrete golf club building (which appeared to be in good condition) and a metal green keepers shed in the north-west section of the site.

Outcrops of sandstone bedrock were visible adjacent to the uphill (eastern) boundary of the site, on the vegetated slope between the two carparks and at the toe of the slope below the carparks. The remainder of the site was heavily vegetated, containing medium to large sized trees and smaller shrubs.

A small fill stockpile (approximately $35m^3$) was observed within the south west section of the site adjacent to the main entrance. The stockpile consisted of silty clay with inclusions of sandstone boulders, cobbles and gravel, concrete, bricks and igneous gravel. On the ground surface close to the stockpile a fibre cement fragment (FCF) was observed. This FCF was sampled and sent to the laboratory for analysis (Ref: GFF1)

No chemicals were seen to be stored in the site area, however chemicals associated with green keeping and garden maintenance are presumably stored in the green keepers shed.

Surface water drainage at the site is likely to flow towards the golf course with the natural slope of the land.

No obvious indications of Underground Storage Tanks (UST/s) were observed at the site.

2.6 Surrounding Land Use

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

- North – Recreational (Golf Course);
- South – Recreational (Golf Course);
- East – Residential; and
- West – Recreational (Golf Course).

EIS did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.7 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the assessment in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. No major services were identified that would be expected to act as preferential pathway for contamination migration.

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

A review of the regional geological map of Sydney (1983[12]), indicates that the site is underlain by Hawkesbury Sandstone, which typically consists of medium to coarse grained quartz sandstone with minor shale and laminite lenses.

3.2 Acid Sulfate Soil Risk and Planning

The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation.

3.3 Hydrogeology

Hydrogeological information presented in the Lotsearch report (EIS 2016 Stage 1 ESA) indicated that the regional aquifer on-site and in the areas immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. There were a total of 4 registered bores within the report buffer of 500m. In summary:

- The nearest registered bore was located approximately 80m from the site. This was utilised for industrial and recreational purposes;
- The majority of the bores were registered for irrigation and recreational purposes.

The information reviewed for this assessment indicated that the subsurface conditions at the site are likely to consist of residual soils overlying relatively shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. A perched aquifer in the subsurface may be present.

3.4 Receiving Water Bodies

Surface water bodies were not identified at the site. The closest surface water body is considered to be the golf course dam located approximately 75m to the west and down gradient of the site. Lane Cover River is located approximately 500m to the west of the site. The golf course dam and Lane Cover River are considered to be potential receptors.

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

4 CONCEPTUAL SITE MODEL

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

4.1 Potential Contamination Sources/AEC and CoPC

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

Table 4-1: Potential Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material - The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Storage of petroleum liquids – WorkCover records indicated that a current licence is held by Chatswood Golf Club. The licence relates to the storage of petroleum and pesticide liquids. The hazardous goods storage area are located within associated green keepers sheds	Lead, TRH, BTEX and PAHs
Historical agricultural use – The site appears to have been owned by a grazier between 1916 and 1918. Contamination impacts associated with agriculture at this time are not expected to have been significant. There may have been some demolition of structures.	Heavy metals and asbestos
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site. The site has been occupied by the Chatswood Golf Course since approximately 1945. Pesticides have been stored at the green keepers located off site. There is a potential that pesticides have been sprayed within the proposed development	Heavy metals, OCPs and OPPs

Source / AEC	CoPC
area. The use of pesticides during this period could have resulted in potential contamination.	
Hazardous Building Material – Hazardous building materials may be present in the existing buildings/ structures on site.	Asbestos, lead and PCBs

4.2 Known Contamination Sources/AEC and CoPC

Asbestos containing materials (ACM) were identified on the surface in the south-east section of the site as part of the EIS Preliminary Environmental Site Assessment undertaken in 2014.

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

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

Table 4-2: CSM

Potential mechanism for contamination	Potential mechanisms for contamination include: • Fill material – importation of impacted material, 'top-down' impacts (e.g. leaching from surficial material), or sub-surface release (e.g. impacts from buried material); • Fuel storage – 'top-down', spills (e.g. during filling of the tanks and/or dispensing activities), or sub-surface release (e.g. from leaking tank or pipework); • Historical agricultural use – 'top-down' and spills (e.g. application of pesticides, refuelling or repairing machinery, and other activities at the ground surface level); • Use of pesticides – 'top-down' and spills (e.g. during normal use, application and/or improper storage); • Hazardous building materials – 'top-down' (e.g. demolition resulting in surficial impacts in unpaved areas).
Affected media	Soil, soil vapour and groundwater have been identified as potentially affected media.
Receptor identification	Human receptors include site occupants/users, construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users, groundwater users and recreational water users within Lane Cove River. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and freshwater/marine ecology in the golf course dam and Lane Cover River.

Potential Exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and use of unpaved areas (i.e. the gardens) and basement (i.e. vapour inhalation or incidental contact with groundwater seepage). Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure to groundwater is unlikely to occur in the Lane Cove River through direct migration, however groundwater has the potential to enter the river via the stormwater system (which is expected to discharge into the river) in a drained basement scenario.
Presence of preferential pathways for contaminant movement	Surface levels and site topography are potential preferential pathways for contamination migration to other parts of the golf course. This could occur via surface run-off/seepage. .

5 SAMPLING, ANALYSIS AND QUALITY PLAN

5.1 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 Site Auditor Guidelines 2006 and the USEPA documents Data Quality Objectives Processes for Hazardous Waste Site Investigations (2000) and Guidance on Systematic Planning Using the Data Quality Objectives Process (2006). These seven steps are applicable to this assessment as summarised in the table below:

Table 5-1: DQOs – Seven Steps

Step	Input
State the Problem	The EIS 2016 Preliminary stage 1 ESA and CSM 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.
Identify the Decisions/ Goal of the Study	The data collection is project specific and has been designed based on the following information: • Review of previous EIS investigation reports; • AEC, CoPC, receptors, pathways and medium identified in the CSM; • Development of SAC for each media; and • The use of decision statements outlined below: 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? 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 with petroleum hydrocarbons can pose a vapour risk to receptors; and ➢ Ecological Investigation Levels (EILs) – elevated EILs can pose a potential point source ecological risk.

Step	Input
Identify Information Inputs	The following information will be collected: • Soil samples based on subsurface conditions; • Fibre Cement Fragments (FCF) in the vicinity of the sampling points; • 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 Blanks (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: ➢ RPDs: - Results that are < 5 times the PQL, any RPD is acceptable; and - Results > 5 times the PQL, RPDs between 0-50% are acceptable; ➢ LCS recovery and matrix spikes: - 70-130% recovery acceptable for metals and inorganics; - 60-140% recovery acceptable for organics; and - 10-140% recovery acceptable for VOCs; ➢ Surrogate spike recovery: - 60-140% recovery acceptable for general organics; and - 10-140% recovery acceptable for VOCs; ➢ Blanks: All less than PQL.

Step	Input
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.

5.2 Soil Sampling Plan and Methodology

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

Table 5-2: 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 25 evenly spaced sampling points for this site with an area of approximately 15,000m^2. Samples for this investigation were obtained from 15 sampling points as shown on the attached Figure 2. This density is approximately 60% of the minimum sampling density recommended by the EPA.
Sampling Plan	The sampling locations were placed on a systematic plan with a grid spacing of approximately 30m between sampling locations. A systematic plan was considered suitable to address potential contaminants associated with the fill material.

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

Aspect	Input
Exclusion Areas (Data Gaps)	Sampling was not undertaken in inaccessible areas of the site such as beneath existing buildings. Sampling was not undertaken from the stockpile located in the south west part of the site. These areas have been excluded from the investigation.
Sampling Equipment	Soil samples were obtained on 30/1/17, 31/1/17 and 1/2/17 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; and • Hand equipment in hard to access areas.
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 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.

Aspect	Input
	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.
Decontamination 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.

5.3 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 5-3: Analytical Schedule

CoPC	Fill Samples	Natural Soil Samples
Heavy Metals	18	6
TRH/BTEXN	18	6
PAHs	18	6
OCPs/OPPs	16	Na
PCBs	16	Na
Asbestos	18	Na
pH/CEC/Clay Content (%)	2	Na
TCLP Metals	2	Na
TCLP PAHs	2	Na
Asbestos in Fibre Cement Fragments (FCF)	1	Na

5.3.1 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 5-4: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicate and trip blank sample)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	161150 & 161150-A
Inter-laboratory duplicate	Envirolab Services Pty Ltd Perth, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	191644

6 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 6-1: SAC Adopted for this Investigation

Guideline	Applicability
Health Investigation Levels (HILs) (NEPM 2013)	The HIL-A criteria for 'residential with accessible soil' have been adopted for this assessment.
Health Screening Levels (HSLs) (NEPM 2013)	The HSL-A criteria for 'residential with accessible soil' have been adopted for this assessment.
Ecological Assessment Criteria (EAC) (NEPM 2013)	The EAC criteria for 'urban residential and public open space (URPOS)' exposure setting have been adopted. The EILs for selected metals have been derived as follows: • The ABC values for high traffic (25th percentiles) areas for old suburbs of NSW published in Olszowy et. al. (1995[14]) has been adopted for this assessment; and • Selected fill samples obtained from the surficial profile (<2m) across the site were analysed for pH, CEC and clay content. The average pH, CEC and clay content values were used to calculate the ACL.
Management Limits for TRH	These guidelines have only been used after considering the relevant HSLs and ESLs 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[15]) 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

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

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

Guideline	Applicability
	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. The following approvals will be adopted if necessary: • Approval 1999/05 - Ash, Ash-contaminated natural excavated materials or coal-contaminated natural excavated material; and • Approval 2009/07 - Metallurgical furnace slag or metallurgical furnace slag contaminated natural excavated materials.

7 INVESTIGATION RESULTS

7.1 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 7-1: Summary of Subsurface Conditions

Profile	Description (m in bgl)
Pavement	Asphaltic Concrete (AC) pavement was encountered in BH102, BH105, and BH106-BH113 at the ground surface of varying thickness between 30mm to 100mm.
Fill	Fill material was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 0.1m to 2.4m. BH115 was terminated in the fill at a maximum depth of approximately 0.25m. The fill typically comprised of: silty clay; sandy clay; silty sand; gravelly silty sand and clayey silty sand. The fill contained inclusions of: ash; slag; sandstone gravel; igneous gravel; ironstone gravel; root fibres, ceramic fragments and glass.
Natural Soil	Natural sandy clay soils were encountered in BH109 and BH111 below the fill. The sandy clays contained inclusions of ironstone gravel.
Bedrock	Sandstone bedrock was encountered beneath the fill and/or natural soils in all boreholes (except BH115) at depths between 0.1m to 2.4m.
Groundwater	Groundwater seepage was not encountered in the boreholes during drilling. All boreholes remained dry on completion of drilling and a short time after.

7.2 Field Screening

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

Table 7-2: 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.

7.3 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 7-3: Summary of Soil Laboratory Results

<table>
<tr><th>Analyte</th><th>Results Compared to SAC</th></tr>
<tr><td>Heavy Metals</td><td><u>HILs:</u>
The lead result of 800mg/kg in the BH114 (1.5-1.95m) sample was above the HIL-A criteria of 300mg/kg. A laboratory replicate result of 1,500mg/kg for lead in the BH114 (1.5-1.95m) sample was above the HIL-A criteria of 300mg/kg. A subsequent triplicate sample was analysed for lead from the BH114 (1.5-1.95m) sample with the result of 2,000mg/kg being above the HIL-A criteria of 300mg/kg. The lead elevations within the BH114 (1.5-1.95m) sample are above 250% of the HIL-A criterion. All remaining heavy metal results were below the HIL-A criteria.

<u>EILs:</u>
Elevated concentrations of individual metals were encountered above the EIL-URPOS as outlined below:

<table>
<tr><th>Analyte</th><th>Sample & Concentration</th><th>Description</th><th>EIL</th></tr>
<tr><td>Zinc</td><td>BH109 (0.05-0.2m) - 1,600mg/kg
BH114 (1.5-1.95m)* - 920mg/kg</td><td>Fill: silty sand
Fill: sandy clay</td><td>777</td></tr>
<tr><td>Copper</td><td>BH114 (1.5-1.95m)* - 270mg/kg</td><td>Fill: sandy clay</td><td>228</td></tr>
<tr><td>Lead</td><td>BH114 (1.5-1.95m)* - 2,000mg/kg</td><td>Fill: sandy clay</td><td>1,204</td></tr>
</table>
* - Triplicate results adopted due to a higher concentration

<u>WC:</u>
Two fill samples encountered lead concertations above the CT1 criteria of 100mg/kg. A triplicate for one of the elevated fill samples, BH114 (1.5-1.95m), encountered a lead concentration above the SCC1 criteria of 1,500mg/kg. The same triplicate encountered a nickel concentration above the CT1 criteria of 40mg/kg. All remaining heavy metal results were less than the CT1 criteria. TCLP leachates were prepared from these samples and analysed for the relevant metals. The results were all less than the TCLP1 criteria.</td></tr>
<tr><td>TRH</td><td><u>HSLs:</u>
All TRH results were below the HSL-A criteria.

<u>ESLs:</u>
All TRH results were below the ESL-URPOS criteria.

<u>WC:</u>
All TRH results were less than the relevant CT1 criteria.</td></tr>
<tr><td>BTEXN</td><td><u>HSLs:</u>
All BTEXN results were below the HSL-A criteria.</td></tr>
</table>

Analyte	Results Compared to SAC
	ESLs: All BTEXN results were below the ESL-URPOS criteria. **WC:** All BTEX results were less than the relevant CT1 criteria.
PAHs	**HILs:** All PAH results were below the HIL-A criteria. **HSLs:** All naphthalene results were below the HSL-A criteria. **ESLs:** The benzo(a)pyrene results of 0.86mg/kg and 1.5mg/kg in the BH101 (0.1-0.2m) and BH109 (0.05-0.2m) samples respectively were above the ESL-URPOS criteria of 0.7mg/kg. All remaining benzo(a)pyrene were below the ESL-URPOS criteria. **EILs:** All naphthalene results were below the EIL-URPOS criteria. **WC:** The benzo(a)pyrene results of 0.86mg/kg and 1.5mg/kg in the BH101 (0.1-0.2m) and BH109 (0.05-0.2m) samples respectively were above the CT1 criteria of 0.8mg/kg. All 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.
OCPs & OPPs	**HILs:** All OCP and OPP results were below the HIL-A criteria. **EILs:** All DDT results were below the EIL-URPOS criteria. **WC:** All OCP and OPP results were less than the relevant CT1 criteria.
PCBs	**HILs:** All PCB results were below the HIL-A criterion. **WC:** All PCB results were less than the CT1 criteria.
Asbestos	Asbestos was not detected in the soil samples analysed for the investigation. Chrysotile asbestos was detected in material sample GFF1 encountered on the ground surface towards the south east part of the site. Chrysotile and Amosite asbestos fibres were detected in the

Analyte	Results Compared to SAC
	ASB1 material sample encountered in a similar location during the EIS 2014 investigation.

8 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 8-1: 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 range of CoPC;
- 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 laboratory/s 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 laboratory/s 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. Groundwater, 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, 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 5.1.**

Intra-laboratory RPD Results:
Soil Samples at a frequency of 4% of the primary samples:

- Dup GF1 is a soil duplicate of primary sample BH114 (0-0.2m)

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 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.

As both the primary and duplicate sample results were less than the SAC, the exceedances are not considered to have had an adverse impact on the data set as a whole.

Inter-laboratory RPD Results:
Soil Samples at a frequency of 4% of the primary samples:

- Dup GF2 is a soil duplicate of primary sample BH115 (0-0.2m)

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

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 the following comments noted by the laboratories:

Envirolab Report 161150 – The laboratory RPD acceptance criteria was exceeded in one sample for chromium and one sample for copper, lead and nickel. Triplicate results were issued to account for this. Excessive sample volume was provided for asbestos analysis. A portion was sub-sampled according to laboratory procedures.

Envirolab Report 161150-A –A portion of the supplied sample was sub-sampled for asbestos analysis according to laboratory procedures.

9 WASTE CLASSIFICATION OF SOIL FOR OFF-SITE DISPOSAL

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

Table 9-1: Waste Classification

Site Extent / Material Type	Classification	Disposal Option
Fill material over southern section of the site (Area A on Figure 2)	General Solid Waste (non-putrescible) (GSW) containing asbestos	A NSW EPA landfill licensed to receive the waste stream. The landfill should be contacted to obtain the required approvals prior to commencement of excavation.
Fill material over remaining parts of the site	General Solid Waste (non-putrescible) (GSW)	A NSW EPA landfill licensed to receive the waste stream. The landfill should be contacted to obtain the required approvals prior to commencement of excavation. Alternatively, the fill material is considered to be suitable for re-use on the subject site (only) provided it meets geotechnical and earthwork requirements.
Fill material containing ash and slag in the vicinity of BH114	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 2009/07	The fill material classified under the GAI can only be disposed of to a NSW EPA landfill licensed to 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.
Natural silty clay soil and sandstone bedrock	Virgin excavated natural material (VENM)	VENM is considered suitable for re-use on-site, or alternatively, the information included in this report may be used to assess whether the material is suitable for beneficial reuse at another site as fill material. Alternatively, the natural material can be disposed of as VENM to a facility licensed by the NSW EPA to receive the waste stream.

10 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 10-1: Tier 1 Risk Assessment and Review of PCSM

Contaminant of Primary Concern (CoPC)	Receptor and Exposure Pathway	Discussion and Risk Rating
Lead	Human Receptors: Dermal Contact, ingestion and inhalation via dust	An elevated lead concentration was encountered in one of the samples above the SAC. EIS are of the opinion that the risk posed to human receptors is low to 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 lead. Although the TCLP result indicates that there is potential for lead to leach under acidic conditions the underlying sandstone bedrock in BH114 does not appear to have been impacted by lead.
Asbestos in FCF	Human Receptors: Inhalation of airborne asbestos fibres	The investigation encountered FCF containing asbestos on the ground surface in the south section of the site. During sampling the FCF were assessed to be in good conditions and could not be broken by hand pressure. Hence the material was assessed to be 'non-friable' based on field information. EIS are of the opinion that the risk posed to human receptors is low to moderate and will require remediation and/or management.
Copper, Lead, Zinc and B(a)P	Environmental Receptors:	The CoPC were above the EAC adopted for this investigation and pose a risk to environmental receptors.

Contaminant of Primary Concern (CoPC)	Receptor and Exposure Pathway	Discussion and Risk Rating
	Direct exposure to plants and animals	Environmental receptors on-site include proposed landscaped areas between buildings. Off-site receptors include surface water runoff into the golf course dam and Lane Cover River. EIS are of the opinion that the risk posed to on-site environmental receptors is moderate and will require remediation and/or management.

10.1 Source and Extent of Contamination

10.1.1 Sources

The source of the PAHs and heavy metals including lead in the fill samples is considered to be associated with the ash, coal and slag inclusions encountered in the fill matrix. The natural soil samples analysed below the fill profile were not impacted by the contaminants.

The asbestos fragments appeared to be confined to the surface of the south section of the site and could have been associated with potential illegal dumping or level filling of the site.

10.1.2 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 0.1m to 2.4m bgl as shown on the attached Figure 2.

10.1.3 Unknown Extent

Sampling was not undertaken in the densely vegetated steep sloped areas of the site including the southern section, north section, west section and between the carparks. Sampling was also not undertaken beneath the green keepers chemical store shed or the existing clubhouse.

10.1.4 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.

10.1.5 Groundwater

The depth of groundwater or the condition of the groundwater at the site is unknown. 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.

10.2 Fate and Transport of Contaminants

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

Table 10-2: Fate and Transport of PCC/CoPC

PCC/CoPC	Fate and Transport
Non-volatile contaminants including: lead and asbestos	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. The transport of lead will depend on whether the lead compound is water soluble or not. **Presence of Asbestos** Asbestos cement fragments are not considered to be very mobile. If broken or crushed the fragments could release asbestos fibres into the atmosphere. A number of studies have found that soils effectively filter out asbestos fibres and retain them within the soil matrix. The studies concluded that there is no significant migration of asbestos fibres, either through soil or groundwater. **Site Conditions** Surface water has the potential to infiltrate into the subsurface at the subject site via garden beds, grassed areas, unlined water retention facilities etc. Surface water infiltration could increase the migration potential of certain contaminants. Excess surface water has the potential to run-off into the golf course dam and Lane Cover River.

10.3 Data Gaps

The assessment has identified the following data gaps:

- Areas beneath the existing buildings have not been included in the assessment;

- Steep sloping areas of the site have not been investigated;
- The groundwater conditions at the site have not been assessed;
- The minimum sampling density recommended for a stage 2 ESA by the NSW EPA has not been met; and
- The presence of hazardous building materials in the existing buildings has not been assessed.

11 CONCLUSION

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

The decision statements specified in **Section 5.1** 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 asbestos was detected in any of the soil samples analysed. A fragment of asbestos cement was detected on the surface of the south section of the site.
3. Is further investigation necessary?	Yes.

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 characterise the risks:

1. Undertake an additional ESA to address the data gaps identified in **Section 10.3;**
2. Prepare a Remediation Action Plan (RAP) to outline remedial measures for the site;
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.

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.

11.1 Regulatory Requirement

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

Table 11-1: Regulatory Requirement

Guideline	Applicability
Duty to Report	The requirement to notify the NSW EPA regarding site contamination should be assessed

Guideline	Applicability
Contamination 2015[16]	once the results of the additional investigation work have been reviewed and a remedial strategy (if necessary) has been selected. Please note that in the event the recommendations for additional work and remediation/management are not undertaken, there may be justification to notify the EPA. EIS can be contacted for further advice regarding notification.
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.
Work Health and Safety Code of Practice 2011[17]	Sites contaminated with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan.
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.

[16] NSW Department of Environment and Climate Change, (2015), *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997.* (referred to as Duty to Report Contamination 2015)
[17] WorkCover NSW, (2011), *WHS Regulation: Code of Practice – How to Manage and Control Asbestos in the Workplace.*

12 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.

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

Title: **SITE LOCATION PLAN**

Location: BEACONSFIELD ROAD
CHATSWOOD, NSW

Report No: E27168KF

Figure No: 1

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

PLOT DATE: 9/03/2017 12:09:15 PM DWG FILE: S:\5 EIS\5C EIS JOBS\27000'S\E27168K CHATSWOOD\CAD\E27168KF.DWG

CHATSWOOD GOLF CLUB

BH102(0.45)
BH112(2.4)
BH111(1.1)
BH113(0.4)
BH115(>0.25)
BH103(0.1)
BH105(0.6)
BH109(0.65)
BH108(0.3)
BH107(0.2)
BH110(0.4)
BH101(1.1)
GFF1
BH106(0.3)
BH114(2.1)
BH104(2.1)

BEACONSFIELD ROAD

COLWELL CRESCENT

LEGEND

- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- × GFF — FIBRE CEMENT FRAGMENT (FCF)
- APPROXIMATE OUTLINE OF PROPOSED BASEMENT 1 LEVEL
- APPROXIMATE OUTLINE OF PROPOSED BASEMENT 2 LEVEL
- AREA A

0 8 16 24 32 40
SCALE 1:800 @A3 METRES

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

Title: **SAMPLE LOCATION PLAN**

Location: BEACONSFIELD ROAD CHATSWOOD, NSW

Report No: E27168KF

Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

PLOT DATE: 15/03/2017 11:04:37 AM DWG FILE: S:\S EIS\SC EIS JOBS\2700'S\E27168K CHATSWOOD\CAD\E27168KF.DWG

CHATSWOOD GOLF CLUB

BH109	0.05-0.2
B(a)P	1.5
ZINC	1,600

BH101	0.1-0.2
B(a)P	0.86

ASBESTOS DETECTED

GFF1

BH102(0.45)
BH112(2.4)
BH111(1.1)
BH113(0.4)
BH115(>0.25)
BH103(0.1)
BH105(0.6)
BH109(0.65)
BH108(0.3)
BH107(0.2)
BH110(0.4)
BH101(1.1)
BH106(0.3)
BH114(2.1)
BH104(2.1)

BH114	1.5-1.95
LEAD	2,000
LEAD	2,000
COPPER	270
ZINC	920

BEACONSFIELD ROAD

COLWELL CRESCENT

LEGEND

- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- × GFF — FIBRE CEMENT FRAGMENT (FCF)
- AREA A

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION (mg/kg)

- SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
- SOIL CONTAMINATION ABOVE SAC FOR ENVIRONMENTAL RISK

0 8 16 24 32 40
SCALE 1:800 @A3 METRES

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

Title: **SITE CONTAMINATION DATA PLAN**

Location: BEACONSFIELD ROAD CHATSWOOD, NSW

Report No: E27168KF

Figure No: 3

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

PLOT DATE: 14/03/2017 12:45:17 PM DWG FILE: S:\5 EIS\5C EIS \JOBS\27000'S\E27168K CHATSWOOD\CAD\E27168KF.DWG

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]			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH101	0.1-0.2	Fill: silty sand	5	LPQL	17	12	28	LPQL	8	41	8.5	1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH102	0.1-0.2	Fill: clayey sand	LPQL	LPQL	9	8	20	LPQL	7	34	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH103	0.-0.1	Fill: silty sand	LPQL	LPQL	20	23	99	0.1	10	93	0.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH104	0.0-0.1	Fill: silty sand	4	LPQL	11	22	53	0.2	8	81	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH104	1.5-1.95	Fill: silty clay	8	LPQL	18	6	31	LPQL	2	19	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH105	0.1-0.2	Fill: silty sand	LPQL	LPQL	11	3	19	LPQL	1	12	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH106	0.05-0.3	Fill: sandy clay	6	LPQL	31	29	27	LPQL	28	49	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH107	0.05-0.2	Fill: silty sand	LPQL	LPQL	14	8	39	0.3	8	31	2.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH107	0.3-0.6	Sandstone	LPQL	LPQL	11	1	4	LPQL	LPQL	8	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH108	0.05-0.2	Fill: gravelly silty sand	LPQL	LPQL	11	16	29	LPQL	1	21	0.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH109	0.05-0.2	Fill: silty sand	LPQL	LPQL	18	34	50	0.3	26	1600	15	2.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH109	0.8-1.1	Sandstone	LPQL	LPQL	11	6	31	LPQL	3	160	0.72	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH110	0.1-0.3	Fill: gravelly silty sand	LPQL	LPQL	14	5	17	LPQL	6	23	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH111	0.06-0.25	Fill: silty sand	LPQL	LPQL	11	6	31	LPQL	4	39	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH111	1.3-1.5	Sandy Clay	LPQL	LPQL	19	LPQL	12	LPQL	1	6	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH112	0.1-0.3	Fill: gravelly silty sand	LPQL	LPQL	16	9	42	LPQL	10	40	0.51	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH112	1.5-1.95	Fill: sandy clay	LPQL	LPQL	6	7	66	LPQL	1	49	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH112	2.7-3.0	Sandstone	LPQL	LPQL	6	4	22	LPQL	LPQL	51	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH113	0.1-0.3	Fill: clayey silty sand	LPQL	LPQL	24	19	110	0.1	8	46	0.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH113	0.4-0.7	Sandstone	LPQL	LPQL	5	2	6	LPQL	LPQL	4	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114	0-0.2	Fill: silty clay	LPQL	LPQL	28	27	48	LPQL	18	71	1.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH114	1.5-1.95	Fill: sandy clay	12	1	19	57	**800**	LPQL	9	780	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH114 - Replicate	1.5-1.95	Fill: sandy clay	16	1	24	230	**1500**	LPQL	33	640	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114 - Triplicate	1.5-1.95	Fill: sandy clay	19	2	41	270	**2000**	LPQL	49	920	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114	2.7-3.0	Sandstone	LPQL	LPQL	6	LPQL	9	LPQL	LPQL	2	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH115	0-0.2	Fill: silty sand	LPQL	LPQL	13	24	21	0.3	12	75	1.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
GFF1	-	Material	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**Detected**
Total Number of Samples			26	26	26	26	26	26	26	26	24	24	16	16	16	16	16	16	16	16	16	19
Maximum Value			19	2	41	270	2000	0.3	49	1600	15	2.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NC

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013, HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

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
Replicate - Laboratory replicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 161150 for explannation
Triplicate - Laboratory triplicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 161150 for explannation

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]					**RESIDENTIAL WITH ACCESSIBLE SOIL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH101 - Repli	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH102	0.1-0.2	Fill: clayey sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH103	0.-0.1	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH104	0.0-0.1	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH104	1.5-1.95	Fill: silty clay	1m to <2m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH105	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH106	0.05-0.3	Fill: sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH107	0.05-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH107	0.3-0.6	Sandstone	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH108	0.05-0.2	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH109	0.05-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH109	0.8-1.1	Sandstone	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH110	0.1-0.3	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH111	0.06-0.25	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH111	1.3-1.5	Sandy Clay	1m to <2m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH112	0.1-0.3	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH112	1.5-1.95	Fill: sandy clay	1m to <2m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH112	2.7-3.0	Sandstone	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH113	0.1-0.3	Fill: clayey silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH113	0.4-0.7	Sandstone	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH114	0-0.2	Fill: silty clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH114	1.5-1.95	Fill: sandy clay	1m to <2m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH114	2.7-3.0	Sandstone	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH115	0-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
Total Number of Samples					24	24	24	24	24	24	24	24
Maximum Value					LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL

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:

HSLs: Health Screening Levels
NA: Not Analysed
NL: Not Limiting
SAC: Site Assessment Criteria
LPQL: Less than PQL
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]					**RESIDENTIAL WITH ACCESSIBLE SOIL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH101 - Repli	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH102	0.1-0.2	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH103	0.-0.1	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH104	0.0-0.1	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH104	1.5-1.95	Fill: silty clay	1m to <2m	Clay	90	NL	1	NL	NL	310	NL
BH105	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH106	0.05-0.3	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH107	0.05-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH107	0.3-0.6	Sandstone	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH108	0.05-0.2	Fill: gravelly silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH109	0.05-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH109	0.8-1.1	Sandstone	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH110	0.1-0.3	Fill: gravelly silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH111	0.06-0.25	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH111	1.3-1.5	Sandy Clay	1m to <2m	Clay	90	NL	1	NL	NL	310	NL
BH112	0.1-0.3	Fill: gravelly silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH112	1.5-1.95	Fill: sandy clay	1m to <2m	Clay	90	NL	1	NL	NL	310	NL
BH112	2.7-3.0	Sandstone	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH113	0.1-0.3	Fill: clayey silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH113	0.4-0.7	Sandstone	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH114	0-0.2	Fill: silty clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH114	1.5-1.95	Fill: sandy clay	1m to <2m	Clay	90	NL	1	NL	NL	310	NL
BH114	2.7-3.0	Sandstone	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH115	0-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3

EIS

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

Land Use Category [1]				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC) [2]				-	-	-	NSL	8	18	104	5	77	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH101 - Replicate	0.1-0.2	Fill: silty sand	Coarse	8.35	13	11.5	5	17	12	28	8	41	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.86
BH102	0.1-0.2	Fill: clayey sand	Coarse	8.35	13	11.5	LPQL	9	8	20	7	34	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH103	0.-0.1	Fill: silty sand	Coarse	8.35	13	11.5	LPQL	20	23	99	10	93	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.08
BH104	0.0-0.1	Fill: silty sand	Coarse	8.35	13	11.5	4	11	22	53	8	81	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH104	1.5-1.95	Fill: silty clay	Fine	8.35	13	11.5	8	18	6	31	2	19	LPQL	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH105	0.1-0.2	Fill: silty sand	Coarse	8.35	13	11.5	LPQL	11	3	19	1	12	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH106	0.05-0.3	Fill: sandy clay	Coarse	8.35	13	11.5	6	31	29	27	28	49	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH107	0.05-0.2	Fill: silty sand	Coarse	8.35	13	11.5	LPQL	14	8	39	8	31	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
BH107	0.3-0.6	Sandstone	Coarse	8.35	13	11.5	LPQL	11	1	4	LPQL	8	LPQL	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH108	0.05-0.2	Fill: gravelly silty sand	Coarse	8.35	13	11.5	LPQL	11	16	29	1	21	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.06
BH109	0.05-0.2	Fill: silty sand	Coarse	8.35	13	11.5	LPQL	18	34	50	26	1600	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.5
BH109	0.8-1.1	Sandstone	Coarse	8.35	13	11.5	LPQL	11	6	31	3	160	LPQL	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.07
BH110	0.1-0.3	Fill: gravelly silty sand	Coarse	8.35	13	11.5	LPQL	14	5	17	6	23	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.07
BH111	0.06-0.25	Fill: silty sand	Coarse	8.35	13	11.5	LPQL	11	6	31	4	39	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH111	1.3-1.5	Sandy Clay	Fine	8.35	13	11.5	LPQL	19	LPQL	12	1	6	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH112	0.1-0.3	Fill: gravelly silty sand	Coarse	8.35	13	11.5	LPQL	16	9	42	10	40	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.07
BH112	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	LPQL	6	7	66	1	49	LPQL		LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH112	2.7-3.0	Sandstone	Coarse	8.35	13	11.5	LPQL	6	4	22	LPQL	51	LPQL	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH113	0.1-0.3	Fill: clayey silty sand	Coarse	8.35	13	11.5	LPQL	24	19	110	8	46	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.06
BH113	0.4-0.7	Sandstone	Coarse	8.35	13	11.5	LPQL	5	2	6	LPQL	4	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH114	0-0.2	Fill: silty clay	Fine	8.35	13	11.5	LPQL	28	27	48	18	71	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
BH114	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	12	19	57	800	9	780	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH114 - Replicate	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	16	24	230	1500	33	640	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114 - Triplicate	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	19	41	270	2000	49	920	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114	2.7-3.0	Sandstone	Coarse	8.35	13	11.5	LPQL	6	LPQL	9	LPQL	2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH115	0-0.2	Fill: silty sand	Coarse	8.35	13	11.5	LPQL	13	24	21	12	75	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
Total Number of Samples				26	26	26	26	26	26	26	26	26	24	19	24	24	24	24	24	24	24	24	24
Maximum Value				8.35	13	11.5	19	41	270	2000	49	1600	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.5

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013

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

Replicate - Laboratory replicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 161150 for explannation

Triplicate - Laboratory triplicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 161150 for explannation

Concentration above the SAC VALUE

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

Abbreviations:

EILs: Ecological Investigation Levels
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
UCL: Upper Level Confidence Limit on Mean Value
ESLs: Ecological Screening Levels
NA: Not Analysed
LPQL: Less than PQL
SAC: Site Assessment Criteria
NEPM: National Environmental Protection Measure
NC: Not Calculated
NSL: No Set Limit
ABC: Ambient Background Concentration

EIL AND ESL ASSESSMENT CRITERIA

Land Use Category [1]				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC) [2]				-	-	-	NSL	8	18	104	5	77	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH101 - Replicate	0.1-0.2	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH102	0.1-0.2	Fill: clayey sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH103	0.-0.1	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH104	0.0-0.1	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH104	1.5-1.95	Fill: silty clay	Fine	8.35	13	11.5	100	408	228	1204	275	777	170	--	180	120	1300	5600	60	105	125	45	0.7
BH105	0.1-0.2	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH106	0.05-0.3	Fill: sandy clay	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH107	0.05-0.2	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH107	0.3-0.6	Sandstone	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	--	180	120	300	2800	50	85	70	105	0.7
BH108	0.05-0.2	Fill: gravelly silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH109	0.05-0.2	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH109	0.8-1.1	Sandstone	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	--	180	120	300	2800	50	85	70	105	0.7
BH110	0.1-0.3	Fill: gravelly silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH111	0.06-0.25	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH111	1.3-1.5	Sandy Clay	Fine	8.35	13	11.5	100	408	818	1204	275	777	170	180	180	120	1300	5600	60	105	125	45	0.7
BH112	0.1-0.3	Fill: gravelly silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170	180	180	120	300	2800	50	85	70	105	0.7
BH112	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	1300	5600	60	105	125	45	0.7
BH112	2.7-3.0	Sandstone	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	300	2800	50	85	70	105	0.7
BH113	0.1-0.3	Fill: clayey silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	300	2800	50	85	70	105	0.7
BH113	0.4-0.7	Sandstone	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	300	2800	50	85	70	105	0.7
BH114	0-0.2	Fill: silty clay	Fine	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	1300	5600	60	105	125	45	0.7
BH114	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	1300	5600	60	105	125	45	0.7
BH114 - Replicate	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	100	408	228	1204	275	777	--		--	--	--	--	--	--	--	--	--
BH114 - Triplicate	1.5-1.95	Fill: sandy clay	Fine	8.35	13	11.5	100	408	228	1204	275	777	--		--	--	--	--	--	--	--	--	--
BH114	2.7-3.0	Sandstone	Coarse	8.35	13	11.5	100	408	818	1204	275	777	170		180	120	300	2800	50	85	70	105	0.7
BH115	0-0.2	Fill: silty sand	Coarse	8.35	13	11.5	100	408	228	1204	275	777	170		180	120	300	2800	50	85	70	105	0.7

TABLE D
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
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 - Replicate	0.1-0.2	Fill: silty sand	5	LPQL	17	12	28	LPQL	8	41	8.5	**0.86**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH102	0.1-0.2	Fill: clayey sand	LPQL	LPQL	9	8	20	LPQL	7	34	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH103	0.-0.1	Fill: silty sand	LPQL	LPQL	20	23	99	0.1	10	93	0.3	0.08	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH104	0.0-0.1	Fill: silty sand	4	LPQL	11	22	53	0.2	8	81	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	120	120	LPQL	LPQL	LPQL	LPQL	Not Detected
BH104	1.5-1.95	Fill: silty clay	8	LPQL	18	6	31	LPQL	2	19	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH105	0.1-0.2	Fill: silty sand	LPQL	LPQL	11	3	19	LPQL	1	12	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH106	0.05-0.3	Fill: sandy clay	6	LPQL	31	29	27	LPQL	28	49	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH107	0.05-0.2	Fill: silty sand	LPQL	LPQL	14	8	39	0.3	8	31	2.5	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH107	0.3-0.6	Sandstone	LPQL	LPQL	11	1	4	LPQL	LPQL	8	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH108	0.05-0.2	Fill: gravelly silty sand	LPQL	LPQL	11	16	29	LPQL	1	21	0.3	0.06	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH109	0.05-0.2	Fill: silty sand	LPQL	LPQL	18	34	50	0.3	26	1600	15	**1.5**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH109	0.8-1.1	Sandstone	LPQL	LPQL	11	6	31	LPQL	3	160	0.72	0.07	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH110	0.1-0.3	Fill: gravelly silty sand	LPQL	LPQL	14	5	17	LPQL	6	23	0.2	0.07	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH111	0.06-0.25	Fill: silty sand	LPQL	LPQL	11	6	31	LPQL	4	39	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH111	1.3-1.5	Sandy Clay	LPQL	LPQL	19	LPQL	12	LPQL	1	6	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH112	0.1-0.3	Fill: gravelly silty sand	LPQL	LPQL	16	9	42	LPQL	10	40	0.51	0.07	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH112	1.5-1.95	Fill: sandy clay	LPQL	LPQL	6	7	66	LPQL	1	49	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH112	2.7-3.0	Sandstone	LPQL	LPQL	6	4	22	LPQL	LPQL	51	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH113	0.1-0.3	Fill: clayey silty sand	LPQL	LPQL	24	19	**110**	0.1	8	46	0.3	0.06	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH113	0.4-0.7	Sandstone	LPQL	LPQL	5	2	6	LPQL	LPQL	4	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH114	0-0.2	Fill: silty clay	LPQL	LPQL	28	27	48	LPQL	18	71	1.2	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH114	1.5-1.95	Fill: sandy clay	12	1	19	57	**800**	LPQL	9	780	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH114 - Replicate	1.5-1.95	Fill: sandy clay	16	1	24	230	**1500**	LPQL	33	640	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114 - Triplicate	1.5-1.95	Fill: sandy clay	19	2	41	270	**2000**	LPQL	**49**	920	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114	2.7-3.0	Sandstone	LPQL	LPQL	6	LPQL	9	LPQL	LPQL	2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH115	0-0.2	Fill: silty sand	LPQL	LPQL	13	24	21	0.3	12	75	1.5	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
GFF1	-	Material	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**Detected**
Total Number of samples			26	26	26	26	26	26	26	26	24	24	19	19	19	19	19	24	24	24	24	24	24	24	24	24	19
Maximum Value			19	2	41	270	2000	0.3	49	1600	15	1.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	120	120	LPQL	LPQL	LPQL	LPQL	NC

Explanation:

[1] - NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (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

Replicate - Laboratory replicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 161150 for explannation

Triplicate - Laboratory triplicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 161150 for explannation

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 E

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**							
BH101	0.1-0.2	Fill: silty sand	NA	NA	NA	NA	NA	NA	LPQL
BH109	0.05-0.2	Fill: silty sand	NA	NA	NA	NA	NA	NA	LPQL
BH113	0.1-0.3	Fill: clayey silty sand	NA	NA	NA	0.04	NA	NA	NA
BH114	1.5-1.95	Fill: sandy clay	NA	NA	NA	1.4	NA	LPQL	NA
Total Number of samples			0	0	0	2	0	1	2
Maximum Value			LPQL	LPQL	LPQL	1.4	LPQL	LPQL	LPQL

Explanation:

1 - NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (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 F
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 = BH114 (0-0.2m)	Arsenic	4	LPQL	LPQL	NC	NC
Dup Ref = Dup GF1	Cadmium	0.4	LPQL	LPQL	NC	NC
	Chromium	1	28	18	23.0	43
Envirolab Report: 161150	Copper	1	27	35	31.0	26
	Lead	1	48	59	53.5	21
	Mercury	0.1	LPQL	LPQL	NC	NC
	Nickel	1	18	13	15.5	32
	Zinc	1	71	79	75.0	11
	Naphthalene	0.1	LPQL	LPQL	NC	NC
	Acenaphthylene	0.1	LPQL	LPQL	NC	NC
	Acenaphthene	0.1	LPQL	LPQL	NC	NC
	Fluorene	0.1	LPQL	LPQL	NC	NC
	Phenanthrene	0.1	LPQL	0.2	0.1	120
	Anthracene	0.1	LPQL	LPQL	NC	NC
	Fluoranthene	0.1	0.2	0.5	0.4	86
	Pyrene	0.1	0.2	0.5	0.4	86
	Benzo(a)anthracene	0.1	0.1	0.2	0.2	67
	Chrysene	0.1	0.1	0.2	0.2	67
	Benzo(b,j+k)fluoranthene	0.2	0.3	0.4	0.4	29
	Benzo(a)pyrene	0.05	0.2	0.3	0.3	40
	Indeno(123-cd)pyrene	0.1	LPQL	0.1	0.1	67
	Dibenzo(ah)anthracene	0.1	LPQL	LPQL	NC	NC
	Benzo(ghi)perylene	0.1	0.1	0.1	0.1	0
	Total OCPs	0.1	LPQL	LPQL	NC	NC
	Total OPPs	0.1	LPQL	LPQL	NC	NC
	Total PCBs	0.1	LPQL	LPQL	NC	NC
	TRH C_6-C_{10} (F1)	25	LPQL	LPQL	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	LPQL	LPQL	NC	NC
	TRH >C_{16}-C_{34} (F3)	100	LPQL	110	80.0	75
	TRH >C_{34}-C_{40} (F4)	100	LPQL	LPQL	NC	NC
	Benzene	0.5	LPQL	LPQL	NC	NC
	Toluene	0.5	LPQL	LPQL	NC	NC
	Ethylbenzene	1	LPQL	LPQL	NC	NC
	m+p-xylene	2	LPQL	LPQL	NC	NC
	o-xylene	1	LPQL	LPQL	NC	NC

Explanation:

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

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

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

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

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
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 = BH115 (0-0.2m)	Arsenic	4	4	LPQL	3	2.5	40
Dup Ref = Dup GF2	Cadmium	0.4	0.4	LPQL	LPQL	NC	NC
	Chromium	1	1	13	12	12.5	8
Envirolab Report: 161150	Copper	1	1	24	26	25.0	8
Envirolab Perth Report: 191644	Lead	1	1	21	22	21.5	5
	Mercury	0.1	0.1	0.3	0.3	0.3	0
	Nickel	1	1	12	12	12.0	0
	Zinc	1	1	75	72	73.5	4
	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	LPQL	LPQL	NC	NC
	Anthracene	0.1	0.1	LPQL	LPQL	NC	NC
	Fluoranthene	0.1	0.1	0.2	0.2	0.2	0
	Pyrene	0.1	0.1	0.2	0.3	0.3	40
	Benzo(a)anthracene	0.1	0.1	0.1	0.1	0.1	0
	Chrysene	0.1	0.1	0.1	0.1	0.1	0
	Benzo(b,j+k)fluoranthene	0.2	0.2	0.3	0.4	0.4	29
	Benzo(a)pyrene	0.05	0.05	0.2	0.23	0.2	14
	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
	Total OCPs	0.1	0.1	LPQL	LPQL	NC	NC
	Total OPPs	0.1	0.1	LPQL	LPQL	NC	NC
	Total PCBs	0.1	0.1	LPQL	LPQL	NC	NC
	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 H

SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TBS
			1/02/2017
	mg/kg	µg/L	mg/kg
TRH C6-C10 (F1)	10	10	LPQL
Benzene	1	1	LPQL
Toluene	1	1	LPQL
Ethylbenzene	1	1	LPQL
m+p-xylene	2	2	LPQL
o-xylene	1	1	LPQL

Explanation:

[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

REPORT APPENDICES

Appendix A: Site Information including Site History

Proposed Development Plans

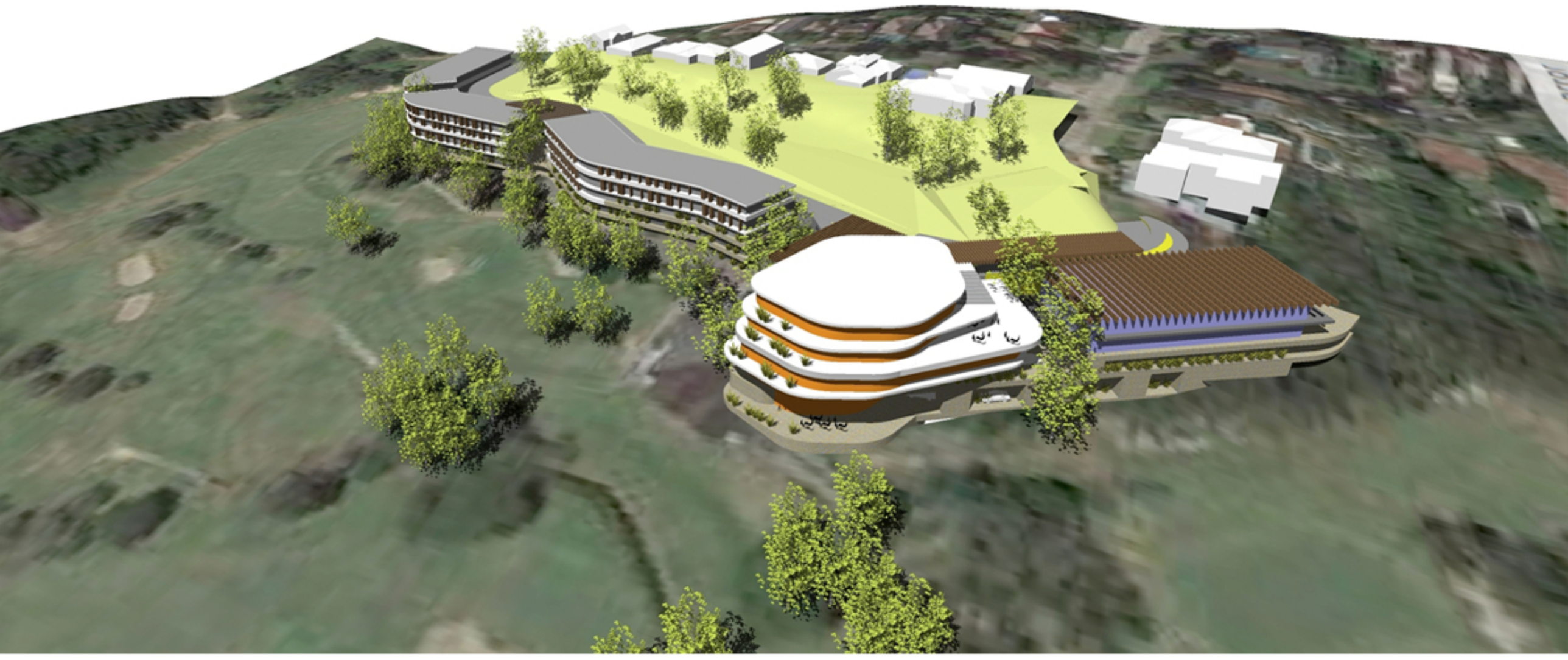
Chatswood Golf Club
Chatswood NSW

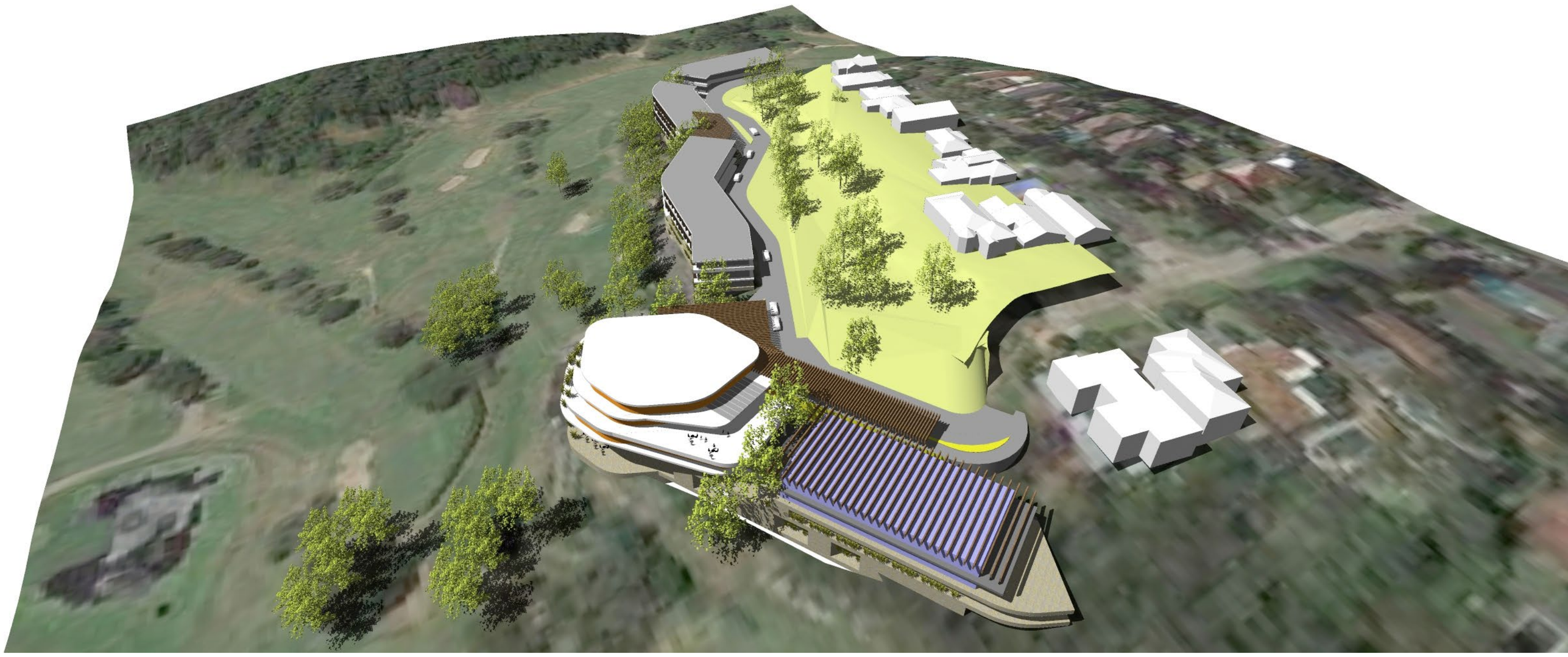
Option C

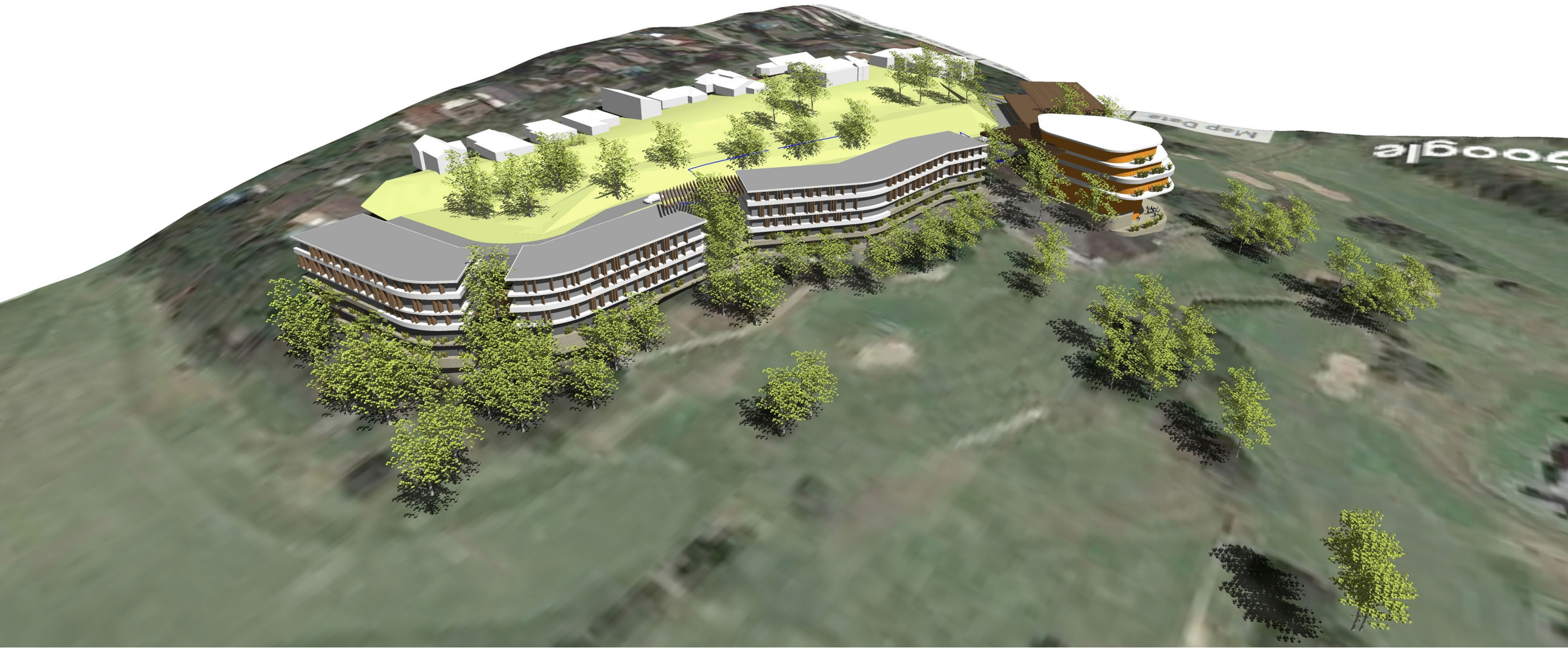
August 2016

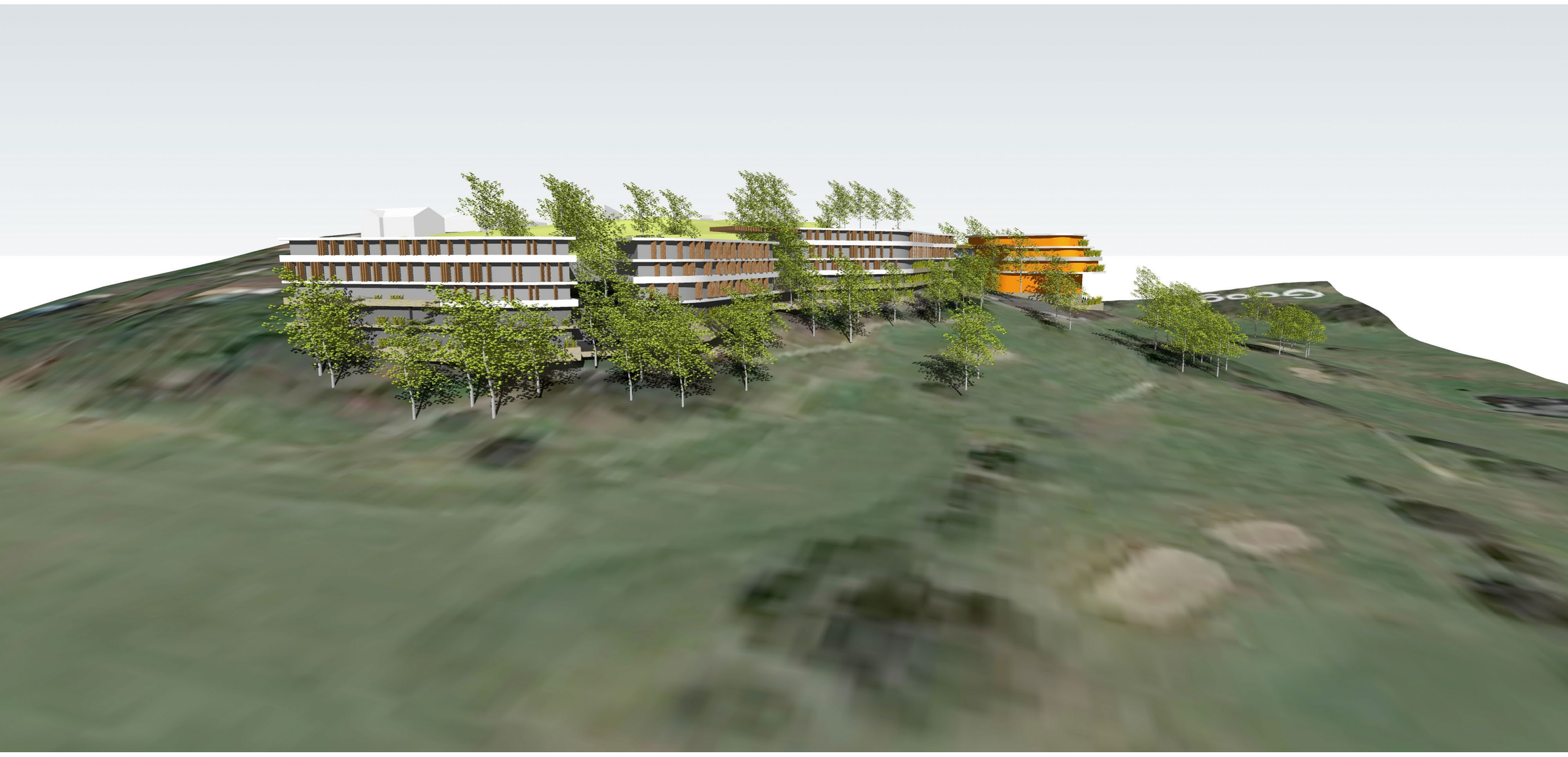
marchesepartners

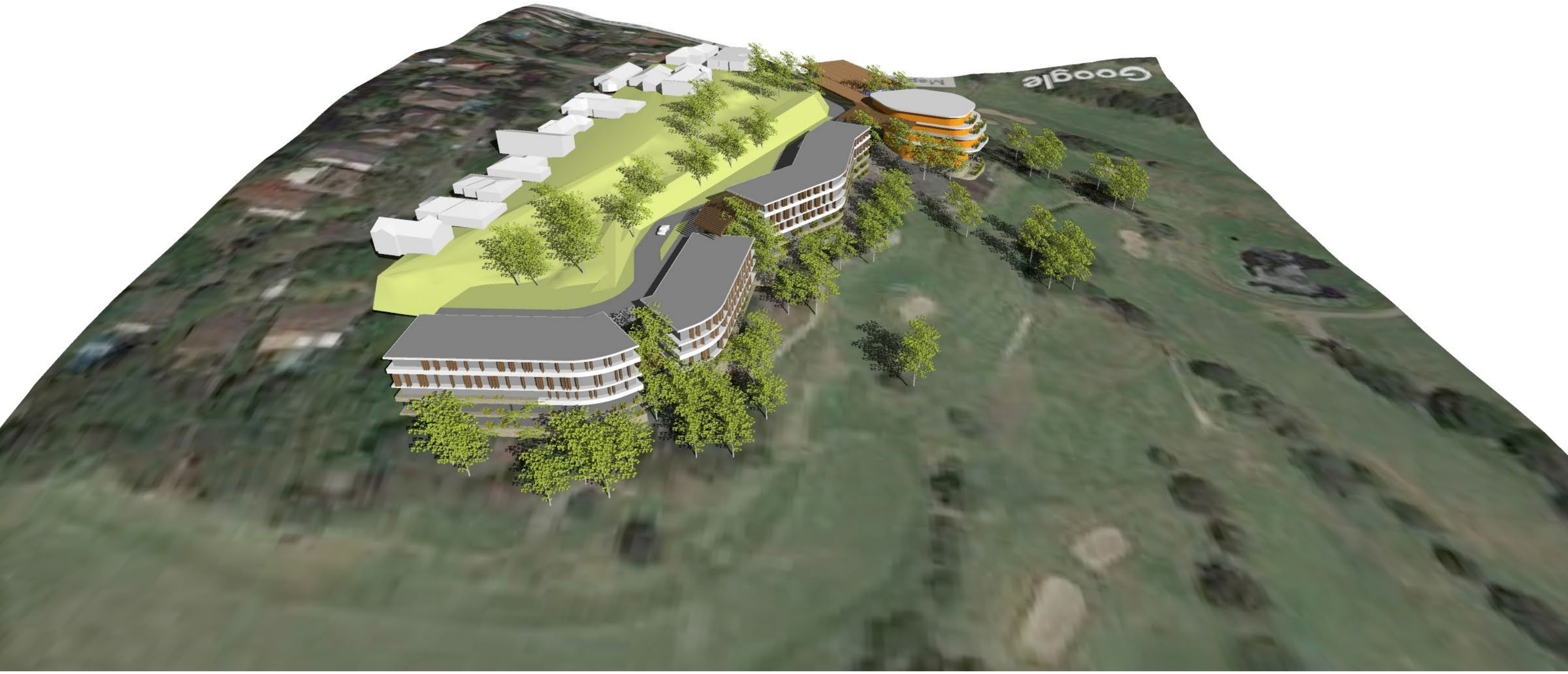
Views






Map Data
Google

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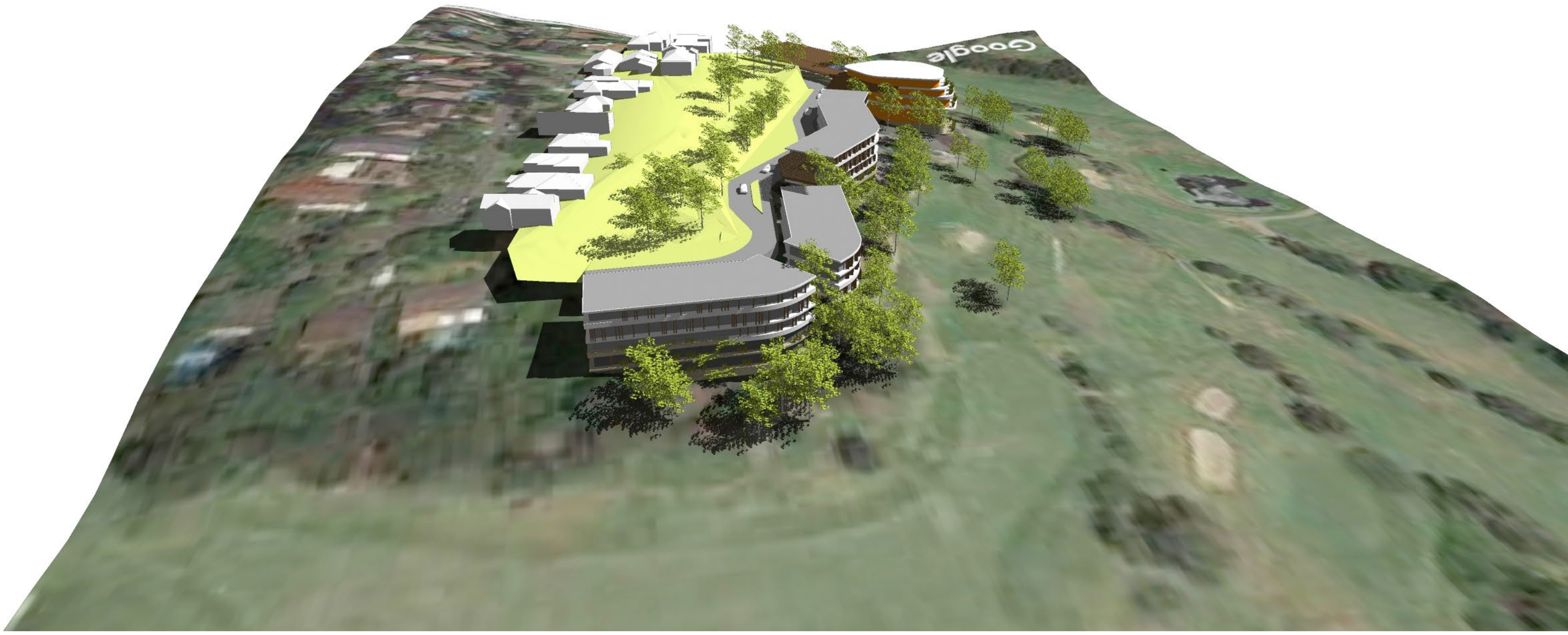
Google

Floor Plans


CLUB
HOUSE
ANCILLARY
FACILITIES
PORTE COCHERE
ENTRY
RL.38.00
RL.36.80
RL.46.00
ILUs
ILUs
PORTE COCHERE
ILUs


CLUB
ADMIN
RL 30.60
B1 RL 30.60
PROPOSED PARKING
PEDESTRIAN RAMP ACCESS
RAMP UP TO GND
B1 RL 30.60
RAMP
ENTRY
RL 38.00
RL 33.70
PROPOSED
ILU's
PROPOSED
ILU's
PROPOSED PARKING
ENTRY
LOBBY
RL 33.70


TEA #1
PRO SHOP
RL 27.50
B2 RL 27.50
PEDESTRIAN RAMP ACCESS
RAMP UPTO B1
PROPOSED PARKING
B2 RL 27.50
PROPOSED
ILU's
PROPOSED
ILU's

Development Study

4 / 5ST BUILDING A

	COMMUNAL GFA (m2)	ILU GFA (m2)
LOWER GROUND	0	490
GROUND	0	1580
LEVEL 1	0	1580
LEVEL 2	0	1580
LEVEL 3	0	1580
TOTALS	0	6810
%		

5ST BUILDING B

	COMMUNAL GFA (m2)	ILU GFA (m2)
GROUND	0	1205
LEVEL 1	0	1205
LEVEL 2	0	1205
LEVEL 3	0	1205
LEVEL 4	0	1205
TOTALS	0	6025

GOLF CLUB / FACILITIES

	COMMUNAL GFA (m2)	ILU GFA (m2)
GROUND	2000	0
		0
TOTALS	2000	0

ANCILLARY FACILITIES

	COMMUNAL GFA (m2)	ILU GFA (m2)
GROUND	2000	0
		0
TOTALS	2000	0

Development Data - CHATSWOOD GOLF COURSE

OPTION C

PROPOSED

	COMMUNAL GFA (m2)	ILU GFA (m2) 85% efficiancy
4 / 5ST BUILDING A	0	5789
5ST BUILDING B	0	5121
GOLF CLUB / FACILITIES	2000	0
ANCILLARY FACILITIES	2000	0
TOTALS	4000	10910
	14910	

SITE AREA =	TBC	sqm	
TOTAL GFA =	14910	sqm	(approx)
TOTAL UNITS=	100		
PROPOSED FSR =	TBC	:1	

NOTE:
RESIDENTIAL GFA TOTALS BASED ON 85% EFFICIANCY .

Schedule of Car Parking			
Description			
Apartment Type	Parking Rate	Achieved / Provided	%
ILU RESIDENT PARKING + VISITOR		120	43%
CLUB + ANCILLARY		160	57%
TOTAL PARKING PROPOSED		280	(approx)

NOTE: ACCESSIBLE PARKING % & SIZES TO BE CONFIRMED WITH TRAFFIC ENGINEER.

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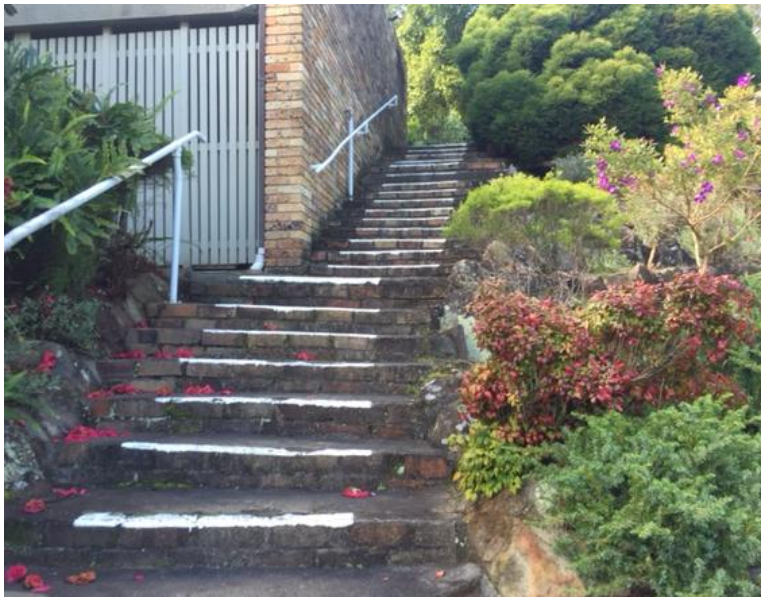
Selected Site Photos

Photograph 1: Showing the asphaltic concrete car park lower level. Photograph taken facing south-west.

Photograph 2: Showing the asphaltic concrete car park upper level. Photograph taken facing south.

Photograph 3: Showing the lower level of the club house building. Photograph taken facing south-west.

Photograph 4: Showing the fill material beneath the club house.



Photograph 5: Showing the site sloping to the west. Photograph taken facing east.

Photograph 6: Showing sandstone outcropping and the site sloping to the west. Photograph taken facing north.

Appendix B: Borehole Logs

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101
1 / 3

BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z **Method:** SPIRAL AUGER **R.L. Surface:** ~43.9 m
Date: 30/1/17 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** D.A.F./A.Z.

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										FILL: Silty sand, fine to medium grained, brown, traces of roots, fine to coarse grained igneous gravel and concrete fragments.	M			GRASS COVER APPEARS POORLY TO MODERATELY COMPACTED
					N = 7 4,4,3					FILL: Clayey sand, fine to coarse grained, brown and light brown, traces of fine to medium grained igneous gravel and fine to coarse grained sandstone gravel.				
						43	1							
									-	SANDSTONE: fine to coarse grained, light brown.	DW	L M - H		LOW 'TC' BIT RESISTANCE MODERATE TO HIGH RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						42	2							
						41	3							
						40	4							
						39	5							
						38	6							
						37								

JK_LIB_CURRENT - V8.00.GLB Log J & K AUGERHOLE - MASTER 27168Z CHATSWOOD.GPJ <<DrawingFile>> 03/03/2017 11:42 Produced by gINT Professional. Developed by Datgel

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101
2 / 3

CORED BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z | **Core Size:** | **R.L. Surface:** ~43.9 m
Date: 30/1/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** D.A.F./A.Z.

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
		43	1		START CORING AT 1.34m					
100% RETURN		42	2		SANDSTONE: fine to coarse grained, orange brown and light grey, cross bedded at 20-30°.	DW	M - H			
		41	3							(2.74m) XWS, 0°, 2 mm.t
					SANDSTONE: fine to medium grained, light grey and light red brown, bedded at 10-15°.					
		40	4							(3.71m) XWS, 0°, 15 mm.t
▼ ON COMPLETION OF CORING					SANDSTONE: fine to coarse grained, red brown and orange brown, bedded at 10-15°.		M			
		39	5							
100% RETURN		38	6							
		37								

JK_LIB_CURRENT - V8.00.GLB Log J & K CORED BOREHOLE - MASTER 27168Z CHATSWOOD.GPJ <<DrawingFile>> 03/03/2017 11:42 Produced by gINT Professional, Developed by Datgel

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101
3 / 3

CORED BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z | **Core Size:** | **R.L. Surface:** ~43.9 m
Date: 30/1/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** D.A.F./A.Z.

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
100% RETURN		36	8		SANDSTONE: fine to medium grained, light grey and grey, bedded at 10-15°.	SW	M			(7.07m) CS, 0°, 10 mm.t
										(7.67m) XWS, 40°, 50 mm.t
										(8.18m) XWS, 40°, 30 mm.t
										(8.47m) XWS, 0°, 20 mm.t
		35	9							
		34	10							
		33	11							(11.27m) CS, 5°, 60 mm.t
		32	12		END OF BOREHOLE AT 11.75 m					
		31	13							
		30								

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
102
1 / 3

BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z **Method:** SPIRAL AUGER **R.L. Surface:** ~32.1 m
Date: 30/1/17 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** D.A.F./A.Z.

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	■					32			-	ASPHALTIC CONCRETE: 30mm.t	M			
										FILL: Clayey sand, fine to coarse grained, light brown, with silt and traces of fine to medium grained igneous and sandstone gravel.	DW	M - H		MODERATE TO HIGH 'TC' BIT RESISTANCE
										SANDSTONE: fine to coarse grained, light brown and light grey.				
						31	1			REFER TO CORED BOREHOLE LOG				
						30	2							
						29	3							
						28	4							
						27	5							
						26	6							

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 102
2 / 3

CORED BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z | **Core Size:** | **R.L. Surface:** ~32.1 m
Date: 30/1/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** D.A.F./A.Z.

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
		32			START CORING AT 0.65m					
100% RETURN		31	1		SANDSTONE: fine to coarse grained, orange brown. SANDSTONE: fine to medium grained, light grey and grey, bedded at 0-10°.	DW	M - H			(1.39m) Be, 0°, P, R (1.64m) Be, 0°, P, R, IS (1.65m) Be, 0°, P, R, IS (1.76m) Be, 10°, P, R, IS (1.84m) Be, 10°, P, R, IS (1.88m) XWS, 10°, 2 mm.t
		30	2							
		29	3				M			(3.15m) 0°, 30 mm.t, SHALE LENSE
ON COMPLETION OF CORING		28	4		SANDSTONE: fine to coarse grained, light orange brown and light grey bedded at 15-30°.					(3.85m) Be, 10°, P, R, IS (4.03m) XWS, 0°, 10 mm.t (4.06m) XWS, 0°, 5 mm.t (4.30m) XWS, 20°, 30 mm.t (4.40m) CS, 0°, 10 mm.t
100% RETURN		27	5		as above, but light red brown and light orange brown, bedded at 0-10°.		H			(5.11m) J, 20°, Un, R
		26	6							
					as above, but orange brown and light grey, bedded at 10-30°.		M			(6.62m) Be, 0°

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
102
3 / 3

CORED BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z
Core Size:
R.L. Surface: ~32.1 m
Date: 30/1/17
Inclination: VERTICAL
Datum: AHD
Plant Type: JK308
Bearing: N/A
Logged/Checked By: D.A.F./A.Z.

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
100% RETURN		25			SANDSTONE: fine to coarse grained, orange brown and light grey, bedded at 10-15°.	DW	M			(7.43m) Cr, 0°, 30 mm.t (7.84m) J, 35°, P, S, IS
		24	8							
		23	9		END OF BOREHOLE AT 8.77 m					
		22	10							
		21	11							
		20	12							
		19	13							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 103
1 / 3

BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z **Method:** SPIRAL AUGER **R.L. Surface:** ~35.7 m
Date: 31/1/17 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** D.A.F./A.Z.

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 COMMENCEMENT OF AUGERING						35	1		-	FILL: Silty sand, fine to medium grained, light brown, traces of fine to medium grained igneous and sandstone gravel.	DW	M		MODERATE 'TC' BIT RESISTANCE
										SANDSTONE: fine to coarse grained, red brown and light red brown.	XW - DW	EL - VL		VERY LOW RESISTANCE
												M - H		MODERATE TO HIGH RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						34	2							
						33	3							
						32	4							
						31	5							
						30	6							
						29								

JK_LIB_CURRENT - V8.00.GLB Log J & K AUGERHOLE - MASTER 27168Z CHATSWOOD.GPJ <<DrawingFile>> 03/03/2017 11:42 Produced by gINT Professional. Developed by Datgel

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 103
2 / 3

CORED BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z | **Core Size:** | **R.L. Surface:** ~35.7 m
Date: 31/1/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** D.A.F./A.Z.

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
		35	1		START CORING AT 1.27m					
100% RETURN		34	2		SANDSTONE: fine to coarse grained, red brown, orange brown and light grey, bedded at 15-20°.	DW	M			(2.21m) CS, 0°, 40 mm.t
ON COMPLETION OF CORING					CORE LOSS 0.50m					
		33	3		SANDSTONE: fine to medium grained, red brown orange brown and light grey, bedded at 10-15°.	DW	L - M			
		32	4							
					as above, but fine to coarse grained.					
20% RETURN (BELOW 2.5M)		31	5							
		30	6		SANDSTONE: fine to medium grained, light grey and grey, bedded at 0-10°.	SW - FR	H			(5.45m) XWS, 0°, 90 mm.t
										(6.19m) Be, 10°, P, S (6.22m) J, 10° (6.25m) Be, 0° (6.29m) XWS, 5°, 10 mm.t, IS (6.31m) Be, 5°, P, R, IS (6.32m) Be, 0°, P, S, IS
		29			as above, but fine to coarse grained.	SW	M			(6.82m) J, 50°, P, R, IS

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 103 3 / 3

CORED BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z **Core Size:** **R.L. Surface:** ~35.7 m
Date: 31/1/17 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** D.A.F./A.Z.

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
20% RETURN (BELOW 2.5M)		28	8		SANDSTONE: fine to coarse grained, light grey and grey, bedded at 0-10°.	SW	M			(7.43m) XWS, 5°, 20 mm.t
		27	9							
		26	10				H			(10.11m) XWS, 5°, 2 mm.t
		25	11							
		24	12		END OF BOREHOLE AT 11.50 m					
		23	13							
		22								

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JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 104
1 / 1

BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z **Method:** SPIRAL AUGER **R.L. Surface:** ~35.5 m
Date: 31/1/17 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** D.A.F./A.Z.

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						35	0			FILL: Silty sand, brown and light grey, trace of fine to medium grained sand.	D			APPEARS MODERATELY COMPACTED
					N = 13 9,6,7					FILL: Silty clay, low to medium plasticity, light grey, red brown and orange brown, trace of fine grained sand and fine to coarse grained sandstone gravel.	MC<PL			
						34	1				MC>PL			APPEARS POORLY COMPACTED
					N = 3 1,2,1									
						33	2		-	SANDSTONE: fine to coarse grained, light orange brown and light grey.	DW	M - H		MODERATE TO HIGH 'TC' BIT RESISTANCE
												M		MODERATE RESISTANCE
						32	3					M - H		MODERATE TO HIGH RESISTANCE
						31	4			END OF BOREHOLE AT 4.00 m				'TC' BIT REFUSAL
						30	5							
						29	6							

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JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
105
1 / 1

BOREHOLE LOG

Client: WATERMARK CHATSWOOD
Project: REDEVELOPMENT OF CHATSWOOD GOLF CLUB
Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No.: 27168Z **Method:** SPIRAL AUGER **R.L. Surface:** ~42.3 m
Date: 31/1/17 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** D.A.F./A.Z.

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	■			■		42			-	ASPHALTIC CONCRETE: 30mm.t				
	■									FILL: Silty sand, fine to coarse grained, light brown, trace of fine to coarse grained sandstone gravel.				
				■	N=SPT 4/ 0mm REFUSAL					SANDSTONE: fine to coarse grained, light orange brown and light grey.	DW	L - M / M - H		LOW TO MODERATE 'TC' BIT RESISTANCE / MODERATE TO HIGH RESISTANCE
						41	1			END OF BOREHOLE AT 1.00 m				'TC' BIT REFUSAL
						40	2							
						39	3							
						38	4							
						37	5							
						36	6							

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ENVIRONMENTAL INVESTIGATION SERVICES

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EIS

ENVIRONMENTAL LOG

Borehole No. 106

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t				
								-	FILL: Sandy clay, low plasticity, brown, orange brown and grey, fine to medium grained sand, trace of fine to medium grained igneous, sandstone and ironstone gravel.	MC<PL			
						0.5			SANDSTONE: fine to medium grained, light grey and yellow brown.	DW	VL		VERY LOW TO LOW 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 0.8m				
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

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EIS

ENVIRONMENTAL LOG

Borehole No. 107

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t				
								-	FILL: Silty sand, fine to medium grained, brown and orange brown, with clay fines, trace of fine to medium grained igneous, sandstone and ironstone gravel.	M			
						0.5			SANDSTONE: fine to medium grained, light grey, orange brown and red brown.	DW	L-M		LOW TO MODERATE 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 0.8m				
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

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EIS

ENVIRONMENTAL LOG

Borehole No. 108

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t				
								-	FILL: Gravelly silty sand, fine to medium grained, light brown and orange brown, fine to coarse grained sandstone, trace of fine to medium grained igneous and ironstone gravel.	M			CRUSHED SANDSTONE
						0.5		-	SANDSTONE: fine to medium grained, light grey, yellow brown and orange brown.	DW	VL		VERY LOW TO LOW 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 0.8m				
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

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EIS

ENVIRONMENTAL LOG

Borehole No. 109

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t FILL: Silty sand, fine to medium grained, light brown, trace of clay, fine to medium grained igneous, sandstone and ironstone gravel.	M			
					N > 10 6,7,3/0mm	0.5		CL	SANDY CLAY: medium to high plasticity, light brown, fine to medium grained sand, trace of fine to medium grained ironstone gravel and ash.	MC≈PL			
					REFUSAL	1		-	SANDSTONE: fine to medium grained, light grey and red brown.	DW	H		HIGH 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 1.1m				'TC' BIT REFUSAL
						1.5							
						2							
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No. 110

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF

Date: 1/2/17

Method: SPIRAL AUGER
JK308

Logged/Checked by: G.F./M.D.

R.L. Surface: N/A

Datum:

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 100mm.t				
								-	FILL: Gravelly silty sand, fine to medium grained, orange brown and light brown, fine to medium grained sandstone gravel, trace of clay nodules.	M			CRUSHED SANDSTONE
						0.5		-	SANDSTONE: fine to medium grained, yellow brown and light grey.	DW	M-H		HIGH 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 0.6m				'TC' BIT REFUSAL
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No. 111

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF

Date: 1/2/17

Method: SPIRAL AUGER
JK308

Logged/Checked by: G.F./M.D.

R.L. Surface: N/A

Datum:

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 60mm.t				
								-	FILL: Silty sand, fine to medium grained, orange brown and light brown, with fine to coarse grained sandstone gravel, trace of fine grained igneous and ironstone gravel.	M			CRUSHED SANDSTONE
					N = 2 2,1,1	0.5			FILL: Sandy clay, low to medium plasticity, grey and brown, fine to medium grained sand, trace of fine to medium grained ironstone and sandstone gravel and ash.	MC≈PL			
						1		CL	SANDY CLAY: medium to high plasticity, orange brown, fine to medium grained sand.	MC>PL			
					N > 10 4,10/ 150mm	1.5		-	SANDSTONE: fine to medium grained, light grey and yellow brown, with iron indurated bands.	XW	EL		
					REFUSAL	2			END OF BOREHOLE AT 1.8m				
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No. 112 1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 100mm.t				
								-	FILL: Gravelly silty sand, fine to medium grained, orange brown and light brown, fine to medium grained sandstone, trace of fine to medium grained igneous gravel and clay nodules.	M			CRUSHED SANDSTONE
					N = 19 11,9,10	0.5							
						1							
					N = 17 12,11,6	1.5			FILL: Sandy clay, low plasticity, brown and orange brown, trace of fine to coarse grained sandstone gravel, ash and glass.	MC<PL			
						2							
						2.5		-	SANDSTONE: fine to medium grained, yellow brown and light grey.	DW	L		LOW 'TC' BIT RESISTANCE
						3			END OF BOREHOLE AT 3.0m				
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No. 113

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 90mm.t				
								-	FILL: Clayey silty sand, fine to medium grained, orange brown, light brown, with fine to coarse grained sandstone gravel, trace of fine to medium grained igneous gravel.	M			
						0.5		-	SANDSTONE: fine to medium grained, red brown, light grey and orange brown.	DW	L		LOW 'TC' BIT RESISTANCE
						1			END OF BOREHOLE AT 1.0m				
						1.5							
						2							
						2.5							
						3							
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No. 114

1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** SPIRAL AUGER JK308 **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET-ION						0			FILL: Silty clay, low plasticity, brown, trace of root fibres, plastic, bricks, fine to coarse grained sandstone and fine to medium grained igneous gravel.	MC<PL			GRASS COVER
					N = 16 20,10,6	0.5							
						1							
						1.5			FILL: Sandy clay, low plasticity, brown and dark grey, trace of glass, ash, slag, ceramic, and fine to medium grained sandstone gravel.				
					N = 1 1,0,1								
						2		-	SANDSTONE: fine to medium grained, light grey, yellow brown and red brown.	DW	L		LOW TO MODERATE 'TC' BIT RESISTANCE
						2.5							
						3			END OF BOREHOLE AT 3.0m				
						3.5							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No. 115 1/1

Environmental logs are not to be used for geotechnical purposes

Client: WATERMARK CHATSWOOD

Project: PROPOSED CHATSWOOD GOLF CLUB REDEVELOPMENT

Location: BEACONSFIELD ROAD, CHATSWOOD, NSW

Job No. E27168KF **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 1/2/17 **Datum:**

Logged/Checked by: G.F./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■	■				0			FILL: Silty sand, fine to medium grained, brown, trace of fine to medium grained igneous gravel, and root fibres.	D			GRASS COVER
									END OF BOREHOLE AT 0.25m				HAND AUGER REFUSAL
						0.5							
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

EXPLANATORY NOTES – ENVIRONMENTAL LOGS

INTRODUCTION

These notes have been provided to supplement the environmental report with regards to drilling and field logging. Not all notes are necessarily relevant to all reports. Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and manmade processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies involve gathering and assimilating limited facts about these characteristics and properties in order to understand the ground on a particular site under certain conditions. These conditions are directly relevant only to the ground at the place where, and time when, the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

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

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (e.g. sandy clay) as set out below (note that unless stated in the report, the soil classification is based on a qualitative field assessment, not laboratory testing):

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2mm
Gravel	2 to 60mm

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

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

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

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

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

DRILLING OR EXCAVATION METHODS

The following is a brief summary of drilling and excavation methods currently adopted by the Company, and some comments on their use and application. All except test pits and hand auger drilling require the use of a mechanical drilling rig.

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

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

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

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

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

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

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

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

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

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as: N = 13 (4, 6, 7)
- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as: N>30 (15, 30/40mm)

The results of the test can be related empirically to the engineering properties of the soil. Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

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

LOGS

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

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

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line"

variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

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

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

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

FILL

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

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

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classifications and rocks strengths indicated on the environmental logs unless noted in the report.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, EIS should be notified immediately.

GRAPHIC LOG SYMBOLS FOR SOIL AND ROCKS

SOIL


FILL


TOPSOIL


CLAY (CL, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CH)


SILTY CLAY (CL, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML)


PEAT AND ORGANIC SOILS

ROCK


CONGLOMERATE


SANDSTONE


SHALE


SILTSTONE, MUDSTONE, CLAYSTONE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

DEFECTS AND INCLUSIONS


CLAY SEAM


SHEARED OR CRUSHED SEAM


BRECCIATED OR SHATTERED SEAM/ZONE


IRONSTONE GRAVEL


ORGANIC MATERIAL

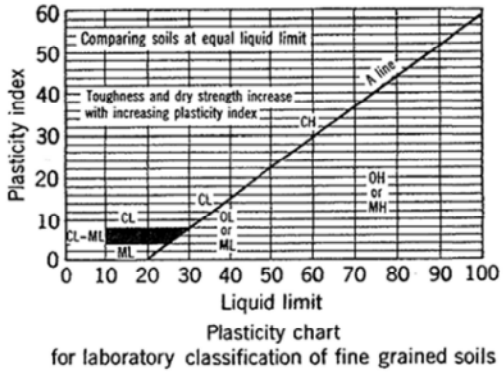
OTHER MATERIALS


CONCRETE


BITUMINOUS CONCRETE, COAL


COLLUVIUM

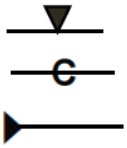
Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)						Group Symbols [a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than 75 μm sieve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



Plasticity chart
for laboratory classification of fine grained soils

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

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record		Standing water level. Time delay following completion of drilling may be shown. Extent of borehole collapse shortly after drilling. Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES U50 DB DS ASB ASS SAL	Soil sample taken over depth indicated, for environmental analysis. Undisturbed 50mm diameter tube sample taken over depth indicated. Bulk disturbed sample taken over depth indicated. Small disturbed bag sample taken over depth indicated. Soil sample taken over depth indicated, for asbestos screening. Soil sample taken over depth indicated, for acid sulfate soil analysis. Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3 R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of Undrained Shear Strength. Photoionisation detector reading in ppm (Soil sample heads pace test).
Moisture (Cohesive Soils) (Cohesionless)	MC > PL MC ≈ PL MC < PL D M W	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. DRY – Runs freely through fingers. MOIST – Does not run freely but no free water visible on soil surface. WET – Free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt H ( )	VERY SOFT – Unconfined compressive strength less than 25kPa SOFT – Unconfined compressive strength 25-5 0kPa FIRM – Unconfined compressive strength 50-1 00kPa STIFF – Unconfined compressive strength 100- 200kPa VERY STIFF – Unconfined compressive strength 200- 400kPa HARD – Unconfined compressive strength greater than 400kPa Bracketed symbol indicates estimated consistency based o n tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)	VL L MD D VD ( )	**Density Index (ID) Range (%)** / **SPT ' N' Value Range (Blows/300mm)** Very Loose <15 / 0-4 Loose 15-35 / 4-10 Medium Dense 35-65 / 10-30 Dense 65-85 / 30-50 Very Dense >85 / >50 Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise
Remarks	'V' bit 'TC' bit T_{60}	Hardened steel 'V' shaped bit. Tungsten carbide wing bit. Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

LOG SYMBOLS CONTINUED

ROCK STRENGTH

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

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

ROCK STRENGTH

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

Appendix C: Laboratory Reports & COC Documents

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

CERTIFICATE OF ANALYSIS 161150

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Geoff Fletcher

Sample log in details:

Your Reference:	**E27168KF, Chatswood**
No. of samples:	1 material 38 soils
Date samples received / completed instructions received	01/02/17 / 01/02/17

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:	8/02/17 / 7/02/17
Date of Preliminary Report:	Not Issued

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

Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017	06/02/2017	06/02/2017
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
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	106	108	106	113

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017	06/02/2017	06/02/2017
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
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	107	98	101	102	111

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017	06/02/2017	06/02/2017
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
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	107	108	110	106	107

vTRH(C6-C10)/BTEXN in Soil				
Our Reference:	UNITS	161150-35	161150-36	161150-38
Your Reference	---------- -	BH115	DUPGF1	TBS
Depth	----------	0-0.2	-	-
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	114	103	111

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
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	120	<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	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	110	109	119	120	114

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
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	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	90	114	104	107	106

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
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	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	105	103	101	108	100

svTRH (C10-C40) in Soil			
Our Reference:	UNITS	161150-35	161150-36
Your Reference	---------- -	BH115	DUPGF1
Depth	----------	0-0.2	-
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	130
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	110
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	110
Surrogate o-Terphenyl	%	110	106

PAHs in Soil Our Reference: Your Reference	UNITS ----------	161150-1 BH101	161150-3 BH102	161150-4 BH103	161150-5 BH104	161150-8 BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.7	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	1.7	<0.1	0.1	<0.1	<0.1
Pyrene	mg/kg	1.5	<0.1	0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.7	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.7	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	1	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.77	<0.05	0.08	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	8.5	<0.05	0.3	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	118	107	116	114	112

PAHs in Soil Our Reference: Your Reference	UNITS ----------	161150-10 BH106	161150-12 BH107	161150-14 BH108	161150-16 BH109	161150-19 BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
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	<0.1	0.7	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	<0.1	0.4	0.1	2.4	<0.1
Pyrene	mg/kg	<0.1	0.5	0.1	2.5	0.1
Benzo(a)anthracene	mg/kg	<0.1	0.2	<0.1	1.4	<0.1
Chrysene	mg/kg	<0.1	0.2	<0.1	1.3	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.4	<0.2	2.5	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.2	0.06	1.5	0.07
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.1	<0.1	0.8	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.2	<0.1	0.8	<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 +ve PAH's	mg/kg	<0.05	2.5	0.3	15	0.2
Surrogate p-Terphenyl-d14	%	105	110	107	115	109

PAHs in Soil Our Reference: Your Reference	UNITS ----------	161150-21 BH111	161150-25 BH112	161150-29 BH113	161150-31 BH114	161150-33 BH114
Depth	-	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled	----------	1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.1	0.1	0.2	<0.1
Pyrene	mg/kg	<0.1	0.2	0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.3	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.07	0.06	0.2	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	0.51	0.3	1.2	<0.05
Surrogate p-Terphenyl-d14	%	113	106	106	110	106

PAHs in Soil			
Our Reference:	UNITS	161150-35	161150-36
Your Reference	----------	BH115	DUPGF1
	-		
Depth	----------	0-0.2	-
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.2
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	0.2	0.5
Pyrene	mg/kg	0.2	0.5
Benzo(a)anthracene	mg/kg	0.1	0.2
Chrysene	mg/kg	0.1	0.2
Benzo(b,j+k)fluoranthene	mg/kg	0.3	0.4
Benzo(a)pyrene	mg/kg	0.2	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Total +ve PAH's	mg/kg	1.5	2.6
Surrogate p-Terphenyl-d14	%	114	107

Organochlorine Pesticides in soil						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	----------	BH101	BH102	BH103	BH104	BH105
Depth	- ----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	119	117	132	121	121

Organochlorine Pesticides in soil						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	121	119	121	119	119

Organochlorine Pesticides in soil						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	122	119	117	126	113

Organochlorine Pesticides in soil			
Our Reference:	UNITS	161150-35	161150-36
Your Reference	----------	BH115	DUPGF1
	-		
Depth	----------	0-0.2	-
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	120	118

Organophosphorus Pesticides						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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	%	119	117	132	121	121

Organophosphorus Pesticides						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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	%	121	119	121	119	119

Organophosphorus Pesticides						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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	%	122	119	117	126	113

Organophosphorus Pesticides			
Our Reference:	UNITS	161150-35	161150-36
Your Reference	---------- -	BH115	DUPGF1
Depth	----------	0-0.2	-
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Surrogate TCMX	%	120	118

PCBs in Soil						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	----------	BH101	BH102	BH103	BH104	BH105
	-					
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	119	117	132	121	121

PCBs in Soil						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	----------	BH106	BH107	BH108	BH109	BH110
	-					
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	121	119	121	119	119

PCBs in Soil						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017	04/02/2017	04/02/2017	04/02/2017
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
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	122	119	117	126	113

PCBs in Soil			
Our Reference:	UNITS	161150-35	161150-36
Your Reference	---------- -	BH115	DUPGF1
Depth	----------	0-0.2	-
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date extracted	-	03/02/2017	03/02/2017
Date analysed	-	04/02/2017	04/02/2017
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	120	118

Acid Extractable metals in soil						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Arsenic	mg/kg	5	<4	<4	4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	17	9	20	11	11
Copper	mg/kg	12	8	23	22	3
Lead	mg/kg	28	20	99	53	19
Mercury	mg/kg	<0.1	<0.1	0.1	0.2	<0.1
Nickel	mg/kg	8	7	10	8	1
Zinc	mg/kg	41	34	93	81	12

Acid Extractable metals in soil						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Arsenic	mg/kg	6	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	31	14	11	18	14
Copper	mg/kg	29	8	16	34	5
Lead	mg/kg	27	39	29	50	17
Mercury	mg/kg	<0.1	0.3	<0.1	0.3	<0.1
Nickel	mg/kg	28	8	1	26	6
Zinc	mg/kg	49	31	21	1,600	23

Acid Extractable metals in soil						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Arsenic	mg/kg	<4	<4	<4	<4	12
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	1
Chromium	mg/kg	11	16	24	28	19
Copper	mg/kg	6	9	19	27	57
Lead	mg/kg	31	42	110	48	800
Mercury	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Nickel	mg/kg	4	10	8	18	9
Zinc	mg/kg	39	40	46	71	780

Acid Extractable metals in soil					
Our Reference:	UNITS	161150-35	161150-36	161150-40	161150-41
Your Reference	---------- -	BH115	DUPGF1	BH111 - [TRIPLICATE]	BH114 - [TRIPLICATE]
Depth	----------	0-0.2	-	0.06-0.25	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	01/02/2017	01/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Arsenic	mg/kg	<4	<4	<4	19
Cadmium	mg/kg	<0.4	<0.4	<0.4	2
Chromium	mg/kg	13	18	17	41
Copper	mg/kg	24	35	7	270
Lead	mg/kg	21	59	44	2,000
Mercury	mg/kg	0.3	<0.1	<0.1	<0.1
Nickel	mg/kg	12	13	6	49
Zinc	mg/kg	75	79	43	920

Moisture						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017	06/02/2017	06/02/2017
Moisture	%	9.5	10	4.4	8.4	6.0

Moisture						
Our Reference:	UNITS	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017	06/02/2017	06/02/2017
Moisture	%	5.0	9.2	7.1	8.2	7.8

Moisture						
Our Reference:	UNITS	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017	03/02/2017	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017	06/02/2017	06/02/2017	06/02/2017
Moisture	%	8.9	8.3	9.4	6.3	12

Moisture			
Our Reference:	UNITS	161150-35	161150-36
Your Reference	---------- -	BH115	DUPGF1
Depth	----------	0-0.2	-
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date prepared	-	03/02/2017	03/02/2017
Date analysed	-	06/02/2017	06/02/2017
Moisture	%	5.1	8.7

Asbestos ID - soils						
Our Reference:	UNITS	161150-1	161150-3	161150-4	161150-5	161150-8
Your Reference	---------- -	BH101	BH102	BH103	BH104	BH105
Depth	----------	0.1-0.2	0.1-0.2	0.-0.1	0.0-0.1	0.1-0.2
Date Sampled		30/01/2017	30/01/2017	31/01/2017	31/01/2017	31/01/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	7/02/2017	7/02/2017	7/02/2017	7/02/2017	7/02/2017
Sample mass tested	g	Approx. 25g	Approx. 35g	Approx. 25g	Approx. 30g	Approx. 25g
Sample Description	-	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy 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	161150-10	161150-12	161150-14	161150-16	161150-19
Your Reference	---------- -	BH106	BH107	BH108	BH109	BH110
Depth	----------	0.05-0.3	0.05-0.2	0.05-0.2	0.05-0.2	0.1-0.3
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	7/02/2017	7/02/2017	7/02/2017	7/02/2017	7/02/2017
Sample mass tested	g	Approx. 35g	Approx. 25g	Approx. 30g	Approx. 30g	Approx. 30g
Sample Description	-	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy 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	161150-21	161150-25	161150-29	161150-31	161150-33
Your Reference	---------- -	BH111	BH112	BH113	BH114	BH114
Depth	----------	0.06-0.25	0.1-0.3	0.1-0.3	0-0.2	1.5-1.9
Date Sampled		1/02/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	7/02/2017	7/02/2017	7/02/2017	7/02/2017	7/02/2017
Sample mass tested	g	Approx. 20g	Approx. 30g	Approx. 30g	Approx. 20g	Approx. 20g
Sample Description	-	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy 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	161150-35
Your Reference	---------- -	BH115
Depth	----------	0-0.2
Date Sampled		1/02/2017
Type of sample		SOIL
Date analysed	-	7/02/2017
Sample mass tested	g	Approx. 20g
Sample Description	-	Brown sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Asbestos ID - materials		
Our Reference:	UNITS	161150-39
Your Reference	----------	GFF1
	-	
Depth	----------	-
Date Sampled		1/02/2017
Type of sample		Material
Date analysed	-	6/02/2017
Mass / Dimension of Sample	-	30x25x5mm
Sample Description	-	Grey compressed fibre cement material
Asbestos ID in materials	-	Chrysotile 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-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. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
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-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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
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-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
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.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 °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 || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			06/02/2017	161150-1	06/02/2017 || 06/02/2017	LCS-6	06/02/2017
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	161150-1	<25 || <25	LCS-6	98%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	161150-1	<25 || <25	LCS-6	98%
Benzene	mg/kg	0.2	Org-016	<0.2	161150-1	<0.2 || <0.2	LCS-6	103%
Toluene	mg/kg	0.5	Org-016	<0.5	161150-1	<0.5 || <0.5	LCS-6	102%
Ethylbenzene	mg/kg	1	Org-016	<1	161150-1	<1 || <1	LCS-6	90%
m+p-xylene	mg/kg	2	Org-016	<2	161150-1	<2 || <2	LCS-6	97%
o-Xylene	mg/kg	1	Org-016	<1	161150-1	<1 || <1	LCS-6	96%
naphthalene	mg/kg	1	Org-014	<1	161150-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	119	161150-1	105 || 109 || RPD: 4	LCS-6	110%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	161150-1	<50 || <50	LCS-6	98%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	161150-1	<100 || <100	LCS-6	87%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	161150-1	<100 || <100	LCS-6	90%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	161150-1	<50 || <50	LCS-6	98%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	161150-1	<100 || <100	LCS-6	87%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	161150-1	<100 || <100	LCS-6	90%
Surrogate o-Terphenyl	%		Org-003	97	161150-1	110 || 112 || RPD: 2	LCS-6	100%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	161150-1	<0.1 || <0.1	LCS-6	100%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	161150-1	<0.1 || <0.1	LCS-6	102%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	161150-1	0.7 || 0.6 || RPD: 15	LCS-6	117%
Anthracene	mg/kg	0.1	Org-012	<0.1	161150-1	0.2 || 0.1 || RPD: 67	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	161150-1	1.7 || 1.9 || RPD: 11	LCS-6	111%
Pyrene	mg/kg	0.1	Org-012	<0.1	161150-1	1.5 || 1.7 || RPD: 12	LCS-6	109%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	161150-1	0.7 || 0.8 || RPD: 13	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	161150-1	0.7 || 0.8 || RPD: 13	LCS-6	102%
Benzo(b,j +k)fluoranthene	mg/kg	0.2	Org-012	<0.2	161150-1	1 || 1 || RPD: 0	[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	161150-1	0.77 || 0.86 || RPD: 11	LCS-6	112%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	161150-1	0.5 || 0.5 || RPD: 0	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	161150-1	0.5 || 0.5 || RPD: 0	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	113	161150-1	118 || 108 || RPD: 9	LCS-6	120%
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	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			04/02/2017	161150-1	04/02/2017 || 04/02/2017	LCS-6	04/02/2017
HCB	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	96%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	110%
Heptachlor	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	101%
delta-BHC	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	100%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	105%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	112%
Dieldrin	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	113%
Endrin	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	119%
pp-DDD	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	99%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	LCS-6	86%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	116	161150-1	119 || 119 || RPD: 0	LCS-6	94%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			04/02/2017	161150-1	04/02/2017 || 04/02/2017	LCS-6	04/02/2017
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	103%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	75%
Dimethoate	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	92%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	93%
Malathion	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	75%
Parathion	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	117%
Ronnel	mg/kg	0.1	Org-008	<0.1	161150-1	<0.1 || <0.1	LCS-6	121%
Surrogate TCMX	%		Org-008	116	161150-1	119 || 119 || RPD: 0	LCS-6	115%
QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			04/02/2017	161150-1	04/02/2017 || 04/02/2017	LCS-6	04/02/2017
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	LCS-6	96%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	161150-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	116	161150-1	119 || 119 || RPD: 0	LCS-6	115%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Date analysed	-			03/02/2017	161150-1	03/02/2017 || 03/02/2017	LCS-6	03/02/2017
Arsenic	mg/kg	4	Metals-020	<4	161150-1	5 || 7 || RPD: 33	LCS-6	111%
Cadmium	mg/kg	0.4	Metals-020	<0.4	161150-1	<0.4 || <0.4	LCS-6	100%
Chromium	mg/kg	1	Metals-020	<1	161150-1	17 || 19 || RPD: 11	LCS-6	107%
Copper	mg/kg	1	Metals-020	<1	161150-1	12 || 14 || RPD: 15	LCS-6	102%
Lead	mg/kg	1	Metals-020	<1	161150-1	28 || 29 || RPD: 4	LCS-6	101%
Mercury	mg/kg	0.1	Metals-021	<0.1	161150-1	<0.1 || <0.1	LCS-6	89%
Nickel	mg/kg	1	Metals-020	<1	161150-1	8 || 10 || RPD: 22	LCS-6	99%
Zinc	mg/kg	1	Metals-020	<1	161150-1	41 || 40 || RPD: 2	LCS-6	100%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	06/02/2017 || 06/02/2017	161150-3	06/02/2017
TRHC$_6$ - C$_9$	mg/kg	161150-21	<25 || <25	161150-3	86%
TRHC$_6$ - C$_{10}$	mg/kg	161150-21	<25 || <25	161150-3	86%
Benzene	mg/kg	161150-21	<0.2 || <0.2	161150-3	89%
Toluene	mg/kg	161150-21	<0.5 || <0.5	161150-3	86%
Ethylbenzene	mg/kg	161150-21	<1 || <1	161150-3	82%
m+p-xylene	mg/kg	161150-21	<2 || <2	161150-3	87%
o-Xylene	mg/kg	161150-21	<1 || <1	161150-3	85%
naphthalene	mg/kg	161150-21	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	161150-21	107 || 116 || RPD: 8	161150-3	98%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	161150-21	<50 || <50	161150-3	99%
TRHC$_{15}$ - C$_{28}$	mg/kg	161150-21	<100 || <100	161150-3	108%
TRHC$_{29}$ - C$_{36}$	mg/kg	161150-21	<100 || <100	161150-3	94%
TRH>C$_{10}$-C$_{16}$	mg/kg	161150-21	<50 || <50	161150-3	99%
TRH>C$_{16}$-C$_{34}$	mg/kg	161150-21	<100 || <100	161150-3	108%
TRH>C$_{34}$-C$_{40}$	mg/kg	161150-21	<100 || <100	161150-3	94%
Surrogate o-Terphenyl	%	161150-21	105 || 102 || RPD: 3	161150-3	109%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Naphthalene	mg/kg	161150-21	<0.1 || <0.1	161150-3	93%
Acenaphthylene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	161150-21	<0.1 || <0.1	161150-3	96%
Phenanthrene	mg/kg	161150-21	<0.1 || <0.1	161150-3	100%
Anthracene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	161150-21	<0.1 || <0.1	161150-3	96%
Pyrene	mg/kg	161150-21	<0.1 || <0.1	161150-3	101%
Benzo(a)anthracene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	161150-21	<0.1 || <0.1	161150-3	90%
Benzo(b,j+k)fluoranthene	mg/kg	161150-21	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	161150-21	<0.05 || <0.05	161150-3	108%
Indeno(1,2,3-c,d)pyrene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	161150-21	113 || 112 || RPD: 1	161150-3	120%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	04/02/2017 || 04/02/2017	161150-3	04/02/2017
HCB	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	161150-21	<0.1 || <0.1	161150-3	94%
gamma-BHC	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	161150-21	<0.1 || <0.1	161150-3	106%
Heptachlor	mg/kg	161150-21	<0.1 || <0.1	161150-3	99%
delta-BHC	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	161150-21	<0.1 || <0.1	161150-3	95%
Heptachlor Epoxide	mg/kg	161150-21	<0.1 || <0.1	161150-3	100%
gamma-Chlordane	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	161150-21	<0.1 || <0.1	161150-3	108%
Dieldrin	mg/kg	161150-21	<0.1 || <0.1	161150-3	108%
Endrin	mg/kg	161150-21	<0.1 || <0.1	161150-3	104%
pp-DDD	mg/kg	161150-21	<0.1 || <0.1	161150-3	102%
Endosulfan II	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	161150-21	<0.1 || <0.1	161150-3	87%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Methoxychlor	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%	161150-21	122 || 119 || RPD: 2	161150-3	95%
QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	04/02/2017 || 04/02/2017	161150-3	04/02/2017
Azinphos-methyl (Guthion)	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	161150-21	<0.1 || <0.1	161150-3	102%
Chlorpyriphos-methyl	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	161150-21	<0.1 || <0.1	161150-3	78%
Dimethoate	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	161150-21	<0.1 || <0.1	161150-3	86%
Fenitrothion	mg/kg	161150-21	<0.1 || <0.1	161150-3	86%
Malathion	mg/kg	161150-21	<0.1 || <0.1	161150-3	75%
Parathion	mg/kg	161150-21	<0.1 || <0.1	161150-3	107%
Ronnel	mg/kg	161150-21	<0.1 || <0.1	161150-3	120%
Surrogate TCMX	%	161150-21	122 || 119 || RPD: 2	161150-3	117%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	04/02/2017 || 04/02/2017	161150-3	04/02/2017
Aroclor 1016	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	161150-21	<0.1 || <0.1	161150-3	98%
Aroclor 1260	mg/kg	161150-21	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	161150-21	122 || 119 || RPD: 2	161150-3	117%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Date analysed	-	161150-21	03/02/2017 || 03/02/2017	161150-3	03/02/2017
Arsenic	mg/kg	161150-21	<4 || <4	161150-3	99%
Cadmium	mg/kg	161150-21	<0.4 || <0.4	161150-3	96%
Chromium	mg/kg	161150-21	11 || 20 || RPD: 58	161150-3	114%
Copper	mg/kg	161150-21	6 || 7 || RPD: 15	161150-3	103%
Lead	mg/kg	161150-21	31 || 40 || RPD: 25	161150-3	95%
Mercury	mg/kg	161150-21	<0.1 || <0.1	161150-3	91%
Nickel	mg/kg	161150-21	4 || 5 || RPD: 22	161150-3	103%
Zinc	mg/kg	161150-21	39 || 43 || RPD: 10	161150-3	92%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	161150-33	03/02/2017 || 03/02/2017
Date analysed	-	161150-33	03/02/2017 || 03/02/2017
Arsenic	mg/kg	161150-33	12 || 16 || RPD: 29
Cadmium	mg/kg	161150-33	1 || 1 || RPD: 0
Chromium	mg/kg	161150-33	19 || 24 || RPD: 23
Copper	mg/kg	161150-33	57 || 230 || RPD: 121
Lead	mg/kg	161150-33	800 || 1500 || RPD: 61
Mercury	mg/kg	161150-33	<0.1 || <0.1
Nickel	mg/kg	161150-33	9 || 33 || RPD: 114
Zinc	mg/kg	161150-33	780 || 640 || RPD: 20

Report Comments:

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 161150-21 for Cr. Therefore a triplicate result has been issued as laboratory sample number 161150-40.

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: Samples 161150-3, 8, 10, 12, & 14were sub-sampled from bags provided by the client.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 161150-33 for Cu, Pb, Ni. Therefore a triplicate result has been issued as laboratory sample number 161150-41.

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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	Geoff Fletcher

Sample Login Details	
Your Reference	E27168KF, Chatswood
Envirolab Reference	**161150**
Date Sample Received	01/02/2017
Date Instructions Received	01/02/2017
Date Results Expected to be Reported	**08/02/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1 material 38 soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	19.3
Cooling Method	Ice
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples
missing BH109 0.65-0.8

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
www.envirolabservices.com.au

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*	*Asbestos ID - materials*	*On Hold*
BH101-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH101-0.5-0.95										✓
BH102-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH103-0.-0.1	✓	✓	✓	✓	✓	✓	✓	✓		
BH104-0.0-0.1	✓	✓	✓	✓	✓	✓	✓	✓		
BH104-0.5-0.95										✓
BH104-1.5-1.95										✓
BH105-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH105-0.5-0.6										✓
BH106-0.05-0.3	✓	✓	✓	✓	✓	✓	✓	✓		
BH106-0.4-0.7										✓
BH107-0.05-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH107-0.3-0.6										✓
BH108-0.05-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH108-0.3-0.6										✓
BH109-0.05-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH109-0.5-0.65										✓
BH109-0.8-1.1										✓
BH110-0.1-0.3	✓	✓	✓	✓	✓	✓	✓	✓		
BH110-0.4-0.6										✓
BH111-0.06-0.25	✓	✓	✓	✓	✓	✓	✓	✓		
BH111-0.5-0.95										✓
BH111-1.6-1.5										✓
BH111-1.65-1.8										✓
BH112-0.1-0.3	✓	✓	✓	✓	✓	✓	✓	✓		
BH112-0.5-0.95										✓
BH112-1.5-1.95										✓
BH112-2.7-3.0										✓

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*	*Asbestos ID - materials*	*On Hold*
BH113-0.1-0.3	✓	✓	✓	✓	✓	✓	✓	✓		
BH113-0.4-0.7										✓
BH114-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
BH114-0.5-0.95										✓
BH114-1.5-1.9	✓	✓	✓	✓	✓	✓	✓	✓		
BH114-2.7-3.0										✓
BH115-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		
DUPGF1	✓	✓	✓	✓	✓	✓	✓			
DUPGF2										✓
TBS	✓									
GFF1									✓	

SAMPLE AND CHAIN OF CUSTODY FORM

TO:
ENVIROLAB SERVICES PTY LTD
12 ASHLEY STREET
CHATSWOOD NSW 2067
P: (02) 99106200
F: (02) 99106201

Attention: Aileen

EIS Job Number: E27168KF

Date Results Required: STANDARD

Page: 1 of 2

FROM:
ENVIRONMENTAL INVESTIGATION SERVICES
REAR OF 115 WICKS ROAD
MACQUARIE PARK, NSW 2113
P: 02-9888 5000 F: 02-9888 5001
Attention: Geoff Fletcher

Location: Chatswood
Sampler: DAF + GF

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 6a	BTEX	Asbestos
30/1/17	1	BH101	0.1–0.2	G,A	0	Fill		X		
	2		0.5–0.95		0					
	3	BH102	0.1–0.2		0			X		
31/1/17	4	BH103	0.0–0.1		0			X		
	5	BH104	0.0–0.1		0			X		
	6		0.5–0.95		0					
	7		1.5–1.95		0					
	8	BH105	0.1–0.2		0			X		
	9		0.5–0.6		0					
1/2/17	10	BH106	0.05–0.3		0	Fill		X		
	11		0.4–0.7		0	Sandstone				
	12	BH107	0.05–0.2		0	Fill		X		
	13		0.3–0.6		0	Sandstone				
	14	BH108	0.05–0.2		0	Fill		X		
	15		0.3–0.6		0	Sandstone				
	16	BH109	0.05–0.2		0	Fill		X		
	17		0.5–0.65		0					
	NR		0.65–0.8	G	0	Sandy clay				
	18		0.8–1.1	G	0	Sandstone				
	19	BH110	0.1–0.3	G,A	0	Fill		X		
	20		0.4–0.6		0	Sandstone				
	21	BH111	0.06–0.25		0	Fill		X		
	22		0.5–0.95		0					
	23		1.3–1.5		0	Sandy clay				
	24		1.65–1.8		0	Sandstone				

ENVIROLAB

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

Job No: 161150
Date Received: 01/02/17
Time Received: 16:00
Received by: SK
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

19.3°C

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:
		16:00	SK	01/02/17

Pg 1/2

161150

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: E27168KF Date Results Required: STANDARD Page: 2 of 2	ENVIRONMENTAL INVESTIGATION SERVICES REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Geoff Fletcher

Location: Chatswood

Sampler: DAF + GF

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 6a	BTEX	Asbestos
1/2/17	25	BH112	0.1–0.3	G,A	0	Fill		X		
	26		0.5–0.95		0					
	27		1.5–1.95		0					
	28		2.7–3.0		0	Sandstone				
	29	BH113	0.1–0.3		0	Fill		X		
	30		0.4–0.7		0	Sandstone				
	31	BH114	0–0.2		0	Fill		X		
	32		0.5–0.95		0					
	33		1.5–1.95		0			X		
	34		2.7–3.0		0	Sandstone				
	35	BH115	0–0.2		0	Fill		X		
	36	DupGF1	—	G	—		X			
	37	DupGF2	—		—		X			
	38	TBS	—		—				X	
30/1/17	39	GFF1		A	—	Material				X

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:

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 161150-A

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Geoff Fletcher

Sample log in details:

Your Reference:	**E27168KF, Chatswood**
No. of samples:	Additional Testing on 12 Soils
Date samples received / completed instructions received	01/02/17 / 08/02/17

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:	15/02/17 / 14/02/17
Date of Preliminary Report:	Not Issued

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

Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	161150-A-7	161150-A-13	161150-A-18	161150-A-23	161150-A-27
Your Reference	---------- -	BH104	BH107	BH109	BH111	BH112
Depth	----------	1.5-1.95	0.3-0.6	0.8-1.1	1.3-1.5	1.5-1.95
Date Sampled		31/01/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017	10/02/2017	10/02/2017
TRHC6 - C9	mg/kg	<25	<25	<25	<25	<25
TRHC6 - C10	mg/kg	<25	<25	<25	<25	<25
vTPHC6 - C10 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
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	86	85	83	81	89

vTRH(C6-C10)/BTEXN in Soil				
Our Reference:	UNITS	161150-A-28	161150-A-30	161150-A-34
Your Reference	---------- -	BH112	BH113	BH114
Depth	----------	2.7-3.0	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017
TRHC6 - C9	mg/kg	<25	<25	<25
TRHC6 - C10	mg/kg	<25	<25	<25
vTPHC6 - C10 less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	89	86	84

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	161150-A-7	161150-A-13	161150-A-18	161150-A-23	161150-A-27
Your Reference	---------- -	BH104	BH107	BH109	BH111	BH112
Depth	----------	1.5-1.95	0.3-0.6	0.8-1.1	1.3-1.5	1.5-1.95
Date Sampled		31/01/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017	10/02/2017	10/02/2017
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	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	77	80	78	78	79

svTRH (C10-C40) in Soil				
Our Reference:	UNITS	161150-A-28	161150-A-30	161150-A-34
Your Reference	---------- -	BH112	BH113	BH114
Depth	----------	2.7-3.0	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100
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	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	80	78	78

PAHs in Soil Our Reference: Your Reference	UNITS ---------- -	161150-A-7 BH104	161150-A-13 BH107	161150-A-18 BH109	161150-A-23 BH111	161150-A-27 BH112
Depth	----------	1.5-1.95	0.3-0.6	0.8-1.1	1.3-1.5	1.5-1.95
Date Sampled		31/01/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	09/02/2017	09/02/2017	09/02/2017	09/02/2017	09/02/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.07	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	<0.05	0.72	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	80	87	86	85	94

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	161150-A-28 BH112 2.7-3.0 1/02/2017 SOIL	161150-A-30 BH113 0.4-0.7 1/02/2017 SOIL	161150-A-34 BH114 2.7-3.0 1/02/2017 SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	09/02/2017	09/02/2017	09/02/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	93	88	93

Organochlorine Pesticides in soil				
Our Reference:	UNITS	161150-A-23	161150-A-30	161150-A-34
Your Reference	---------- -	BH111	BH113	BH114
Depth	----------	1.3-1.5	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	09/02/2017	09/02/2017	09/02/2017
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	89	89

Organophosphorus Pesticides Our Reference: Your Reference	UNITS ---------- -	161150-A-23 BH111	161150-A-30 BH113	161150-A-34 BH114
Depth	----------	1.3-1.5	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	09/02/2017	09/02/2017	09/02/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	89	89

PCBs in Soil				
Our Reference:	UNITS	161150-A-23	161150-A-30	161150-A-34
Your Reference	----------	BH111	BH113	BH114
	-			
Depth	----------	1.3-1.5	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	09/02/2017	09/02/2017	09/02/2017
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	89	89	89

Acid Extractable metals in soil						
Our Reference:	UNITS	161150-A-7	161150-A-13	161150-A-18	161150-A-23	161150-A-27
Your Reference	---------- -	BH104	BH107	BH109	BH111	BH112
Depth	----------	1.5-1.95	0.3-0.6	0.8-1.1	1.3-1.5	1.5-1.95
Date Sampled		31/01/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	09/02/2017	09/02/2017	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017	10/02/2017	10/02/2017
Arsenic	mg/kg	8	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	18	11	11	19	6
Copper	mg/kg	6	1	6	<1	7
Lead	mg/kg	31	4	31	12	66
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	2	<1	3	1	1
Zinc	mg/kg	19	8	160	6	49

Acid Extractable metals in soil				
Our Reference:	UNITS	161150-A-28	161150-A-30	161150-A-34
Your Reference	---------- -	BH112	BH113	BH114
Depth	----------	2.7-3.0	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	6	5	6
Copper	mg/kg	4	2	<1
Lead	mg/kg	22	6	9
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	<1	<1
Zinc	mg/kg	51	4	2

Misc Inorg - Soil			
Our Reference:	UNITS	161150-A-16	161150-A-33
Your Reference	----------	BH109	BH114
	-		
Depth	----------	0.05-0.2	1.5-1.95
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date prepared	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
pH 1:5 soil:water	pH Units	8.2	8.5

Clay 50-120g			
Our Reference:	UNITS	161150-A-16	161150-A-33
Your Reference	----------	BH109	BH114
	-		
Depth	----------	0.05-0.2	1.5-1.95
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date prepared	-	10/02/2017	10/02/2017
Date analysed	-	13/02/2017	13/02/2017
Clay in soils <2µm	% (w/w)	14	9

CEC Our Reference: Your Reference	UNITS ---------- -	161150-A-16 BH109	161150-A-33 BH114
Depth	----------	0.05-0.2	1.5-1.95
Date Sampled		1/02/2017	1/02/2017
Type of sample		SOIL	SOIL
Date prepared	-	14/02/2017	14/02/2017
Date analysed	-	14/02/2017	14/02/2017
Exchangeable Ca	meq/100g	5.9	16
Exchangeable K	meq/100g	0.1	0.4
Exchangeable Mg	meq/100g	1.3	0.79
Exchangeable Na	meq/100g	0.70	0.16
Cation Exchange Capacity	meq/100g	8.0	18

Moisture						
Our Reference:	UNITS	161150-A-7	161150-A-13	161150-A-18	161150-A-23	161150-A-27
Your Reference	---------- -	BH104	BH107	BH109	BH111	BH112
Depth	----------	1.5-1.95	0.3-0.6	0.8-1.1	1.3-1.5	1.5-1.95
Date Sampled		31/01/2017	1/02/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	09/02/2017	09/02/2017	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017	10/02/2017	10/02/2017
Moisture	%	16	7.5	5.8	17	4.8

Moisture				
Our Reference:	UNITS	161150-A-28	161150-A-30	161150-A-34
Your Reference	---------- -	BH112	BH113	BH114
Depth	----------	2.7-3.0	0.4-0.7	2.7-3.0
Date Sampled		1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	09/02/2017	09/02/2017	09/02/2017
Date analysed	-	10/02/2017	10/02/2017	10/02/2017
Moisture	%	4.7	5.6	5.2

Asbestos ID - soils			
Our Reference:	UNITS	161150-A-7	161150-A-27
Your Reference	----------	BH104	BH112
	-		
Depth	----------	1.5-1.95	1.5-1.95
Date Sampled		31/01/2017	1/02/2017
Type of sample		SOIL	SOIL
Date analysed	-	10/02/2017	10/02/2017
Sample mass tested	g	Approx. 35g	Approx. 20g
Sample Description	-	Brown sandy soil	Brown sandy soil
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
Trace Analysis	-	No asbestos detected	No asbestos detected

Metals in TCLP USEPA1311					
Our Reference:	UNITS	161150-A-1	161150-A-16	161150-A-29	161150-A-33
Your Reference	----------	BH101	BH109	BH113	BH114
	-				
Depth	----------	0.1-0.2	0.05-0.2	0.1-0.3	1.5-1.95
Date Sampled		30/01/2017	1/02/2017	1/02/2017	1/02/2017
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	10/02/2017	10/02/2017	10/02/2017	10/02/2017
Date analysed	-	[NA]	[NA]	10/02/2017	10/02/2017
pH of soil for fluid# determ.	pH units	6.5	7.2	8.0	7.9
pH of soil TCLP (after HCl)	pH units	1.5	1.3	1.5	1.5
Extraction fluid used	-	1	1	1	1
pH of final Leachate	pH units	4.9	4.9	4.9	5.1
Lead in TCLP	mg/L	[NA]	[NA]	0.04	1.4
Nickel in TCLP	mg/L	[NA]	[NA]	[NA]	<0.02

PAHs in TCLP (USEPA 1311)			
Our Reference:	UNITS	161150-A-1	161150-A-16
Your Reference	----------	BH101	BH109
	-		
Depth	----------	0.1-0.2	0.05-0.2
Date Sampled		30/01/2017	1/02/2017
Type of sample		SOIL	SOIL
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
Naphthalene in TCLP	mg/L	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	105	99

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-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. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
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-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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
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-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
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.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
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.
AS1289.3.6.3	Determination Particle Size Analysis using AS1289.3.6.3 and AS1289.3.6.1 and in house method INORG-107. Clay fraction at <2µm reported.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Inorg-008	Moisture content determined by heating at 105+/-5 °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.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
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 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	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			10/02/2017	[NT]	[NT]	LCS-5	10/02/2017
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-5	105%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-5	105%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-5	95%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-5	101%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-5	107%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-5	110%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-5	112%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	88	[NT]	[NT]	LCS-5	87%

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	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-5	103%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	106%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	106%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-5	103%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	106%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	106%
Surrogate o-Terphenyl	%		Org-003	86	[NT]	[NT]	LCS-5	100%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	98%
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-5	100%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	109%
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-5	103%
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	105%
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-5	104%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[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	[NT]	[NT]	LCS-5	88%
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]
Surrogate p-Terphenyl-d14	%		Org-012	96	[NT]	[NT]	LCS-5	115%
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	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	116%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	118%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	107%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	114%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	117%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	124%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	127%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	124%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	115%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	88%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	95	[NT]	[NT]	LCS-5	99%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	108%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	95%
Dimethoate	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	93%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	116%
Malathion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	91%
Parathion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	123%
Ronnel	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	126%
Surrogate TCMX	%		Org-008	95	[NT]	[NT]	LCS-5	94%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-5	114%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	95	[NT]	[NT]	LCS-5	94%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			09/02/2017	[NT]	[NT]	LCS-5	09/02/2017
Date analysed	-			10/02/2017	[NT]	[NT]	LCS-5	10/02/2017
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	LCS-5	98%
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	LCS-5	105%
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-5	103%
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-5	102%
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-5	100%
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	LCS-5	92%
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-5	101%
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-5	103%

QUALITY CONTROL Misc Inorg - Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			13/02/2017	[NT]	[NT]	LCS-5	13/02/2017
Date analysed	-			13/02/2017	[NT]	[NT]	LCS-5	13/02/2017
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-5	102%

QUALITY CONTROL Clay 50-120g	UNITS	PQL	METHOD	Blank
Date prepared	-			[NT]
Date analysed	-			[NT]
Clay in soils <2µm	% (w/w)		AS1289.3.6.3	[NT]

QUALITY CONTROL CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			14/02/2017	[NT]	[NT]	LCS-5	14/02/2017
Date analysed	-			14/02/2017	[NT]	[NT]	LCS-5	14/02/2017
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	LCS-5	102%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	LCS-5	111%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	LCS-5	100%
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	LCS-5	102%

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank
Date extracted	-			10/02/2017
Date analysed	-			10/02/2017
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank
Date extracted	-			13/02/2017
Date analysed	-			13/02/2017
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001
Surrogate p-Terphenyl-d14	%		Org-012	125

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	LCS-W1	10/02/2017
Date analysed	-	[NT]	[NT]	LCS-W1	10/02/2017
Lead in TCLP	mg/L	[NT]	[NT]	LCS-W1	100%
Nickel in TCLP	mg/L	[NT]	[NT]	LCS-W1	101%

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	LCS-W1	13/02/2017
Date analysed	-	[NT]	[NT]	LCS-W1	13/02/2017
Naphthalene in TCLP	mg/L	[NT]	[NT]	LCS-W1	106%
Acenaphthylene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	[NT]	[NT]	LCS-W1	124%
Phenanthrene in TCLP	mg/L	[NT]	[NT]	LCS-W1	125%
Anthracene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	[NT]	[NT]	LCS-W1	120%
Pyrene in TCLP	mg/L	[NT]	[NT]	LCS-W1	118%
Benzo(a)anthracene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	[NT]	[NT]	LCS-W1	108%
Benzo(bjk)fluoranthene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	[NT]	[NT]	LCS-W1	119%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	[NT]	[NT]	LCS-W1	104%

Report Comments:

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples 161150-A-7, 27 were sub-sampled from jars provided by the client.

Asbestos ID was analysed by Approved Identifier: Lucy Zhu

Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test
NR: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
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.

Measurement Uncertainty estimates are available for most tests upon request.

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SAMPLE RECEIPT ADVICE

Client Details	
Client	Environmental Investigation Services
Attention	Geoff Fletcher

Sample Login Details	
Your Reference	E27168KF, Chatswood
Envirolab Reference	**161150-A**
Date Sample Received	01/02/2017
Date Instructions Received	08/02/2017
Date Results Expected to be Reported	**15/02/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	Additional Testing on 12 Soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	19.3
Cooling Method	Ice
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples
missing BH109 0.65-0.8

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
www.envirolabservices.com.au

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*	*pH 1:5 soil:water*	*Clay 50-120g*	*CEC*	*Asbestos ID - soils*	*Metals in TCLP USEPA1311*	*PAHs in TCLP (USEPA 1311)*	*On Hold*
BH101-0.1-0.2												✓	✓	
BH101-0.5-0.95														✓
BH102-0.1-0.2														✓
BH103-0.-0.1														✓
BH104-0.0-0.1														✓
BH104-0.5-0.95														✓
BH104-1.5-1.95	✓	✓	✓				✓				✓			
BH105-0.1-0.2														✓
BH105-0.5-0.6														✓
BH106-0.05-0.3														✓
BH106-0.4-0.7														✓
BH107-0.05-0.2														✓
BH107-0.3-0.6	✓	✓	✓				✓							
BH108-0.05-0.2														✓
BH108-0.3-0.6														✓
BH109-0.05-0.2								✓	✓	✓		✓	✓	
BH109-0.5-0.65														✓
BH109-0.8-1.1	✓	✓	✓				✓							
BH110-0.1-0.3														✓
BH110-0.4-0.6														✓
BH111-0.06-0.25														✓
BH111-0.5-0.95														✓
BH111-1.3-1.5	✓	✓	✓	✓	✓	✓	✓							
BH111-1.65-1.8														✓
BH112-0.1-0.3														✓
BH112-0.5-0.95														✓
BH112-1.5-1.95	✓	✓	✓				✓				✓			
BH112-2.7-3.0	✓	✓	✓				✓							

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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	pH 1:5 soil:water	Clay 50-120g	CEC	Asbestos ID - soils	Metals in TCLP USEPA1311	PAHs in TCLP (USEPA 1311)	On Hold
BH113-0.1-0.3												✓		
BH113-0.4-0.7	✓	✓	✓	✓	✓	✓	✓							
BH114-0-0.2														✓
BH114-0.5-0.95														✓
BH114-1.5-1.95								✓	✓	✓		✓		
BH114-2.7-3.0	✓	✓	✓	✓	✓	✓	✓							
BH115-0-0.2														✓
DUPGF1														✓
DUPGF2														✓
TBS														✓
GFF1														✓
BH111 - [TRIPLICATE]-0.06-0.25														✓
BH114 - [TRIPLICATE]-1.5-1.9														✓

Aileen Hie

From: Geoff Fletcher <GFletcher@jkgroup.net.au>
Sent: Wednesday, 8 February 2017 1:19 PM
To: Aileen Hie
Subject: Additional testing 161150 Chatswood E27168KF

Importance: High

Hi Aileen,

The lab report also references BH114 1.5-1.9m. This sample should be BH114 1.5-1.95

Could we please schedule the following additional testing from the above lab report:

1 • BH101 (0.1-0.2m) TCLP B(a)P;
7 • BH104 (1.5-1.95m) Combo 3a;
13 • BH107 (0.3-0.6m) Combo 3;
16 • BH109 (0.05-0.2m) TCLP B(a)P and (pH, CEC, Clay content);
18 • BH109 (0.8-1.1m) Combo 3;
23 • BH111 (1.3-1.5m) Combo 6;
27 • BH112 (1.5-1.95m) Combo 3a;
28 • BH112 (2.7-3.0m) Combo 3;
29 • BH113 (0.1-0.3m) TCLP lead;
30 • BH113 (0.4-0.7m) Combo 6;
33 • BH114 (1.5-1.95m) TCLP lead and nickel, and (pH, CEC and clay content); and
34 • BH114 (2.7-3.0m) Combo 6.

Envirolab Ref: 161150A
Due: 15/2/17
Std + 1A.

Regards,

Geoff Fletcher
Senior Environmental Scientist

T: +612 9888 5000
F: +612 9888 5001
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

16-18 Hayden Court, Myaree, Western Australia 6154
PO Box 4023 Myaree BC, Western Australia 6960
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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 191644

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

Attention: G Fletcher

Sample log in details:

Your Reference:	**E27168KF**
No. of samples:	1 Sample
Date/Time samples received:	03/02/2017 / 12:40
Date completed instructions received:	03/02/2017
Location:	

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:	9/02/17
Date of Preliminary Report:	Not issued
Issue Date:	9/02/17

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

Results Approved By:

Todd Lee
Laboratory Manager

vTRH(C6-C10)/MBTEXN in soil		
Our Reference:	UNITS	191644-1
Your Reference	----------	Dup GF 2
Type of sample	----------	Soil
Date extracted	-	06/02/2017
Date analysed	-	07/02/2017
$TRHC_6$ - 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	%	93

svTRH(C10-C36) in soil		
Our Reference:	UNITS	191644-1
Your Reference	----------	Dup GF 2
Type of sample	----------	Soil
Date extracted	-	06/02/2017
Date analysed	-	07/02/2017
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	%	98

PAHs in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	191644-1 Dup GF 2 Soil
Date extracted	-	06/02/2017
Date analysed	-	08/02/2017
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.2
Pyrene	mg/kg	0.3
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.4
Benzo(a)pyrene	mg/kg	0.23
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	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Total Positive PAHs	mg/kg	1.8
p-Terphenyl-D_{14}	%	110

Organochlorine Pesticides in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	191644-1 Dup GF 2 Soil
Date extracted	-	06/02/2017
Date analysed	-	08/02/2017
Hexachlorobenzene (HCB)	mg/kg	<0.1
a-BHC	mg/kg	<0.1
b-BHC	mg/kg	<0.1
Lindane (g-BHC)	mg/kg	<0.1
d-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
a-Chlordane	mg/kg	<0.1
g-Chlordane	mg/kg	<0.1
a-Endosulphan	mg/kg	<0.1
p,p'-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
p,p'-DDD	mg/kg	<0.1
b-Endosulphan	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
p,p'-DDT	mg/kg	<0.1
Endrin Ketone	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
p-Terphenyl-D_{14}	%	110

Organophosphorus Pesticides Our Reference: Your Reference Type of sample	UNITS ---------- ----------	 191644-1 Dup GF 2 Soil
Date extracted	-	06/02/2017
Date analysed	-	08/02/2017
Diazinon (Dimpylate)	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion (Maldison)	mg/kg	<0.1
Chlorpyrifos (ethyl)	mg/kg	<0.1
Parathion (ethyl)	mg/kg	<0.1
Ethion	mg/kg	<0.1
Bromophos Ethyl	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Dichlorvos	mg/kg	<0.1
Azinphos Methyl (Guthion)	mg/kg	<0.1
p-Terphenyl-D_{14}	%	110

PCBs in Soil		
Our Reference:	UNITS	191644-1
Your Reference	----------	Dup GF 2
Type of sample	----------	Soil
Date extracted	-	06/02/2017
Date analysed	-	08/02/2017
Arochlor 1016	mg/kg	<0.1
Arochlor 1221	mg/kg	<0.1
Arochlor 1232	mg/kg	<0.1
Arochlor 1242	mg/kg	<0.1
Arochlor 1248	mg/kg	<0.1
Arochlor 1254	mg/kg	<0.1
Arochlor 1260	mg/kg	<0.1

Acid Extractable metals in soil		
Our Reference:	UNITS	191644-1
Your Reference	----------	Dup GF 2
Type of sample	----------	Soil
Date digested	-	6/02/2017
Date analysed	-	8/02/2017
Arsenic	mg/kg	3
Cadmium	mg/kg	<0.4
Chromium	mg/kg	12
Copper	mg/kg	26
Lead	mg/kg	22
Mercury	mg/kg	0.3
Nickel	mg/kg	12
Zinc	mg/kg	72

Moisture		
Our Reference:	UNITS	191644-1
Your Reference	----------	Dup GF 2
Type of sample	----------	Soil
Date prepared	-	6/02/2017
Date analysed	-	7/02/2017
Moisture	%	5.7

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-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 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.
ORG-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
ORG-008/015	Organophosphorus Pesticides in soil by DCM:Acetone extraction and water by DCM extraction with determination by GC-ECD/GC-MS.
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	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 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	-			06/02/2017	[NT]	[NT]	LCS-1	06/02/2017
Date analysed	-			07/02/2017	[NT]	[NT]	LCS-1	07/02/2017
TRH C_6 - C_9	mg/kg	25	ORG-016	<25	[NT]	[NT]	LCS-1	96%
TRH C_6 - C_{10}	mg/kg	25	ORG-016	<25	[NT]	[NT]	LCS-1	96%
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	100%
Toluene	mg/kg	0.5	ORG-016	<0.5	[NT]	[NT]	LCS-1	99%
Ethylbenzene	mg/kg	1	ORG-016	<1	[NT]	[NT]	LCS-1	94%
m+p-xylene	mg/kg	2	ORG-016	<2	[NT]	[NT]	LCS-1	93%
o-xylene	mg/kg	1	ORG-016	<1	[NT]	[NT]	LCS-1	93%
Naphthalene	mg/kg	1	ORG-016	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		ORG-016	97	[NT]	[NT]	LCS-1	91%

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	-			06/02/2017	[NT]	[NT]	LCS-1	06/02/2017
Date analysed	-			07/02/2017	[NT]	[NT]	LCS-1	07/02/2017
TRH C_{10} - C_{14}	mg/kg	50	ORG-003	<50	[NT]	[NT]	LCS-1	95%
TRH C_{15} - C_{28}	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	96%
TRH C_{29} - C_{36}	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	97%
TRH>C_{10} - C_{16}	mg/kg	50	ORG-003	<50	[NT]	[NT]	LCS-1	94%
TRH>C_{16} - C_{34}	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	96%
TRH>C_{34} - C_{40}	mg/kg	100	ORG-003	<100	[NT]	[NT]	LCS-1	98%
Surrogate o-Terphenyl	%		ORG-003	94	[NT]	[NT]	LCS-1	95%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/02/2017	[NT]	[NT]	LCS-1	06/02/2017
Date analysed	-			08/02/2017	[NT]	[NT]	LCS-1	08/02/2017
Naphthalene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	97%
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	101%
Phenanthrene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	99%
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	101%
Pyrene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	98%
Benzo(a)anthracene	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
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	103%
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	110	[NT]	[NT]	LCS-1	109%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/02/2017	[NT]	[NT]	LCS-1	06/02/2017
Date analysed	-			08/02/2017	[NT]	[NT]	LCS-1	08/02/2017
Hexachlorobenzene (HCB)	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
a-BHC	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	92%
b-BHC	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	95%
Lindane (g-BHC)	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
d-BHC	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Heptachlor	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	69%
Aldrin	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	92%
Heptachlor Epoxide	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	91%
a-Chlordane	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
g-Chlordane	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
a-Endosulphan	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
p,p'-DDE	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	95%
Dieldrin	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	93%
Endrin	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
p,p'-DDD	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	118%
b-Endosulphan	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	LCS-1	103%
p,p'-DDT	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Ketone	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
Methoxychlor	mg/kg	0.1	ORG-012	<0.1	[NT]	[NT]	[NR]	[NR]
p-Terphenyl-D_{14}	%		ORG-008/015	110	[NT]	[NT]	LCS-1	109%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/02/2017	[NT]	[NT]	LCS-1	06/02/2017
Date analysed	-			08/02/2017	[NT]	[NT]	LCS-1	08/02/2017
Diazinon (Dimpylate)	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyrifos-methyl	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	LCS-1	90%
Ronnel	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	[NR]	[NR]
Fenitrothion	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	LCS-1	110%
Malathion (Maldison)	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyrifos (ethyl)	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	LCS-1	93%
Parathion (ethyl)	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	LCS-1	114%
Bromophos Ethyl	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	0.1	ORG-008/015	<0.1	[NT]	[NT]	[NR]	[NR]
Dichlorvos	mg/kg	0.1	ORG-008	<0.1	[NT]	[NT]	[NR]	[NR]
Azinphos Methyl (Guthion)	mg/kg	0.1	ORG-008	<0.1	[NT]	[NT]	[NR]	[NR]
p-Terphenyl-D_{14}	%		ORG-008/015	110	[NT]	[NT]	LCS-1	109%

Client Reference: E27168KF

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/02/217	[NT]	[NT]	LCS-1	06/02/217
Date analysed	-			08/02/2017	[NT]	[NT]	LCS-1	08/02/2017
Arochlor 1016	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	LCS-1	96%
Arochlor 1260	mg/kg	0.1	ORG-006	<0.1	[NT]	[NT]	[NR]	[NR]
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	-			6/02/2017	[NT]	[NT]	LCS-1	6/02/2017
Date analysed	-			8/02/2017	[NT]	[NT]	LCS-1	8/02/2017
Arsenic	mg/kg	2	METALS-020	<2	[NT]	[NT]	LCS-1	98%
Cadmium	mg/kg	0.4	METALS-020	<0.4	[NT]	[NT]	LCS-1	98%
Chromium	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	99%
Copper	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	104%
Lead	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	99%
Mercury	mg/kg	0.1	METALS-021	<0.1	[NT]	[NT]	LCS-1	115%
Nickel	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	102%
Zinc	mg/kg	1	METALS-020	<1	[NT]	[NT]	LCS-1	100%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			06/02/ 2017
Date analysed	-			07/02/ 2017
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.

Measurement Uncertainty estimates are available for most tests upon request.

Part of the Envirolab Group

16 - 18 Hayden Court, Myaree, Western Australia 6154
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email: laboratory@mpl.com.au
www.mpl.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

SAMPLE RECEIPT ADVICE

Client Details	
Client	Environmental Investigation Services
Attention	G Fletcher

Sample Login Details	
Your Reference	E27168KF
Envirolab Reference	**191644**
Date Sample Received	03/02/2017
Date Instructions Received	03/02/2017
Date Results Expected to be Reported	**09/02/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1 Sample
Turnaround Time Requested	Standard
Temperature on receipt (°C)	28
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:

Joshua Lim	Meredith Conroy
Phone: 08 9317 2505	Phone: 08 9317 2505
Fax: 08 9317 4163	Fax: 08 9317 4163
Email: jlim@mpl.com.au	Email: mconroy@mpl.com.au

Sample and Testing Details on following page

Part of the Envirolab Group

16 - 18 Hayden Court, Myaree, Western Australia 6154
PO Box 4023 Myaree BC, Western Australia 6960
Tel: +61 8 9317 2505 / Fax: +61 8 9317 4163
email: laboratory@mpl.com.au
www.mpl.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

Sample Id	***vTRH(C6-C10)/MBTEXN in soil***	***svTRH(C10-C36) in soil***	***PAHs in Soil***	***Organochlorine Pesticides in soil***	***Organophosphorus Pesticides***	***PCBs in Soil***	***Acid Extractable metals in soil***
Dup GF 2	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. ***THIS IS NOT A REPORT OF THE RESULTS****.*

161150

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: E27168KF Date Results Required: STANDARD Page: 2 of 2	ENVIRONMENTAL INVESTIGATION SERVICES REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Geoff Fletcher

Location: Chatswood
Sampler: DAF + GF
Sample Preserved in Esky on Ice
Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 6a	BTEX	Asbestos
16/1/50										
1/2/17	25	BH112	0.1–0.3	G,A	0	Fill		X		
	26		0.5–0.95		0					
	27		1.5–1.95		0	↓				
	28	↓	2.7–3.0		0	Sandstone				
	29	BH113	0.1–0.3		0	Fill		X		
	30	↓	0.4–0.7		0	Sandstone				
	31	BH114	0–0.2		0	Fill		X		
	32		0.5–0.95		0					
	33		1.5–1.95		0	↓		X		
	34	↓	2.7–3.0		0	Sandstone				
	35	BH115	0–0.2	↓	0	Fill		X		
	36	DupF1	—	G	—		X			
1	37	DupF2	—		—		X			
	38	TBS	—	↓	—				X	
30/1/17	39	QFF1		A	—	Material				X

Envirolab Services
Job No.- 191644
Date Rec - 3-2
Time Rec - 1240
Rec By - MC
TAT Req - SAME 1/2/3 STD
Temp - cool / ambient
Cooling - Ice / Ice pack / None
Security Seal - Yes / No

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:
				3/2

Appendix D: Report Explanatory Notes

STANDARD SAMPLING PROCEDURE (SSP)

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[18].
- 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.
- Ensure the decontamination materials are clean prior to proceeding with the decontamination.

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

- 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[19]) methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (H. Keith 1991[20]).

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

[20] 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%.

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

Surrogate Spikes

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

Duplicates

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

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