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McGILL ADVANCE MANAGEMENT PTY LTD

DETAILED SITE INVESTIGATION REPORT

4-12 McGILL STREET, LEWISHAM NSW

Report E22830 AA_Rev 0
26 APRIL 2016

REPORT DISTRIBUTION

Detailed Site Investigation Report
4-12 McGill Street, Lewisham NSW

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EXECUTIVE SUMMARY

Background

McGill Advance Management Pty Ltd engaged Environmental Investigations Australia Pty Ltd (EI) to conduct a Detailed Site Investigation Report (Stage 2 DSI) for the warehouse property located at 4-12 McGill Street, Lewisham NSW ('the site'). This environmental assessment was completed as part of a development application process through Marrickville Council to allow site development for multi-storey, residential land uses.

Based on previous Preliminary Site Investigation Report had been completed by Douglas partners in November 2015, it was indicated that the site has been subject to some commercial/industrial activity including potential filling, especially around on the western side of the site near the stormwater canal, and from general commercial/industrial activity including commercial drycleaners in the northern part of the site.

Objectives

The main objectives of the assessment were to:

- Characterise site environmental conditions in relation to the nature, degree and sources of any soil, vapour and groundwater impacts;
- Target potentially impacted areas identified during the preliminary stages of the assessment for intrusive investigation;
- Understand the influence of site specific, geologic and hydrogeological conditions on the potential fate and transport of any impacts that may be identified;
- Evaluate potential risks that identified impacts may pose to human health and the environment; and
- Where site contamination is confirmed, provide data to assist in the selection and design of appropriate remedial options.

Findings

The land parcel known as 4-12 McGill Street, Lewisham NSW, was the subject of a Detailed Site Investigation in order to assess the environmental conditions and the potential for on-site contamination associated with the identified current and former land uses. Based on the findings of this assessment and within the limitations of normal environmental investigations (**Section 12**), EI concluded that:

- The site comprises a 2460m^2 area occupied by several adjoining commercial warehouses with upstairs offices and concrete flooring throughout. The property was situated between McGill Street and a light rail corridor in a multistorey residential redevelopment area.
- A ground penetrating radar search indicated that at an empty UST measuring approximately 1.6 x 2.5m to a depth of 0.8 mBGL was present at the central eastern boundary of the site.
- Soil sampling and testing were conducted at seven borehole locations across accessible parts of the site down to a maximum depth of 1.5 mBGL.

- The sub-surface layers comprised of Gravelly Sand and Clay fill materials overlying brown orange Clays, underlain by Hawkesbury Sandstone.
- One Groundwater bore installed on-site was found to be dry at 4.5m, further groundwater monitoring was not completed due to site access constraints.
- Laboratory results of all soil samples tested reported concentrations of the screened heavy metals, TRH/BTEX, pesticides and asbestos to be below the adopted human health based investigation criteria.
- Laboratory testing results of soil samples exceeding adopted SILs is as follows:
    - Exceedance of the adopted human health criteria for carcinogenic PAH (TEQ) at BH7 (8.2 – 13mg/kg) to a minimum depth of 0.7 m BGL.
    - Exceedances of the adopted ecological criterion for benzo(α)pyrene in the fill layer at BH2_0.4-0.5 (2mg/kg), BH2_0.9-1.0 (2.6mg/kg), BH7_0.0-0.1 (8.5mg/kg) and BH7_0.5-0.7 (5.8mg/kg).
    - The ecological screening level (ESL) for the F3 TRH fraction was exceeded in the fill layer in sample BH7_0.0-0.1 with a concentration of 340mg/kg.

In summary, EI concludes that the site can be made suitable for the proposed residential development, subject to the recommendations provided. Site contamination issues can be managed through the development application process in accordance with the State Environmental Planning Policy 55 (SEPP 55) – Remediation of Land and the Marrickville Council Contaminated Land Policy.

Recommendations

- Preparation of a Remedial Action Plan (RAP) to outline necessary remediation and validation requirements associated with the decommissioning of the UPSS and any unexpected finds during redevelopment. The RAP should include further soil and groundwater investigations to close outstanding data gaps, including:
    - Drilling of an additional two boreholes to a depth of approximately 6m BGL at the northern part of the site (No.4 McGill St.) to complete site characterisation and for assessment of potential impacts from former drycleaners (identified adjacent the site to the north at No. 2 McGill St.) to soil and groundwater at the site;
    - Installation of three groundwater monitoring bores to complete site groundwater assessment with at least one round of groundwater monitoring and laboratory analysis for the relevant chemicals of concern;
    - Additional soil investigation for any proposed deep soil planting areas to evaluate ecological risks from benzo(a) pyrene identified at BH2 and BH7;
    - Removal of all UPSS infrastructure at the site in accordance with WorkCover requirements and UPSS Regulations (2014);
    - Remediation and validation of soils surrounding all identified UPSS infrastructure; and
    - Remediation, waste classification of impacted soils from the UPSS areas and fill soils associated with bulk excavation of the proposed basement.

Any material being removed from site (including virgin excavated natural materials or VENM) must be classified for off-site disposal with an accompanying Waste Classification Certificate provided by a suitably qualified and experienced environmental consultant, in accordance the EPA (2014) Waste Classification Guidelines.

Any material being imported to the site should be assessed (validated) for potential contamination in accordance with NSW EPA guidelines as being suitable for the intended land use or be certified in accordance with EPA (2014) as VENM or ENM.

Preparation of a validation report by a qualified environmental consultant, certifying the suitability of the site for the proposed development.

CONTENTS

REFERENCES

ABBREVIATIONS

TABLES (In Text)

TABLES

FIGURES

DIAGRAMS

APPENDICES

1. INTRODUCTION

1.1 BACKGROUND AND PURPOSE

Mr Tony Wang of McGill Advance Management Pty Ltd engaged Environmental Investigations Australia Pty Ltd (EI) to conduct a Detailed Site Investigation Report (DSI) for site characterisation purposes at 4-12 McGill Street, Lewisham NSW ('the site').

The site is currently occupied by several warehouse businesses and is located approximately 6km southwest of the Sydney central business district as shown in **Figure 1**. The site is situated within the Local Government Area of Marrickville Council covers a total area of approximately 0.25 hectares (2, 460m^2), as depicted in the site plan presented as **Figure 2**.

A Preliminary Site Contamination Investigation Report (PSI) for the site has previously been completed by Douglas Partners in November 2015 (Ref. Project 85086.01.Rev1, November 2015). The PSI report incorporated site walkover observation, a desktop assessment involving historical records search, and review of other available environmental reports for the site.

A Geotechnical assessment (GA) was also undertaken by EI in conjunction with the DSI. This report is presented separately in the report referenced E22830 GA. The GA report provides geotechnical advice and recommendations for the preparation of the designs for the proposed residential development. The GI report should be read in conjunction with this report.

This assessment was conducted in support of a Development Application (DA) to Marrickville Council and for the purpose of enabling the developer to meet its obligations under the Contaminated Land Management Act 1997 (CLM Act), for the assessment and management of contaminated soil and/or groundwater.

1.2 PROPOSED DEVELOPMENT

To assist us with the preparation of this DSI report, the Client has supplied EI with:

- Architectural drawings prepared by Tony Owen Partners, Project: *Lewisham 3*, Project No. 947, Drawing No. A090, A091, A100 to A102, A200 to A205, A300, dated August 2015.

Based on the above drawings also attached in **Appendix A**, we understand that the proposed development will involve the demolition of the existing site structures and the construction of two, five and six-storey residential apartment buildings over a common, one to two-level stepped basement carpark excavated to a depth of approximately 3-6mBGL. Locally deeper excavations may be required for footings, service trenches and lift overrun pits.

1.3 REGULATORY FRAMEWORK

The following regulatory framework and guidelines were considered during the preparation of this report:

- ANZECC & ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*;

- DECCW (2009) *Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008*, (UPSS Guidelines);

- DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*;

- DEC (2006) *Guidelines for the NSW Site Auditor Scheme (2nd Edition)*;
- EPA (1995) *Sampling Design Guidelines*;
- EPA (2014) *Technical Note: Investigation of Service Station Sites*;
- NEPC (2013) *Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater*;
- NEPC (2013) *Schedule B(2) Guideline on Site Characterisation*;
- *Contaminated Land Management Act (1997)*;
- State Environment Protection Policy 55 (SEPP 55) – *Remediation of Land*, and
- OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*.

1.4 PROJECT OBJECTIVES

The primary objectives of this investigation were therefore to:

- Evaluate the potential for site contamination on the basis of historical land uses, anecdotal and documentary evidence of possible pollutant sources;
- To investigate the degree of any potential contamination by means of limited intrusive sampling and laboratory analysis, for relevant contaminants; and
- Where site contamination is confirmed, make recommendations for the appropriate management of any contaminated soils and/or groundwater.

1.5 SCOPE OF WORKS

In order to achieve the above objectives and in keeping the project cost-effective while generally complying with the OEH (2011) guidelines for consultants reporting on contaminated sites, the scope of works was as follows:

1.5.1 Desktop Study

- A review of the previous Phase 1 Preliminary Site Investigation Report prepared by Douglas Partners (DP, 2015);
- A review of existing underground services on site; and
- Preparation of a Work, Health, Safety & Environment Plan and quality assurance and quality control measures (QA/QC).

1.5.2 Field Work & Laboratory Analysis

- A detailed site walkover inspection;
- Drilling of test boreholes at seven locations (BH1 to BH7) across accessible areas of the site. It is noted that nine boreholes were proposed as part of the site investigation, in accordance with the minimum sampling protocol recommended under EPA (1995); however, due to access

restriction (by tenant at No.4 McGill Street) for investigation in the northern Lot at the site, only seven test bores were completed;

- Installation of one groundwater monitoring well to a maximum depth of 4.5 m (or prior refusal), constructed to standard environmental protocols to investigate potential groundwater contamination It is noted that three groundwater monitoring wells were proposed as part of the site investigation to assess groundwater conditions, however, due to site access limitations (operating businesses and height restrictions), only one groundwater monitoring well was completed;

- Multiple level soil sampling within fill and natural soils and one round of groundwater sampling from the constructed groundwater monitoring well; and

- Laboratory analysis of selected soil and groundwater samples for relevant analytical parameters as determined from the site history survey and field observations during the investigation programme.

1.5.3 Data Analysis and Reporting

A DSI report would also be prepared to document desk study findings, the conceptual site model, data quality objectives, investigation methodologies and results. The report would also provide a record of observations made during the detailed site walkover inspection, borehole and monitoring well construction logs and a discussion of laboratory analytical results in regards to potential risks to human health, the environment and the aesthetic uses of the land.

2. SITE DESCRIPTION

2.1 PROPERTY IDENTIFICATION, LOCATION AND PHYSICAL SETTING

The site identification details and associated information are presented in **Table 2-1**, while the site locality is shown in **Figure 1**.

Table 2-1 Site Identification, Location and Zoning

Attribute	Description
Street Address	4-12 McGill Street, Lewisham NSW
Location Description	Approx. 6 km southwest of Sydney CBD, a rectangular shaped block bound by several multistorey residential developments to the north, south and east, and a light rail corridor to the west. Northeast corner of site: GDA94-MGA56 Easting: 328369.229, Northing: 6248033.289 (Source: http://maps.six.nsw.gov.au).
Site Area	The site is approximately 2459.8m2 (Geomat Engineering Pty Ltd, dated 12 November 2014)
Site Owner	McGill Advance Management Pty Ltd, Kam Shan Josephine Lam and Amen Kwai Ping Lee (Ref. DP, 2015).
Lot and Deposited Plan (DP)	Lot 2 in DP 533963, Lot B in DP 161098, Lot E in DP 419611, and Lot F in DP101532
State Survey Marks	No State Survey Marks (SSM) are situated in close proximity to the site.
Local Government Authority	Marrickville Council
Parish	Petersham
County	Cumberland
Current Zoning	R4 – High Density Residential (8-12 McGill Street) & B4 – Mixed Use (4 McGill Street) (Marrickville Local Environment Plan 2011)
Current Land Uses	Northern Lot (No. 4 McGill St.) – Currently display office for adjacent residential development, formerly an “A.N.T” commercial Laundry. North Central Lot (6-8 McGill St.) – “Peckam Binding Company”, a commercial binding/print manufacturer. South Central Lot (10 McGill St.) – “Wholesale Imaging”, a commercial printer. Southern Lot (12 McGill St.) – “TK Pacific marketing”, a commercial storage warehouse for tobacco and baby products.

2.2 SURROUNDING LAND USE

The site is situated within an area of mixed land uses with current uses of surrounding land described in **Table 2-2**.

Table 2-2 Surrounding Land Uses

Direction Relative to Site	**Land Use Description**
North	An unoccupied single-storey brick commercial dry cleaning warehouse (No.2 McGill St.), bounded to the north by Hudson Street, beyond which is a development site for medium to high density residential apartments.
South	A two-storey brick commercial warehouse immediately adjacent to the site (No. 14 McGill Street). The site is proposed to be redeveloped into an eight-storey residential apartment building over a four-level basement carpark.
East	McGill Street, followed by construction sites which currently completed demolition for redevelopment. A five-storey residential apartment with a single-level basement lies to the southeast.
West	A light rail corridor immediately adjacent to the site near Lewisham West Light Rail Station running in a NE-SW direction. A concrete-lined drainage channel (Hawthorne Canal) runs NW-SE and is adjacent to the site on the southwestern corner of the site..

Sensitive land uses, such as schools or childcare centres, were not identified within the vicinity the site.

2.3 REGIONAL SETTING

Regional topography, geology, soil landscape and hydrogeological information are summarised in **Table 2-3**.

Table 2-3 Regional Setting Information

Attribute	**Description**
Topography	The local topography falls towards the west from an RL of approximately 14.2m AHD at the south-eastern corner to RL of about 11.3m AHD at the south-western corner.
Site Drainage	Consistent with the general slope of the site, stormwater is assumed to flow west towards the Hawthorne Canal drainage system.
Regional Geology	Information on regional sub-surface conditions, referenced from the Department of Mineral Resources Geological Map Sydney 1:100,000 Geological Series Sheet 9130 (DMR 1991) indicates the site to be on the boundary of man-made fill on Quaternary Holocene aged alluvial to the west of the site and Ashfield Shale of the Wianamatta Group to the east. The alluvial sand deposits typically comprise of silty to peaty quartz sand, silt, and clay, with ferruginous and humic cementation in places. Ashfield Shale comprises of black to dark-grey shale and laminite. EI's drilling investigation results indicate that the site is underlain by Hawkesbury Sandstone.
Soil Landscapes	The Soil Conservation Service of NSW Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman and Murphy, 1989) indicates that the site overlies the Birrong (Bg) Alluvial Soil Landscape Group, which typically includes level to gently undulating alluvial floodplains draining the Wianamatta Group shales. It was noted however, that the site lies within an area of the map that borders a Disturbed Terrain (xx) soil landscape, which includes *level plain to hummocky terrain extensively disturbed by human activity including complete disturbance, removal or burial of soils*.

Attribute	**Description**
Acid Sulphate Soil Risk	A review of the NSW Acid Sulfate Soil Risk Map indicates that the site is not mapped as an area of potential acid sulfate soils (ASS) or within 500 m of an area mapped as potential acid sulfate soils. As the local geology is Hawkesbury Sandstone ASS are unlikely to be present.
Likelihood & Depth of Site Filling	Based on observations during previous investigations in the local area, maximum fill depth across the site is anticipated to be approximately 0.5-1.0 metres below ground level (m bgl) comprising sand, silty sand with brick/concrete fragments and gravel.
Typical Soil Profile	Concrete hardstand over clayey sand and sand fill with some gravel including brick and sandstone, overlying Sandstone, distinctly to slightly weathered or fresh with depth, medium to coarse grained.
Depth to Groundwater	Based on previous investigations close to the site conducted by EI, the average depth to groundwater is anticipated to be 3 – 4 mBGL.
Aquifer Types / Estimated Thickness	The groundwater includes intermittent seepage zones that may be present in the fill layer (estimated to be up to 0.5m thick) and deeper groundwater moving through fractures, joints and bedding planes within the underlying sandstone bedrock.
Nearest Surface Water Feature	The nearest surface water is Hawthorne Canal which drains to Iron Cove, a part of Sydney Harbour, approximately 2.6 km to the north. Sydney harbour is tidally influenced and is therefore classed as a marine water ecosystem, for impact assessment purposes.
Groundwater Flow Direction	Groundwater is anticipated to flow in the direction of Hawthorne Canal which flows to Iron Cove and Sydney harbour approximately 2.6 km north of the site.
Hydraulic Gradient	Unknown
Hydraulic Conductivity	Unknown
Aquifer Porosity	Unknown
Groundwater Seepage Velocity	Unknown
Groundwater Salinity	Based on previous GME data at the adjacent site, groundwater is generally *fresh* with total dissolved solids (TDS) content generally below 1000 mg/L.

2.4 GROUNDWATER BORE RECORDS AND LOCAL GROUNDWATER USE

An online search of registered groundwater bores conducted by EI through the NSW Office of Water (Ref. http:// realtimedata.water.nsw.gov.au/water.stm) indicated that there were no registered groundwater bores within 1km of the site.

2.5 SITE WALKOVER INSPECTION

EI staff made a number of observations during a detailed site inspection on 17 December 2015:

- The site comprised a trapezoidal shaped block of land, situated between McGill Street and a light rail corridor in a multistorey residential redevelopment area. The block comprised of several adjoining commercial warehouses with upstairs offices and concrete flooring throughout.

- The site topography was sloping down to the west with site drainage also expected to flow to the west towards an adjacent drainage channel (Hawthorne Canal).

- The warehouse was built from brick and was in moderate condition with some weathering of painted surfaces and / or metallic surfaces observed.

- The site was tenanted by four separate commercial businesses including a sign printer, a tobacco wholesaler and a binding/print manufacturer.

- A commercial Laundry/dry cleaning warehouse business was observed adjacent the site the north at No. 2 McGill Street. At the time of the inspection the dry cleaners appeared to have ceased operations.

- Condition of suspected corrugated fibreboard roofing (potentially containing Asbestos) were not able to be closely examined due to height/access restriction.

- An underground petroleum storage system (UPSS) was confirmed to exist in the loading bay of the central northern property (No. 6-8 McGill St.) as shown in **Figure 2**. A survey of the UPSS area by ground penetrating radar (GPR) and using an existing dip-stick indicated the existence of a single empty underground tank measuring approximately 2.5 x 1.6m installed to a depth of approximately 0.8m.

3. PREVIOUS INVESTIGATIONS

3.1 AVAILABLE DOCUMENTS

A Preliminary Site Contamination Investigation Report (PSI) for the site has previously been completed by Douglas Partners (DP) in November 2015 (Ref. Project 85086.01.Rev1, November 2015). A summary of DP's works and key findings is outlined in **Table 3-1**.

Table 3-1 Summary of Previous Investigation Works and Findings

Assessment Details	Project Tasks and Findings (DP, 2015)
Work Objectives	PSI to provide indicative information as to the risk and nature of contamination at the site based on past and current land uses. The PSI to make further comment on the potential contamination risks at the site and the need for further investigation (if required).
Scope of Works	• A review of published geological, soil landscape and acid sulphate soils; • A review of site operational history including the following database searches; • Review of the NSW Department of Primary Industries Water groundwater database for registered groundwater bores in the vicinity of the site; • Review of readily available historical aerial photographs to identify previous land uses that may indicate potential contamination; • Review of current and historical title deeds to identify previous owners that may indicate potentially contaminating activities; • Review of Section 149 Planning Certificates available for the site; • Review of the NSW EPA Register for notices issued under the Contaminated Land Management Act 1997 and the Protection of the Environment Operations Act 1997; • Review of the NSW WorkCover Stored Chemical Information Database to identify dangerous goods and thereby contamination sources that may have been kept on site; • A site walkover by an environmental scientist/engineer to observe site features and activities that may indicate the potential for contamination of the site from present or past land uses; and • Provision of a PSI report detailing the findings of the assessment including a preliminary conceptual site model, comments on the risk and nature of potential contamination at the site and recommendations for further assessment.
Conclusions	• The presence of the laundry and dry cleaner is considered to present a moderate to high risk of contamination in both soil and groundwater at the site, particularly in the form of VOC, primarily PCE contamination. • It is considered that the remainder of the site has a moderate risk of contamination, from both historic and current land use, including potential filling, especially around on the western side of the site near the stormwater canal, from historic demolition activities and from general commercial/industrial activities.
Recommendations	It is considered likely that the site can be rendered suitable for the proposed development after undertaking further contamination assessment and remediation (if required) including: • A detailed site investigation (for contamination) be undertaken at the site, and recommendation for a remediation action plan as required. • A hazardous building materials assessment of the buildings on site should also be conducted (which is understood to have commenced) to identify whether hazardous materials are present and to develop an appropriate management plan if hazardous materials are identified.

3.2 WORKCOVER NSW AUTHORITY SEARCH

The results of the NSW WorkCover search for the site were not reported in the previous PSI report (DP, 2015). In light of this, a search of WorkCover NSW Authority records relating to the site was requested on 15 December 2015 by EI, on behalf of the client. Correspondence dated 23 December 2015 from the Dangerous Goods Licensing Section received by EI (**Appendix E**), confirmed that a search of Stored Chemical Information Database (SCID) and the microfiche records held by WorkCover was conducted and revealed that no records pertaining to the premises were held.

4. CONCEPTUAL SITE MODEL

In accordance with NEPM (2013) *Schedule B2 – Guideline on Site Characterisation* and to aid in the assessment of data collection for the site, EI developed a preliminary conceptual site model (CSM) assessing plausible pollutant linkages between potential contamination sources, migration pathways and receptors. The CSM provides a framework for the review of the reliability and useability of the data collected and to identify data gaps in the existing site characterisation.

4.1 CHEMICAL HAZARDS AND CONTAMINATION SOURCES

On the basis of the site walkover, the preliminary site investigation and site history (described in **Section 3**) EI consider potential chemical hazards and onsite contamination sources to be as follows:

- Imported fill soils of unknown origin distributed across the site;
- Impacts from previous and current commercial/industrial activities at the site, including the laundromat and storage of hydrocarbon products in the identified UPSS;
- Painted surfaces in relation to the structures (buildings) that are currently present on the site;
- Hazardous materials, including potential asbestos-containing materials (ACM) from building products;
- Deeper, natural soils containing residual impacts, representing potential secondary sources of contamination; and
- Impacts that may have migrated onto the site from offsite contamination sources including the former dry cleaners immediately to the north of the site.

4.2 CHEMICALS OF CONCERN

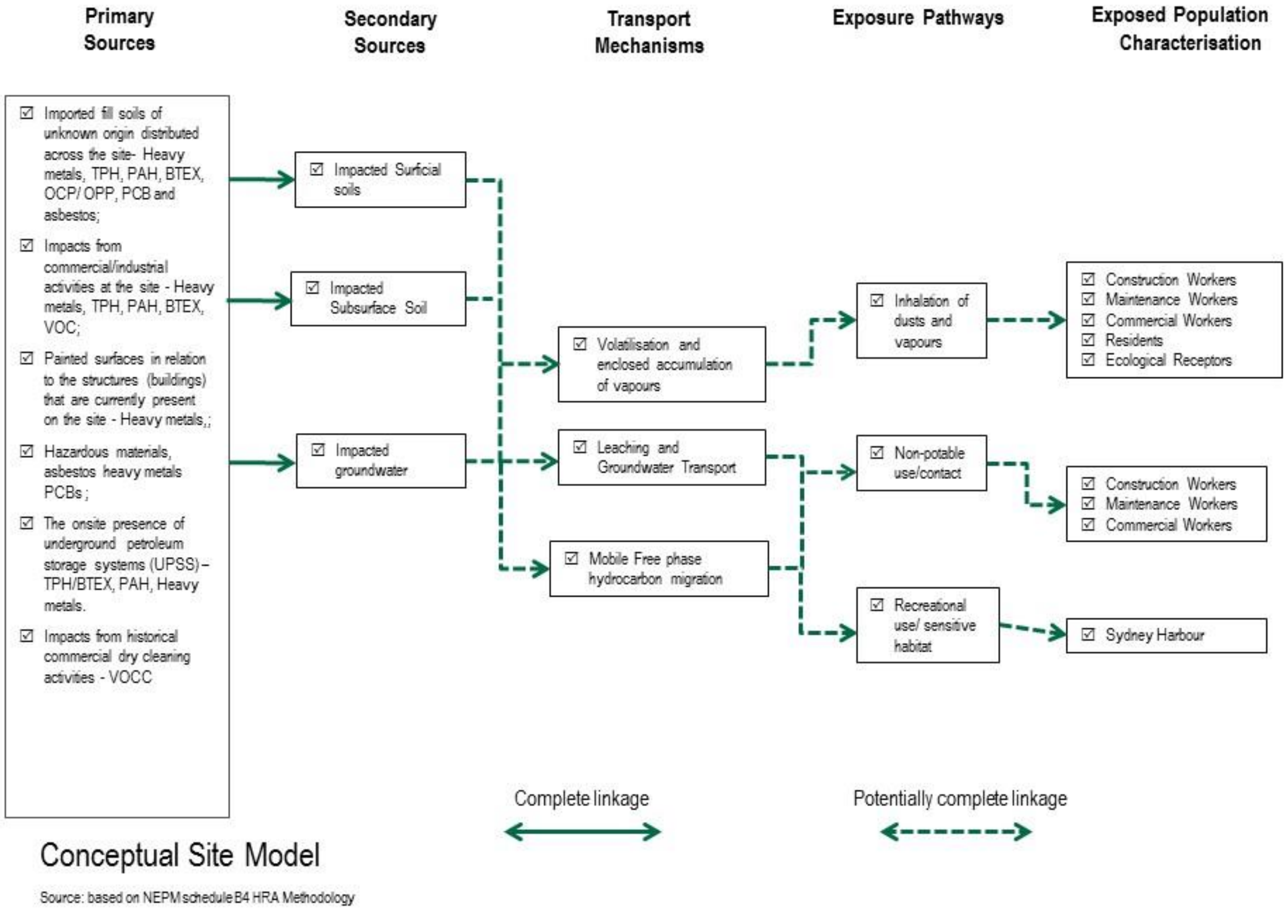
Based on the findings of the site contamination appraisal the chemicals of concern (COC) at the site are considered to be:

- Soil – heavy metals (HMs), TPH, PAH, the monocyclic aromatic hydrocarbon compounds benzene, toluene, ethylbenzene and xylenes (BTEX), organochlorine and organophosphate pesticides (OCP/ OPP), polychlorinated biphenyls (PCB) and asbestos.
- Groundwater – HMs, TPH, BTEX, PAH and volatile organic compounds (VOC), including chlorinated VOC (VOCC) such as trichloroethylene (TCE).

4.3 POTENTIAL SOURCES, EXPOSURE PATHWAYS AND RECEPTORS

Potential contamination sources, exposure pathways and human and environmental receptors that were considered relevant for this assessment are summarised along with a qualitative assessment of the potential risks posed by complete exposure pathways in **Diagram 1**.

Diagram 1 – Preliminary Conceptual Site Model



Source: based on NEPM schedule B4 HRA Methodology

4.4 DATA GAPS

Based on information from the site walkover inspection and site history review, EI considered a programme of intrusive investigation was warranted to conduct targeted sampling at locations of known, potential sources of contamination (as listed in **Section 5.1**), with systematic sampling coverage in site areas where operational site history was not documented.

5. SAMPLING, ANALYTICAL AND QUALITY PLAN (SAQP)

The SAQP plays a crucial role in ensuring that the data collected as part of this, and ongoing environmental works carried out at the site are representative, and provide a robust basis for site assessment decisions. This SAQP includes the following:

- Data quality objectives, including a summary of the objectives of the DSI;
- Investigation methodology including media to be sampled, details of analytes and parameters to be monitored and a description of intended sampling points;
- Sampling methods and procedures;
- Field screening methods;
- Analysis Methods;
- Sample handling, preservation and storage; and
- Analytical QA/QC.

5.1 DATA QUALITY OBJECTIVES (DQO)

In accordance with the USEPA (2006) *Data Quality Assessment* and the DEC (2006) *Guidelines for the NSW Site Auditor Scheme*, the process of developing Data Quality Objectives (DQO) was used by the EI assessment team to determine the appropriate level of data quality needed for the specific data requirements of the project. The DQO process that was applied for this assessment is documented in **Table 5-1**.

Table 5-1 Summary of Project Data Quality Objectives

DQO Steps (NSW DEC, 2006)	US EPA (2006) (modified)	Details	Comments (changes during investigation)
1. State the Problem Summarise the contamination problem that will require new environmental data, and identify the resources available to resolve the problem; develop a conceptual site model	Give a concise description of the problem. Develop a conceptual model of the environmental hazard to be investigated. Identify resources available.	The site is to be developed for residential land use with minimal access to soils including demolition of existing structures and construction of a 5-6 storey apartment block with stepped double basement. The site has been historically used for some industrial purposes followed by commercial warehouses. Possible contamination could derive from these former site uses, as well as possible contamination from; building material weathering, hazardous materials (including potential ACM), subsurface infrastructure (UPSS), filling material of unknown origin and quality, and offsite sources including groundwater/vapour impacts from adjacent dry cleaners. Possible soil contaminates include TRH/BTEX, VOCs, Heavy metals, PAHs, pesticides and asbestos. The investigation sampling must provide supportive information on the environmental conditions of the site to help determine its suitability for the proposed development.	
2. Identify the Goal of the Study (Identify the decisions) Identify the decisions that need to be made on the contamination problem and the new environmental data required to make them.	Identify principal study question(s). Consider alternative outcomes or actions that may result from answering the question(s). For decision problems, develop decision statement(s), organise multiple decisions. For estimation problems, state what needs to be estimated and key assumptions.	The goal of the study is to determine if the soil and groundwater conditions at the site are suitable for the proposed commercial development; and if not, what are the remediation requirements necessary to make the site suitable for redevelopment? EI consider the appropriate assessment criteria are the HIL B commercial with limited soil access.	

DQO Steps (NSW DEC, 2006)	US EPA (2006) (modified)	Details	Comments (changes during investigation)
3. Identify Information Inputs (Identify inputs to decision) Identify the information needed to support any decision and specify which inputs require new environmental measurements	Identify types and sources of information needed to resolve decisions or produce estimates. Identify the basis of information that will guide or support choices to be made in later steps of the DQO Process. Select appropriate sampling and analysis methods for generating the information.	The main inputs to the environmental investigation works include: Identification of historic potential contamination on site; derived from the preliminary site investigation **(Section 3**) and site walkover; National and NSW EPA guidelines under the NSW Contaminated Land Management Act 1997. Seven (7) borehole sampling locations were selected using a combined systematic/targeted sampling pattern across accessible areas of the site. A single borehole location was utilised for the installation of a groundwater monitoring well. Laboratory analysis of subsurface and deeper soils, and groundwater. National and NSW EPA guidelines under the NSW Contaminated Land Management Act 1997.	Two additional boreholes and monitoring wells proposed in northern area (No. 4 McGill St.) were unable to be completed due to site access restrictions. Hand auger borehole sampling replaced mechanical drilling rig sampling on 6 of the 7 boreholes due to height access restriction.
4. Define the Boundaries of the Study Specify the spatial and temporal aspects of the environmental media that the data must represent to support decision	Define the target land-use and receptors of interest and its relevant spatial boundaries. Define what constitutes a sampling unit. Specify temporal boundaries and other practical constraints associated with sample/data collection. Specify the smallest unit on which decisions or estimates will be made.	Lateral – the site is located on the western side of McGill Street and is surrounded by a mix of residential, transportation and residential construction site land uses; Vertical – from the existing ground level to at least the base of the proposed excavations at approximately 6.0 mBGL; Temporal – The findings of this assessment will hold true for as long as the site use remains passive in nature; that is, for as long as the site is used for residential uses and there are no activities taking place onsite or on immediately adjacent (upgrading) properties that may compromise onsite environmental conditions.	Scope of DSI investigation reduced (for soil sampling coverage and groundwater investigation) due to site access limitations from existing warehouse businesses and indoor height restrictions for mechanical borehole drilling.

DQO Steps (NSW DEC, 2006)	US EPA (2006) (modified)	Details	Comments (changes during investigation)
5. Develop the Analytic Approach (Develop a decision rule) To define the parameter of interest, specify the action level, and integrate previous DQO outputs into a single statement that describes a logical basis for choosing from alternative actions	Specify appropriate land-use parameters for making decisions or estimates. For decision problems, choose a workable Action Level and generate an "If then else" decision rule which involves it. For estimation problems, specify the methodology and the estimation procedure.	The decision rules for the investigation were: • If the concentrations of contaminants in the soils data exceed the land use criteria; then assess the need to further investigate the extent of impacts onsite. • The waste classification for off-site disposal of excavated materials is determined on the basis of soil sampling and laboratory analysis for a relevant suite of analytical parameters. • Decision criteria for QA/QC measures are defined by the Data Quality Indicators (DQI) in **Table 5-2**.	
6. Specify Performance or Acceptance Criteria (Specify limits on decision errors) Specify the decision-maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data	For decision problems, specify the decision rule as a statistical hypothesis test, examine consequences of making incorrect decisions from the test, and place acceptable limits on the likelihood of making decision errors. For estimation problems, specify acceptable limits on estimation uncertainty.	Specific limits for this project were in accordance with the appropriate guidance made by the NSW EPA, appropriate indicators of data quality and standard procedures for field sampling and handling. This should include the following points to quantify tolerable limits: • A decision can be made based on a probability that 95% Upper Confidence Limits (UCL) of the data will satisfy the given site criteria. Therefore a limit on the decision error will be 5% that a conclusive statement may be incorrect. • A decision can be made based on the probability that a contamination hotspot of a certain circular diameter will be detected with 95% confidence using a selected density of systematic data points. The decision error will be limited to a probability of 5% that a contamination hotspot may not be detected. • If contaminant concentrations in groundwater exceed the adopted criteria, further investigation will be considered prudent. If no contamination is detected in groundwater, further action will not be warranted.	

DQO Steps (NSW DEC, 2006)	US EPA (2006) (modified)	Details	Comments (changes during investigation)
7. Develop the Detailed Plan for Obtaining Data (Optimise the design for obtaining data) Identify the most resource-effective sampling and analysis design for general data that are expected to satisfy the DQOs	Compile all data and outputs generated in Steps 1 to 6. Use this information to identify alternative sampling designs that fit your intended use Select and document a design that will yield data to best achieve your data quality.	Written instructions will be issued to guide field personnel in the required fieldwork activities. Soil samples would be collected from accessible areas across the site and at targeted locations such as the suspected UPSS area and proposed deep soil landscape areas to characterise the site's suitability for the intended land use. One round of groundwater sampling (minimum) would be performed at predefined monitoring well locations to assess groundwater conditions at the site.	Groundwater assessment yet to be completed due site access restrictions.

5.2 DATA QUALITY INDICATORS

To ensure that the investigation data collected was of an acceptable quality, the investigation data set was assessed against the data quality indicators (DQI) outlined in **Table 5-2**, which related to both field and laboratory-based procedures. The assessment of data quality is discussed in **Section 7**.

Table 5-2 Data Quality Indicators

Data Quality Objective	Data Quality Indicator	Acceptable Range
Accuracy	Field – Trip blank (laboratory prepared) Laboratory – Laboratory control spike and matrix spike	< laboratory limit of reporting (LOR) Prescribed by the laboratories
Precision	Field – Blind replicate and spilt duplicate Laboratory – Laboratory duplicate and matrix spike duplicate	< 30 % relative percentage difference (RPD [%]) Prescribed by the laboratories
Representativeness	Field – Trip blank (laboratory prepared) Laboratory – Method blank	< laboratory limit of reporting (LOR) Prescribed by the laboratories
Completeness	Completion (%)	-

6. ASSESSMENT METHODOLOGY

6.1 SAMPLING RATIONALE

With reference to the preliminary CSM and DQO described in **Section 4** and **Section 5** respectively, soil and groundwater investigation works were planned in accordance with the following rationale:

- Sampling fill and natural soils from seven accessible test bore locations located systematically across the site using a mixed triangular grid-based and targeted sampling pattern to characterise in-situ soils;
- Sample location BH2 targeted the UST areas identified during the site walkover and ground penetrating radar (GPR) survey;
- Sample location BH7 targeted suspected deep fill identified during the site walkover;
- Sampling groundwater during a single groundwater monitoring event (GME) at a single monitoring well (BH1) located close to the up gradient site boundary and immediately down to assess site groundwater conditions; and
- Laboratory analysis of representative soil and groundwater samples for the identified chemicals of concern.

6.2 INVESTIGATION CONSTRAINTS

The number of test bores drilled and monitoring wells proposed for the investigation phase did not achieve the planned investigation scope of nine boreholes and three groundwater monitoring wells due to a number of physical obstructions, which comprised:

- Limited access to internal areas of the buildings;
- Limited head-clearance for the mechanical drilling rig;
- Limited access to deeper soils due to use of hand auger i.e. in gravelly fill (BH7);
- Access restriction in northern allotment at No.4 McGill Street (by tenant) for two additional boreholes including groundwater investigation. Therefore only seven test bores and one groundwater well was completed; and
- Groundwater monitoring at the newly installed monitoring well BH1 revealed the well to be dry at 4.5mBGL and therefore no groundwater data could be assessed in this DSI report.

Due to drilling rig access restrictions, six of the seven test bores within the site were drilled using the manual auger method for soil sampling purposes.

6.3 ASSESSMENT CRITERIA

The assessment criteria proposed for this project are outlined in **Table 6-1**. These were selected from available published guidelines that are endorsed by national or state regulatory authorities, with due consideration of the exposure scenario that is expected for various parts of the site, the likely exposure pathways and the identified potential receptors.

Table 6-1 Adopted Investigation Levels for Soil and Groundwater

Environmental Media	Adopted Guidelines	Rationale
Soil	NEPM, 2013 Soil HILs, EILs, HSLs, ESLs & Management Limits for TPHs	**Soil Health-based Investigation Levels (HILs)** All samples to be assessed against the NEPM 2013 HIL-B thresholds for residential sites with minimal access to soils, as these areas would be under slabs. **Ecological Investigation Levels (EILs)** Soil samples would also be assessed against the NEPM 2013 EILs for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene, which have been derived for protection of terrestrial ecosystems. EILs apply to deep soil/landscape areas proposed for the development. **Soil Health-based Screening Levels (HSLs)** The NEPM 2013 Soil HSL-A&B thresholds for low-high density residential sites for vapour intrusion would be applied to assess for potential human health impacts from residual vapours resulting from petroleum, BTEX & naphthalene. Soils asbestos results to be assessed against the NEPM 2013 Soil HSL thresholds for “all forms of asbestos”. **Ecological Screening Levels (ESLs)** Soil samples to be assessed against the NEPM 2013 ESLs for selected petroleum hydrocarbons & TRH fractions for protection of terrestrial ecosystems. ESLs apply to deep soil/landscape areas proposed for the development. **Management Limits for Petroleum Hydrocarbons** Should the ESLs and HSLs be exceeded for petroleum hydrocarbons, soil samples from BH2, BH3 & BH5 would also assessed against the NEPM 2013 *Management Limits* for the TRH fractions F1 – F4 to assess propensity for phase-separated hydrocarbons (PSH), fire and explosive hazards & adverse effects on buried infrastructure.
Groundwater	NEPM, 2013 GILs for Marine Waters	**Groundwater Investigation Levels (GILs) for Marine Water** NEPM 2013 provides GILs for typical, slightly-moderately disturbed aquatic ecosystems, which are based on the ANZECC & ARMCANZ 2000 Trigger Values (TVs) for the 95% level of protection of aquatic ecosystems; however, the 99% TVs were applied for the bio-accumulative metals *cadmium* and *mercury*. The marine criteria were considered relevant as the closest, potential surface water receptor was Iron Cove, located 2.6 km north of the site and is tidally influenced.
	NEPM, 2013 Groundwater HSLs for Vapour Intrusion	**Health-based Screening Levels (HSLs)** The NEPM 2013 groundwater HSLs for vapour intrusion were used to assess for potential human health impacts from residual vapours resulting from petroleum, BTEX and naphthalene impacts. The *HSL A* and *HSL B* thresholds for low and medium-density residential sites were applied for groundwater.

Environmental Media	Adopted Guidelines	Rationale
	NEPM, 2013 GILs for Drinking purposes	**Drinking Water GILs** The NEPM (2013) GILs for drinking water quality were applied for specific parameters, for which freshwater/marine GILs were not provided. These were based on the Australian Drinking Water Guidelines (Ref. NHMRC, 2011).

For the purposes of this investigation, the adopted soil assessment criteria are referred to as the Soil Investigation Levels (SILs) and the adopted groundwater assessment criteria are referred to as the Groundwater Investigation Levels (GILs). SILs are presented alongside the analytical results in the corresponding summary tables, which are discussed in **Section 8**.

It is noted that as no groundwater sampling was achieved at the time of the DSI field works, groundwater laboratory analysis and comparison to GILs could not be completed for this DSI report.

6.4 SOIL INVESTIGATIONS

The soil investigations conducted at the site are described in **Table 6-2**. Test bore locations are illustrated in **Figure 2**.

Table 6-2 Summary of Soil Investigation Methodology

Activity/Item	Details
Fieldwork	Site walkover including service location and a GPR survey were undertaken on 17 December 2015. Borehole drilling and soil sampling was undertaken on 6 April 2016.
Drilling Method & Investigation Depth	Test bore BH1 was drilled using a Dando Duel Mast (model), mechanical, track-mounted, solid flight auger drilling rig using 100 mm diameter augers to a depth of 8.05m for geotechnical core sampling purposes. Test bores BH2, BH3, BH4, BH5, BH6 and BH7 were drilled using the hand auger method due to height/access restrictions within the building. Final bore depths for BH2 – BH6 ranged from 0.2 – 1.5m into natural soils or bedrock. Manual auger refusal was experienced at borehole BH7 at 0.8 m bgl in gravelly fill.
Soil Logging	Drilled soils were classified in the field with respect to lithological characteristics and evaluated on a qualitative basis for odour and visual signs of contamination. Soil classifications and descriptions were based on Unified Soil Classification System (USCS) and Australian Standard (AS) 4482.1-2005. Bore logs are presented in **Appendix D**.
Field Observations (including visual and olfactory signs of potential contamination)	A summary of field observations is provided, as follows: • dark staining and hydrocarbon odour was observed in the fill layer at BH2 at depth interval 0.4-1.1 m bgl; • charcoal fragments were identified shallow filling at 0.0-0.1 in BH4; • fibre cement sheet fragments were not observed in any drilling cuttings; and • no signs of ash materials were detected in any of the drilled boreholes.

Activity/Item	Details
Soil Sampling	• Soil samples were collected using a dry grab method (unused, dedicated nitrile gloves) & placed into laboratory-supplied, acid-washed, solvent-rinsed glass jars. • Blind field duplicates was separated from the primary samples and placed into glass jars. • A small amount of duplicate was collected from each soil samples and placed into zip-lock bag for Photo-ionisation Detector (PID) screening. • A small amount of duplicate was separated from all fill samples and placed into a zip-lock bag for asbestos analysis.
Decontamination Procedures	*Drilling Equipment* - The drilling rods were decontaminated between sampling locations with potable water until the augers were free of all residual materials. *Sampling Equipment* - Sampling equipment (i.e. trowel) was cleaned with suitable phosphate free detergent and rinsed with potable water between sampling episodes.
Sample Preservation	Samples were stored in a refrigerated (ice brick-filled) chest, whilst on-site and in transit to the laboratory. All samples were submitted and analysed within the required holding period, as documented in laboratory reports discussed in a later section.
Management of Soil Cuttings	Soil cuttings were used as backfill for completed boreholes.
Quality Control & Laboratory Analysis	A number of soil samples were submitted for analysis of previously-identified COPC by SGS Laboratories (SGS). QA/QC testing comprised intra-laboratory duplicates ('field duplicates') tested blind by SGS and an inter-laboratory field duplicate tested blind by Envirolab Services (Envirolab). All samples were transported under strict Chain-of-Custody (COC) conditions and COC certificates and laboratory sample receipt documentation were provided to EI for confirmation purposes, as discussed in **Section 7.**
Soil Vapour Screening	Screening for potential VOCs in collected soil samples was conducted using a calibrated Photo-ionisation Detector (PID) fitted with a 10.6 eV lamp and recorded on borehole logs.

6.5 GROUNDWATER INVESTIGATIONS

The groundwater investigations conducted at the site are described in **Table 6-3**. Monitoring well locations are illustrated in **Figure 2**.

Table 6-3 Summary of Groundwater Investigation Methodology

Activity/Item	Details
Fieldwork	A single groundwater monitoring well (BH1) was installed on 6.4.2016. Water level gauging of BH1 was conducted on 12.4.2016 and was found to be dry.
Well Construction	Test bore BH1 was converted to a groundwater monitoring well as follows: A single test bore BH1 was converted to a groundwater monitoring well to a depth of 4.5m in a partly up-gradient location. Test bore BH1 was drilled using a Dando Duel Mast (model), mechanical, track-mounted, solid flight auger drilling rig using 100 mm diameter augers. Well construction details are documented in the bore logs presented in **Appendix D**. The well was installed to screen the confined Sandstone aquifer within the interval 1.4 to 4.5 m bgl.
Well Construction (continued)	Well construction was in general accordance with the standards described in NUDLC (2012) and involved the following: • 50 mm, Class 18 uPVC, threaded, machine-slotted screen and casing, with slotted intervals in shallow wells set to screen to at least 500 mm above the standing water level to allow sampling of phase-separated hydrocarbon product, if present; • base and top of each well was sealed with a uPVC cap; • annular, graded sand filter was used to approximately 300mm above top of screen interval; • granular bentonite was applied above annular filter to seal the screened interval; • drill cuttings were used to backfill the bore annulus to just below ground level; and • surface completion comprised a steel road box cover set in neat cement and finished flush with the concrete slab level. BH1 was plugged with granular bentonite from 4.5 to 5.0 mBGL due to the presence of a void that had been created for the NLMC core sampling.
Well Development	Well development was not conducted due to the groundwater well BH1 being dry at the time of investigation.
Well Survey (Elevation and location)	Well elevations at ground level were extrapolated from the spot elevations marked on the survey plan provided by the client (**Figure 2**). Well elevations at ground level were extrapolated in metres relative to Australian Height Datum (m AHD).
Well Gauging	Well BH1 found dry on 12.4.16.
Well Purging & Field Testing	NA – Well BH1 found dry on 12.4.16.
Groundwater sampling	
Decontamination Procedure	
Sample Preservation	
Quality Control & Laboratory Analysis	
Sample Transport	

7. DATA QUALITY ASSESSMENT

The assessment of data quality is defined as the scientific and statistical evaluation of environmental data to determine if these data meet the objectives of the project (Ref. USEPA 2006). Data quality assessment includes an evaluation of the compliance of the field sampling and laboratory analytical procedures and an assessment of the accuracy and precision of these data from the laboratory quality control measurements obtained.

The data quality assessment process for this assessment included a review of analytical procedures to confirm compliance with established laboratory protocols and an assessment of the accuracy and precision of analytical data from a range of quality control measurements. The QC measures generated from the field sampling and analytical program were as follows:

- suitable records of fieldwork observations including borehole logs;
- relevant and appropriate sampling plan (density, type, and location);
- use of approved and appropriate sampling methods;
- preservation and storage of samples upon collection and during transport to the laboratory;
- complete field and analytical laboratory sample COC procedures and documentation;
- sample holding times within acceptable limits;
- use of appropriate analytical procedures and NATA-accredited laboratories; and
- required LOR (to allow for comparison with adopted IL);
- frequency of conducting quality control measurements;
- laboratory blanks;
- field duplicates;
- laboratory duplicates;
- matrix spike/matrix spike duplicates (MS/MSDs);
- surrogates (or System Monitoring Compounds);
- analytical results for replicated samples, including field and laboratory duplicates and inter-laboratory duplicates, expressed as Relative Percentage Difference (RPD); and
- checking for the occurrence of apparently unusual or anomalous results, e.g. laboratory results that appear to be inconsistent with field observations or measurements.

The findings of the data quality assessment in relation to the soil investigations at the site are discussed in detail in **Appendix G**. QA/QC policies and DQOs are presented in **Appendix H**.

On the basis of the analytical data validation procedure employed the overall quality of the soil analytical data produced for the site were considered to be of an acceptable standard for interpretive use.

8. RESULTS

8.1 SOIL INVESTIGATION RESULTS

8.1.1 Site Geology and Subsurface Conditions

The general site geology encountered during the drilling of the soil investigation boreholes may be described as a layer of anthropogenic filling overlying residual Clays and Hawkesbury Sandstone at depth. The geological information obtained during the investigation is summarised in **Table 8-1** and borehole logs from these works are presented in **Appendix G**.

Table 8-1 Generalised Subsurface Profile (m bgl)

Layer	Description	Depth to top & bottom of layer (m bgl)
Concrete		0 – 0.16 (max 0.16 at BH1)
Fill	Gravelly Clayey Sand & Silty Gravelly Sand; orange/grey, red/brown - grey, dry-moist, no odour.	0.1 – 1.5+ (max 1.5+ at BH7)
Residual Soil	CLAY; medium plasticity, orange/brown, very stiff, moist, no odour.	0.1 – 1.5+ (max 1.1 – 1.5+ at BH2)
Bedrock	SANDSTONE; weathered Hawkesbury Sandstone, medium grained, pale yellow grey, no odour.	0.1 – 8.05+

Notes: + Termination depth of borehole

8.1.2 Field Observations and PID Results

Soil samples were obtained from the test bores at various depths ranging between 0.0 m to 1.5 m bgl. All examined soil samples were evaluated on a qualitative basis for odour and visual signs of contamination (e.g. hydrocarbon odours, oil staining, petrochemical filming, asbestos fragments, ash, charcoal) and the following observations were noted:

- Dark staining and hydrocarbon odour was observed in the fill layer at BH2 at depth interval 0.4-1.1 m bgl;
- Charcoal fragments were identified shallow filling at 0.0-0.1 in BH4;
- No fibre cement sheet fragments were observed in any drilling cuttings; and
- No signs of ash materials were detected in any of the drilled boreholes.

- Elevated VOC concentrations ranging from 50 to 106 parts per million (ppm) were detected in soil headspace samples BH2_0.4-0.5 and BH2_0.9-1.0 (adjacent UPSS area), which were field-screened using a portable PID fitted with a 10.9 eV lamp. The PID results are shown in the borehole logs (**Appendix D**) and the samples showing higher PID values were therefore assigned for laboratory hydrocarbon/VOC analysis.

LABORATORY ANALYTICAL RESULTS

8.1.3 Soil Analytical Results

A summary of laboratory results showing test sample quantities, minimum/maximum analyte concentrations and samples found to exceed the SILs, is presented in **Table 8-2**. More detailed tabulations of results showing the tested concentrations for individual samples alongside the adopted soil criteria are presented in **Tables T1** to **T6** at the end of this report. Completed documentation used to track soil sample movements and laboratory receipt (i.e. COC and SRA forms) are copied in **Appendix E** and all laboratory analytical reports for tested soil samples are presented in **Appendix F**.

Table 8-2 Summary of Soil Analytical Results

No. of primary samples	Analyte	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)	Sample locations exceeding investigation levels
Hydrocarbons				
13	F1	<25	<25	None
13	F2	<25	<25	None
13	F3	<90	340	BH7_0.0-0.1 exceeding ESL of 300mg/kg.
13	F4	<120	<120	None
13	Benzene	<0.1	<0.5	None
13	Toluene	<0.1	<0.5	None
13	Ethyl benzene	<0.1	<1.0	None
13	Total xylenes	<0.3	<2.0	None
13	Naphthalene	<0.1	<1.0	None
13	Benzo(a)pyrene	<0.1	8.5	BH2_0.4-0.5, BH2_0.9-1.0, BH7_0.0-0.1 & BH7_0.5-0.7 exceeding ESL of 0.7mg/kg.
13	B(α)P TEQ	<0.3	13	BH7_0.0-0.1 & BH7_0.5-0.7 exceeding HIL B of 4mg/kg.
13	Total PAHs	<0.8	120	None.
Pesticides				
7	Aldrin & Dieldrin	<0.1	0.4	None
7	Endrin	<0.2	<0.2	None.
7	Chlordane	<0.1	0.4	None
7	DDT+DDD+DDE	<0.2	<0.2	None
7	Heptachlor	<0.1	<0.1	None

No. of primary samples	Analyte	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)	Sample locations exceeding investigation levels
7	OPPs	Not Detected	Not Detected	None
PCBs				
7	Total PCBs	<0.1	<0.1	None
Heavy Metal				
13	Arsenic	<3	9	None
13	Cadmium	<0.3	0.9	None
13	Chromium (Total)	8	25	None
13	Copper	1	71	None
13	Lead	6	370	None
13	Mercury	<0.01	0.35	None
13	Nickel	1	10	None
13	Zinc	9	640	None
Asbestos				
7	Asbestos	No asbestos detected	No asbestos detected	None

Heavy Metals

With reference to **Table T1**, all heavy metals concentrations were below the corresponding health based SILs for residential settings with minimal access to soils.

All heavy metals concentrations were below the derived ecological based investigation levels (EIL).

TRH

As shown in **Table T2**, all TRH concentrations were below the adopted human health criteria for TRH.

The ecological screening level (ESL) for the F3 TRH fraction was exceeded in the fill layer in sample BH7_0.0-0.1 with a concentration of 340mg/kg.

BTEX and Naphthalene

As shown in **Table T2** all BTEX and naphthalene concentrations were below the detection limit and below the adopted criteria for human and ecological health.

PAH

As summarised in **Table T3** exceedances of the adopted human health criteria were noted for carcinogenic PAHs in the fill layer of BH7_0.0-0.1 (13mg/kg) and BH7_0.5-0.7 (8.2mg/kg).

The remaining analysed soil samples for PAHs reported concentrations either below the detection limit or below the adopted criteria for human health.

Exceedances were also noted of the adopted ecological criterion for benzo(α)pyrene in the fill layer at BH2_0.4-0.5 (2mg/kg), BH2_0.9-1.0 (2mg/kg), BH7_0.0-0.1 (8.5mg/kg) and BH7_0.5-0.7 (5.8mg/kg).

Asbestos

As summarised in **Table T4**, no detectable asbestos concentrations or traces of respirable fibres were identified in any of the tested soil samples.

OCP, OPP and PCB

With reference to **Table T5**, trace or non-detectable concentration of any of the screened OCP, OPP and PCB compounds was identified in any of the tested samples. All laboratory PQLs were also within the corresponding SILs.

9. SITE CHARACTERISATION DISCUSSION

9.1 CONCEPTUAL SITE MODEL

On the basis of investigation findings the preliminary CSM discussed in **Section 4** was considered to appropriately identify contamination sources, migration mechanisms and exposure pathways, as well as potential onsite and offsite receptors. Previously known data gaps, as outlined in **Section 4.4** have been largely addressed; however, the following data gaps remain:

- Extent of any soil or groundwater impacts from UPSS as indicated on the central eastern site boundary (shown in **Figure 2**);
- Extent and depth of PAH impacted filling identified beyond 0.7m BGL in the south western part of the site at BH7.
- Soil and groundwater Investigation of the northern part of the site (No.4 McGill St.) for assessment of potential impacts from former drycleaners adjacent the site to the north (No. 2 McGill St.); and
- Groundwater at the site has not been adequately addressed, given only a single monitoring well was installed due to access restriction (i.e. from operating businesses and height restrictions). As such further investigation is warranted to adequately characterise both up-gradient and down-gradient groundwater and flow direction.

Although site soil sampling coverage was partly restricted due to site accessibility (i.e. drilling rig height restrictions, tenanted areas), the investigation showed consistent shallow fill overlying sandstone bedrock across the central and eastern parts of the site.

9.2 POLYCYCLIC AROMATIC HYDROCARBON (PAH) IN SOIL

Carcinogenic PAH concentrations (calculated as benzo(a)pyrene toxicity equivalent quotient as per NEPM 2013) were reported in excess of the health-based SILs for residential use with minimal soil access at sampling location BH7. Impacted B(α)P TEQ fill material should be visually identified and segregated in accordance with the NSW EPA Waste Classification Guidelines before removal offsite during excavation for the proposed development.

Benzo(a)pyrene impacts in exceedance of the ecological-based criteria were identified at BH2 and BH7 within filling layers. If fill materials will be excavated and removed for offsite disposal to enable construction of a two-level, basement car park, no further ecological assessment would be required. If deep soils will be retained for landscaping at the site, it is recommended that additional intrusive investigation is performed to evaluate ecological risks from benzo(α)pyrene.

9.3 UNDERGROUND PETROLEUM STORAGE SYSTEM

As at least one underground storage tank was installed on-site and currently remains *in-situ*, along with associated infrastructure (dip/filling points and vent line).

In accordance with the *Technical Note: Investigation of Service Station Sites* (NSW EPA, 2014), all existing UPSS facilities shall be decommissioned, removed from the site and the soils in proximity be validated for their suitability of site redevelopment.

9.4 ASBESTOS RISK

While no soil borehole samples tested positive for asbestos in fill materials beneath the building slab, potential existing building materials (i.e. fibrous cement sheet roofing), identified on the warehouse covering the site, may potentially contain asbestos and therefore may require management for any planned demolition works.

EI also has no knowledge of any Hazardous Materials Survey (HMS) for the site. A HMS should be completed prior to demolition of existing structures. If asbestos is identified, an Asbestos Clearance Certificate is to be prepared by an appropriately licenced contractor to ensure that any hazardous materials are adequately managed before and during demolition to prevent the spreading of contamination and potential health risk to site workers and surrounding areas.

Any demolition works are to be in accordance with Code of Practice for the Safe Removal of Asbestos in Workplaces (Ref. Safe Work Australia, 2011). Following any demolition works, prior to the commencement of any construction activities. A visual inspection of all fill soils across the site should be conducted by a qualified environmental consultant post building demolition, and all wastes designated for offsite disposal to be classified in accordance with the NSW waste classification guidelines.

10. CONCLUSIONS

The land parcel known as 4-12 McGill Street, Lewisham NSW, was the subject of a Detailed Site Investigation in order to assess the environmental conditions and the potential for on-site contamination associated with the identified current and former land uses. Based on the findings of this assessment and within the limitations of normal environmental investigations (**Section 12**), EI concluded that:

- The site comprises a 2460m^2 area occupied by several adjoining commercial warehouses with upstairs offices and concrete flooring throughout. The property was situated between McGill Street and a light rail corridor in a multistorey residential redevelopment area.
- A previous Preliminary Site Investigation Report had been completed by Douglas partners in November 2015, which indicated that the site has been subject to some commercial/industrial activity including potential filling, especially around on the western side of the site near the stormwater canal, from historic demolition activities and from general commercial/industrial activity including commercial drycleaners in the northern part of the site.
- A ground penetrating radar search indicated that at an empty UST measuring approximately 1.6 x 2.5m to a depth of 0.8 mBGL was present at the central eastern boundary of the site.
- Soil sampling and testing were conducted at seven borehole locations across accessible parts of the site down to a maximum depth of 1.5 mBGL.
- The sub-surface layers comprised of Gravelly Sand and Clay fill materials overlying brown orange Clays, underlain by Hawkesbury Sandstone.
- One Groundwater bore installed on-site was found to be dry at 4.5m, further groundwater monitoring was not completed due to site access constraints.
- Laboratory results of all soil samples tested reported concentrations of the screened heavy metals, TRH/BTEX, pesticides and asbestos to be below the adopted human health based investigation criteria.
- Laboratory testing results of soil samples exceeding adopted SILs is as follows:
  - Exceedance of the adopted human health criteria for carcinogenic PAH (TEQ) at BH7 (8.2 – 13mg/kg) to a minimum depth of 0.7 m BGL.
  - Exceedances of the adopted ecological criterion for benzo(α)pyrene in the fill layer at BH2_0.4-0.5 (2mg/kg), BH2_0.9-1.0 (2.6mg/kg), BH7_0.0-0.1 (8.5mg/kg) and BH7_0.5-0.7 (5.8mg/kg).
  - The ecological screening level (ESL) for the F3 TRH fraction was exceeded in the fill layer in sample BH7_0.0-0.1 with a concentration of 340mg/kg.

In summary, EI concludes that the site can be made suitable for the proposed residential development, subject to the recommendations provided in **Section 11**. Site contamination issues can be managed through the development application process in accordance with the State Environmental Planning Policy 55 (SEPP 55) – Remediation of Land and the Marrickville Council Contaminated Land Policy.

11. RECOMMENDATIONS

In view of the above findings and in accordance with the NEPM 2013 guidelines, it is considered that the site can be made suitable for the proposed redevelopment for residential use, and subject to the following recommendations:

- Preparation of a Remedial Action Plan (RAP) to outline necessary remediation and validation requirements associated with the decommissioning of the UPSS and any unexpected finds during redevelopment. The RAP should include further soil and groundwater investigations to close outstanding data gaps, including:
    - Drilling of an additional two boreholes at the northern part of the site (No.4 McGill St.) to complete site characterisation and for assessment of potential impacts from former drycleaners (identified adjacent the site to the north at No. 2 McGill St.) to soil and groundwater at the site;
    - Installation of three groundwater monitoring bores to complete site groundwater assessment with at least one round of groundwater monitoring and laboratory analysis for the relevant chemicals of concern;
    - Additional soil investigation for any proposed deep soil planting areas to evaluate ecological risks from benzo(a) pyrene identified at BH2 and BH7;
    - Removal of all UPSS infrastructure at the site in accordance with WorkCover requirements and UPSS Regulations (2014);
    - Remediation and validation of soils surrounding all identified UPSS infrastructure; and
    - Remediation, waste classification of impacted soils from the UPSS areas and fill soils associated with bulk excavation of the proposed basement.

Any material being removed from site (including virgin excavated natural materials or VENM) must be classified for off-site disposal with an accompanying Waste Classification Certificate provided by a suitably qualified and experienced environmental consultant, in accordance the EPA (2014) Waste Classification Guidelines.

Any material being imported to the site should be assessed (validated) for potential contamination in accordance with NSW EPA guidelines as being suitable for the intended land use or be certified in accordance with EPA (2014) as VENM or ENM.

Preparation of a validation report by a qualified environmental consultant, certifying the suitability of the site for the proposed development.

12. STATEMENT OF LIMITATIONS

The findings presented in this report are the result of discrete and specific sampling methodologies used in accordance with best industry practices and standards. Due to the site-specific nature of soil sampling from point locations, it is considered likely that all variations in subsurface conditions across a site cannot be fully defined, no matter how comprehensive the field investigation program.

While normal assessments of data reliability have been made, EI assumes no responsibility or liability for errors in any data obtained from previous assessments conducted on site, regulatory agencies (e.g. Council, EPA), statements from sources outside of EI, or developments resulting from situations outside the scope of works of this project.

Despite all reasonable care and diligence, the ground conditions encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. In addition, site characteristics may change at any time in response to variations in natural conditions, chemical reactions and other events, e.g. groundwater movement and or spillages of contaminating substances. These changes may occur subsequent to EI’s investigations and assessment.

EI’s assessment is necessarily based upon the result of the site investigation and the restricted program of surface and subsurface sampling, screening and chemical testing which was set out in the proposal. Neither EI, nor any other reputable consultant, can provide unqualified warranties nor does EI assume any liability for site conditions not observed or accessible during the time of the investigations.

This report was prepared for the above named client and no responsibility is accepted for use of any part of this report in any other context or for any other purpose or by other third parties. This report does not purport to provide legal advice.

This report and associated documents remain the property of EI subject to payment of all fees due for this assessment. The report shall not be reproduced except in full and with prior written permission by EI.

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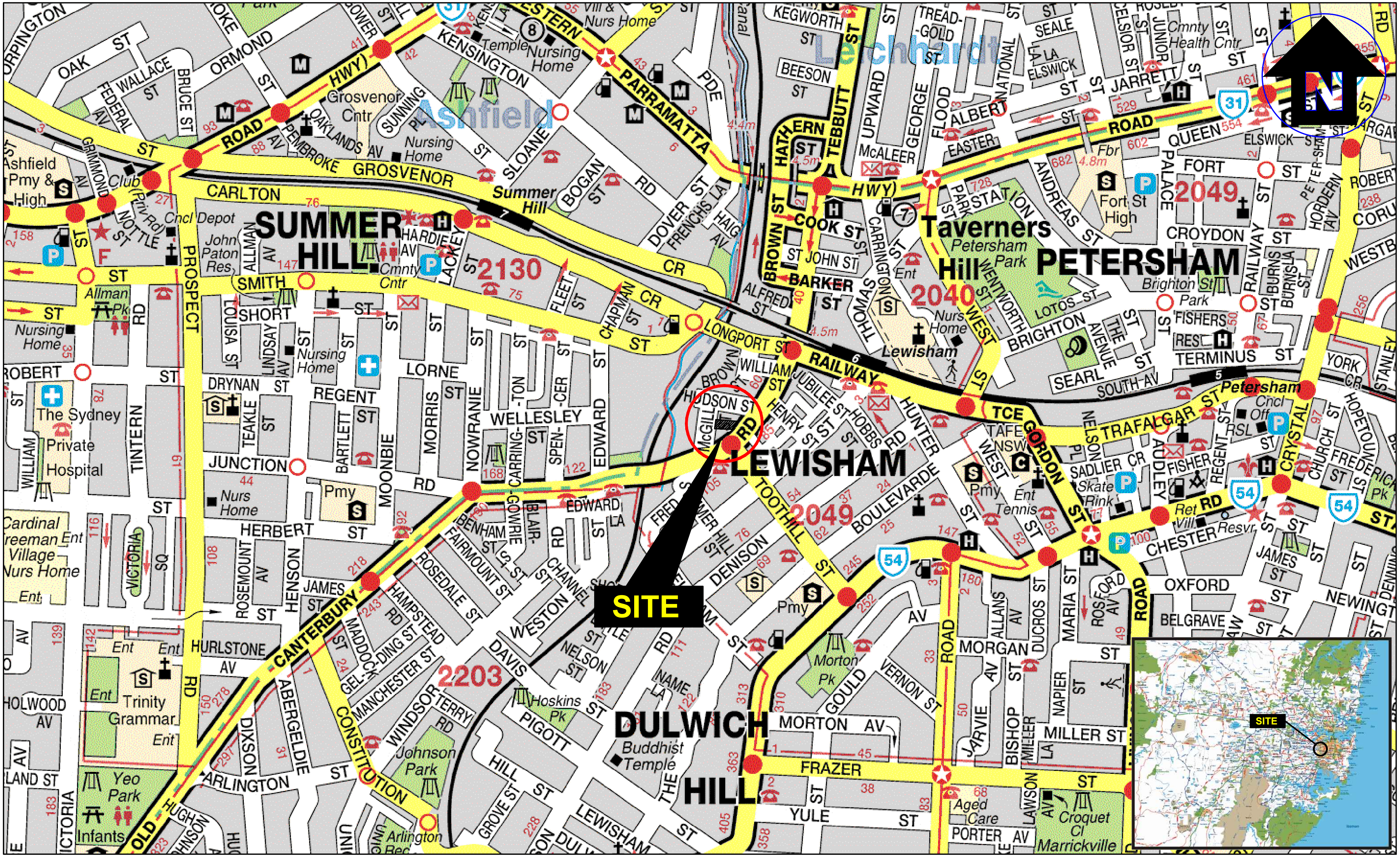
ABBREVIATIONS

ACM	Asbestos-containing materials
ASS	Acid sulfate soils
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
B(a)P	Benzo(a)Pyrene (a PAH compound)
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
COC	Chain of Custody
DEC	Department of Environment and Conservation, NSW (see OEH)
DECC	Department of Environment and Climate Change, NSW (see OEH)
DECCW	Department of Environment, Climate Change and Water, NSW (see OEH)
DA	Development Application
DO	Dissolved Oxygen
DP	Deposited Plan
EC	Electrical Conductivity
Eh	Redox potential
EPA	Environment Protection Authority
EMP	Environmental Management Plan
F1	TRH C_6 – C_{10} less the sum of BTEX concentrations (Ref. NEPM 2013, Schedule B1)
F2	TRH >C_{10} – C_{16} less the concentration of naphthalene (Ref. NEPM 2013, Schedule B1)
GIL	Groundwater Investigation Level
GME	Groundwater Monitoring Event
HIL	Health-based Investigation Level
HSL	Health-based Screening Level
km	Kilometres
LNAPL	Light, non-aqueous phase liquid (also referred to as PSH)
DNAPL	Dense, non-aqueous phase liquid
EIL	Ecological Investigation Level
ESL	Ecological Screening Level
m	Metres
m AHD	Metres Australian Height Datum
m BGL	Metres Below Ground Level
mg/m^3	Milligrams per cubic metre
mg/L	Milligrams per litre
µg/L	Micrograms per litre
mV	Millivolts
MW	Monitoring well
NATA	National Association of Testing Authorities, Australia
NEPC	National Environmental Protection Council
NSW	New South Wales
OEH	Office of Environment and Heritage, NSW (formerly DEC, DECC, DECCW)
PAHs	Polycyclic Aromatic Hydrocarbons
pH	Measure of the acidity or basicity of an aqueous solution
PSH	Phase-separated hydrocarbons (also referred to as LNAPL)
PQL	Practical Quantitation Limit (limit of detection for respective laboratory instruments)
QA/QC	Quality Assurance / Quality Control
RAP	Remediation Action Plan

SRA	Sample receipt advice (document confirming laboratory receipt of samples)
SWL	Standing Water Level
TDS	Total dissolved solids (a measure of water salinity)
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbons (superseded term equivalent to TRH)
TRH	Total Recoverable Hydrocarbons (non-specific analysis of organic compounds)
UCL	Upper Confidence Limit of the mean
USEPA	United States Environmental Protection Agency
UPSS	Underground Petroleum Storage System
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds (specific organic compounds which are volatile)
VOCCs	Volatile Organic Chlorinated Compounds (a sub-set of the VOC analysis suite)

FIGURES



eiaustralia

Contamination | Remediation | Geotechnical

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Drawn:	L.X.
Approved:	E.S.
Date:	22-04-16
Approx Scale:	N.T.S.

McGill Advance Management Pty Ltd

Detailed Site Investigation
4-12 McGill Street, Lewisham NSW

Site Locality Plan

Figure:
1

Project: E22830 AA_Rev0

KEY

🟨	Concentration exceeds adopted 4 mg/kg NEPM human health criteria (HIL B) for Carcinogenic PAHs (TEQ) for residential use with minimal access to soils.

No access to warehouse at No. 4 McGill Street due to tenant

UST measuring approx. 1.6 x 2.5 m

Sample ID	Carcinogenic PAH as B(a)P TEQ
BH7_0.0-0.1	13 mg/kg
BH7_0.5-0.7	8.2 mg/kg

0 5 10 20 30

Approx. Scale (m)

Map Source: Geomat Engineering Pty Ltd, Drawing No. 14100-01, Dated 12/11/14

LEGEND

◐	Approximate borehole location
▼	Approximate borehole / monitoring well location
▨	Approx. Underground Storage Tank (UST) location
▨	Proposed upper basement extent
▨	Proposed lower basement extent
🟧	Area not investigated
– – –	Approximate site boundary

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Suite 6.01, 55 Miller Street, PYRMONT 2009
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Drawn:	L.X.
Approved:	E.S.
Date:	22-04-16
Approx Scale:	1:400 @ A3 or as shown

McGill Advance Management Pty Ltd
Detailed Site Investigation
4-12 McGill Street, Lewisham, NSW

Borehole Location Plan

Figure:
2

Project: E22830 AA_Rev0

TABLES

Sample ID	Arsenic[1] (mg/kg)	Cadmium (mg/kg)	Chromium[2] (mg/kg)	Copper (mg/kg)	Lead[3] (mg/kg)	Mercury[4] (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
BH1_0.16-0.25	4	<0.3	8	9	30	0.02	3	45
BH2_0.1-0.2	5	<0.3	10	2	6	<0.01	1	44
BH2_0.4-0.5	7	0.4	19	11	79	0.10	3	96
BH2_0.9-1.0	5	0.3	13	12	85	0.2	3	88
BH2_1.3-1.5	6	0.4	25	1	11	0.01	1	9
BH3_0.1-0.2	4	<0.3	11	4	13	0.01	2	32
BH4_0.0-0.1	4	<0.3	16	2	20	0.03	2	22
BH5_0.1-0.2	5	0.4	17	11	74	0.09	4	200
BH5_0.7-0.8	4	<0.3	12	4	45	0.02	2	24
BH6_0.0-0.1	3	<0.3	9	18	200	0.03	2	67
BH6_0.4-0.5	<3	<0.3	11	6	48	0.02	2	23
BH7_0.0-0.1	6	0.6	12	33	170	0.27	10	410
BH7_0.5-0.7	9	0.9	15	71	370	0.35	9	640
SIL								
HIL B	500	150	500	30000	1200	120	1200	60000
EIL [5]	100[6]	NR	200	220	1100	NR	350	980

Notes:

SIL	Soil investigation level.
HIL	Health-based investigation levels (mg/kg) as per NEPM 1999 Schedule B1 2013 Amendment.
HIL B	Residential with minimal oppurtunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
EIL	Ecological Investigation Levels (mg/kg) as per NEPM Urban Residential and Public open Space.
NR	No recommended soil assessment criteria are currently available for the indicated parameter(s).
NA	Sample 'not analysed'
1	Arsenic - HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer to NEPM 1999 Schedule B7 2013 Amendment).
2	HILs are for Chromium VI while EILs for Chromium III. Concentrations reported were total Chromium including both VI and III. Speciation were not conducted as total Chromium concentrations reported were well under SILs.
3	Lead - HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.
4	Value shown is representative of inorganic mercury as provided in Table 1A(1) (refer to NEPM 1999 Schedule B1 2013 Amendment).
5	Added contaminant limits for Urban Residential and Public open Space as described within the NEPM 2013 have been derived as per Table 6.
6	Aged values are applicable to arsenic contamination present in soil for at least two years. For fresh contamination refer to NEPM 1999 Schedule B5c 2013 Amendment.

Table T2 –Soil Analytical Results for TPH, BTEX, and Naphthalene

Sample ID	Depth (m BGL)	Primary Soil Texture	Total Petroleum Hydrocarbons (mg/kg)				Benzene (mg/kg)	Toluene (mg/kg)	Ethyl benzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)
			F1[1]	F2[2]	F3[3]	F4[4]					
BH1_0.16-0.25	0.16-0.25	FILL: Sandy Gravelly CLAY	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH2_0.1-0.2	0.1-0.2	FILL: Gravelly Clayey SAND	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH2_0.4-0.5	0.4-0.5	FILL: Gravelly Clayey SAND, hydrocarbon staining and odou	<25	<25	90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH2_0.9-1.0	0.9-1.0	FILL: Gravelly Clayey SAND, hydrocarbon staining and odou	<25	<25	150	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH2_1.3-1.5	1.3-1.5	Residual CLAY	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH3_0.1-0.2	0.1-0.2	Weathered SANDSTONE	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH4_0.0-0.1	0.0-0.1	Residual CLAY	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH5_0.1-0.2	0.1-0.2	FILL: Gravelly Clayey SAND	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH5_0.7-0.8	0.7-0.8	Weathered SANDSTONE	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH6_0.0-0.1	0.0-0.1	FILL: Gravelly Clayey SAND	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH6_0.4-0.5	0.4-0.5	Residual CLAY	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH7_0.0-0.1	0.0-0.1	FILL: Silty Gravelly Sand	<25	<25	**340**	<120	<0.1	<0.1	<0.1	<0.3	<0.1
BH7_0.5-0.7	0.5-0.7	FILL: Silty Sandy Gravel	<25	<25	180	<120	<0.1	<0.1	<0.1	<0.3	<0.1
SIL											
HSL A & B (SAND)	0m to <1 m	Sand	45	110	NR	NR	0.5	160	55	40	3
	1m to <2m		70	240	NR	NR	0.5	220	NL	60	NL
	2m to <4m		110	440	NR	NR	0.5	310	NL	95	NL
	4m+		200	NL	NR	NR	0.5	540	NL	170	NL
ESL[5]		Coarse grained	180*	NR	300	2800	50	85	70	105	170
		Fine grained			1300	5600	65	105	125	45	
Management Limits[6]		Coarse grained	700	NR	2500	10000	NL	NL	NL	NL	NR
		Fine grained	800		3500		NL	NL	NL	NL	

Notes:

🟩	Concentration exceeds adopted ESL.
SIL	Soil investigation level.
HSL	Health screening level as per NEPM 1999 Schedule B1 2013 Amendment. Different HSLs apply based on the primary soil texture encountered.
HSL A & B	Low to high density residential settings.
ESL	Ecological screening levels (mg/kg). ESL adopted is for urban residential and public open space settings.
Management limits	As per Table 1 B(7) in NEPM 1999 Schedule B1 2013 Amendment.
NL	'Not Limiting' If the derived soil vapour limit exceeds the soil concentration at which the pore water phase cannot dissolve any more of the individual chemical, i.e. where the soil vapour is at equilibrium with the pore water, then the soil vapour source cannot exceed a level that would result in the maximum allowable vapour risk for the given scenario, therefore the limit is not limiting.
NR	No recommended soil assessment criteria are currently available for the indicated parameter(s).
NA	Sample 'not analysed'
ND	Concentrations of all tested analytes in this group was under the laboratory practical quantifation limit.
<PQL	Concentrations of analytes were below laboratory Practical Quantification Limit.
1	To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.
2	F2 refers to Total Recoverable Hydrocarbon >C10-C16 fraction minus Naphthalene.
3	F3 refers to Total Recoverable Hydrocarbon >C16-C34.
4	F4 refers to Total Recoverable Hydrocarbon >C34-C40.
5	ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.
6	Management limits are applied after consideration of relevant ESLs and HSLs. BTEX and Naphtalene are not subtracted from the relevant fractions to obtain F1 and F2 when considering management limits.

Table T3 – Soil Analytical Results for PAHs

Sample	Polyaromatic Hydrocarbons (mg/kg)		
ID	Carcinogenic PAHs (as Benzo[a]pyrene TEQ)	Benzo(a)pyrene	Total PAHs
BH1_0.16-0.25	<0.3	<0.1	1.3
BH2_0.1-0.2	<0.3	<0.1	<0.8
BH2_0.4-0.5	2.9	**2**	29
BH2_0.9-1.0	3.9	**2.6**	41
BH2_1.3-1.5	<0.3	<0.1	<0.8
BH3_0.1-0.2	<0.3	0.1	1.5
BH4_0.0-0.1	<0.3	<0.1	<0.8
BH5_0.1-0.2	<0.3	<0.1	<0.8
BH5_0.7-0.8	<0.3	<0.1	<0.8
BH6_0.0-0.1	<0.3	<0.1	<0.8
BH6_0.4-0.5	<0.3	<0.1	<0.8
BH7_0.0-0.1	**13**	**8.5**	120
BH7_0.5-0.7	**8.2**	**5.8**	66
SIL			
HIL B	4	NR	400
ESL	NR	0.7	NR

Notes:

🟨	Concentration exceeds adopted HIL.
🟩	Concentration exceeds adopted ESL.
SIL	Soil investigation level.
HIL	Health-based investigation level (mg/kg).
HIL B	Residential with minimal oppurtunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
ESL	Ecological screening levels (mg/kg) as per NEPM 1999 Schedule B1 2013 Amendment.
NR	No recommended soil assessment criteria are currently available for the indicated parameter(s).

Sample ID	Asbestos (% w/w)
BH1_0.16-0.25	<0.01
BH2_0.1-0.2	<0.01
BH3_0.1-0.2	<0.01
BH4_0.0-0.1	<0.01
BH5_0.1-0.2	<0.01
BH6_0.0-0.1	<0.01
BH7_0.0-0.1	<0.01
SIL	
HSL B	0.04%

Notes:

SIL	Soil investigation level.
HSL	Health screening level as per NEPM 1999 Schedule B1 2013 Amendment.
HSL B	Residential with minimal oppurtunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
NA	Sample 'not analysed'

Table T5 – Soil Analytical Results for Pesticides (OCPs, OPPs) and PCBs

Sample ID	OCPs								Total OPPs (mg/kg)	Total PCBs (mg/kg)
	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Chlordane (mg/kg)	Heptachlor (mg/kg)	DDT (mg/kg)	DDD (mg/kg)	DDE (mg/kg)		
BH1_0.16-0.25	<0.1	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	ND	<1
BH2_0.1-0.2	<0.1	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	ND	<1
BH3_0.1-0.2	<0.1	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	ND	<1
BH4_0.0-0.1	<0.1	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	ND	<1
BH5_0.1-0.2	<0.1	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	ND	<1
BH6_0.0-0.1	<0.1	0.4	<0.2	0.4	<0.1	<0.2	<0.2	<0.2	ND	<1
BH7_0.0-0.1	<0.1	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	ND	<1
SIL										
HIL B	Total 10		20	90	10	Total 600			NR	1
EIL	NR	NR	NR	NR	NR	180	NR	NR	NR	NR

Notes:

SIL	Soil investigation level.
HIL	Health-based investigation level (mg/kg) as per NEPM 1999 Schedule B1 2013 Amendment.
HIL B	Residential with minimal oppurtunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
EIL	Ecological Investigation Level (mg/kg) as per NEPM as per NEPM 1999 Schedule B1 2013 Amendment.
NR	No recommended soil assessment criteria are currently available for the indicated parameter(s).
ND	Concentrations of all tested analytes in this group was under the laboratory practical quantifation limit.
NA	Sample not tested for analyte.

Table T6 – Derivation of EIL Soil Criteria

Sample ID	Soil Description	Depth (mBGL)	Arsenic	Cadmium	Chromium[1]	Copper	Lead	Mercury	Nickel	Zinc	pH (pH units)	CEC (cmol$_c$/kg)	Clay (%)
Average Background Concentration (ABC)													
BH5_0.7-0.8	Bedrock / Sandstone	0.7-0.8	4	<0.3	12	4	45	0.02	1.5	24	8.4	26	NA
BH6_0.4-0.5	Residual / Clay	0.4-0.5	<3	<0.3	11	6	48	0.02	1.5	23	8.3	29	NA
ACL (Urban residential/public open space)			NR	NR	190	220[2]	1100	NR	350	960			
Urban residential/public open space EIL[3]			100	NR	200	220	1100	NR	350	980			

Notes:

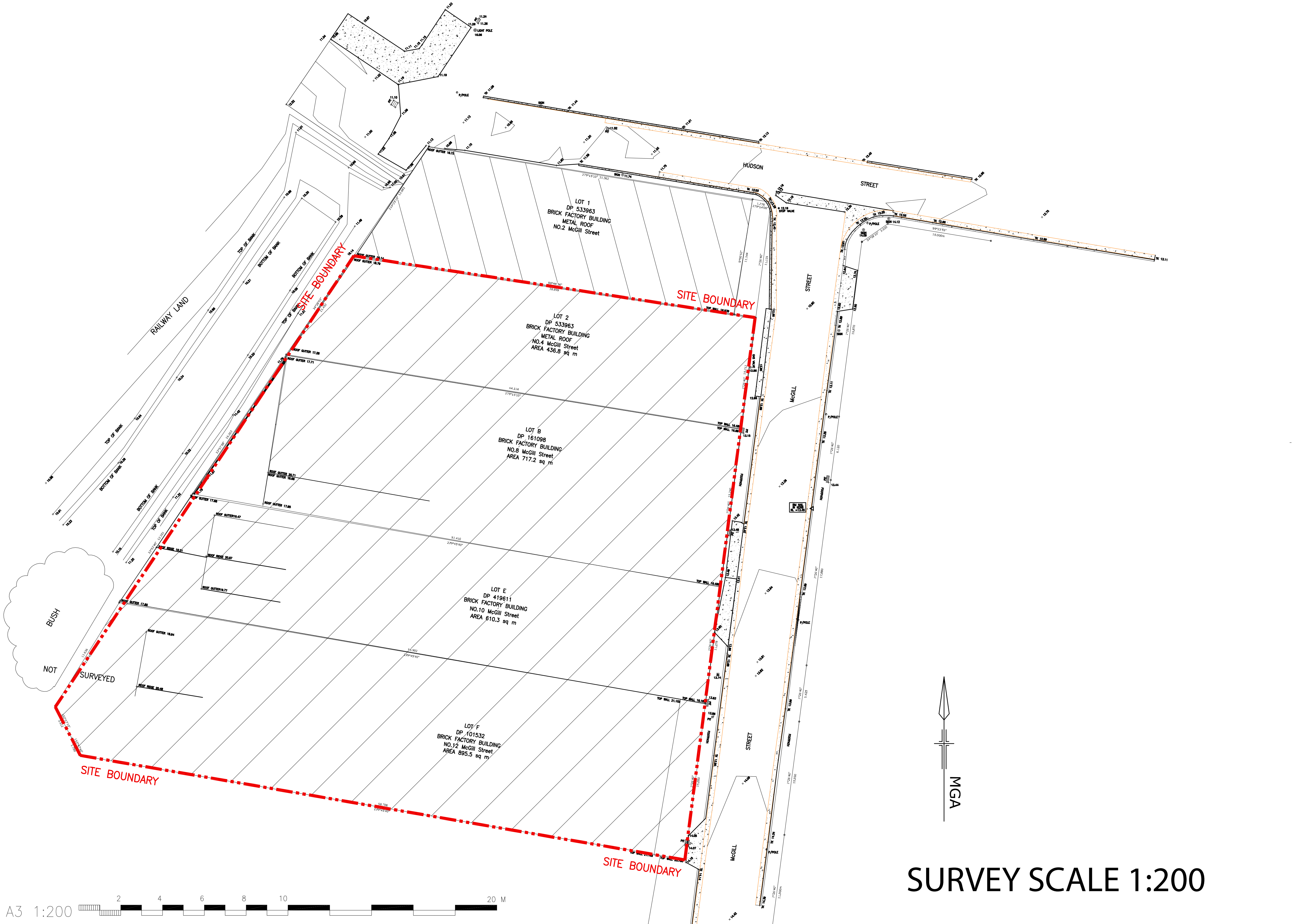
All results are in units of mg/kg, unless noted;

All soil assessment criteria are sourced from National Environment Protection (Assessment of Site Contamination) Measure 1999 – Amendment 2013, Schedule (B1) - Guideline on Investigation Levels for Soil and Groundwater

EIL	Ecological Investigation Level (mg/kg) = ABC+ACL as per NEPM 1999 Schedule B1 2013 Amendment.
NR	No Recommended soil assessment criteria are currently available for the indicated parameter(s).
NA	Sample not tested for analyte.
1	EIL's are for Chromium III. Concentrations reported were total Chromium including both VI and III.
2	CEC based Value applied, being the most conservative.
3	Value shown includes rounding in according with rounding rules (NEPC Schedule B1, Pg 47).

APPENDIX A

PROPOSED DEVELOPMENT PLANS



SURVEY SCALE 1:200

LEGEND

LINE TYPES

LIP OF KERB	───
TOP OF KERB	━━━
RIDGE	─ · ─ · ─
ROOF	─ ─ ─ ─
BUILDING	───
SERVICE PIT	───
CONCRETE & BITMEN	━━━
METAL FENCE	─○─○─○─
TOP OF BANK	───
BOTTOM OF BANK	─ ─ ─ ─

⊕ STOP VAVLE

△ BM

▲ HYDRANT

⊕ SIGN

Ⓟ POWER POLE

NOTES

BOUNDARIES HAVE NOT BEEN DEFINED (TITLE DIMENSIONS ONLY) –BOUNDARY DEFINITION IS SUBJECT TO FURTHER SURVEY

TREE SIZES ARE ESTIMATES ONLY

THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF Modern Constrcution Group

RELATIONSHIP OF IMPROVEMENTS TO BOUNDARIES IS DIAGRAMMATIC ONLY. WHERE OFFSETS ARE CRITICAL THEY SHOULD BE CONFIRMED BY FURTHER SURVEY.

EXCEPT WHERE SHOWN BY DIMENSION LOCATION OF DETAIL WITH RESPECT TO BOUNDARIES IS INDICATIVE ONLY.

ONLY VISIBLE SERVICES HAVE BEEN LOCATED. UNDERGROUND SERVICES HAVE NOT BEEN LOCATED. DIAL BEFORE YOU DIG SERVICES (PH 1100) SHOULD BE USED AND A FULL UTILITY INVESTIGATION, INCLUDING A UTILITY LOCATION SURVEY, SHOULD BE UNDERTAKEN BEFORE CARRYING OUT ANY CONSTRUCTION ACTIVITY IN OR NEAR THE SURVEYED AREA.

CRITICAL SPOT LEVELS SHOULD BE CONFIRMED WITH SURVEYOR.

THIS IS ONLY TO BE USED TO FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS.

CONTOURS SHOWN DEPICT THE THE TOPOGRAPHY. EXCEPT AT SPOT LEVELS SHOWN, THEY DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION.

CONTOUR INTERVAL – 0.5 m – SPOT LEVELS SHOULD BE ADOPTED.

POSITION OF RIDGES ARE DIAGRAMMATIC ONLY (NOT TO SCALE).

THE INFORMATION IS ONLY TO BE USED AT A SCALE ACCURACY OF 1:100

DO NOT SCALE OFF THIS PLAN / FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED READINGS.

ALL DIMENSIONS TO BE CHECKED ON SITE.

IF ACCURATE TRUE NORTH IS REQUIRED A FURTHER SURVEY WOULD BE NECCESSARY.

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RevNo	Revision note	Date	Drawn	Checked

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PHONE : (02) 9453 0100

Surveyed By	Date of Survey	Other Ref	Ref Plan	LGA	Origin of Levels	Client Job Numb
MF	03/11/2014			Marrickville	SSM50170 RL17.331	

Drawn by	Checked by	Issue date	Filename	UBD Map Ref	Level Datum	Grid	Scale
XM	MF	12/11/2014	14100–01DSrevA	254 L/5	AHD	NA	1:100

Project:
DETAIL SURVEY
4–12 McGill Street
Lewisham NSW 2049

Client:
Modern Constrcution Group

Drawing Number: 14100–01
Revision: A
Sheet: 2/2
Original: A

PROJECT	CLIENT	ADDRESS	TITLE	SCALE	DATE
Lewisham Apartments	McGill Advance Pty ltd	4-12 Mcgill St, Lewisham	Pre-DA	1:200	June 2015

tony owen ptnrs
ARCHITECTS
INTERIORS
PLANNERS

SITEPLAN

PROJECT	CLIENT	ADDRESS	TITLE	SCALE	DATE
Lewisham Apartments	McGill Advance Pty Ltd	4-12 Mcgill St, Lewisham	Pre-DA		June 2015

tony owen ptnrs
ARCHITECTS
INTERIORS
PLANNERS

VIEW FROM SOUTH-EAST CORNER

NORTH-EAST BOUNDARY VIEW

VIEW FROM NORTH-EAST

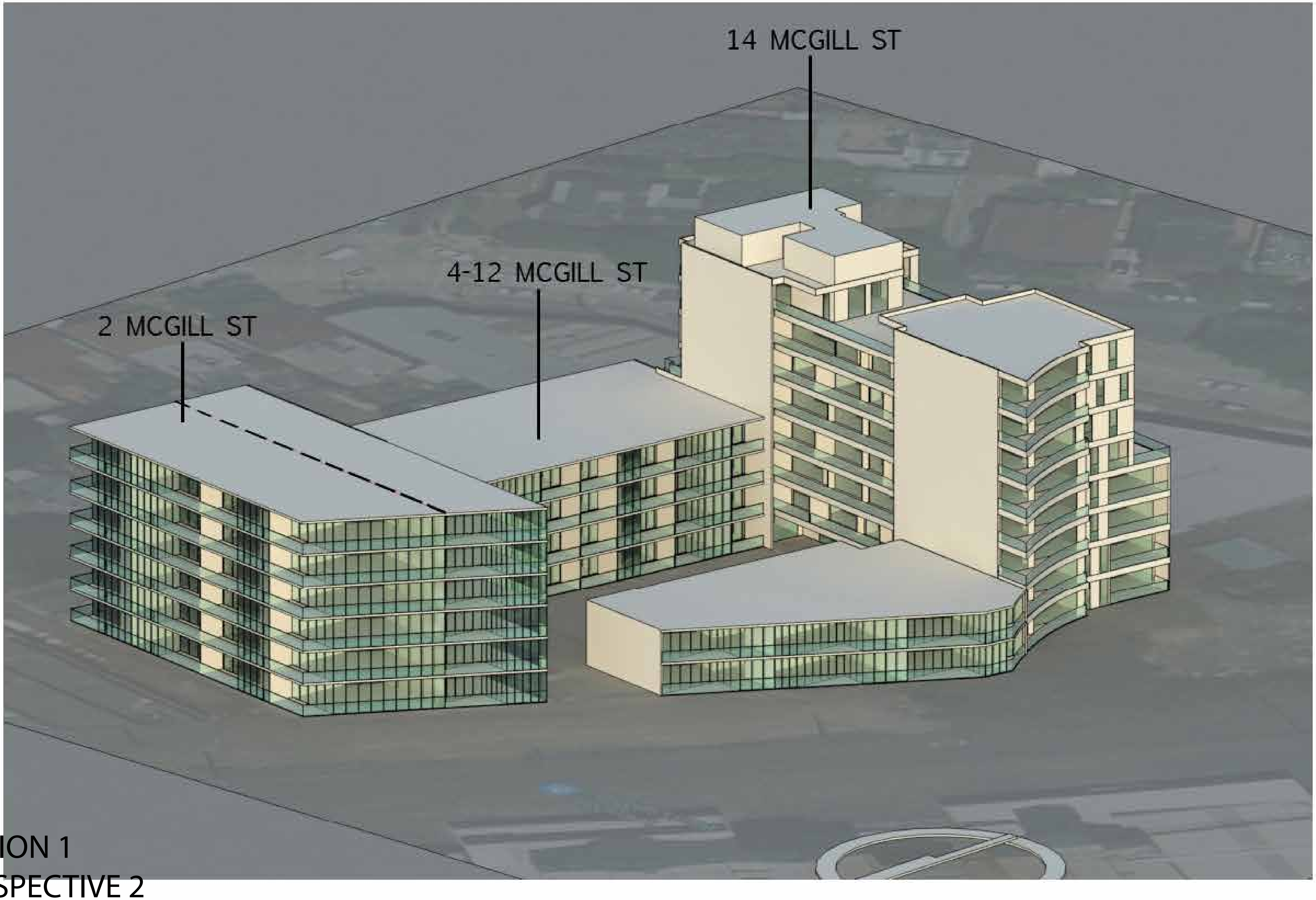
SITE PHOTOS McGill St

PROJECT	CLIENT	ADDRESS	TITLE	SCALE	DATE
Lewisham Apartments	McGill Advance Pty ltd	4-12 Mcgill St, Lewisham	Pre-DA		June 2015

tony owen ptnrs
ARCHITECTS
INTERIORS
PLANNERS

MASTERPLAN DIAGRAM

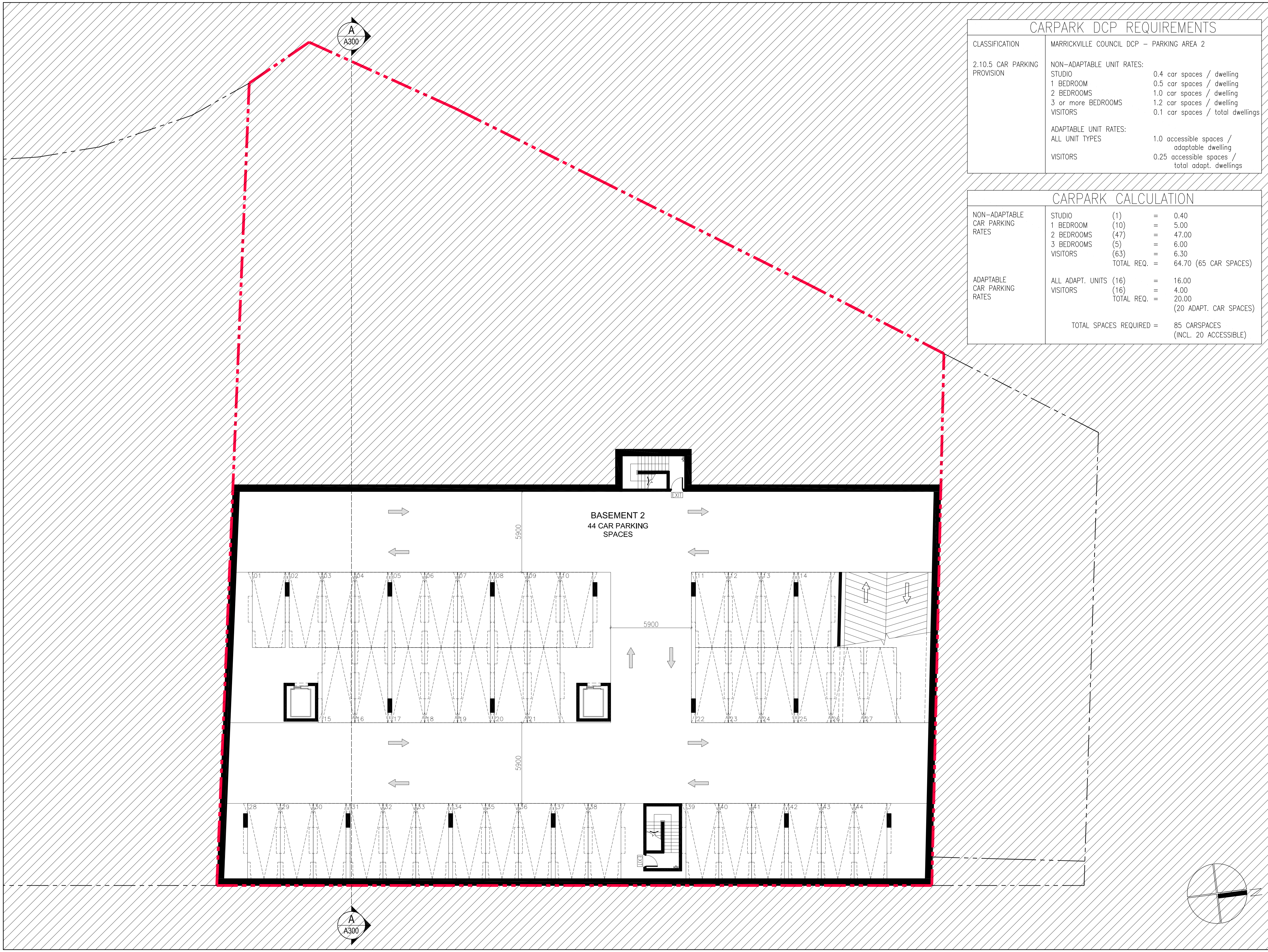
SETBACK / HEIGHT DIAGRAM



OPTION 1
PERSPECTIVE 2

PROJECT	CLIENT	ADDRESS	TITLE	SCALE	DATE
Lewisham Apartments	McGill Advance Pty ltd	4-12 Mcgill St, Lewisham	Pre-DA		June 2015

tony owen ptnrs
ARCHITECTS
INTERIORS
PLANNERS



CARPARK DCP REQUIREMENTS

CLASSIFICATION	MARRICKVILLE COUNCIL DCP – PARKING AREA 2	
2.10.5 CAR PARKING PROVISION	NON-ADAPTABLE UNIT RATES:	
	STUDIO	0.4 car spaces / dwelling
	1 BEDROOM	0.5 car spaces / dwelling
	2 BEDROOMS	1.0 car spaces / dwelling
	3 or more BEDROOMS	1.2 car spaces / dwelling
	VISITORS	0.1 car spaces / total dwellings
	ADAPTABLE UNIT RATES:	
	ALL UNIT TYPES	1.0 accessible spaces / adaptable dwelling
	VISITORS	0.25 accessible spaces / total adapt. dwellings

CARPARK CALCULATION

NON-ADAPTABLE CAR PARKING RATES	STUDIO	(1)	=	0.40
	1 BEDROOM	(10)	=	5.00
	2 BEDROOMS	(47)	=	47.00
	3 BEDROOMS	(5)	=	6.00
	VISITORS	(63)	=	6.30
		TOTAL REQ.	=	64.70 (65 CAR SPACES)
ADAPTABLE CAR PARKING RATES	ALL ADAPT. UNITS	(16)	=	16.00
	VISITORS	(16)	=	4.00
		TOTAL REQ.	=	20.00 (20 ADAPT. CAR SPACES)
	TOTAL SPACES REQUIRED		=	85 CARSPACES (INCL. 20 ACCESSIBLE)

Rev.	Description	Date
A	xx	xx

DISCLAIMER

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NOTES:

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BUILDER TO CHECK ALL SITE DIMENSIONS PRIOR TO FABRICATION OF FITMENTS

TONY OWEN PARTNERS
PRELIMINARY
AUGUST 2015

Consultants

Client

Architects

tony owen ptnrs
Level 2,
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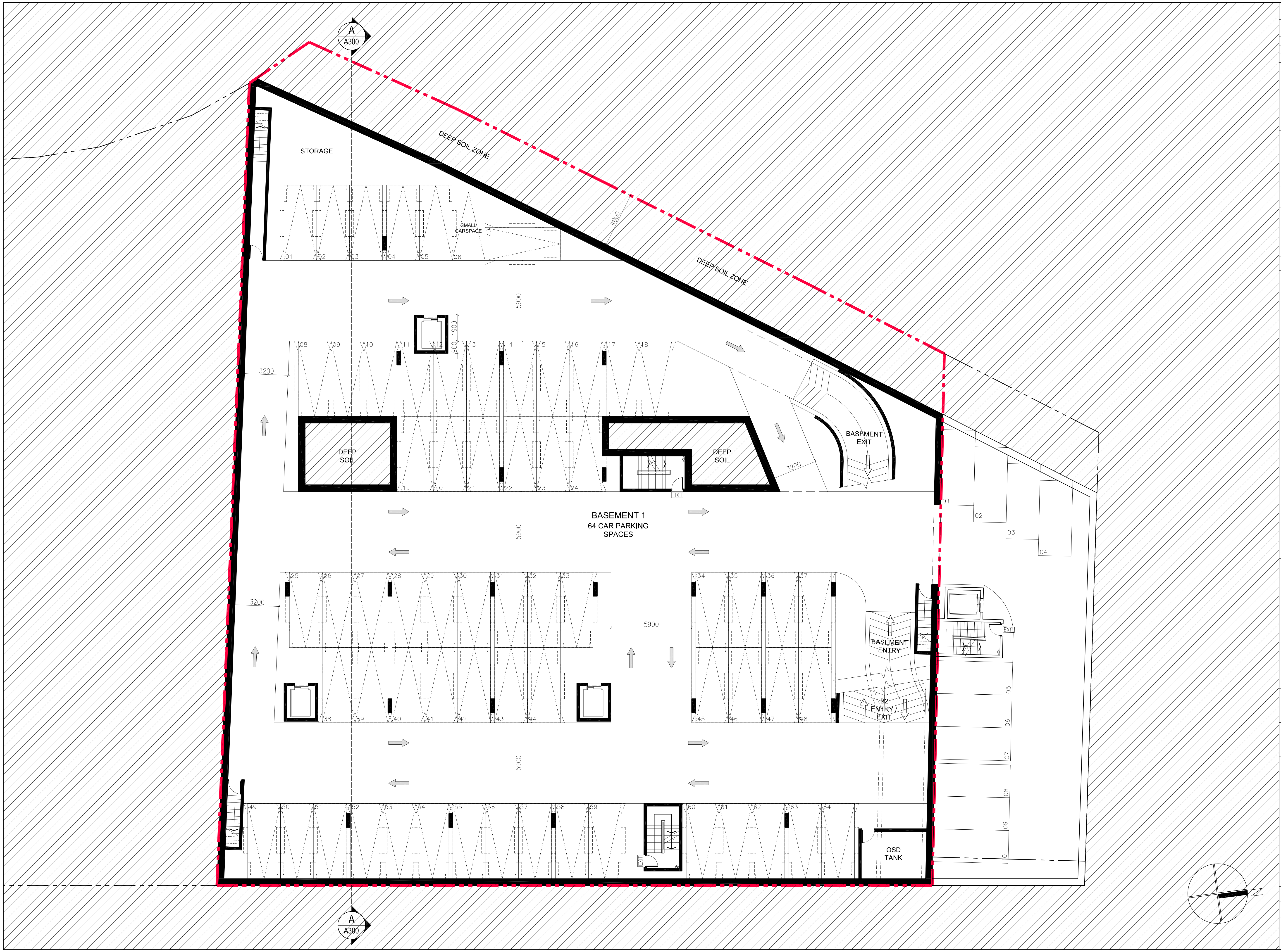
Chippendale NSW 2008
P 612 9698 2900
F 612 9699 3018
E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:250 @ A3
Date: AUG 2015
Drawing title: BASEMENT 2 PLAN
Project no. 947
Dwg #. A090
Drawn: DC
Drawing status: SKETCH DESIGN



Rev.	Description	Date
A	xx	xx

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Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

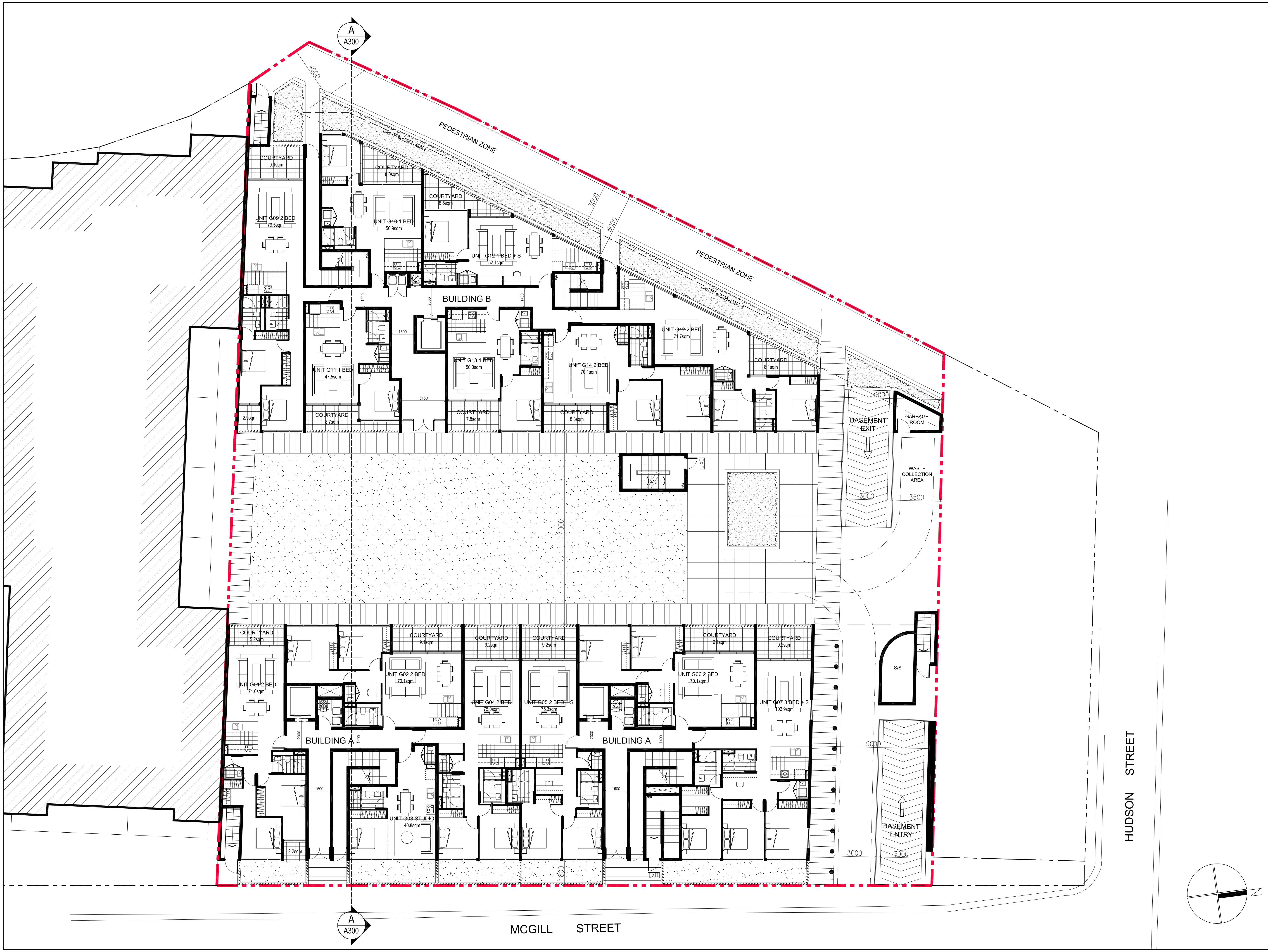
Scale: 1:250 @ A3
Date: AUG 2015

Drawing title:
BASEMENT 1 PLAN

Project no. 947
Dwg #. A091

Drawn: DC

Drawing status:
SKETCH DESIGN



Rev.	Description	Date
A	xx	xx

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Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:250 @ A3
Date: AUG 2015

Drawing title:
GROUND FLOOR PLAN

Project no. 947
Dwg #. A100

Drawn: DC

Drawing status:
SKETCH DESIGN

TYPICAL FLOOR PLAN
BUILDING A: LEVELS 1-4
BUILDING B: LEVELS 1-3

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

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Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:250 @ A3

Date: AUG 2015

Drawing title:
TYPICAL FLOOR PLAN

Project no. 947

Dwg #. A101

Drawn: DC

Drawing status:
SKETCH DESIGN

TOP STOREY FLOOR PLAN
BUILDING A: LEVEL 5
BUILDING B: LEVEL 4

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

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E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:250 @ A3
Date: AUG 2015

Drawing title:
TOP STOREY FLOOR PLAN

Project no. 947
Dwg #. A102

Drawn: DC

Drawing status:
SKETCH DESIGN

BUILDING A - EAST ELEVATION

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

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Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:200 @ A3
Date: AUG 2015
Drawing title: BUILDING A - EAST ELEVATION
Project no. 947
Dwg #. A200
Drawn: DC
Drawing status: SKETCH DESIGN

BUILDING A - WEST ELEVATION

Rev.	Description	Date
A	xx	xx

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TONY OWEN PARTNERS
PRELIMINARY
AUGUST 2015

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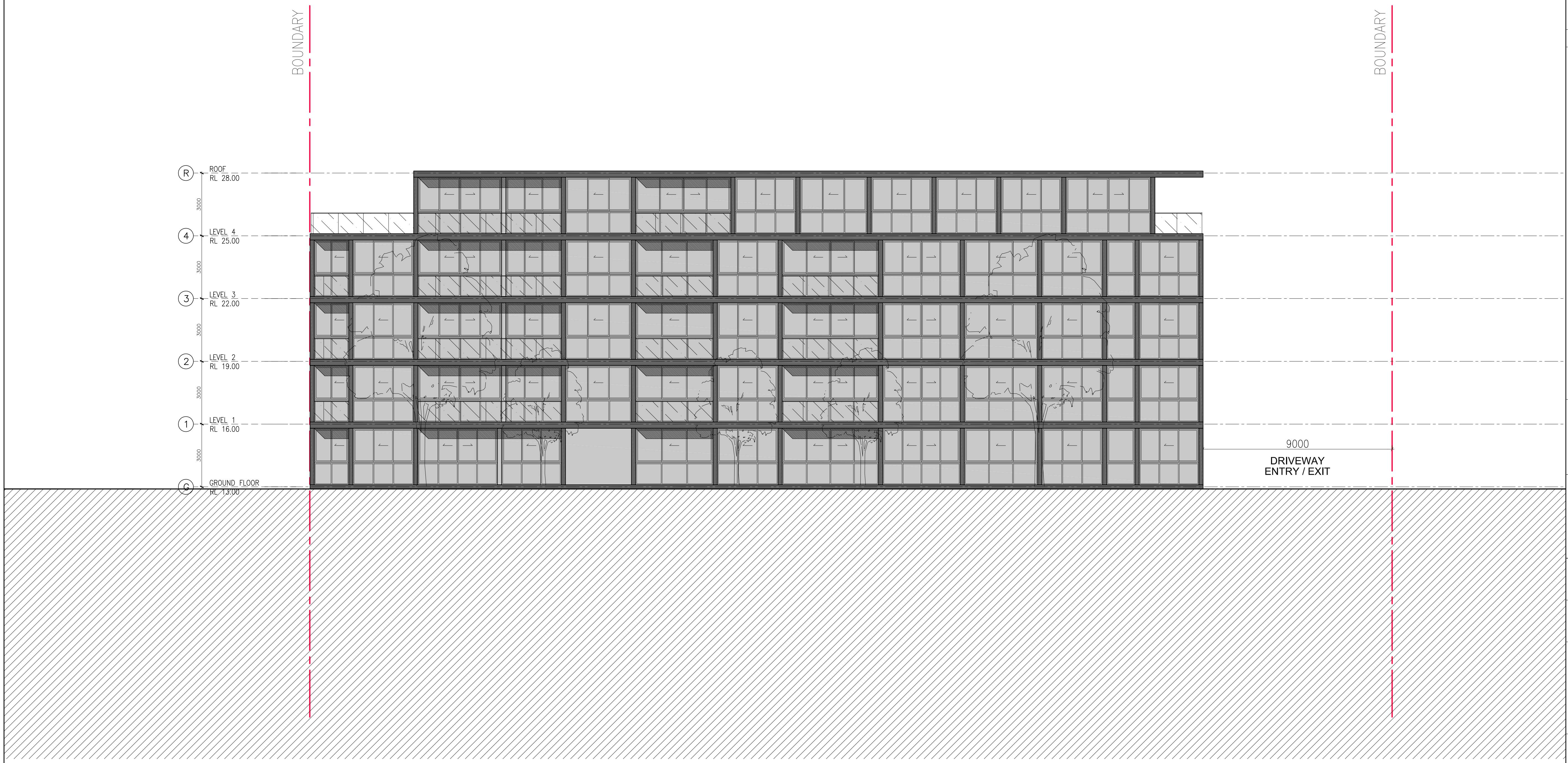
E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:200 @ A3
Date: AUG 2015
Drawing title: BUILDING A - WEST ELEVATION
Project no. 947
Dwg #. A201
Drawn: DC
Drawing status: SKETCH DESIGN



BUILDING B - EAST ELEVATION

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

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Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

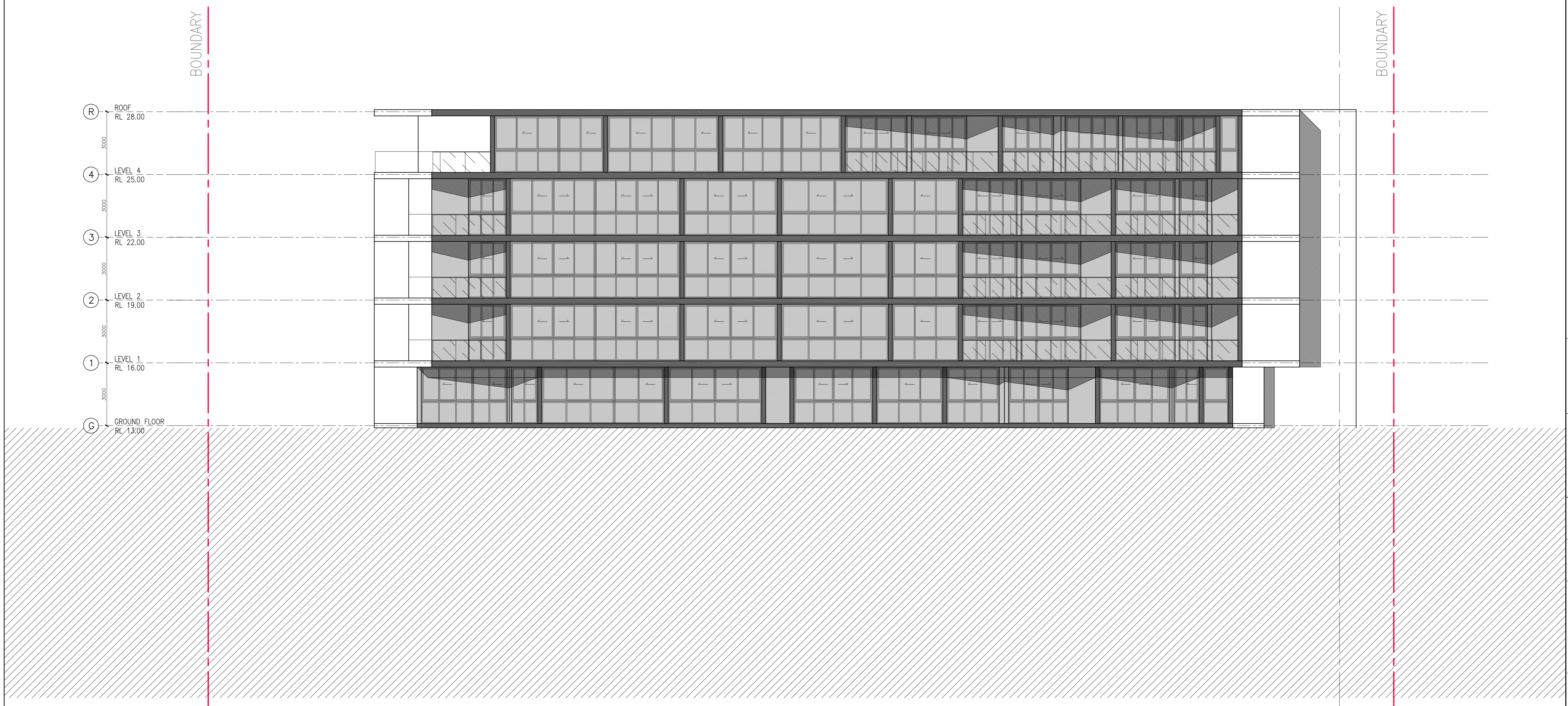
Scale: 1:200 @ A3
Date: AUG 2015

Drawing title:
BUILDING B - EAST ELEVATION

Project no. 947
Dwg #. A202

Drawn: DC

Drawing status:
SKETCH DESIGN



BUILDING B WEST ELEVATION

Rev.	Description	Date
A	xx	xx

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TONY OWEN PARTNERS
PRELIMINARY
AUGUST 2015

Consultants

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E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

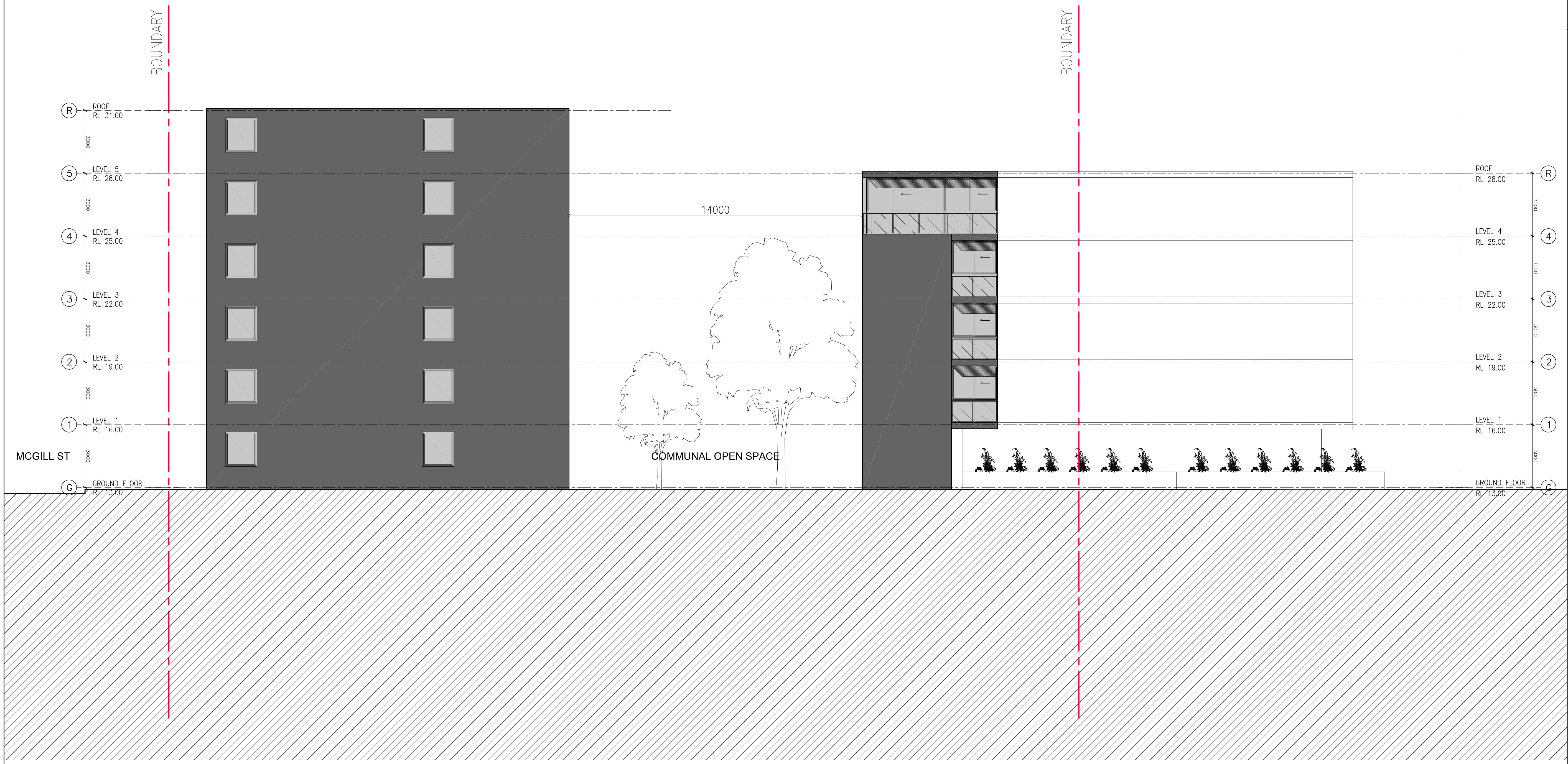
Scale: 1:200 @ A3
Date: AUG 2015

Drawing title:
BUILDING B WEST ELEVATION

Project no. 947
Dwg #. A203

Drawn: DC

Drawing status:
SKETCH DESIGN



NORTH ELEVATION

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

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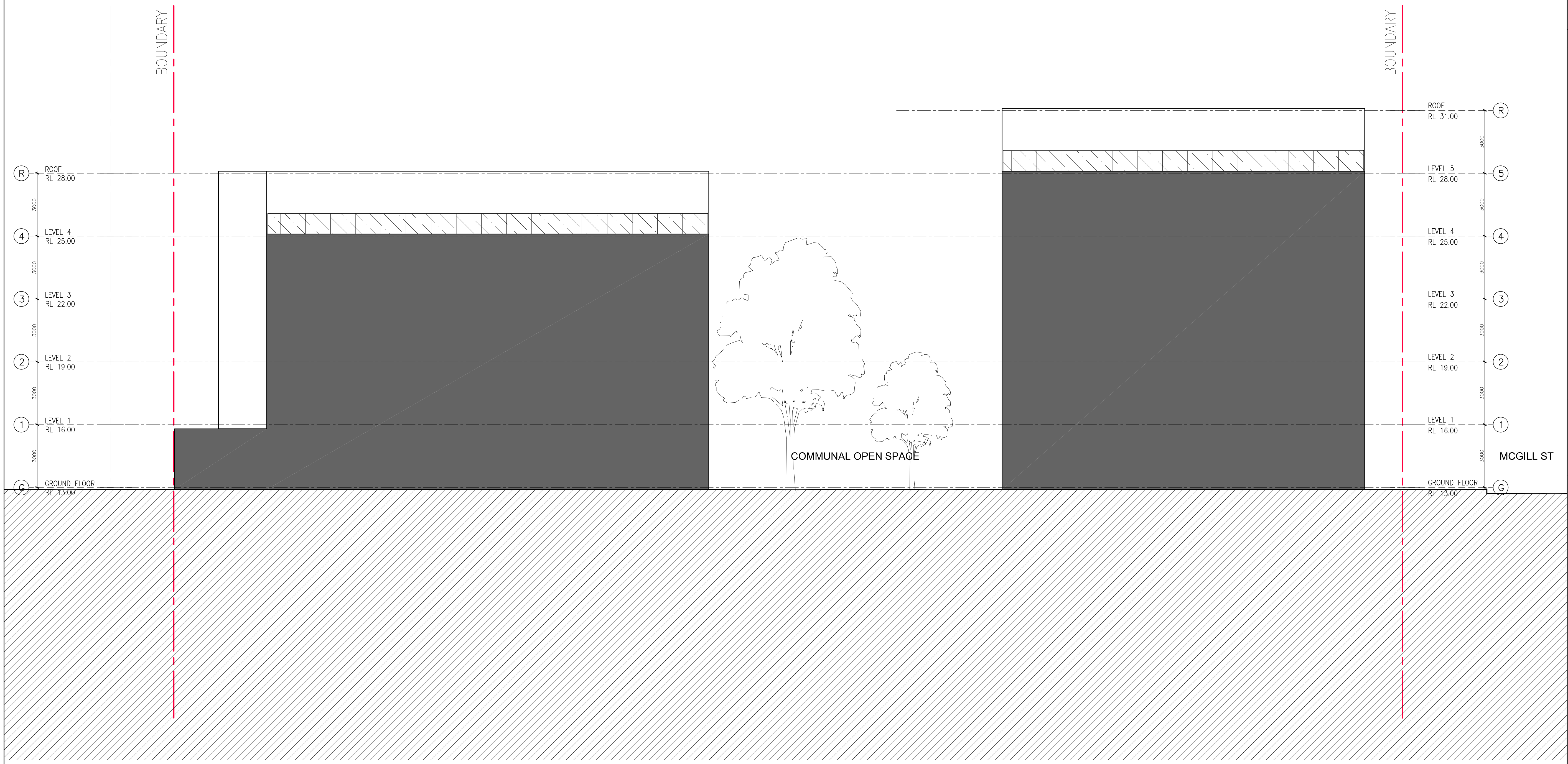
E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:200 @ A3
Date: AUG 2015
Drawing title: NORTH ELEVATION
Project no. 947
Dwg #. A204
Drawn: DC
Drawing status: SKETCH DESIGN



SOUTH ELEVATION

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

Consultants

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F 612 9699 3018
E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale:
1:200 @ A3

Date:
AUG 2015

Drawing title:
SOUTH ELEVATION

Project no. 947
Dwg #. A205

Drawn: DC

Drawing status:
SKETCH DESIGN

SECTION A

Rev.	Description	Date
A	xx	xx

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PRELIMINARY
AUGUST 2015

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P 612 9698 2900
F 612 9699 3018
E info@tonyowen.com.au

Project:
LEWISHAM 3

Project address:
2-12 McGill St, Lewisham

Key plan

Scale: 1:200 @ A3
Date: AUG 2015

Drawing title:
SECTION A

Project no. 947
Dwg #. A300

Drawn: DC

Drawing status:
SKETCH DESIGN

Schedule of Areas

Sketch Design

tony owen ptnrs

Project: Project Number 947

Project Address: **2-12 McGill St, Lewisham**

SITE AREA **2659.9 sqm**

Site Area:	**2659.9**	**sqm**
DCP FSR ALLOWANCE	**2.3**	**:1**

Issued
For information

Design Revision No:

Day	20	10
Month	5	8
Year	15	15

BUILDING A (6 STOREYS)

	STUDIO	1 BED	2 BED	3 BED	Total	Development Total
Ground Floor	1	0	5	1	7	7
Level 1	0	2	6	0	8	8
Level 2	0	2	6	0	8	8
Level 3	0	2	6	0	8	8
Level 4	0	2	6	0	8	8
Level 5	0	2	5	0	7	7
Unit sub-total	**1**	**10**	**34**	**1**	**46**	**46**
MIX PERCENTAGE	**2%**	**22%**	**74%**	**2%**		
DCP REQUIREMENT	5-10%	10-30%	40-75%	10-100%		

BUILDING B (5 STOREYS)

	STUDIO	1 BED	2 BED	3 BED	Total	Development Total
Ground Floor	0	4	3	0	7	7
Level 1	0	1	5	1	7	7
Level 2	0	1	5	1	7	7
Level 3	0	1	5	1	7	7
Level 4	0	0	3	2	5	5
Unit sub-total	**0**	**7**	**21**	**5**	**33**	**33**
MIX PERCENTAGE	**0%**	**21%**	**64%**	**15%**		
DCP REQUIREMENT	5-10%	10-30%	40-75%	10-100%		

Total Development Unit Mix

		MIX PERCENTAGE
Studio	**1**	**1%**
1 bedroom	**17**	**22%**
2 bedroom	**55**	**70%**
3 bedroom	**6**	**8%**
Total Units	**79**	**100%**

FSR Calculation

	BUILDING A	BUILDING B	TOTAL
Ground Floor	580.4 sqm	489.4 sqm	**1069.8** sqm
Level 1	597.7 sqm	561.9 sqm	**1159.6** sqm
Level 2	597.7 sqm	561.9 sqm	**1159.6** sqm
Level 3	597.7 sqm	561.9 sqm	**1159.6** sqm
Level 4	597.7 sqm	471.7 sqm	**1069.4** sqm
Level 5	520.2 sqm	0.0 sqm	**520.2** sqm
TOTAL	3491.4 sqm	2646.8 sqm	**6138.2 sqm**

SITE AREA **2659.9 sqm**

CURRENT FSR **2.31 :1**

APPENDIX B
Site Photographs

Photograph 1 – Identified UPSS Area on the central eastern boundary of the site.

Photograph 2 –Fill and dipping points for the single UST identified.

APPENDIX C

NSW WorkCover Dangerous Goods Search

SafeWork NSW

SafeWork NSW
92-100 Donnison Street, Gosford, NSW, 2250
Locked Bag 2906, Lisarow, NSW, 2252 |
Customer Service Centre **13 10 50**
licensing@safework.nsw.gov.au | www.safework.nsw.gov.au

Our Ref: D15/206794
Your Ref: Michael Youssef

23 December 2015

Attention: Michael Youssef
Environmental Investigations Australia Pty Ltd
Suite 6.01
55 Miller St
Pyrmont NSW 2009

Dear Mr Youssef,

RE SITE: 4-12 McGill St Lewisham NSW

I refer to your site search request received by SafeWork NSW on 18 December 2015 requesting information on Storage of Hazardous Chemicals for the above site.

A search of the records held by SafeWork NSW has not located any records pertaining to the above mentioned premises.

For further information or if you have any questions, please call our Customer Service Centre on 13 10 50 or email licensing@safework.nsw.gov.au

Yours sincerely,

Brent Jones
Customer Service Officer
Customer Service Centre - Operations
SafeWork NSW

APPENDIX D

Borehole Logs

BOREHOLE: BH1

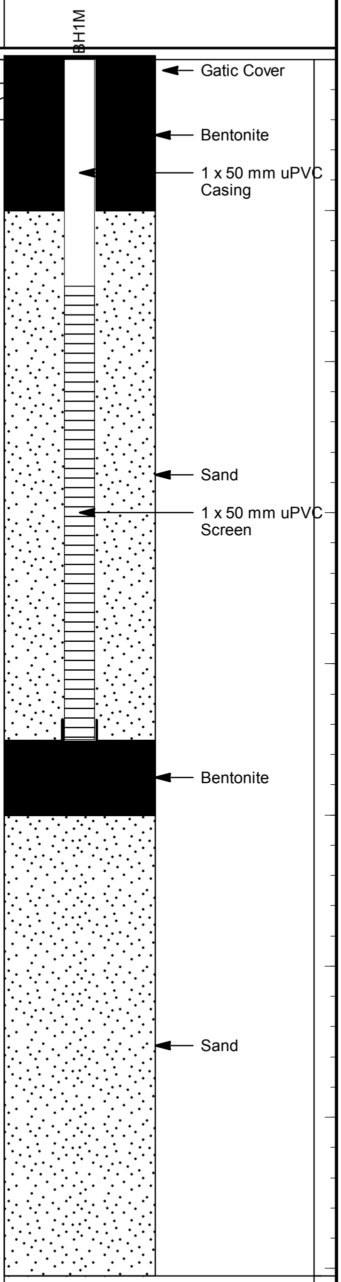
Project	Proposed Residential Development	East	328335.3 m		
Location	4-12 McGill Street, Lewisham NSW	North	6247987.6 m MGA94 Zone 56	Sheet	1 OF 1
Position	Refer to Figure 2	Surface RL	12.50 m AHD	Date Started	6/4/16
Job No.	E22830	Contractor	BG Drilling Pty Ltd	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Dando Dual Mast	Logged JZ	Date: 20/4/16
		Inclination	-90°	Checked JC	Date: 20/4/16

Drilling					Sampling	Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY
AD/TDT	-	GWNE	0	*0.16*				-	CONCRETE: 160mm thick.	-	-
	E				BH1_0.16-0.25 ES 0.16-0.25 m			-	FILL: Sandy CLAY; low plasticity, fine to coarse grained sand, with fine to coarse igneous gravel, dark brown/grey.	M>PL	-
NMLC	F	50-60% RETURN		*0.40* 12.10	BH1_0.25-0.40 DS 0.25-0.40 m BH1_0.25-0.40 ES 0.25-0.40 m C 0.40-1.93 m 0.40 m 1.40 m C 1.93-3.52 m 2.40 m 3.00 m			- -	SANDSTONE; fine to medium grained, pale brown/pale grey, distinctly weathered, medium strength. SANDSTONE; medium grained, bedding dipping 0-10 degrees, <1-2mm thick, pale brown to pale grey/dark brown.	-	-
				3.52 8.98	3.50 m C 3.52-4.87 m 4.50 m C 4.87-6.46 m 5.50 m C 6.46-8.05 m 6.50 m 7.50 m			-	SANDSTONE; medium grained, bedding dipping 0-10 degrees, 2-3mm thick, pale grey with dark grey laminations.		
			8	*8.05*	8.00 m				Hole Terminated at 8.05 m Borehole Converted into Monitoring Well.		
			10								

PIEZOMETER DETAILS

ID Static Water Level

BH1M



This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

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BOREHOLE: BH2

Project	Proposed Residential Development				
Location	4-12 McGill Street, Lewisham NSW	East	328357.8 m	Sheet	1 OF 1
Position	Refer to Figure 2	North	6248011.6 m MGA94 Zone 56	Date Started	6/4/16
Job No.	E22830	Contractor	NA	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Hand Auger	Logged ES	Date: 6/4/16
		Inclination	-90°	Checked EG	Date: 26/4/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	-	GWNE	0	*0.10*	BH2_0.1-0.2 ES 0.10-0.20 m 0.20 m PID = 8 ppm BH2_0.4-0.5 ES 0.40-0.50 m 0.50 m PID = 50 ppm BH2_0.9-1.0 ES 0.90-1.00 m 1.00 m PID = 106 ppm BH2_1.3-1.5 ES 1.30-1.50 m 1.50 m PID = 1.2 ppm			-	CONCRETE: 100mm thick.	-	-	CONCRETE HARDSTAND
	-			*0.40*				-	FILL: Gravelly Clayey SAND; fine to coarse grained sand, orange/brown to red/brown, no odour.	M	-	FILL
	-		1	*1.10*					from 0.4m, orange grey with hydrocarbon staining and hydrocarbon odour.	M	-	
	-			*1.50*				CI-CH	CLAY; medium to high plasticity, orange/brown, no odour.	M	VSt	NATURAL
									Hole Terminated at 1.50 m			

This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

BOREHOLE: BH3

Project	Proposed Residential Development				
Location	4-12 McGill Street, Lewisham NSW	East	328317.5 m	Sheet	1 OF 1
Position	Refer to Figure 2	North	6248003.1 m MGA94 Zone 56	Date Started	6/4/16
Job No.	E22830	Contractor	NA	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Hand Auger	Logged ES	Date: 6/4/16
		Inclination	-90°	Checked EG	Date: 26/4/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	-	GWNE	0	*0.10*	BH3_0.1-0.2 ES 0.10-0.20 m	■		-	CONCRETE: 100mm thick.	-	-	CONCRETE HARDSTAND
	-			*0.20*				-	SANDSTONE: fine to medium grained, pale brown/pale grey, weathered, no odour.	-	-	BEDROCK
									Hole Terminated at 0.20 m Refusal at 0.2 m			
			1									
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

BOREHOLE: BH4

Project	Proposed Residential Development				
Location	4-12 McGill Street, Lewisham NSW	East	328340.2 m	Sheet	1 OF 1
Position	Refer to Figure 2	North	6248004.9 m MGA94 Zone 56	Date Started	6/4/16
Job No.	E22830	Contractor	NA	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Hand Auger	Logged ES	Date: 6/4/16
		Inclination	-90°	Checked EG	Date: 26/4/16

Drilling					Sampling	Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	-	GWNE	0	*0.10*	BH4_0.0-0.1 ES 0.00-0.10 m	■		-	FILL: Gravelly Clayey SAND; fine to coarse grained sand, orange/brown to red/brown, minor charcoal, no odour.	D	-	FILL
	-			*0.50*	BH4_0.3-0.4 ES 0.30-0.40 m	■		CI-CH	CLAY; medium to high plasticity, orange/brown, no odour.	M	VSt	NATURAL
									Hole Terminated at 0.50 m			
			1									
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

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BOREHOLE: BH5

Project	Proposed Residential Development				
Location	4-12 McGill Street, Lewisham NSW	East	328321.5 m	Sheet	1 OF 1
Position	Refer to Figure 2	North	6248021.1 m MGA94 Zone 56	Date Started	6/4/16
Job No.	E22830	Contractor	NA	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Hand Auger	Logged ES	Date: 6/4/16
		Inclination	-90°	Checked EG	Date: 26/4/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	-	GWNE	0	*0.10*	BH5_0.1-0.2 QD1/QT1 0.10-0.20 m	■		-	CONCRETE: 100mm thick.	-	-	CONCRETE HARDSTAND
	-			*0.40*				-	FILL: Gravelly Clayey SAND; fine to coarse grained sand, orange/brown to red/brown, no odour.	D	-	FILL
	-		1	*1.00*	BH5_0.7-0.8 ES 0.70-0.80 m	■		-	SANDSTONE: fine to medium grained, pale brown/pale grey, weathered, no odour.	-	-	BEDROCK
									Hole Terminated at 1.00 m			
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

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BOREHOLE: BH6

Project	Proposed Residential Development				
Location	4-12 McGill Street, Lewisham NSW	East	328336.8 m	Sheet	1 OF 1
Position	Refer to Figure 2	North	6248023.8 m MGA94 Zone 56	Date Started	6/4/16
Job No.	E22830	Contractor	NA	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Hand Auger	Logged ES	Date: 6/4/16
		Inclination	-90°	Checked EG	Date: 26/4/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	-	GWNE	0	0.10	BH6_0.0-0.1 ES 0.00-0.10 m	■		-	FILL: Gravelly Clayey SAND; fine to coarse grained sand, orange/brown to red/brown, no odour.	D	-	FILL
	-			0.50	BH6_0.4-0.5 ES 0.40-0.50 m	■		CI-CH	CLAY; medium to high plasticity, orange/brown, no odour.	M	-	NATURAL
									Hole Terminated at 0.50 m Refusal at 0.8 m			

This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

BOREHOLE: BH7

Project	Proposed Residential Development				
Location	4-12 McGill Street, Lewisham NSW	East	328307.4 m	Sheet	1 OF 1
Position	Refer to Figure 2	North	6247995.9 m MGA94 Zone 56	Date Started	6/4/16
Job No.	E22830	Contractor	NA	Date Completed	6/4/16
Client	McGill Advance Management Pty Ltd	Drill Rig	Hand Auger	Logged ES	Date: 6/4/16
		Inclination	-90°	Checked EG	Date: 26/4/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	-	GWNE	0	0.30	BH7_0.0-0.1 ES 0.00-0.10 m	■	☒	S-F	FILL: Silty Gravelly SAND; fine to course grained, brown to dark brown, some organic matter, no odour.	D	-	FILL
	-			0.80	BH7_0.5-0.7 ES 0.50-0.70 m	■	☒	G-M	FILL: Silty Sandy GRAVEL; red/brown to grey, no odour.	D	-	
									Hole Terminated at 0.80 m			
			1									
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

This borehole log should be read in conjunction with Environmental Investigations Australia's accompanying standard notes.

APPENDIX E

Chain of Custody and Sample Receipt Forms

SAMPLE RECEIPT ADVICE

SE150913

CLIENT DETAILS

Contact	Earin Short
Client	Environmental Investigations
Address	Suite 6.01, 55 Miller Street NSW 2009
Telephone	02 9516 0722
Facsimile	02 9516 0741
Email	Earin.Short@eiaustralia.com.au
Project	**E22830 4-12 McGill St Lewisham NSW**
Order Number	**E22830**
Samples	17

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Fri 8/4/2016
Report Due	Wed 13/4/2016
SGS Reference	**SE150913**

SUBMISSION DETAILS

This is to confirm that 17 samples were received on Friday 8/4/2016. Results are expected to be ready by Wednesday 13/4/2016. Please quote SGS reference SE150913 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	16 Soil, 1 Water	Type of documentation received	COC
Date documentation received	8/4/2016	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	12.1°C
Sample container provider	SGS	Turnaround time requested	Three Days
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

Trip Spike analysed for BTEX only

SAMPLE RECEIPT ADVICE

CLIENT DETAILS

Client Environmental Investigations

Project E22830 4-12 McGill St Lewisham NSW

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	OP Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	PCBs in Soil	pH in soil (1:5)	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
001	BH1_0.16-0.25	28	13	25	11	-	10	12	8
002	BH2_0.1-0.2	28	13	25	11	-	10	12	8
003	BH2_0.4-0.5	-	-	25	-	-	10	12	8
004	BH2_0.9-1.0	-	-	25	-	-	10	12	8
005	BH2_1.3-1.5	-	-	25	-	-	10	12	8
006	BH3_0.1-0.2	28	13	25	11	-	10	12	8
007	BH4_0.0-0.1	28	13	25	11	-	10	12	8
008	BH5_0.1-0.2	28	13	25	11	-	10	12	8
009	BH5_0.7-0.8	-	-	25	-	1	10	12	8
010	BH6_0.0-0.1	28	13	25	11	-	10	12	8
011	BH6_0.4-0.5	-	-	25	-	1	10	12	8
012	BH7_0.0-0.1	28	13	25	11	-	10	12	8
013	BH7_0.5-0.7	-	-	25	-	-	10	12	8
014	QD1	-	-	-	-	-	10	12	8
016	Trip Blank	-	-	-	-	-	-	12	8
017	Trip Spike	-	-	-	-	-	-	12	-

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

CLIENT DETAILS

Client Environmental Investigations

Project E22830 4-12 McGill St Lewisham NSW

SUMMARY OF ANALYSIS

No.	Sample ID	Exchangeable Cations and Cation Exchange Capacity	Fibre Identification in soil	Mercury in Soil	Moisture Content	Total Recoverable Metals in Soil/Waste	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	BH1_0.16-0.25	-	2	1	1	7	-	-
002	BH2_0.1-0.2	-	2	1	1	7	-	-
003	BH2_0.4-0.5	-	-	1	1	7	-	-
004	BH2_0.9-1.0	-	-	1	1	7	-	-
005	BH2_1.3-1.5	-	-	1	1	7	-	-
006	BH3_0.1-0.2	-	2	1	1	7	-	-
007	BH4_0.0-0.1	-	2	1	1	7	-	-
008	BH5_0.1-0.2	-	2	1	1	7	-	-
009	BH5_0.7-0.8	9	-	1	1	7	-	-
010	BH6_0.0-0.1	-	2	1	1	7	-	-
011	BH6_0.4-0.5	9	-	1	1	7	-	-
012	BH7_0.0-0.1	-	2	1	1	7	-	-
013	BH7_0.5-0.7	-	-	1	1	7	-	-
014	QD1	-	-	1	1	7	-	-
015	QR1	-	-	-	-	-	12	8
016	Trip Blank	-	-	-	1	-	-	-

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

CLIENT DETAILS

Client Environmental Investigations

Project E22830 4-12 McGill St Lewisham NSW

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (dissolved) in Water	Trace Metals (Dissolved) in Water by ICPMS	TRH (Total Recoverable Hydrocarbons) in Water
015	QR1	1	7	9

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

Sheet 1 of 2

Site: 4-12 McGill St. Lewisham NSW

Project No: E22830

Laboratory: **SGS Australia**
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

	Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	Sample Matrix: WATER	SOIL	OTHERS (i.e. Fibro, Paint, etc.)	Analysis: HM A /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM A /TRH/BTEX/PAHs	HM A /TRH/BTEX	TRH/BTEX/Lead	TRH/BTEX	PAHs	VOCs	Asbestos	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	sPOCAS				TCLP PAHs	TCLP HM A	TCLP HM B
1	BH1_0.16-0.25		J + ZLB	6.4.16	Am/PM		X		X																
	BH1_0.25-0.4																								
2	BH2_0.1-0.2		+ ZLB						X																
3	BH2_0.4-0.5									X															
4	BH2_0.9-1.0									X															
5	BH2_1.3-1.5									X															
6	BH3_0.1-0.2		+ ZLB						X																
7	BH4_0.0-0.1		+ ZLB						X																
	BH4_0.3-0.4																								
8	BH5_0.1-0.2		+ ZLB						X																
9	BH5_0.7-0.8									X							X								
10	BH6_0.0-0.1		+ ZLB						X																

SGS Alexandria Environmental
SE150913 COC
Received: 08 – Apr – 2016

Comments

HM A
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
ZinC

HM B
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

LABORATORY TURNAROUND

☐ Standard
☐ 24 Hours
☐ 48 Hours
☑ 72 Hours
☐ Other_____

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Sampler's Comments:

Sampler's Name (EI):	Received by (SGS):
Print E. Short	Print A. Odisho
Signature	Signature
Date 8.4.16	Date 8/4/16 @3:00

Container Type:
J= solvent washed, acid rinsed,Teflon sealed, glass jaR
S= solvent washed, acid rinsed glass bottle
P= natural HDPE plastic bottle
VC= glass vial, Teflon Septum
ZLB = Zip-Lock Bag

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

Environmental Investigations Australia
Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

Sheet 2 of 2

Site: 4-12 McGill St. Lewisham NSW

Project No: E22830

Laboratory: **SGS Australia**
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

	Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	WATER	SOIL	OTHERS (i.e. Fibro, Paint, etc.)	HM A /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM A /TRH/BTEX/PAHs	HM A /TRH/BTEX	TRH/BTEX/Lead	TRH/BTEX C6-C9	PAHs	VOCs	Asbestos	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	sPOCAS				TCLP PAHs	TCLP HM A	TCLP HM B
11	BH6_0.4-0.5		J	8.4.16	Am/PM		X			X							X								
12	BH7_0.0-0.1		↓ + ZLB	↓	↓		↓		X																
13	BH7_0.5-0.7		↓	↓	↓		↓			X															
14	QD1		↓	↓	↓		↓				X														
15	QR1		1S, 2VC, 1P	↓	↓		↓				X														
16	Trip Blank		1V	↓	↓		↓						X												
17	Trip Spike		1V	↓	↓		↓						X												

Comments

HM A
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
ZinC

HM B
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

LABORATORY TURNAROUND

☐ Standard
☐ 24 Hours
☐ 48 Hours
☑ 72 Hours
☐ Other______

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Sampler's Comments:

	Sampler's Name (EI):	Received by (SGS):
Print	E. Short	A. Odisho
Signature		
Date	8.4.16	8/4/16 @ 3:00

Container Type:
J= solvent washed, acid rinsed,Teflon sealed, glass jaR
S= solvent washed, acid rinsed glass bottle
P= natural HDPE plastic bottle
VC= glass vial, Teflon Septum
ZLB = Zip-Lock Bag

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

Environmental Investigations Australia
Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

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 Investigations
Attention	E Short

Sample Login Details	
Your Reference	E22830
Envirolab Reference	**144532**
Date Sample Received	08/04/2016
Date Instructions Received	08/04/2016
Date Results Expected to be Reported	**13/04/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1 Soil
Turnaround Time Requested	72hr
Temperature on receipt (°C)	8.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

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

Please direct any queries to:

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

Sample and Testing Details on following page

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

Sample Id	***vTRH(C6-C10)/BTEXN in Soil***	***svTRH (C10-C40) in Soil***	***Acid Extractable metals in soil***
QT1	✓	✓	✓

APPENDIX F

Laboratory Analytical Reports

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Earin Short
Client	Environmental Investigations
Address	Suite 6.01, 55 Miller Street NSW 2009
Telephone	02 9516 0722
Facsimile	02 9516 0741
Email	Earin.Short@eiaustralia.com.au
Project	**E22830 4-12 McGill St Lewisham NSW**
Order Number	**E22830**
Samples	17

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE150913 R0**
Date Received	8/4/2016
Date Reported	13/4/2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

No respirable fibres detected in all samples using trace analysis technique.

Asbestos analysed by Approved Identifiers Yusuf Kuthpudin and Ravee Sivasubramaniam .

SIGNATORIES

Andy Sutton

Andy Sutton
Senior Organic Chemist

Dong Liang
Metals/Inorganics Team Leader

Huong Crawford
Production Manager

Ly Kim Ha
Organic Section Head

Ravee Sivasubramaniam
Hygiene Team Leader

VOC's in Soil [AN433/AN434] Tested: 11/4/2016

			BH1_0.16-0.25	BH2_0.1-0.2	BH2_0.4-0.5	BH2_0.9-1.0	BH2_1.3-1.5
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.001**	**SE150913.002**	**SE150913.003**	**SE150913.004**	**SE150913.005**
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	**0.2**	**0.5**	**0.2**

			BH3_0.1-0.2	BH4_0.0-0.1	BH5_0.1-0.2	BH5_0.7-0.8	BH6_0.0-0.1
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.006**	**SE150913.007**	**SE150913.008**	**SE150913.009**	**SE150913.010**
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

			BH6_0.4-0.5	BH7_0.0-0.1	BH7_0.5-0.7	QD1	Trip Blank
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.011**	**SE150913.012**	**SE150913.013**	**SE150913.014**	**SE150913.016**
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

			Trip Spike
			SOIL
			-
			6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.017**
Benzene	mg/kg	0.1	[79%]
Toluene	mg/kg	0.1	[81%]
Ethylbenzene	mg/kg	0.1	[93%]
m/p-xylene	mg/kg	0.2	[82%]
o-xylene	mg/kg	0.1	[88%]
Total Xylenes*	mg/kg	0.3	-
Total BTEX	mg/kg	0.6	-
Naphthalene	mg/kg	0.1	-

Volatile Petroleum Hydrocarbons in Soil [AN433/AN434/AN410] Tested: 11/4/2016

			BH1_0.16-0.25	BH2_0.1-0.2	BH2_0.4-0.5	BH2_0.9-1.0	BH2_1.3-1.5
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.001**	**SE150913.002**	**SE150913.003**	**SE150913.004**	**SE150913.005**
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25	<25

			BH3_0.1-0.2	BH4_0.0-0.1	BH5_0.1-0.2	BH5_0.7-0.8	BH6_0.0-0.1
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.006**	**SE150913.007**	**SE150913.008**	**SE150913.009**	**SE150913.010**
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25	<25

			BH6_0.4-0.5	BH7_0.0-0.1	BH7_0.5-0.7	QD1	Trip Blank
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.011**	**SE150913.012**	**SE150913.013**	**SE150913.014**	**SE150913.016**
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 11/4/2016

			BH1_0.16-0.25	BH2_0.1-0.2	BH2_0.4-0.5	BH2_0.9-1.0	BH2_1.3-1.5
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.001**	**SE150913.002**	**SE150913.003**	**SE150913.004**	**SE150913.005**
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	64	110	<45
TRH C29-C36	mg/kg	45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	90	150	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110	110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210	<210

			BH3_0.1-0.2	BH4_0.0-0.1	BH5_0.1-0.2	BH5_0.7-0.8	BH6_0.0-0.1
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.006**	**SE150913.007**	**SE150913.008**	**SE150913.009**	**SE150913.010**
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	<45	<45	<45
TRH C29-C36	mg/kg	45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210	<210

			BH6_0.4-0.5	BH7_0.0-0.1	BH7_0.5-0.7	QD1
			SOIL	SOIL	SOIL	SOIL
			-	-	-	-
			6/4/2016	6/4/2016	6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.011**	**SE150913.012**	**SE150913.013**	**SE150913.014**
TRH C10-C14	mg/kg	20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	240	130	<45
TRH C29-C36	mg/kg	45	<45	120	59	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	340	180	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	360	190	<110
TRH C10-C40 Total	mg/kg	210	<210	360	<210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH2_0.4-0.5 SOIL - 6/4/2016 SE150913.003	BH2_0.9-1.0 SOIL - 6/4/2016 SE150913.004	BH2_1.3-1.5 SOIL - 6/4/2016 SE150913.005
Naphthalene	mg/kg	0.1	<0.1	<0.1	0.4	0.8	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	0.2	0.5	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	0.3	0.6	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	0.6	1.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	0.1	0.2	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	0.2	0.4	<0.1
Phenanthrene	mg/kg	0.1	0.1	<0.1	3.9	6.8	0.2
Anthracene	mg/kg	0.1	<0.1	<0.1	1.0	1.2	<0.1
Fluoranthene	mg/kg	0.1	0.3	<0.1	4.8	6.6	0.2
Pyrene	mg/kg	0.1	0.3	<0.1	5.9	7.3	0.2
Benzo(a)anthracene	mg/kg	0.1	0.1	<0.1	2.3	3.1	<0.1
Chrysene	mg/kg	0.1	0.1	<0.1	2.1	2.6	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	0.1	<0.1	1.8	2.6	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	0.1	<0.1	1.3	1.6	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	2.0	2.6	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	0.9	1.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	0.2	0.5	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	1.0	1.2	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	<0.2	2.9	3.9	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	2.9	3.9	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	<0.2	2.9	3.9	<0.2
Total PAH (18)	mg/kg	0.8	1.3	<0.8	29	41	<0.8

PARAMETER	UOM	LOR	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008	BH5_0.7-0.8 SOIL - 6/4/2016 SE150913.009	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	0.2	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.4	<0.1	0.2	<0.1	<0.1
Pyrene	mg/kg	0.1	0.4	<0.1	0.2	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	0.2	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.1	0.2	<0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	0.2	<0.2	<0.2	<0.2	<0.2
Total PAH (18)	mg/kg	0.8	1.5	<0.8	<0.8	<0.8	<0.8

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 11/4/2016 (continued)

PARAMETER	UOM	LOR	BH6_0.4-0.5 SOIL - 6/4/2016 SE150913.011	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012	BH7_0.5-0.7 SOIL - 6/4/2016 SE150913.013
Naphthalene	mg/kg	0.1	<0.1	0.8	0.3
2-methylnaphthalene	mg/kg	0.1	<0.1	0.3	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	0.4	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	1.3	0.9
Acenaphthene	mg/kg	0.1	<0.1	0.5	<0.1
Fluorene	mg/kg	0.1	<0.1	1.0	0.2
Phenanthrene	mg/kg	0.1	<0.1	17	6.3
Anthracene	mg/kg	0.1	<0.1	3.0	1.4
Fluoranthene	mg/kg	0.1	<0.1	20	11
Pyrene	mg/kg	0.1	<0.1	25	15
Benzo(a)anthracene	mg/kg	0.1	<0.1	11	6.2
Chrysene	mg/kg	0.1	<0.1	8.5	5.3
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	9.1	4.7
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	4.6	4.0
Benzo(a)pyrene	mg/kg	0.1	<0.1	8.5	5.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	3.7	2.4
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	1.2	0.7
Benzo(ghi)perylene	mg/kg	0.1	<0.1	4.0	2.8
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	13	8.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	13	8.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	13	8.2
Total PAH (18)	mg/kg	0.8	<0.8	120	66

OC Pesticides in Soil [AN400/AN420] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

OC Pesticides in Soil [AN400/AN420] Tested: 11/4/2016 (continued)

PARAMETER	UOM	LOR	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	0.2	<0.1
Alpha Chlordane	mg/kg	0.1	0.2	<0.1
trans-Nonachlor	mg/kg	0.1	0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	0.4	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1

OP Pesticides in Soil [AN400/AN420] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008
Dichlorvos	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methidathion	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2

PARAMETER	UOM	LOR	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012
Dichlorvos	mg/kg	0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2	<0.2
Malathion	mg/kg	0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2
Methidathion	mg/kg	0.5	<0.5	<0.5
Ethion	mg/kg	0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2

PCBs in Soil [AN400/AN420] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008
Arochlor 1016	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1	<1	<1	<1

PARAMETER	UOM	LOR	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012
Arochlor 1016	mg/kg	0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1

pH in soil (1:5) [AN101]   Tested: 12/4/2016

			BH5_0.7-0.8	BH6_0.4-0.5
			SOIL	SOIL
			-	-
			6/4/2016	6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.009**	**SE150913.011**
pH	pH Units	-	8.4	8.3

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) [AN122] Tested: 12/4/2016

PARAMETER	UOM	LOR	BH5_0.7-0.8 SOIL - 6/4/2016 SE150913.009	BH6_0.4-0.5 SOIL - 6/4/2016 SE150913.011
Exchangeable Sodium, Na	mg/kg	2	6	6
Exchangeable Sodium, Na	cmol (+)/kg	0.01	0.03	0.03
Exchangeable Potassium, K	mg/kg	2	67	75
Exchangeable Potassium, K	cmol (+)/kg	0.01	0.17	0.19
Exchangeable Calcium, Ca	mg/kg	2	5200	5600
Exchangeable Calcium, Ca	cmol (+)/kg	0.01	26	28
Exchangeable Magnesium, Mg	mg/kg	2	41	50
Exchangeable Magnesium, Mg	cmol (+)/kg	0.02	0.33	0.41
Cation Exchange Capacity	cmol (+)/kg	0.02	26	29

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH2_0.4-0.5 SOIL - 6/4/2016 SE150913.003	BH2_0.9-1.0 SOIL - 6/4/2016 SE150913.004	BH2_1.3-1.5 SOIL - 6/4/2016 SE150913.005
Arsenic, As	mg/kg	3	4	5	7	5	6
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	0.4	0.3	0.4
Chromium, Cr	mg/kg	0.3	7.6	9.8	19	13	25
Copper, Cu	mg/kg	0.5	8.9	1.9	11	12	1.2
Lead, Pb	mg/kg	1	30	6	79	85	11
Nickel, Ni	mg/kg	0.5	3.4	1.0	2.9	3.1	1.1
Zinc, Zn	mg/kg	0.5	45	44	96	88	8.7

PARAMETER	UOM	LOR	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008	BH5_0.7-0.8 SOIL - 6/4/2016 SE150913.009	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010
Arsenic, As	mg/kg	3	4	4	5	4	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	0.4	<0.3	<0.3
Chromium, Cr	mg/kg	0.3	11	16	17	12	9.3
Copper, Cu	mg/kg	0.5	3.8	2.2	11	4.3	18
Lead, Pb	mg/kg	1	13	20	74	45	200
Nickel, Ni	mg/kg	0.5	2.4	2.4	3.8	1.5	2.1
Zinc, Zn	mg/kg	0.5	32	22	200	24	67

PARAMETER	UOM	LOR	BH6_0.4-0.5 SOIL - 6/4/2016 SE150913.011	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012	BH7_0.5-0.7 SOIL - 6/4/2016 SE150913.013	QD1 SOIL - 6/4/2016 SE150913.014
Arsenic, As	mg/kg	3	<3	6	9	7
Cadmium, Cd	mg/kg	0.3	<0.3	0.6	0.9	0.4
Chromium, Cr	mg/kg	0.3	11	12	15	27
Copper, Cu	mg/kg	0.5	5.7	33	71	2.0
Lead, Pb	mg/kg	1	48	170	370	11
Nickel, Ni	mg/kg	0.5	1.5	9.7	9.3	1.8
Zinc, Zn	mg/kg	0.5	23	410	640	25

Mercury in Soil [AN312] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH2_0.4-0.5 SOIL - 6/4/2016 SE150913.003	BH2_0.9-1.0 SOIL - 6/4/2016 SE150913.004	BH2_1.3-1.5 SOIL - 6/4/2016 SE150913.005
Mercury	mg/kg	0.01	0.02	<0.01	0.10	0.20	0.01

PARAMETER	UOM	LOR	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008	BH5_0.7-0.8 SOIL - 6/4/2016 SE150913.009	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010
Mercury	mg/kg	0.01	0.01	0.03	0.09	0.02	0.03

PARAMETER	UOM	LOR	BH6_0.4-0.5 SOIL - 6/4/2016 SE150913.011	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012	BH7_0.5-0.7 SOIL - 6/4/2016 SE150913.013	QD1 SOIL - 6/4/2016 SE150913.014
Mercury	mg/kg	0.01	0.02	0.27	0.35	0.07

Moisture Content [AN002] Tested: 11/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH2_0.4-0.5 SOIL - 6/4/2016 SE150913.003	BH2_0.9-1.0 SOIL - 6/4/2016 SE150913.004	BH2_1.3-1.5 SOIL - 6/4/2016 SE150913.005
% Moisture	%w/w	0.5	17	12	15	12	19

PARAMETER	UOM	LOR	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008	BH5_0.7-0.8 SOIL - 6/4/2016 SE150913.009	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010
% Moisture	%w/w	0.5	16	21	16	13	12

PARAMETER	UOM	LOR	BH6_0.4-0.5 SOIL - 6/4/2016 SE150913.011	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012	BH7_0.5-0.7 SOIL - 6/4/2016 SE150913.013	QD1 SOIL - 6/4/2016 SE150913.014	Trip Blank SOIL - 6/4/2016 SE150913.016
% Moisture	%w/w	0.5	13	13	14	16	<0.5

Fibre Identification in soil [AN602] Tested: 12/4/2016

PARAMETER	UOM	LOR	BH1_0.16-0.25 SOIL - 6/4/2016 SE150913.001	BH2_0.1-0.2 SOIL - 6/4/2016 SE150913.002	BH3_0.1-0.2 SOIL - 6/4/2016 SE150913.006	BH4_0.0-0.1 SOIL - 6/4/2016 SE150913.007	BH5_0.1-0.2 SOIL - 6/4/2016 SE150913.008
Asbestos Detected	No unit	-	No	No	No	No	No
Estimated Fibres*	%w/w	0.01	<0.01	<0.01	<0.01	<0.01	<0.01

PARAMETER	UOM	LOR	BH6_0.0-0.1 SOIL - 6/4/2016 SE150913.010	BH7_0.0-0.1 SOIL - 6/4/2016 SE150913.012
Asbestos Detected	No unit	-	No	No
Estimated Fibres*	%w/w	0.01	<0.01	<0.01

VOCs in Water [AN433/AN434] Tested: 12/4/2016

			QR1 WATER - 6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.015**
Benzene	µg/L	0.5	<0.5
Toluene	µg/L	0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5
m/p-xylene	µg/L	1	<1
o-xylene	µg/L	0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5
Total BTEX	µg/L	3	<3
Naphthalene	µg/L	0.5	<0.5

Volatile Petroleum Hydrocarbons in Water [AN433/AN434/AN410] Tested: 12/4/2016

PARAMETER	UOM	LOR	QR1 WATER - 6/4/2016 SE150913.015
TRH C6-C9	µg/L	40	<40
Benzene (F0)	µg/L	0.5	<0.5
TRH C6-C10	µg/L	50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 11/4/2016

			QR1 WATER - 6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.015**
TRH C10-C14	µg/L	50	<50
TRH C15-C28	µg/L	200	<200
TRH C29-C36	µg/L	200	<200
TRH C37-C40	µg/L	200	<200
TRH >C10-C16 (F2)	µg/L	60	<60
TRH >C16-C34 (F3)	µg/L	500	<500
TRH >C34-C40 (F4)	µg/L	500	<500
TRH C10-C36	µg/L	450	<450
TRH C10-C40	µg/L	650	<650

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 11/4/2016

PARAMETER	UOM	LOR	QR1 WATER - 6/4/2016 SE150913.015
Arsenic, As	μg/L	1	<1
Cadmium, Cd	μg/L	0.1	<0.1
Chromium, Cr	μg/L	1	<1
Copper, Cu	μg/L	1	<1
Lead, Pb	μg/L	1	<1
Nickel, Ni	μg/L	1	<1
Zinc, Zn	μg/L	5	180

Mercury (dissolved) in Water [AN311/AN312] Tested: 11/4/2016

			QR1 WATER - 6/4/2016
PARAMETER	**UOM**	**LOR**	**SE150913.015**
Mercury	mg/L	0.0001	<0.0001

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN122	The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100. ESP can be used to categorise the sodicity of the soil as below: ESP < 6% non-sodic ESP 6-15% sodic ESP >15% strongly sodic Method is refernced to Rayment and Higginson, 1992, sections 15D3 and 15N1.-
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).

AN433/AN434/AN410	VOCs and C6-C9/C6-C10 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.
AN602	Fibres/material that cannot be unequivocably identified as one of the three asbestos forms, will be reported as unknown mineral fibres (umf).
AN602	AS4964.2004 Method for the Qualitative Identification of Asbestos in Bulk Samples, Section 8.4, Trace Analysis Criteria, Note 4 states:"Depending upon sample condition and fibre type, the detection limit of this technique has been found to lie generally in the range of 1 in 1,000 to 1 in 10,000 parts by weight, equivalent to 1 to 0.1 g/kg."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/terms-and-conditions. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Earin Short	Manager	Huong Crawford
Client	Environmental Investigations	Laboratory	SGS Alexandria Environmental
Address	Suite 6.01, 55 Miller Street NSW 2009	Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	02 9516 0722	Telephone	+61 2 8594 0400
Facsimile	02 9516 0741	Facsimile	+61 2 8594 0499
Email	Earin.Short@eiaustralia.com.au	Email	au.environmental.sydney@sgs.com
Project	**E22830 4-12 McGill St Lewisham NSW**	SGS Reference	**SE150913 R0**
Order Number	**E22830**	Date Received	08 Apr 2016
Samples	7	Date Reported	13 Apr 2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

No respirable fibres detected in all samples using trace analysis technique.

Asbestos analysed by Approved Identifiers Yusuf Kuthpudin and Ravee Sivasubramaniam .

SIGNATORIES

Andy Sutton
Senior Organic Chemist

Dong Liang
Metals/Inorganics Team Leader

Huong Crawford
Production Manager

Ly Kim Ha
Organic Section Head

Ravee Sivasubramaniam
Hygiene Team Leader

ANALYTICAL REPORT

RESULTS

Fibre Identification in soil | Method AN602

Laboratory Reference	Client Reference	Matrix	Sample Description	Date Sampled	Fibre Identification	Est.%w/w*
SE150913.001	BH1_0.16-0.25	Soil	185g Clay, Sand, Rocks	06 Apr 2016	No Asbestos Found	<0.01
SE150913.002	BH2_0.1-0.2	Soil	140g Clay, Sand, Rocks	06 Apr 2016	No Asbestos Found	<0.01
SE150913.006	BH3_0.1-0.2	Soil	99g Clay, Sand, Rocks	06 Apr 2016	No Asbestos Found Organic Fibres Detected	<0.01
SE150913.007	BH4_0.0-0.1	Soil	188g Clay, Sand, Soil, Rocks	06 Apr 2016	No Asbestos Found	<0.01
SE150913.008	BH5_0.1-0.2	Soil	44g Clay, Sand, Soil, Rocks	06 Apr 2016	No Asbestos Found	<0.01
SE150913.010	BH6_0.0-0.1	Soil	174g Clay, Sand, Rocks	06 Apr 2016	No Asbestos Found	<0.01
SE150913.012	BH7_0.0-0.1	Soil	138g Clay, Sand, Soil, Rocks	06 Apr 2016	No Asbestos Found	<0.01

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.
AN602	Fibres/material that cannot be unequivocably identified as one of the three asbestos forms, will be reported as unknown mineral fibres (umf).
AN602	AS4964.2004 Method for the Qualitative Identification of Asbestos in Bulk Samples, Section 8.4, Trace Analysis Criteria, Note 4 states:"Depending upon sample condition and fibre type, the detection limit of this technique has been found to lie generally in the range of 1 in 1,000 to 1 in 10,000 parts by weight, equivalent to 1 to 0.1 g/kg."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.

FOOTNOTES

Amosite	-	Brown Asbestos	NA	-	Not Analysed
Chrysotile	-	White Asbestos	LNR	-	Listed, Not Required
Crocidolite	-	Blue Asbestos	*	-	NATA accreditation does not cover the performance of this service.
Amphiboles	-	Amosite and/or Crocidolite	**	-	Indicative data, theoretical holding time exceeded.

(In reference to soil samples only) This report does not comply with the analytical reporting recommendations in the Western Australian Department of Health Guidelines for the Assessment and Remediation and Management of Asbestos Contaminated sites in Western Australia - May 2009.

Sampled by the client.

Where reported: 'Asbestos Detected': Asbestos detected by polarised light microscopy, including dispersion staining.
Where reported: 'No Asbestos Found': No Asbestos Found by polarised light microscopy, including dispersion staining.
Where reported: 'UMF Detected': Mineral fibres of unknown type detected by polarised light microscopy, including dispersion staining. Confirmation by another independent analytical technique may be necessary.

Even after disintegration it can be very difficult, or impossible, to detect the presence of asbestos in some asbestos-containing bulk materials using polarised light microscopy. This is due to the low grade or small length or diameter of asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

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CERTIFICATE OF ANALYSIS 144532

Client:

Environmental Investigations
Suite 6.01, 55 Miller Street
Pyrmont
NSW 2009

Attention: E Short

Sample log in details:

Your Reference:	**E22830**		
No. of samples:	1 Soil		
Date samples received / completed instructions received	08/04/2016	/	08/04/2016

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:	13/04/16	/	12/04/16
Date of Preliminary Report:	Not Issued		

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

ACCREDITED FOR TECHNICAL COMPETENCE

vTRH(C6-C10)/BTEXN in Soil		
Our Reference:	UNITS	144532-1
Your Reference	------------- -	QT1
Date Sampled	------------	6/04/2016
Type of sample		Soil
Date extracted	-	11/04/2016
Date analysed	-	12/04/2016
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
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	%	89

svTRH (C10-C40) in Soil		
Our Reference:	UNITS	144532-1
Your Reference	-------------	QT1
Date Sampled	------------	6/04/2016
Type of sample		Soil
Date extracted	-	11/04/2016
Date analysed	-	12/04/2016
TRHC $_{10}$ - C $_{14}$	mg/kg	<50
TRHC $_{15}$ - C $_{28}$	mg/kg	<100
TRHC $_{29}$ - C $_{36}$	mg/kg	<100
TRH>C $_{10}$-C $_{16}$	mg/kg	<50
TRH>C $_{10}$ - C $_{16}$ less Naphthalene (F2)	mg/kg	<50
TRH>C $_{16}$-C $_{34}$	mg/kg	<100
TRH>C $_{34}$-C $_{40}$	mg/kg	<100
Surrogate o-Terphenyl	%	78

Acid Extractable metals in soil		
Our Reference:	UNITS	144532-1
Your Reference	-------------	QT1
Date Sampled	------------	6/04/2016
Type of sample		Soil
Date prepared	-	11/04/2016
Date analysed	-	11/04/2016
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	14
Copper	mg/kg	3
Lead	mg/kg	9
Mercury	mg/kg	<0.1
Nickel	mg/kg	2
Zinc	mg/kg	28

Moisture		
Our Reference:	UNITS	144532-1
Your Reference	------------- -	QT1
Date Sampled	------------	6/04/2016
Type of sample		Soil
Date prepared	-	11/04/2016
Date analysed	-	12/04/2016
Moisture	%	18

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/04/2016	[NT]	[NT]	LCS-7	11/04/2016
Date analysed	-			12/04/2016	[NT]	[NT]	LCS-7	11/04/2016
TRHC_{6} - C_{9}	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-7	116%
TRHC_{6} - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-7	116%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-7	119%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-7	109%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-7	117%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-7	117%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-7	115%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	126	[NT]	[NT]	LCS-7	116%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/04/2016	[NT]	[NT]	LCS-3	11/04/2016
Date analysed	-			12/04/2016	[NT]	[NT]	LCS-3	12/04/2016
TRHC_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-3	95%
TRHC_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-3	89%
TRHC_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-3	115%
TRH>C_{10}-C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-3	95%
TRH>C_{16}-C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-3	89%
TRH>C_{34}-C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-3	115%
Surrogate o-Terphenyl	%		Org-003	86	[NT]	[NT]	LCS-3	82%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			11/04/2016	[NT]	[NT]	LCS-6	11/04/2016
Date analysed	-			11/04/2016	[NT]	[NT]	LCS-6	11/04/2016
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-6	110%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-6	101%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	106%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	109%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	103%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-6	81%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	101%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	102%

Report Comments:

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

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

Quality Control Definitions

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

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

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

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

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

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

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

APPENDIX G

QA/QC Assessment

G1 QUALITY CONTROL PROGRAM

G1.1 INTRODUCTION

For the purpose of assessing the quality of data presented in this Contaminant Delineation Report, EI collected field QC samples for analysis. The primary laboratory, SGS Australia Pty Ltd (SGS) and secondary laboratory, Envirolab Services Pty Ltd (Envirolab) also prepared and analysed internal QC samples. Details of the field and laboratory QC samples, with the allowable data acceptance ranges are presented in **Table G-1**.

Table G-1 Sampling Data Quality Indicators

QA/QC Measures	Data Quality Indicators
Precision – A quantitative measure of the variability (or reproducibility) of data	Data precision would be assessed by reviewing the performance of blind field duplicate sample sets, through calculation of relative percentage differences (RPD). Data precision would be deemed acceptable if RPDs are found to be less than 30%. RPDs that exceed this range may be considered acceptable where: • Results are less than 10 times the limits of reporting (LOR); • Results are less than 20 times the LOR and the RPD is less than 50%; or • Heterogeneous materials or volatile compounds are encountered.
Accuracy – A quantitative measure of the closeness of reported data to the "true" value	Data accuracy would be assessed through the analysis of: • Method blanks, which are analysed for the analytes targeted in the primary samples; • Matrix spike and matrix spike duplicate sample sets; • Laboratory control samples; and • Calibration of instruments against known standards.
Representativeness – The confidence (expressed qualitatively) that data are representative of each medium present onsite	To ensure the data produced by the laboratory is representative of conditions encountered in the field, the laboratory would carry out the following: • Blank samples will be run in parallel with field samples to confirm there are no unacceptable instances of laboratory artefacts; • Review of relative percentage differences (RPD) values for field and laboratory duplicates to provide an indication that the samples are generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities; and • The appropriateness of collection methodologies, handling, storage and preservation techniques will be assessed to ensure/confirm there was minimal opportunity for sample interference or degradation (i.e. volatile loss during transport due to incorrect preservation / transport methods).
Completeness – A measure of the amount of useable data from a data collection activity	Analytical data sets acquired during the assessment will be evaluated as complete, upon confirmation that: • Standard operating procedures (SOPs) for sampling protocols were adhered to; and • Copies of all COC documentation are presented, reviewed and found to be properly completed. It can therefore be considered whether the proportion of "useable data" generated in the data collection activities is sufficient for the purposes of the land use assessment.

QA/QC Measures	Data Quality Indicators
Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Given that a reported data set can comprise several data sets from separate sampling episodes, issues of comparability between data sets are reduced through adherence to SOPs and regulator-endorsed or published guidelines and standards on each data gathering activity. In addition the data will be collected by experienced samplers and NATA-accredited laboratory methodologies will be employed in all laboratory testing programs.

G1.2 CALCULATION OF RELATIVE PERCENTAGE DIFFERENCE (RPD)

The RPD values were calculated using the following equation:

$$RPD = \frac{|C_O - C_R|}{[(C_O + C_R)/2]} \times 100$$

Where:

C_O = Concentration obtained for the primary sample; and

C_R = Concentration obtained for the blind replicate or split duplicate sample.

G2 FIELD QA/QC DATA EVALUATION

The field quality assurance/quality control (QA/QC) soil samples collected during the DSI works were as follows:

- Blind field duplicates;
- Inter-laboratory duplicates;
- Trip blanks;
- Trip spikes; and
- Rinsate blanks.

Analytical results for tested soil QA/QC samples, including calculated RPD values between primary and duplicate samples, are presented in **Table G-2**.

G2.1 SOIL INVESTIGATION

G2.1.1 Blind Field Duplicates

One (1) blind field duplicate (BFD) sample, being sample QD1, was collected from the primary sample BH5_0.1-0.2. The preparation of the BFD sample involved the collection of a bulk quantity of soil from the same sampling point without mixing, before dividing the material into identical sampling vessels. The duplicate sample was then presented blind to the primary laboratory (SGS) to avoid any potential analytical bias. The BFD was analysed for TPH, BTEX and selected metals with the RPD values calculated found to be within the Data Acceptance Criteria (**Appendix H**, Table QC5), with the exception of Copper (138.46%), Lead (148.24%), Nickel (71.43%) and Zinc (155.56%). These exceedances can be explained due to the low concentrations reported for these analytes.

G2.1.2 Inter-Laboratory Duplicate

One (1) inter laboratory duplicate (ILD) sample, being sample QT1, was collected from the primary sample BH5_0.1-0.2. The preparation of the ILD sample was identical to the BFD sample as described above and analysed for TPH, BTEX and selected heavy metals. The RPD values calculated for the ILD sample were found to be within the Data Acceptance Criteria (**Appendix J**, Table QC5), with the exception of Copper (114.29%), Lead (156.63%), Nickel (62.07%) and Zinc (150.88%). These exceedances can be explained due to the low concentrations reported for these analytes.

G2.1.3 Trip Blank

One trip blank sample was prepared and analysed by the primary laboratory for F1, BTEX and Naphthalene. Analytical results for this sample were below the laboratory LOR, indicating that ideal sample transport and handling conditions were achieved.

G2.1.4 Trip Spike

One trip spike sample was submitted to the primary laboratory for BTEX analysis, the results for which were reported within the RPD acceptance levels for trip spike recovery. It was therefore concluded that satisfactory sample transport and handling conditions were achieved, and that unacceptable volatile loss during sample transportation had not occurred.

G2.1.5 Rinsate Blank

One rinsate blank sample QR1 was submitted to the primary laboratory for TRH, BTEX and selected metal analysis, the results for which were reported below laboratory LOR with the exception of Zinc (180µg/L). The zinc concentration detected in rinsate water was not considered significant enough to have influence the soil results at the site.

Therefore, it was concluded that decontamination procedures performed during the field works had been effective.

G3 LABORATORY QA/QC

G3.1 LABORATORY ACCREDITATION

To undertake all analytical testing, EI commissioned SGS as the primary laboratory and Envirolab as the secondary laboratory. SGS and Envirolab, both established analytical laboratories which operate in accordance with the guidelines set out in ISO/IEC Guide 25 “General requirements for the competence of calibration and testing laboratories”, conducted all respective analyses using National Association Testing Authorities (NATA)-registered procedures.

In relation to contingencies, should the pre-determined DQOs not be achieved, in accordance with each laboratory’s QC policy (**Appendix H**), respective tests would be accordingly repeated. Should the results again fall outside the DQOs, then sample heterogeneity may be assumed and written comment will be provided to this effect on the final laboratory certificate. The laboratory QA/QC reports are included in **Appendix H**.

G3.2 SAMPLE HOLDING TIMES

All sample holding times were generally within standard environmental protocols as tabulated in **Appendix H, Tables QC1** and **QC2**.

G3.3 TEST METHODS AND PRACTICAL QUANTITATION LIMITS (PQLS)

Practical Quantitation Limits for all tested parameters during the assessment of soils are presented in **Appendix H**, **Tables QC3** and **QC4**.

G3.4 METHOD BLANKS

Concentrations of all parameters in method blanks during the assessment were below the laboratory PQLs and were therefore within the DAC.

G3.5 LABORATORY DUPLICATE SAMPLES

All Laboratory Duplicate Samples for the analysis batches were within acceptable ranges and conformed to the DAC.

G3.6 LABORATORY CONTROL SAMPLES

All Laboratory Control Samples for the analysis batches were within acceptable ranges and conformed to the DAC.

G3.7 MATRIX SPIKES

All matrix spikes for the analysis batches were within acceptable ranges and conformed to the DAC.

G3.8 SURROGATE

Recovery results for all surrogate samples conformed to the DAC.

G3.9 CONCLUDING REMARK

Based on the laboratory QA/QC results EI considers that the analytical results were valid and useable for interpretation purposes.

Table G-2 QA/QC Results for Investigation Samples

		TRH				BTEX						Heavy Metals							
Sample identification	**Description**	F1*	F2**	F3 ($>C_{16}$ - C_{34})	F4 ($>C_{34}$ - C_{40})	Benzene	Toluene	Ethylbenzene	Xylene (total)	m/p-xylene	o-xylene	Arsenic	Cadmium	Chromium (Total)	Copper	Lead	Mercury	Nickel	Zinc
Intra-laboratory Duplicate																			
BH5_0.1-0.2	Gravelly Clayey Sand	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.2	<0.1	5	0.4	17	11	74	0.09	3.8	200
QD1	Replicate of BH5_0.1-0.2	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.2	<0.1	7	0.4	27	2	11	0.07	1.8	25
RPD		***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***33.33***	***0.00***	***45.45***	**138.46**	**148.24**	***25.00***	**71.43**	**155.56**
Inter-laboratory Duplicate																			
BH5_0.1-0.2	Gravelly Clayey Sand	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.2	<0.1	5	0.4	17	11	74	0.09	3.8	200
QT1	Replicate of BH5_0.1-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<2	<1	<4	<0.4	14	3	9	<0.1	2	28
RPD		***0.00***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***28.57***	***0.00***	***19.35***	**114.29**	**156.63**	***14.29***	**62.07**	**150.88**
Trip Blanks																			
Trip Blank	Trip Blank	<25	-	-	-	<0.1	<0.1	<0.1	<0.3	<0.2	<0.1	-	-	-	-	-	-	-	-
Trip Spikes																			
Trip Spikes	Trip Spike	-	-	-	-	79%	81%	93%	82%	88%	-	-	-	-	-	-	-	-	-
Rinsate Blanks																			
QR1	De-ionised water	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	<0.5	<1	<0.1	<1	<1	<1	<0.1	<1	**180**

52.17	Indicates values where a single result is found to be less than detection, with the duplicate sample found to be over the detection limit.
82.35	RPD exceeds 30-50% range referenced from AS4482.1 (2005).

NOTE:

All soil results are reported in mg/kg . All water results are reported in µg/L.

* - to obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

** - to obtain F2 subtract naphthalene from the > C_{10}-C_{16} fraction.

APPENDIX H

Laboratory QA/AC Policies and DQOs

STATEMENT OF QA/QC PERFORMANCE

SE150913 R0

CLIENT DETAILS

Contact	Earin Short
Client	Environmental Investigations
Address	Suite 6.01, 55 Miller Street NSW 2009
Telephone	02 9516 0722
Facsimile	02 9516 0741
Email	Earin.Short@eiaustralia.com.au
Project	**E22830 4-12 McGill St Lewisham NSW**
Order Number	**E22830**
Samples	17

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE150913 R0**
Date Received	08 Apr 2016
Date Reported	13 Apr 2016

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Sample counts by matrix	16 Soil, 1 Water	Type of documentation received	COC
Date documentation received	8/4/2016	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	12.1°C
Sample container provider	SGS	Turnaround time requested	Three Days
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH5_0.7-0.8	SE150913.009	LB098882	06 Apr 2016	08 Apr 2016	04 May 2016	12 Apr 2016	04 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098997	06 Apr 2016	08 Apr 2016	04 May 2016	13 Apr 2016	04 May 2016	13 Apr 2016

Fibre Identification in soil

Method: ME-(AU)-[ENV]AN602

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098948	06 Apr 2016	08 Apr 2016	06 Apr 2017	12 Apr 2016	06 Apr 2017	13 Apr 2016

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QR1	SE150913.015	LB098836	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	11 Apr 2016

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016
QD1	SE150913.014	LB098830	06 Apr 2016	08 Apr 2016	04 May 2016	11 Apr 2016	04 May 2016	13 Apr 2016

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
QD1	SE150913.014	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016
Trip Blank	SE150913.016	LB098815	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	16 Apr 2016	13 Apr 2016

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

OC Pesticides in Soil (continued)

Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH5_0.1-0.2	SE150913.008	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
QD1	SE150913.014	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
QD1	SE150913.014	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
QD1	SE150913.014	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
QD1	SE150913.014	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

pH in soil (1:5) (continued)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH5_0.7-0.8	SE150913.009	LB098967	06 Apr 2016	08 Apr 2016	13 Apr 2016	12 Apr 2016	13 Apr 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098967	06 Apr 2016	08 Apr 2016	13 Apr 2016	12 Apr 2016	13 Apr 2016	13 Apr 2016

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016
QD1	SE150913.014	LB098829	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	13 Apr 2016

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QR1	SE150913.015	LB098877	06 Apr 2016	08 Apr 2016	03 Oct 2016	11 Apr 2016	03 Oct 2016	12 Apr 2016

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016
QD1	SE150913.014	LB098806	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QR1	SE150913.015	LB098805	06 Apr 2016	08 Apr 2016	13 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QD1	SE150913.014	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
Trip Blank	SE150913.016	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
Trip Spike	SE150913.017	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QR1	SE150913.015	LB098897	06 Apr 2016	08 Apr 2016	13 Apr 2016	12 Apr 2016	22 May 2016	13 Apr 2016

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1_0.16-0.25	SE150913.001	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_0.1-0.2	SE150913.002	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_0.4-0.5	SE150913.003	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_0.9-1.0	SE150913.004	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH2_1.3-1.5	SE150913.005	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH3_0.1-0.2	SE150913.006	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH4_0.0-0.1	SE150913.007	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH5_0.1-0.2	SE150913.008	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH5_0.7-0.8	SE150913.009	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH6_0.0-0.1	SE150913.010	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH6_0.4-0.5	SE150913.011	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH7_0.0-0.1	SE150913.012	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
BH7_0.5-0.7	SE150913.013	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
QD1	SE150913.014	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
Trip Blank	SE150913.016	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	12 Apr 2016
Trip Spike	SE150913.017	LB098799	06 Apr 2016	08 Apr 2016	20 Apr 2016	11 Apr 2016	21 May 2016	13 Apr 2016

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QR1	SE150913.015	LB098897	06 Apr 2016	08 Apr 2016	13 Apr 2016	12 Apr 2016	22 May 2016	13 Apr 2016

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	97
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	93
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	98
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	102
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	86
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	92
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	109

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	72
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	78
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	72
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	74
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	80
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	78
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	76
d14-p-terphenyl (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	88
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	84
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	88
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	90
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	90
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	98
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	78

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH1_0.16-0.25	SE150913.001	%	70 - 130%	72
	BH2_0.1-0.2	SE150913.002	%	70 - 130%	78
	BH2_0.4-0.5	SE150913.003	%	70 - 130%	80
	BH2_0.9-1.0	SE150913.004	%	70 - 130%	80
	BH2_1.3-1.5	SE150913.005	%	70 - 130%	76
	BH3_0.1-0.2	SE150913.006	%	70 - 130%	72
	BH4_0.0-0.1	SE150913.007	%	70 - 130%	74
	BH5_0.1-0.2	SE150913.008	%	70 - 130%	80
	BH5_0.7-0.8	SE150913.009	%	70 - 130%	76
	BH6_0.0-0.1	SE150913.010	%	70 - 130%	78
	BH6_0.4-0.5	SE150913.011	%	70 - 130%	82
	BH7_0.0-0.1	SE150913.012	%	70 - 130%	76
	BH7_0.5-0.7	SE150913.013	%	70 - 130%	78
d14-p-terphenyl (Surrogate)	BH1_0.16-0.25	SE150913.001	%	70 - 130%	88
	BH2_0.1-0.2	SE150913.002	%	70 - 130%	84
	BH2_0.4-0.5	SE150913.003	%	70 - 130%	84
	BH2_0.9-1.0	SE150913.004	%	70 - 130%	82
	BH2_1.3-1.5	SE150913.005	%	70 - 130%	86
	BH3_0.1-0.2	SE150913.006	%	70 - 130%	88
	BH4_0.0-0.1	SE150913.007	%	70 - 130%	90
	BH5_0.1-0.2	SE150913.008	%	70 - 130%	90
	BH5_0.7-0.8	SE150913.009	%	70 - 130%	94
	BH6_0.0-0.1	SE150913.010	%	70 - 130%	98
	BH6_0.4-0.5	SE150913.011	%	70 - 130%	100
	BH7_0.0-0.1	SE150913.012	%	70 - 130%	78
	BH7_0.5-0.7	SE150913.013	%	70 - 130%	80
d5-nitrobenzene (Surrogate)	BH1_0.16-0.25	SE150913.001	%	70 - 130%	78
	BH2_0.1-0.2	SE150913.002	%	70 - 130%	74
	BH2_0.4-0.5	SE150913.003	%	70 - 130%	84
	BH2_0.9-1.0	SE150913.004	%	70 - 130%	84
	BH2_1.3-1.5	SE150913.005	%	70 - 130%	74
	BH3_0.1-0.2	SE150913.006	%	70 - 130%	78
	BH4_0.0-0.1	SE150913.007	%	70 - 130%	86
	BH5_0.1-0.2	SE150913.008	%	70 - 130%	90
	BH5_0.7-0.8	SE150913.009	%	70 - 130%	88

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d5-nitrobenzene (Surrogate)	BH6_0.0-0.1	SE150913.010	%	70 - 130%	88
	BH6_0.4-0.5	SE150913.011	%	70 - 130%	90
	BH7_0.0-0.1	SE150913.012	%	70 - 130%	82
	BH7_0.5-0.7	SE150913.013	%	70 - 130%	84

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	97
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	93
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	98
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	102
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	86
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	92
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	109

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	128
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	124
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	129
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	129
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	104
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	95
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	107
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	96
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	105
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	96
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	105
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	93
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	90
	QD1	SE150913.014	%	60 - 130%	84
	Trip Blank	SE150913.016	%	60 - 130%	90
	Trip Spike	SE150913.017	%	60 - 130%	120
d4-1,2-dichloroethane (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	80
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	77
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	74
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	75
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	72
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	77
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	73
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	81
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	71
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	72
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	76
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	73
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	74
	QD1	SE150913.014	%	60 - 130%	80
	Trip Blank	SE150913.016	%	60 - 130%	79
	Trip Spike	SE150913.017	%	60 - 130%	79
d8-toluene (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	90
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	89
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	92
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	106
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	85
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	71
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	103
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	89
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	99
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	96
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	97
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	93
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	90

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d8-toluene (Surrogate)	QD1	SE150913.014	%	60 - 130%	81
	Trip Blank	SE150913.016	%	60 - 130%	92
	Trip Spike	SE150913.017	%	60 - 130%	82
Dibromofluoromethane (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	92
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	100
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	84
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	72
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	79
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	84
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	73
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	100
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	74
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	74
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	75
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	71
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	73
	QD1	SE150913.014	%	60 - 130%	93
	Trip Blank	SE150913.016	%	60 - 130%	78
	Trip Spike	SE150913.017	%	60 - 130%	94

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	QR1	SE150913.015	%	40 - 130%	86
d4-1,2-dichloroethane (Surrogate)	QR1	SE150913.015	%	40 - 130%	112
d8-toluene (Surrogate)	QR1	SE150913.015	%	40 - 130%	93
Dibromofluoromethane (Surrogate)	QR1	SE150913.015	%	40 - 130%	116

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	128
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	124
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	129
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	129
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	104
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	95
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	107
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	96
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	105
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	96
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	105
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	93
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	90
	QD1	SE150913.014	%	60 - 130%	84
	Trip Blank	SE150913.016	%	60 - 130%	90
d4-1,2-dichloroethane (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	80
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	77
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	74
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	75
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	72
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	77
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	73
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	81
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	71
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	72
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	76
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	73
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	74
	QD1	SE150913.014	%	60 - 130%	80
	Trip Blank	SE150913.016	%	60 - 130%	79
d8-toluene (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	90
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	89
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	92

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Soil (continued)

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d8-toluene (Surrogate)	BH2_0.9-1.0	SE150913.004	%	60 - 130%	106
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	85
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	71
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	103
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	89
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	99
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	96
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	97
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	93
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	90
	QD1	SE150913.014	%	60 - 130%	81
	Trip Blank	SE150913.016	%	60 - 130%	92
Dibromofluoromethane (Surrogate)	BH1_0.16-0.25	SE150913.001	%	60 - 130%	92
	BH2_0.1-0.2	SE150913.002	%	60 - 130%	100
	BH2_0.4-0.5	SE150913.003	%	60 - 130%	84
	BH2_0.9-1.0	SE150913.004	%	60 - 130%	72
	BH2_1.3-1.5	SE150913.005	%	60 - 130%	79
	BH3_0.1-0.2	SE150913.006	%	60 - 130%	84
	BH4_0.0-0.1	SE150913.007	%	60 - 130%	73
	BH5_0.1-0.2	SE150913.008	%	60 - 130%	100
	BH5_0.7-0.8	SE150913.009	%	60 - 130%	74
	BH6_0.0-0.1	SE150913.010	%	60 - 130%	74
	BH6_0.4-0.5	SE150913.011	%	60 - 130%	75
	BH7_0.0-0.1	SE150913.012	%	60 - 130%	71
	BH7_0.5-0.7	SE150913.013	%	60 - 130%	73
	QD1	SE150913.014	%	60 - 130%	93
	Trip Blank	SE150913.016	%	60 - 130%	78

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	QR1	SE150913.015	%	40 - 130%	86
d4-1,2-dichloroethane (Surrogate)	QR1	SE150913.015	%	60 - 130%	112
d8-toluene (Surrogate)	QR1	SE150913.015	%	40 - 130%	93
Dibromofluoromethane (Surrogate)	QR1	SE150913.015	%	40 - 130%	116

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Sample Number	Parameter	Units	LOR	Result
LB098836.001	Mercury	mg/L	0.0001	<0.0001

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result
LB098830.001	Mercury	mg/kg	0.01	<0.01

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number		Parameter	Units	LOR	Result
LB098806.001		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
		Alpha BHC	mg/kg	0.1	<0.1
		Lindane	mg/kg	0.1	<0.1
		Heptachlor	mg/kg	0.1	<0.1
		Aldrin	mg/kg	0.1	<0.1
		Beta BHC	mg/kg	0.1	<0.1
		Delta BHC	mg/kg	0.1	<0.1
		Heptachlor epoxide	mg/kg	0.1	<0.1
		Alpha Endosulfan	mg/kg	0.2	<0.2
		Gamma Chlordane	mg/kg	0.1	<0.1
		Alpha Chlordane	mg/kg	0.1	<0.1
		p,p'-DDE	mg/kg	0.1	<0.1
		Dieldrin	mg/kg	0.2	<0.2
		Endrin	mg/kg	0.2	<0.2
		Beta Endosulfan	mg/kg	0.2	<0.2
		p,p'-DDD	mg/kg	0.1	<0.1
		p,p'-DDT	mg/kg	0.1	<0.1
		Endosulfan sulphate	mg/kg	0.1	<0.1
		Endrin Aldehyde	mg/kg	0.1	<0.1
		Methoxychlor	mg/kg	0.1	<0.1
		Endrin Ketone	mg/kg	0.1	<0.1
		Isodrin	mg/kg	0.1	<0.1
		Mirex	mg/kg	0.1	<0.1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	97

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number		Parameter	Units	LOR	Result
LB098806.001		Dichlorvos	mg/kg	0.5	<0.5
		Dimethoate	mg/kg	0.5	<0.5
		Diazinon (Dimpylate)	mg/kg	0.5	<0.5
		Fenitrothion	mg/kg	0.2	<0.2
		Malathion	mg/kg	0.2	<0.2
		Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2
		Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2
		Bromophos Ethyl	mg/kg	0.2	<0.2
		Methidathion	mg/kg	0.5	<0.5
		Ethion	mg/kg	0.2	<0.2
		Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2
	Surrogates	2-fluorobiphenyl (Surrogate)	%	-	80
		d14-p-terphenyl (Surrogate)	%	-	86

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB098806.001		Naphthalene	mg/kg	0.1	<0.1
		2-methylnaphthalene	mg/kg	0.1	<0.1
		1-methylnaphthalene	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	<0.1
		Anthracene	mg/kg	0.1	<0.1
		Fluoranthene	mg/kg	0.1	<0.1
		Pyrene	mg/kg	0.1	<0.1
		Benzo(a)anthracene	mg/kg	0.1	<0.1
		Chrysene	mg/kg	0.1	<0.1
		Benzo(a)pyrene	mg/kg	0.1	<0.1
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
		Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
		Benzo(ghi)perylene	mg/kg	0.1	<0.1
		Total PAH (18)	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	82
		2-fluorobiphenyl (Surrogate)	%	-	80
		d14-p-terphenyl (Surrogate)	%	-	86

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number		Parameter	Units	LOR	Result
LB098806.001		Arochlor 1016	mg/kg	0.2	<0.2
		Arochlor 1221	mg/kg	0.2	<0.2
		Arochlor 1232	mg/kg	0.2	<0.2
		Arochlor 1242	mg/kg	0.2	<0.2
		Arochlor 1248	mg/kg	0.2	<0.2
		Arochlor 1254	mg/kg	0.2	<0.2
		Arochlor 1260	mg/kg	0.2	<0.2
		Arochlor 1262	mg/kg	0.2	<0.2
		Arochlor 1268	mg/kg	0.2	<0.2
		Total PCBs (Arochlors)	mg/kg	1	<1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	97

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number		Parameter	Units	LOR	Result
LB098829.001		Arsenic, As	mg/kg	3	<3
		Cadmium, Cd	mg/kg	0.3	<0.3
		Chromium, Cr	mg/kg	0.3	<0.3
		Copper, Cu	mg/kg	0.5	<0.5
		Lead, Pb	mg/kg	1	<1
		Nickel, Ni	mg/kg	0.5	<0.5
		Zinc, Zn	mg/kg	0.5	<0.5

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number		Parameter	Units	LOR	Result
LB098877.001		Arsenic, As	μg/L	1	<1
		Cadmium, Cd	μg/L	0.1	<0.1
		Chromium, Cr	μg/L	1	<1
		Copper, Cu	μg/L	1	<1
		Lead, Pb	μg/L	1	<1
		Nickel, Ni	μg/L	1	<1
		Zinc, Zn	μg/L	5	<5

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result
LB098806.001		TRH C10-C14	mg/kg	20	<20
		TRH C15-C28	mg/kg	45	<45
		TRH C29-C36	mg/kg	45	<45
		TRH C37-C40	mg/kg	100	<100
		TRH C10-C36 Total	mg/kg	110	<110

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result
LB098805.001		TRH C10-C14	µg/L	50	<50
		TRH C15-C28	µg/L	200	<200
		TRH C29-C36	µg/L	200	<200
		TRH C37-C40	µg/L	200	<200

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result
LB098799.001	Monocyclic Aromatic Hydrocarbons	Benzene	mg/kg	0.1	<0.1
		Toluene	mg/kg	0.1	<0.1
		Ethylbenzene	mg/kg	0.1	<0.1
		m/p-xylene	mg/kg	0.2	<0.2
		o-xylene	mg/kg	0.1	<0.1
	Polycyclic VOCs	Naphthalene	mg/kg	0.1	<0.1
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	99
		d4-1,2-dichloroethane (Surrogate)	%	-	100
		d8-toluene (Surrogate)	%	-	102
		Bromofluorobenzene (Surrogate)	%	-	94
	Totals	Total BTEX	mg/kg	0.6	<0.6

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result
LB098897.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		o-xylene	µg/L	0.5	<0.5
	Polycyclic VOCs	Naphthalene	µg/L	0.5	<0.5
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	111
		d4-1,2-dichloroethane (Surrogate)	%	-	116
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	91

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number		Parameter	Units	LOR	Result
LB098799.001		TRH C6-C9	mg/kg	20	<20
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	99
		d4-1,2-dichloroethane (Surrogate)	%	-	100
		d8-toluene (Surrogate)	%	-	102

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number		Parameter	Units	LOR	Result
LB098897.001		TRH C6-C9	µg/L	40	<40
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	111
		d4-1,2-dichloroethane (Surrogate)	%	-	116
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	91

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.015	LB098836.010	Mercury	μg/L	0.0001	<0.0001	0.0000	200	120

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.010	LB098830.014	Mercury	mg/kg	0.01	0.03	0.03	187	0

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.008	LB098815.011	% Moisture	%w/w	0.5	16	16	36	1
SE150913.016	LB098815.019	% Moisture	%w/w	0.5	<0.5	<0.5	200	0

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.010	LB098806.014		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Lindane	mg/kg	0.1	<0.1	<0.1	200	0
			Heptachlor	mg/kg	0.1	<0.1	<0.1	200	0
			Aldrin	mg/kg	0.1	<0.1	<0.1	200	0
			Beta BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Delta BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	200	0
			o,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
			Gamma Chlordane	mg/kg	0.1	0.2	0.1	96	46
			Alpha Chlordane	mg/kg	0.1	0.2	0.1	97	41
			trans-Nonachlor	mg/kg	0.1	0.1	<0.1	131	15
			p,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
			Dieldrin	mg/kg	0.2	0.4	0.3	58	43
			Endrin	mg/kg	0.2	<0.2	<0.2	200	0
			o,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
			o,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
			Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
			p,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
			p,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
			Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	200	0
			Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	200	0
			Methoxychlor	mg/kg	0.1	<0.1	<0.1	200	0
			Endrin Ketone	mg/kg	0.1	<0.1	<0.1	200	0
			Isodrin	mg/kg	0.1	<0.1	<0.1	200	0
			Mirex	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.14	0.15	30	6

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.010	LB098806.014		Dichlorvos	mg/kg	0.5	<0.5	<0.5	200	0
			Dimethoate	mg/kg	0.5	<0.5	<0.5	200	0
			Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5	200	0
			Fenitrothion	mg/kg	0.2	<0.2	<0.2	200	0
			Malathion	mg/kg	0.2	<0.2	<0.2	200	0
			Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2	200	0
			Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2	200	0
			Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2	200	0
			Methidathion	mg/kg	0.5	<0.5	<0.5	200	0
			Ethion	mg/kg	0.2	<0.2	<0.2	200	0
			Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2	200	0
		Surrogates	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.4	0.4	30	0
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	2

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150868.002	LB098806.021		Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
			Phenanthrene	mg/kg	0.1	<0.1	<0.1	200	0
			Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Chrysene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	134	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	<0.2	175	0
			Total PAH (18)	mg/kg	0.8	<0.8	<0.8	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	30	6
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.4	0.4	30	8
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.4	30	2
SE150913.010	LB098806.014		Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
			Phenanthrene	mg/kg	0.1	<0.1	<0.1	200	0
			Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Pyrene	mg/kg	0.1	<0.1	<0.1	173	0
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	173	0
			Chrysene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	134	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	<0.2	175	0
			Total PAH (18)	mg/kg	0.8	<0.8	<0.8	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.4	0.5	30	4
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.4	0.4	30	0
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	2

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.010	LB098806.014		Arochlor 1016	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1221	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1232	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1242	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1248	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1254	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1260	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1262	mg/kg	0.2	<0.2	<0.2	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PCBs in Soil (continued)

Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.010	LB098806.014		Arochlor 1268	mg/kg	0.2	<0.2	<0.2	200	0
			Total PCBs (Arochlors)	mg/kg	1	<1	<1	200	0
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0	0	30	6

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150952.003	LB098967.014	pH	pH Units	-	6.792	6.829	31	1
SE150952.006	LB098967.018	pH	pH Units	-	7.531	7.567	31	0

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.010	LB098829.014	Arsenic, As	mg/kg	3	3	3	62	4
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	145	0
		Chromium, Cr	mg/kg	0.3	9.3	9.5	35	3
		Copper, Cu	mg/kg	0.5	18	19	33	3
		Lead, Pb	mg/kg	1	200	190	31	4
		Nickel, Ni	mg/kg	0.5	2.1	2.2	53	5
		Zinc, Zn	mg/kg	0.5	67	65	33	2
SE150916A.037	LB098829.027	Arsenic, As	mg/kg	3	<3	<3	71	16
		Cadmium, Cd	mg/kg	0.3	1.4	1.5	50	7
		Chromium, Cr	mg/kg	0.3	42	42	31	1
		Copper, Cu	mg/kg	0.5	390	420	30	8
		Lead, Pb	mg/kg	1	700	820	30	16
		Nickel, Ni	mg/kg	0.5	51	53	31	5
		Zinc, Zn	mg/kg	0.5	4300	4700	30	8

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.015	LB098877.019	Arsenic, As	µg/L	1	<1	<1	200	0
		Cadmium, Cd	µg/L	0.1	<0.1	<0.1	200	0
		Chromium, Cr	µg/L	1	<1	<1	200	0
		Copper, Cu	µg/L	1	<1	<1	200	0
		Lead, Pb	µg/L	1	<1	<1	200	0
		Nickel, Ni	µg/L	1	<1	<1	200	0
		Zinc, Zn	µg/L	5	180	180	18	2

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150868.002	LB098806.021		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH C10-C40 Total	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0
SE150913.010	LB098806.014		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH C10-C40 Total	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Original	Duplicate	Parameter	Units	LOR

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433/AN434

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.008	LB098799.014	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
			Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	5.0	5.2	50	5
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.1	3.7	50	8
			d8-toluene (Surrogate)	mg/kg	-	4.4	4.7	50	6
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.8	5.1	50	6
		Totals	Total Xylenes*	mg/kg	0.3	<0.3	<0.3	200	0
			Total BTEX	mg/kg	0.6	<0.6	<0.6	200	0
SE150913.014	LB098799.024	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	0.01	200	0
			Toluene	mg/kg	0.1	<0.1	0.01	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	0.01	200	0
			m/p-xylene	mg/kg	0.2	<0.2	0.02	200	0
			o-xylene	mg/kg	0.1	<0.1	0.01	200	0
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	0	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.6	4.71	50	1
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.0	3.6	50	11
			d8-toluene (Surrogate)	mg/kg	-	4.1	4.06	50	0
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.2	4.12	50	2
		Totals	Total Xylenes*	mg/kg	0.3	<0.3	0.03	200	0
			Total BTEX	mg/kg	0.6	<0.6	0.06	200	0

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150913.008	LB098799.014		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	5.0	5.2	30	5
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.1	3.7	30	8
			d8-toluene (Surrogate)	mg/kg	-	4.4	4.7	30	6
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.8	5.1	30	6
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0
SE150913.014	LB098799.024		TRH C6-C10	mg/kg	25	<25	0.17	200	0
			TRH C6-C9	mg/kg	20	<20	0	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.6	4.71	30	1
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.0	3.6	30	11
			d8-toluene (Surrogate)	mg/kg	-	4.1	4.06	30	0
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.2	4.12	30	2
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	0.01	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	0.11	200	0

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE150855.004	LB098897.014		TRH C6-C10	µg/L	50	0	0	200	0
			TRH C6-C9	µg/L	40	0	0	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.65	5.88	30	4
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.81	5.68	30	2
			d8-toluene (Surrogate)	µg/L	-	4.41	4.51	30	2
			Bromofluorobenzene (Surrogate)	µg/L	-	4.29	4.52	30	5
		VPH F Bands	Benzene (F0)	µg/L	0.5	0.03	0.02	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	-0.09	-0.07	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098882.002	Exchangeable Sodium, Na	mg/kg	2	NA	390	80 - 120	85
	Exchangeable Potassium, K	mg/kg	2	NA	343	80 - 120	87
	Exchangeable Calcium, Ca	mg/kg	2	NA	2570	80 - 120	91
	Exchangeable Magnesium, Mg	mg/kg	2	NA	635	80 - 120	89
LB098997.002	Exchangeable Sodium, Na	mg/kg	2	NA	390	80 - 120	85
	Exchangeable Potassium, K	mg/kg	2	NA	343	80 - 120	87
	Exchangeable Calcium, Ca	mg/kg	2	NA	2570	80 - 120	91
	Exchangeable Magnesium, Mg	mg/kg	2	NA	635	80 - 120	89

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098830.002	Mercury	mg/kg	0.01	0.19	0.2	70 - 130	93

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098806.002	Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	92
	Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	100
	Delta BHC	mg/kg	0.1	0.2	0.2	60 - 140	91
	Dieldrin	mg/kg	0.2	<0.2	0.2	60 - 140	97
	Endrin	mg/kg	0.2	<0.2	0.2	60 - 140	85
	p,p'-DDT	mg/kg	0.1	0.2	0.2	60 - 140	75
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.15	0.15	40 - 130	100

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098806.002	Dichlorvos	mg/kg	0.5	1.7	2	60 - 140	85
	Diazinon (Dimpylate)	mg/kg	0.5	1.9	2	60 - 140	97
	Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	1.8	2	60 - 140	92
	Ethion	mg/kg	0.2	1.7	2	60 - 140	85
Surrogates	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	78
	d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	80

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098806.002	Naphthalene	mg/kg	0.1	3.8	4	60 - 140	96
	Acenaphthylene	mg/kg	0.1	4.0	4	60 - 140	100
	Acenaphthene	mg/kg	0.1	3.8	4	60 - 140	96
	Phenanthrene	mg/kg	0.1	3.9	4	60 - 140	98
	Anthracene	mg/kg	0.1	4.2	4	60 - 140	105
	Fluoranthene	mg/kg	0.1	3.9	4	60 - 140	98
	Pyrene	mg/kg	0.1	3.6	4	60 - 140	90
	Benzo(a)pyrene	mg/kg	0.1	4.1	4	60 - 140	102
Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	90
	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	78
	d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	80

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098806.002	Arochlor 1260	mg/kg	0.2	0.5	0.4	60 - 140	115

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098967.003	pH	pH Units	-	7.5	7.415	98 - 102	101

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098829.002	Arsenic, As	mg/kg	3	44	50	80 - 120	89
	Cadmium, Cd	mg/kg	0.3	44	50	80 - 120	89
	Chromium, Cr	mg/kg	0.3	43	50	80 - 120	86
	Copper, Cu	mg/kg	0.5	42	50	80 - 120	85
	Lead, Pb	mg/kg	1	44	50	80 - 120	88
	Nickel, Ni	mg/kg	0.5	44	50	80 - 120	87
	Zinc, Zn	mg/kg	0.5	43	50	80 - 120	85

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098877.002	Arsenic, As	µg/L	1	20	20	80 - 120	101
	Cadmium, Cd	µg/L	0.1	20	20	80 - 120	100
	Chromium, Cr	µg/L	1	20	20	80 - 120	102
	Copper, Cu	µg/L	1	20	20	80 - 120	102
	Lead, Pb	µg/L	1	20	20	80 - 120	100
	Nickel, Ni	µg/L	1	21	20	80 - 120	103
	Zinc, Zn	µg/L	5	21	20	80 - 120	105

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098806.002		TRH C10-C14	mg/kg	20	37	40	60 - 140	93
		TRH C15-C28	mg/kg	45	<45	40	60 - 140	85
		TRH C29-C36	mg/kg	45	<45	40	60 - 140	68
	TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	36	40	60 - 140	90
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	78
		TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	65

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098805.002		TRH C10-C14	µg/L	50	1000	1200	60 - 140	84
		TRH C15-C28	µg/L	200	1100	1200	60 - 140	90
		TRH C29-C36	µg/L	200	1000	1200	60 - 140	87
	TRH F Bands	TRH >C10-C16 (F2)	µg/L	60	1100	1200	60 - 140	88
		TRH >C16-C34 (F3)	µg/L	500	1100	1200	60 - 140	91
		TRH >C34-C40 (F4)	µg/L	500	510	600	60 - 140	86

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098799.002	Monocyclic Aromatic	Benzene	mg/kg	0.1	3.0	2.9	60 - 140	105
		Toluene	mg/kg	0.1	2.5	2.9	60 - 140	85
		Ethylbenzene	mg/kg	0.1	2.3	2.9	60 - 140	79
		m/p-xylene	mg/kg	0.2	5.1	5.8	60 - 140	88
		o-xylene	mg/kg	0.1	2.3	2.9	60 - 140	80
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.3	5	60 - 140	86
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.3	5	60 - 140	86
		d8-toluene (Surrogate)	mg/kg	-	4.7	5	60 - 140	93
		Bromofluorobenzene (Surrogate)	mg/kg	-	6.3	5	60 - 140	126

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098897.002	Monocyclic Aromatic	Benzene	µg/L	0.5	50	45.45	60 - 140	110
		Toluene	µg/L	0.5	50	45.45	60 - 140	110
		Ethylbenzene	µg/L	0.5	50	45.45	60 - 140	109
		m/p-xylene	µg/L	1	100	90.9	60 - 140	110
		o-xylene	µg/L	0.5	50	45.45	60 - 140	109
	Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	4.9	5	60 - 140	98
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.3	5	60 - 140	105
		d8-toluene (Surrogate)	µg/L	-	4.9	5	60 - 140	98
		Bromofluorobenzene (Surrogate)	µg/L	-	4.5	5	60 - 140	90

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number	Parameter	Units	LOR

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Volatile Petroleum Hydrocarbons in Soil (continued)

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098799.002		TRH C6-C10	mg/kg	25	<25	24.65	60 - 140	89
		TRH C6-C9	mg/kg	20	<20	23.2	60 - 140	86
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.3	5	60 - 140	86
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.3	5	60 - 140	86
		d8-toluene (Surrogate)	mg/kg	-	4.7	5	60 - 140	93
		Bromofluorobenzene (Surrogate)	mg/kg	-	6.3	5	60 - 140	126
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	7.25	60 - 140	93

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB098897.002		TRH C6-C10	µg/L	50	940	946.63	60 - 140	100
		TRH C6-C9	µg/L	40	770	818.71	60 - 140	94
	Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	4.3	5	60 - 140	87
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	4.4	5	60 - 140	88
		d8-toluene (Surrogate)	µg/L	-	4.7	5	60 - 140	94
		Bromofluorobenzene (Surrogate)	µg/L	-	5.5	5	60 - 140	110
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	630	639.67	60 - 140	98

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE150805.009	LB098836.006	Mercury	mg/L	0.0001	0.0073	<0.0001	0.008	92

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE150913.001	LB098830.004	Mercury	mg/kg	0.01	0.20	0.02	0.2	91

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number	Parameter	Units	LOR	Original	Spike	Recovery%
SE150913.002	LB098806.022	Naphthalene	mg/kg	0.1	<0.1	4	92
		2-methylnaphthalene	mg/kg	0.1	<0.1	-	-
		1-methylnaphthalene	mg/kg	0.1	<0.1	-	-
		Acenaphthylene	mg/kg	0.1	<0.1	4	94
		Acenaphthene	mg/kg	0.1	<0.1	4	92
		Fluorene	mg/kg	0.1	<0.1	-	-
		Phenanthrene	mg/kg	0.1	<0.1	4	101
		Anthracene	mg/kg	0.1	<0.1	4	100
		Fluoranthene	mg/kg	0.1	<0.1	4	94
		Pyrene	mg/kg	0.1	<0.1	4	91
		Benzo(a)anthracene	mg/kg	0.1	<0.1	-	-
		Chrysene	mg/kg	0.1	<0.1	-	-
		Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	-	-
		Benzo(k)fluoranthene	mg/kg	0.1	<0.1	-	-
		Benzo(a)pyrene	mg/kg	0.1	<0.1	4	98
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	-	-
		Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	-	-
		Benzo(ghi)perylene	mg/kg	0.1	<0.1	-	-
		Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	-	-
		Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	-	-
		Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	-	-
		Total PAH (18)	mg/kg	0.8	<0.8	-	-
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.4	-	80
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.4	-	80
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	-	76

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE150913.001	LB098829.004	Arsenic, As	mg/kg	3	50	4	50	90
		Cadmium, Cd	mg/kg	0.3	44	<0.3	50	88
		Chromium, Cr	mg/kg	0.3	50	7.6	50	86
		Copper, Cu	mg/kg	0.5	52	8.9	50	87
		Lead, Pb	mg/kg	1	69	30	50	78
		Nickel, Ni	mg/kg	0.5	46	3.4	50	86
		Zinc, Zn	mg/kg	0.5	82	45	50	73

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE150743.001	LB098877.004	Arsenic, As	µg/L	1	24	4	20	103
		Cadmium, Cd	µg/L	0.1	20	<0.1	20	100
		Chromium, Cr	µg/L	1	21	<1	20	102
		Copper, Cu	µg/L	1	21	2	20	97
		Lead, Pb	µg/L	1	19	<1	20	96
		Nickel, Ni	µg/L	1	32	12	20	100
		Zinc, Zn	µg/L	5	130	120	20	91

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number	Parameter	Units	LOR

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

TRH (Total Recoverable Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE150913.002	LB098806.023		TRH C10-C14	mg/kg	20	<20	40	118
			TRH C15-C28	mg/kg	45	<45	40	108
			TRH C29-C36	mg/kg	45	<45	40	90
			TRH C37-C40	mg/kg	100	<100	-	-
			TRH C10-C36 Total	mg/kg	110	<110	-	-
			TRH C10-C40 Total	mg/kg	210	<210	-	-
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	<25	40	115
			TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	-	-
			TRH >C16-C34 (F3)	mg/kg	90	<90	40	100
			TRH >C34-C40 (F4)	mg/kg	120	<120	-	-

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE150868.001	LB098799.004	Monocyclic Aromatic	Benzene	mg/kg	0.1	2.2	<0.1	2.9	77
			Toluene	mg/kg	0.1	2.4	<0.1	2.9	80
			Ethylbenzene	mg/kg	0.1	2.0	<0.1	2.9	67
			m/p-xylene	mg/kg	0.2	4.0	0.2	5.8	65
			o-xylene	mg/kg	0.1	2.0	<0.1	2.9	66
		Polycyclic	Naphthalene	mg/kg	0.1	4.0	7.9	-	-
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	5.0	3.8	-	100
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.6	3.9	-	91
			d8-toluene (Surrogate)	mg/kg	-	6.4	5.6	-	127
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.3	5.3	-	107
		Totals	Total Xylenes*	mg/kg	0.3	5.9	<0.3	-	-
			Total BTEX	mg/kg	0.6	13	<0.6	-	-

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE150868.001	LB098799.004		TRH C6-C10	mg/kg	25	67	45	24.65	89
			TRH C6-C9	mg/kg	20	35	20	23.2	63
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	5.0	3.8	-	100
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.6	3.9	-	91
			d8-toluene (Surrogate)	mg/kg	-	6.4	5.6	-	127
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.3	5.3	-	107
		VPH F Bands	Benzene (F0)	mg/kg	0.1	2.2	<0.1	-	-
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	55	45	7.25	136

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover tthe performance of this service.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.

①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to Analytical Report comments for further information.

SGS Environmental Services is accredited by NATA for Chemical Testing (Reg.No.2562) and Quality System compliance to ISO/IEC 17025. The QC parameters contained within are designed to meet NEPM 1999 requirements.

Quality Control samples included in any analytical run are listed below.

Reagent/Analysis Blank (BLK) **Method Blank (MB)**	Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. A reagent blank is prepared and analysed with every batch of samples plus with each new batch of solvent prior to use.
Sample Matrix Spike (MS) & Matrix Spike Duplicate (MSD)	Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water may be used. A duplicate spiked sample is analysed at least every 20 samples.
Surrogate Spike (SS)	At least one but up to three surrogate compounds are added to all samples requiring analysis for organics prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples. Where possible they are surrogate compounds recommended by the USEPA.
Control Matrix Spike (CMS)	To ensure spike recoveries can be determined for every batch of samples a control matrix is spiked with identical concentrations of target analyte(s) and then analysed. These results allow recoveries to be determined in the event that the matrix spikes are unusable (eg. matrix spikes performed on heavily contaminated samples). These are analysed at least every 20 samples.
Internal Standard (IS)	Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments. Where possible they are standard compounds recommended by the USEPA.
Lab Duplicates (D)	A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Lab Control Standards/Samples (LCS)	Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity. Thereafter they are analysed at least every one in 20 samples plus at the end of each analytical run. This data is not reported.
Continuous Calibration Verification (CCV) or **Calibration Check Standard & Blank**	A calibration check standard or CCV and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift. Calibration Standards are checked old versus new with a criteria of ±10%

1 OBJECTIVE

This procedure will be used by the laboratory to comply with NEPM requirements for QA/QC reporting (and is typical of other regulatory requirements).

This procedure is applicable to all Environmental samples eg from Environmental Consultants. Samples from non-Environmental Consultants such as Councils, mines or trade waste etc do not necessarily have to conform with these requirements, however, it will be the Envirolab Group's default policy that this procedure be used whenever possible.

2 DEFINITIONS

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.

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware, instrument etc, can be determined by processing solvents, acids and reagents in exactly the same manner as for samples. Other terms cited in literature, but not used here include: Reagent Blank, Control Blank, Method Blank.

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. Other terms cited in literature include Laboratory Fortified Matrix. It is suggested that the spiking concentration be near the middle of the working calibration range.

Surrogate Spike

Surrogates are known additions to each standard, sample, blank, matrix spike and LCS in a process batch, of compounds which are similar to the analyte of interest in terms of:
a) extraction
b) recovery through clean up procedures
c) response to chromatography or other determinations

but which:
d) are not expected to be found in real samples
e) will not interfere with quantification of any analyte of interest
f) may be separately and independently quantified

These are only applicable to organic testing.

Internal Standards

Internal standards are used to check the consistency of the analytical step (e.g. injections, retention times, potential instrument suppression/enhancement etc) and provide a reference against which results may be adjusted in case of variation. For many organic and metals analyses, internal standards are added after all extraction, cleanup and concentration steps, to each final extract solution/sample/standard.

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. Other terms cited in literature include: laboratory control standard, quality control check sample, laboratory fortified blank.

Process Batch

A group of samples which behave similarly with respect to the sampling or the testing procedures being employed and which are processed as a unit for QC purposes. It is important that all factors within a process batch be the same. If any factors change e.g. reagents, staff, standards then a new process batch is deemed to have begun. A process batch is considered to be $\leq$20 samples.

Percent Recovery

Percent recovery describes the capability of the method to recover a known amount of analyte added to the sample.

% Recovery = C-A / B x 100

where: A = natural concentration of analyte in the sample
B = concentration of analyte added to the sample
C = concentration of analyte determined in the spiked sample

RPD (Relative Percent Difference)

This calculation measures the precision between two figures. Commonly used to compare the precision of Duplicate results.

% RPD = ((Highest – Lowest)/Average) x 100

3 QC REQUIRED AND WHAT IS REPORTED

The following QC is required for all Environmental Samples, unless justified otherwise by a Manager/Supervisor.

Blank

At least one per process batch.
The Blanks must be labelled throughout the day e.g.: Blk_1, Blk_2 etc.
The Blank is analysed at a rate of one per $\leq$20 samples.

LCS

At least one per process batch.
The LCS's must be labelled throughout the day e.g.: LCS_1, LCS_2 etc.
The LCS is reported to all clients at a rate of one per $\leq$20 samples.

Duplicate

At least one per ten samples i.e. a Duplicate is carried $\leq$ 10 samples.
So, if there is one process batch of 100 samples there will be at least 10 Duplicates.
There are instances where there is insufficient sample for a duplicate analysis and hence the

frequency will not apply, however, every effort will be made to perform a duplicate in each process batch (water volumes supplied for VOC and SVOC are often insufficient).

The Duplicate is only reported to the client if it is performed on their sample.

Matrix Spike

One for each soil/water/air sample (where applicable) type e.g.: if a batch contains soils/waters/air samples then a matrix spike must be done on each sample type at a frequency of 5%, typically a matrix spike is carried out where ≥5 samples and then every 20.

The sample type is generally recorded on the Chain of Custody. If a client calls all samples 'soil' then we will treat all samples as 1 sample type (unless they are very obviously different).
If there is only one sample type e.g. soil, then a matrix spike is performed every 20 samples.

There is no requirement in NEPM for a Matrix Spike Duplicate.

The Matrix Spike is only reported to the client if it is performed on their sample.

Certified/Standard Reference Materials

Where available, CRMs/SRMs are analysed (particularly during validation/verification). Due to the high cost and lack of stability of many CRMs/SRMs, the frequency of analysis is relatively low. Typically SRMs are run for Metals only (e.g. AGAL series 6, 10, 12 for example) as they are cost effective and stable over a long period of time. Therefore once a week or once a month is not uncommon.

4 ACCEPTANCE CRITERIA

If QC fails, take corrective action promptly to determine and eliminate the source of the error. Do not report data until the cause of the problem is identified and either corrected or qualified by a supervisor.

Matrix Spikes

As a general rule, the recoveries of most analytes spiked into samples should fall within the range 60% - 140% and this range should be used as a guide in evaluating in house performance, exceptions exist within individual methods. (*see tables 1-3 below for global acceptance criteria*).

Matrix Spikes will regularly fail, often due to matrix interferences. If a Matrix Spike fails it should be investigated:

a) check calculations and transcriptions to ensure a mistake has not been made.

b) look at the background concentration of the sample. If sample background is high then recovery can be affected (sample heterogeneity). A useful rule of thumb is where background concentration of an analyte is >3* the spike level then the spike recovery is n/a, however, where the sample is very non-homogenous acceptable spike recovery may be difficult. As long as the LCS is acceptable (*see below*) then the Process Batch will be accepted.

c) If the LCS has also failed then the Process Batch is deemed to have failed and data should not be reported unless justified. The batch should be repeated after consultation with the supervisor, possibly replacing standards or reagents (see guidelines below).

If a matrix spike has failed yet the process batch has been accepted by the supervisor, the failed matrix spike should still be reported to the client (unless the spiked sample has very high background levels). This should be accompanied by an appropriate comment such as ‘percent recovery not available due to significant background levels of analyte in the sample’ or ‘the matrix spike recovery was outside recommended acceptance criteria, however, an acceptable recovery was achieved for the LCS. This indicates a sample matrix interference’.

Matrix spikes are not carried out for all tests. These exceptions are mainly the inorganic tests such as TSS, pH, EC etc. and OHS samples (tubes/badges/filters/swabs etc) where all the sample is extracted as opposed to a portion. In these cases an acceptable LCS is required.

Matrix spikes are also not reported for all analytes. For example in a SVOC run of >100 analytes it is acceptable to only spike a range of analytes e.g. some PAHs, some OCP, some OPP, some speciated Phenols etc.

Duplicates

Acceptable Duplicate data is judged by % RPD.

See tables 1-3 below for acceptance criteria, the acceptance criteria will increase as the analyte concentration approaches the PQL as measurement uncertainty will become a more significant factor.

If a water duplicate fails then repeat the analysis (if there is sufficient sample left). If the RPD% fails again it is likely to be due to a non-homogeneity or a matrix issue and an appropriate comment should be applied to the report such as ‘the duplicate is outside acceptable %RPD, re-analysis indicates possible sample heterogeneity’. All failed duplicate results should be reported, a triplicate should be reported to illustrate analyte variability where applicable. *Poor reproducibility for water samples is rare unless the sediment loading is significant*.

If a soil duplicate fails then it should be repeated (if there is sufficient sample left). If the RPD% fails again it is likely to be due to a matrix non-homogeneity issue and an appropriate comment should be applied to the report such as ‘the duplicate is outside acceptable %RPD, reanalysis indicates possible sample heterogeneity’. All failed duplicate results should be reported and a triplicate should be reported to illustrate analyte variability where applicable. Soil matrices are a common issue with poor analyte precision given samples are typically prepared field moist

If an air duplicate fails then it should be repeated (if there is sufficient sample left). Duplicates for air samples are only applicable for canister and air sample (tedlar) bag analyses, precision failures should be rare given the relative simplicity of the matrix, however variation will be higher near reporting limits (PQL).

Internal Standards

Acceptance criteria for internal standards are 70-130% for Metals and 50-150% for Organics, note exceptions may exist in individual methods – see tables 1 and 3 below.

If internal standards exceed this criteria they will need to be either re-vialed and re-run for organics or diluted and re-run for metals. If they continue to fail consult the supervisor.

Surrogates

Surrogate recoveries should generally be within the range of 60-140%, table 3 below.

High analyte concentrations may cause surrogates to fail – this needs to be annotated on the final report (e.g. for svTRH).

The surrogate recovery in BLKs and LCSs should be within Global Acceptance Criteria (GAC) or Analyte Specific Acceptance Criteria (ASAC) for labile surrogates (e.g. d5-phenol etc.). The GAC and ASAC are discussed in more detail below.

Certified/Standard Reference Materials

CRMs/SRM recoveries should generally be within the range of 70-130%. Some certified levels are below or within 10*PQL and therefore ±30% tolerance is not achievable on all instruments (e.g. some elements in AGAL12 will struggle with this criteria on ICP-OES but should be achieved on ICP-MS due to higher uncertainty based on PQL differences for the two instruments).

Global Acceptance Criteria (GAC) for Matrix Spikes, LCS and BLKS

The criteria specified below covers >90% of the analytes determined by the laboratory, however due to limitation of the methodology and/or the labile nature of some analytes there are analytes whose recovery is outside of this acceptance criteria (GAC). Therefore ***Analyte Specific Acceptance Criteria*** (ASAC) is applied for these analytes. The ASAC is determined from 6-12 months of LCS recovery data and is Defined as 3 x std dev from the mean LCS recovery %.

See GAC in the tables below.

Table 1 – Metals GAC

	ICV	CCV	Internal Standards	LCS	PQL std	Calibration Blank	Matrix Spikes#	%RPD≥ 10*PQL@	5*PQL≥*sample* *%RPD*<10*PQL@	%RPD<5*PQL
Dissolved Waters	±10%	±20%	70-130%	±20%	±50%	<1/2*PQL std	±30%	20	50	any
Impingers	±10%	±20%	70-130%	±20%	±50%	<1/2*PQL std	±30%	30	50	any
Total Waters	±10%	±20%	70-130%	±20%	±50%	<1/2*PQL std	±30%	30	50	any
Soils/Paint/Filters (if cut in pieces)	±10%	±20%	70-130%	±30%	±50%	<1/2*PQL std	±30%	40	50	any

n/a where background is ≥ 3* spike level
@ where an original and duplicate result are above and below a cut off (5* and 10*PQL), then the mean of the two defines the criteria used.

Table 2 – Inorganics GAC

	ICV (LCS in many cases)	CCV	PQL std	Calibration Blank	LCS	Matrix Spikes#	%RPD≥10*PQL[@]	5*PQL≥*sample %RPD*<10*PQL[@]	%RPD<5*PQL
Waters - Nutrients no preparation	±20%	±20%	±50%	<1/2*PQL std	±20%	±30%	20	50	any
Waters digested/distilled	±20%	±20%	±50%	<1/2*PQL std	±20%	±30%	30	50	any
Impingers	±20%	±20%	±50%	<1/2*PQL std	±20%	±30%	30	50	any
Soils/Filters (if cut in pieces)	±20%	±20%	±50%	<1/2*PQL std	±30%	±30%	30	50	any

n/a where background is ≥ 3* spike level
@ where an original and duplicate result are above and below a cut off (5* and 10*PQL) then the average defines the criteria used.

Table 3 - Organics (includes Air Toxics unless specified in the method) GAC (TD tubes are an exception for field duplicates)

	ICV (LCS in many cases)	CCV*	Internal Stds	PQL std	Calibration Blank	LCS[$]	Matrix Spikes#[$] and Surrogates	%RPD≥5*PQL (although sampling may be the source of error)	%RPD<5*PQL
Waters/Air Toxic - VOC	±20%	±20%	50-150%	±50%	n/a	±20%	±40%	30	any
Waters extracted	±20%	±20%	50-150%	±50%	n/a	±40%	±40%	50	any
Soils	±20%	±20%	50-150%	±50%	n/a	±40%	±40%	50	any

n/a where background is ≥ 3* spike level
$ - there will be exception to this rule as some analytes are particularly labile and recovery as low as 10% has been documented in the literature (see ASAC).

@ where an original and duplicate result are above and below a cut off (5* and 10*PQL) then the average defines the criteria used.

See MICRO/ASBESTOS and ASS methods for acceptance criteria in those sections.

Decision Path for LCS

As a general rule, the recoveries of most LCS's should fall within the ranges specified in the tables above.

If an LCS fails it should be investigated:-

a) check calculations and transcriptions to ensure a basic mistake has not been made.

b) If all other QC has passed, repeat the LCS analysis. If the LCS fails again it should be re-made and re-analysed.

c) If the LCS fails after the second attempt there could be a problem with the LCS and hence the procedure – consult the supervisor.

If the failure is specific to the LCS then the Process Batch may be acceptable, if not, then repeat the process batch (if sufficient sample available). If insufficient sample is available then the data must be qualified with respect to the LCS result (for example a surrogate is half the expected value for all samples and LCS, this may be due to a setting on a pipette and is not reflective of poor extraction efficiency).

d) If the LCS fails the criteria in the GAC tables above, then compare to the ASAC for the individual analytes (i.e. 3 x stdev of LCS over 6-12 months). If within these criteria then the LCS is acceptable as long as above 10% recovery. Recovery below this limit implies the analytical method in not fit for purpose and hence the data must be qualified accordingly if reported.

There should be an LCS available for >99% of tests (exceptions include Asbestos for example).

Practical Quantitation Limit Checks (PQLs)

As can be seen from the tables above, a PQL standard run in the calibration or as a sample can be used to confirm the ability to determine the PQL on a sequence by sequence basis. This negates the need for MDL studies as the PQL is confirmed for each analytical sequence.

5 CHECKING THE CORRECTNESS OF ANALYSIS (see also form 346)

Anion Cation Balance

The anion and cation sums, when expressed as milliequivalents per litre, must approximately balance because all potable waters are electrically neutral.

As a minimum ion balance is determined from cations:-Na/Ca/Mg/K and anions:- Alk/Cl/SO_4.

The full calculation can be found in APHA and Form 213 - Mass Balance Calculation sheet can be used to determine the ion balance in Excel.

The acceptance criteria in APHA are very strict as they are based on potable water. The environmental waters we receive could rarely be termed potable so our % Difference has been determined to be ±15%, with supervisor discretion.

If the % is >15% for “cation total Meq vs anion total Meq” then there is a possibility of gross error and reruns/checks may be necessary. If the result is confirmed then an appropriate comment must accompany the report such as ‘the mass imbalance may be caused by other ions that have not been measured’. Extremes of pH can also cause an imbalance.

TDS v Ions

Measured TDS should be similar or greater than ion calculated TDS. This is because the calculation will normally not involve ions such as F, Si, NO_3 etc.

Note, as a guide in mg/L:-

0.6(alk) + Cl + SO_4 + Na + Ca + Mg + K + = Approx TDS.

Measured EC and Ion sums

Both the anion & cation sums (expressed as meq) should be 1/100 of the measured EC value. If either of the 2 sums does not meet this criteria, that sum is suspect.

The calculation is: 100 x anion (or cation sum) meq/L = (0.9-1.1 EC).

The full calculation can be found in APHA or use the spreadsheet i.e. Form 213 - Mass Balance Calculation sheet v1. Note another useful rule of thumb is that Chloride (mg/L) is $^1/_3$ of EC.

Measured TDS to EC Ratio

EC x (0.55-0.7) = TDS.

If it is outside this criteria one of the tests may be suspect. The exception is waters with high colloidal particulates that may contribute to a higher measured TDS result.

Metals – Total Recoverable v Dissolved.

In theory Total recoverable metals must be equal or higher than dissolved metals for the same water sample. If the difference is within the uncertainty of the individual tests then this should be noted on the worksheets. If the difference is outside the uncertainty of the individual tests then one of the results is suspect and should be re-analysed for confirmation/denial.

Metals – CrVI vs total dissolved Cr and FeII vs total dissolved Fe

The sample preservation for hexavalent Chromium, Ferrous Iron and the total dissolved Chromium and Iron are from different preservations. Hence different bottles are used during sampling which can lead to variations in results given:-

$Cr^{VI} \leq$ total dissolved Cr and $Fe^{II} \leq$ total dissolved Fe (taking into account some MU in analysis)

A common source of error is where samples for Cr^{VI} and Fe^{II} are not field filtered (into caustic and HCl preserved containers respectively), whereas the total dissolved metals are field filtered into HNO_3 preserved bottles. Therefore interaction with sediment can lead to higher Cr^{VI} and Fe^{II} numbers than would be given if filtered. Therefore, where this occurs a note should be recorded on the report and/or communicated to the customer/sampler.

Organics

Some simple checks to be aware of include:

C_6-C_{10} should generally be greater than BTEX.

>C_{10}-C_{36} should generally be greater than PAH.

Naphthalene in the VOC run should be similar to PAH (SVOC) run, however where the soil is non-homogenous then poor precision may exist. Additionally two different solvent mixes are used which can lead to variability in extraction efficiency.

Nutrients

TKN should be greater than or equal to Ammonia. If the difference is within the uncertainty of the individual tests then this should noted on the worksheets. If the difference is outside the uncertainty of the individual tests then one of the results is suspect and should be reanalysed for confirmation/denial. Use of different bottle for TKN and Ammonia can cause anomalies do to sampling variability.

See form 346 for more detail on checking correctness of data.

6 CONTROL CHARTS

Control Charts can be generated from LIMS as required. LCS data is used to construct these charts. LCS data is a good indication of the health of the method.

Matrix spike and duplicate data can vary significantly due to the nature of certain matrices so are not considered an ideal measure. If a MS result is grossly out due to a known interference then control data will be invalidated as the result is an outlier.

Control charts can used to monitor trends and should alert the analyst to potential problems. In theory all plotted data should lie within 2SD (Warning Limits =WL) of the mean or within the target recovery (e.g. GAC and ASAC recovery limits discussed above).

Results outside the CL or outside the target recovery (e.g. GAC and ASAC recovery limits discussed above) should not be accepted unless there is a valid, documented reason.

7 STANDARDS / CALIBRATIONS

Calibration standards are purchased either in commercial mixes that are traceable to NIST (wherever possible with CoAs) and/or as neat compounds/salts. Where possible, purity of neat compounds/salts is >>95% (as high as available but still cost effective). Standards used for calibration are prepared (working standards) as required and allocated a shelf life in accordance with the methods (in house and via international standards) and in consultation with approved suppliers and senior staff experience.

Calibration standards are verified by an independently sourced standard (where available) as described within individual methods. Standards that are used beyond the specified shelf-life (e.g. the default shelf-life for many commercial standards) must be verified by a standard that is within the specified shelf-life.

Note, inorganic salts with purity >>95% (>99% preferable) typically have a shelf life >10 years (the shelf life is typically not specified by the supplier). The standards from such salts are checked versus other sources of analyte regardless, for example a working standard from a $NaNO_3$ salt (as a Nitrate source) could be confirmed as acceptable for use by checking versus a working standard prepared from a KNO_3 salt (or a commercial mix of NO_3 where a CoA is supplied).

Calibration

In general calibrations are linear or linear through zero (i.e. through the blank). Exceptions to this rule occur where the chemistry is non-linear (e.g. some colourimetric chemistry) and quadratic fits can be used. Another example would be for labile Organic analytes where, for example, breakdown and/or adsorption effects become significant, therefore quadratic fits become necessary.

Calibration curves are constructed for each daily sequence for most instrumentation, the exceptions would be for some colourimetric chemistries where the reagents are very stable (e.g. NH_3/NO_3/PO_4/CrVI/TKN) and also for some GC-MS/ECD analyses where acceptable response is maintained for all analytes (can be confirmed with PQL standard analyses and S/N observation). To confirm the validity of the calibration curves an Independent Calibration Check (ICV) is run with a tolerance of ±20% of expected result (as described below).

For most methods an Independent Calibration Check (ICC or ICV where V = verification) is analysed straight after the calibration. This should be an independent check (i.e. made from another standard source) and acceptance is defined in the tables 1-3 in section 4 above. If it is outside this acceptance criteria, a new calibration may be necessary and/or calibration standards should be re-prepared and/or the Independent Calibration Check should be re-prepared.

Results may only be reported if within the calibration range (exceptions include ICPOES/IC/FID where linearity way beyond the top standard has been demonstrated in validation data). Results +10% beyond the top standard are acceptable in general where linear calibrations are used, *not* where quadratics are used.

The correlation coefficient (R^2) should be >0.995 for the vast majority of analytes (individual methods may have specific criteria). Where failures occurs, calibration points may be removed as a last resort (e.g. for a poor injection where internal standards are indicative) and should be a rarity as opposed to normal practice. In general 3-5 calibration standards are used to generate a response curve and/or a Continuing Calibration Verification (CCV) standard is run to ensure signal to noise is maintained.

Continuing Calibration

A continuing calibration is analysed approximately every 20 samples and at the end of the run. Acceptance should be ±20%. If it is outside this acceptance a new calibration will be necessary (the ability to maintain the detection limit (PQL) is a requirement i.e. run the PQL standard as described above with the required acceptance criteria (tables 1-3)).

New v's Old Standard Checks

New standards should always be compared to the old with an acceptance of ±10%.

Expired Standards

Standards that have expired may still be used, however, need to be verified against another in date standard, CRM or confirmed by another lab. The expiry date may then be extended a further 6 months (or less as deemed appropriate). For some analytes, such as metals, extending the expiry date for many years may be acceptable as there is known stability.

8 Intralaboratory Check Samples

Soils –

Internally prepared reference materials can be used to check the validity of analysis. Typically for soil, customer samples are collated and are then air dried, homogenised and sieved. The analyte concentrations are then determined by analysing 7-10 replicates to achieve a mean with an RSD%$\leq$30% (although concentration dependant). The results can then be internally (Melbourne ↔ Perth ↔ Sydney lab) verified and/or externally verified with another NATA accredited facility.

Once an acceptable mean and acceptance criteria has been established (professional judgement of the senior chemists can be utilised here), then the material can then be analysed periodically to check laboratory performance. Alternatively, if available, confirm against a CRM/SRM.

Other non-certified reference materials can be used to assess laboratory performance if suitably verified data has been generated (e.g. ELIG soil where 10 labs participated in generating data).

Waters –

The R&D Manager or delegate will periodically prepare QC samples for an ILCP between the labs in the Envirolab Group. Samples may be prepared from standard solutions, independant check solutions and/or solutions remaining from previous proficiency programs (stability may have to be ascertained. These solutions will generally be of known concentration.

Spike solutions using products may also be prepared for comparison purposes e.g. petrol for TRH/BTEX or Diesel for PAHs etc.

Table QC1 - Containers, Preservation Requirements and Holding Times - Soil

Parameter	Container	Preservation	Maximum Holding Time
Acid digestible metals and metalloids - Total and TCLP (As,Cd.,Cu,Cr,Ni,Pb,Zn)	Glass with Teflon Lid	Nil	6 months
Mercury	Glass with Teflon Lid	Nil	28 days
TPH / BTEX / VOC / SVOC / CHC	Glass with Teflon Lid	4°C, zero headspace	14 days
PAHs (total and TCLP)	Glass with Teflon Lid	4°C [1]	14 days
Phenols	Glass with Teflon Lid	4°C [1]	14 days
OCPs, OPPs and total PCBs	Glass with Teflon Lid	4°C [1]	14 days
Asbestos	Sealed Plastic Bag	Nil	N/A

Table QC2 - Containers, Preservation Requirements and Holding Times - Water

Parameter	Container Volume (mL)	Preservation	Maximum Holding Time
Heavy Metals	60mL Plastic	Field filtration 0.45μm HNO_3 / 4°C	6 months
Mercury	60mL Plastic	Field filtration 0.45μm HNO_3 / 4°C	~~6 months~~ 28 days
Cyanide	125mL Amber Glass or 125mL Opaque HDPE	pH > 12 NaOH / 4°C	~~6 months~~ 14 days
TPH (C6-C9) / BTEX / VOCs SVOCs / CHCs	4 x 44mL Glass	HCl / 4°C [1] or Sodium Bisulphate	14 days
TPH (C10-**C40**) / PAH / Phenolics OCP / OPP / TDS / pH	3 x 1L Amber Glass	None / 4°C [1]	28 days (TDS is 7 days, pH is ideally a field test and should be analysed ASAP)

Notes: [1] = Extraction within 14 days, Analysis within 40 days.

Table QC3 - Analytical Parameters, PQLs and Methods - Soil *(Routine Levels)*

Parameter	Unit	PQL	Method Reference
Metals in Soil			
Arsenic - As[1]	mg / kg	4	USEPA 200.7 (also reference USEPA 6010C and 3050)
Cadmium - Cd[1]	mg / kg	0.4	USEPA 200.7 (also reference USEPA 6010C and 3050)
Chromium - Cr[1]	mg / kg	1	USEPA 200.7 (also reference USEPA 6010C and 3050)
Copper - Cu[1]	mg / kg	1	USEPA 200.7 (also reference USEPA 6010C and 3050)
Lead - Pb[1]	mg / kg	1	USEPA 200.7 (also reference USEPA 6010C and 3050)
Mercury - Hg[2]	mg / kg	0.1	USEPA 7471A (also reference USEPA 3050)
Nickel - Ni[1]	mg / kg	1	USEPA 200.7 (also reference USEPA 6010C and 3050)
Zinc - Zn[1]	mg / kg	1	USEPA 200.7 (also reference USEPA 6010C and 3050)
Total Petroleum Hydrocarbons (TRHs) in Soil			
old fractions			
C_6-C_9 fraction	mg / kg	25	USEPA 8260
C_{10}-C_{14} fraction	mg / kg	50	USEPA 8000
C_{15}-C_{28} fraction	mg / kg	100	USEPA 8000
C_{29}-C_{36} fraction	mg / kg	100	USEPA 8000
NEPM 2013 Fractions			
C_6-C_{10} fraction	mg / kg	25	USEPA 8260
$>C_{10}$-C_{16} fraction	mg / kg	50	USEPA 8000
$>C_{16}$-C_{34} fraction	mg / kg	100	USEPA 8000
$>C_{34}$-C_{40} fraction	mg / kg	100	USEPA 8000
BTEX in Soil			
Benzene	mg / kg	0.2	USEPA 8260
Toluene	mg / kg	0.5	USEPA 8260
Ethylbenzene	mg / kg	0.5	USEPA 8260
m & p Xylene	mg / kg	1	USEPA 8260
o- Xylene	mg / kg	0.5	USEPA 8260
Other Organic Contaminants in Soil			
PAHs	mg / kg	0.05-0.2	USEPA 8270
CHCs	mg / kg	1	USEPA 8260
VOCs	mg / kg	1	USEPA 8260
SVOCs	mg / kg	1	USEPA 8260
OCPs	mg / kg	0.1	USEPA 8140, 8080
OPPs	mg / kg	0.1	USEPA 8140, 8080
PCBs	mg / kg	0.1	USEPA 8080
Phenolics	mg / kg	5	APHA 5530
Asbestos			
Asbestos	mg / kg	Presence / Absence	AS4964-2004

Notes:

1. Acid Soluble Metals by ICP-AES
2. Total Recoverable Mercury

Table QC4 - Analytical Parameters, PQLs and Methods - Groundwater

Parameter	Unit	PQL	Method
Heavy Metals			
Antimony - Sb	µg/L	1	USEPA 200.8
Arsenic - As	µg/L	1	USEPA 200.8
Beryllium - Be	µg/L	0.5	USEPA 200.8
Cadmium - Cd	µg/L	0.1	USEPA 200.8
Chromium - Cr	µg/L	1	USEPA 200.8
Cobalt - Co	µg/L	1	USEPA 200.8
Copper - Cu	µg/L	1	USEPA 200.8
Lead - Pb	µg/L	1	USEPA 200.8
Mercury - Hg	µg/L	0.05	USEPA 7471A
Molybdenum - Mo	µg/L	1	USEPA 200.8
Nickel - Ni	µg/L	1	USEPA 200.8
Selenium - Se	µg/L	1	USEPA 200.8
Silver - Ag	µg/L	1	USEPA 200.8
Tin ~~(inorg.)~~ - Sn (all forms)	µg/L	1	USEPA 200.8
Nickel - Ni	µg/L	1	USEPA 200.8
Zinc - Zn	µg/L	1	USEPA 200.8
Total Petroleum Hydrocarbons (TRHs)			
C_6-C_9 fraction	µg/L	10	USEPA 8220A / 8000
C_{10}-C_{14} fraction	µg/L	50	USEPA 8000
C_{15}-C_{28} fraction	µg/L	100	USEPA 8000
C_{29}-C_{36} fraction	µg/L	100	USEPA 8000
NEPM 2013			
C_6-C_{10} fraction	µg/L	10	USEPA 8220A / 8000
$>C_{10}$-C_{16} fraction	µg/L	50	USEPA 8000
$>C_{16}$-C_{34} fraction	µg/L	100	USEPA 8000
$>C_{34}$-C_{40} fraction	µg/L	100	USEPA 8000
BTEX			
Benzene	µg/L	1	USEPA 8260
Toluene	µg/L	1	USEPA 8260
Ethylbenzene	µg/L	1	USEPA 8260
m- & p-Xylene	µg/L	2	USEPA 8260
o-Xylene	µg/L	1	USEPA 8260
Polyciclic Aromatic Hydrocarbons (PAHs)			
PAHs Level 2	µg/L	0.1	USEPA 8270
Benzo(a)pyrene Level 3	µg/L	0.01	USEPA 8270
OrganoChlorine Pesticides (OCPs) Trace Level			
Aldrin	µg/L	0.001	USEPA 8082A
Chlordane	µg/L	0.001	USEPA 8082A
DDT	µg/L	0.001	USEPA 8082A
Dieldrin	µg/L	0.001	USEPA 8082A
Endosulfan	µg/L	0.001	USEPA 8082A
Endrin	µg/L	0.001	USEPA 8082A
Heptachlor	µg/L	0.001	USEPA 8082A
Lindane	µg/L	0.001	USEPA 8082A
Toxaphene	µg/L	0.001	USEPA 8082A

Parameter	Unit	PQL	Method
Chlorinated Hydrocarbons (CHCs)			
1,2-dichlorobenzene	µg/L	1	USEPA 8260C
1,3-dichlorobenzene	µg/L	1	USEPA 8260C
1,4-dichlorobenzene	µg/L	1	USEPA 8260C
1,2,3-trichlorobenzene	µg/L	1	USEPA 8260C
1,2,4-trichlorobenzene	µg/L	1	USEPA 8260C
Hexachlorobutadeine	µg/L	1	USEPA 8260C
1,1,2-trichloroethane	µg/L	1	USEPA 8260C
Hexachloroethane	µg/L	10	USEPA 8270D
Other CHCs	µg/L	1	USEPA 8260C
Semi-Volatile Organic Compounds (SVOCs)			
Aniline	µg/L	10	USEPA 8270D
2,4-dichloroaniline	µg/L	10	USEPA 8270D
3,4-dichloroaniline	µg/L	10	USEPA 8270D
Nitrobenzene	µg/L	10	USEPA 8270D
2,4-dinitrotoluene	µg/L	10	USEPA 8270D
2,4,6-trinitrotoluene	µg/L	10	USEPA 8270D
Phenolic Compounds			
Phenol	µg/L	10	USEPA 8270D
2-chlorophenol	µg/L	10	USEPA 8270D
4-chlorophenol	µg/L	10	USEPA 8270D
2, 4-dichlorophenol	µg/L	10	USEPA 8270D
2,4,6-trichlorophenol	µg/L	10	USEPA 8270D
2,3,4,6-tetrachlorophenol	µg/L	10	USEPA 8270D
Pentachlorophenol	µg/L	10	USEPA 8270D
2,4-dinitrophenol	µg/L	100	USEPA 8270D
Miscellaneous Parameters			
Total Cyanide	µg/L	4	APHA 4500C&E-CN
Fluoride	µg/L	100	APHA 4500 F-C
Salinity (TDS)	mg/L	5	APHA 2510
pH	units	0.1	APHA 4500H+
OrganoPhosphate Pesticides (OPPs) Trace Level			
Azinphos Methyl	µg/L	0.01	USEPA 8082A/8270D
Chloropyrifos	µg/L	0.01	USEPA 8082A/8270D
Diazinon	µg/L	0.01	USEPA 8082A/8270D
Dimethoate	µg/L	0.01	USEPA 8082A/8270D
Fenitrothion	µg/L	0.01	USEPA 8082A/8270D
Malathion	µg/L	0.01	USEPA 8082A/8270D
Parathion	µg/L	0.01	USEPA 8082A/8270D
Temephos	µg/L	0.01	USEPA 8082A/8270D
Polychlorinated Biphenyls (PCBs) Trace Level			
Individual PCBs	µg/L	0.01	USEPA 8082A/8270D

Table QC5 - QC Sample Data Acceptance Criteria

QC Sample Type	Method of Assessment	Acceptable Range
Field QC		
Blind Duplicates and Split Samples	The assessment of split duplicate is undertaken by calculating the Relative Percent Difference (RPD) of the duplicate concentration compared with the primary sample concentration. The RPD is defined as: $\text{RPD} = 100 \times \frac{\mid X_1 - X_2 \mid}{\text{mean} (X1, X2)}$ Where: X_1 and X_2 are the concentrations of the primary and duplicate samples.	The acceptable range depends upon the levels detected: - 0-150% RPD (when the average concentration is <5 times the LOR/PQL) - 0-75% RPD (when the average concentration is 5 to 10 times the LOR/PQL) - 0-50% RPD (when the average concentration is >10 times the LOR/PQL)
Rinsate & Trip Blanks	Each blank is analysed as per the original samples.	Analytical Result <LOR/PQL
Laboratory prepared Trip Spike	The Trip Spike is analysed after returning from the field and the % recovery of the known spike is calculated.	70 - 130%
Laboratory QC		
Laboratory Duplicates	Assessment of Lab Duplicate RPD as per Blind Duplicates and Split Samples.	The acceptable range depends upon the levels detected: - Any RPD (when the average concentration is <5 times the PQL) - 0-50% RPD (when the average concentration is >5 times the PQL
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the percent recovery of the known surrogate spike (SS) or addition to the sample. $\% \text{ Recovery} = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; and C = Calculated Concentration.	60-140% (General Analytes) 70-130% (Inorganics / Metals) 60-140% (Organics) 10-140% (SVOC and Speciated Phenols) If the result is outside the above ranges, the result must be <3x Standard Deviation of the Historical Mean (calculated over the past 12 months).
Sample Matrix Spike Duplicates	Recovery RPD	<30% (Inorganics & Organics)
Method Blanks	Each blank is analysed as per the original samples.	Analytical Result <LOR/PQL

Note: PQL - Laboratory Practical Quantitation Limit (PQL) or the minimum detection limit for a particular analyte.
LOR = Limit of Reporting

Quality Assurance Programs are listed below:

Statistical analysis of Quality Control data (SQC)	Quality control data is plotted on control charts using the APHA procedure with warning and control limits at 2 and 3 standard deviations respectively. See also QMS Procedure “Statistical Quality Control”.
Certified Reference Materials (CRM/SRM)	Certified Reference Materials and Standards are regularly analysed. These materials/standards have certified reference values for various parameters.
Proficiency Testing	Regular proficiency test samples are analysed by our laboratories. SGS Environmental participates in a number of programs. Results and proficiency status are compiled and sent to participating laboratory post data interpretation. Failure to comply with acceptable values result in further investigations.
Inter-laboratory & Intra-laboratory Testing	SGS Environmental Services has schedules in the Quality Systems to participate in Inter/Intra laboratory testing conducted internally and by other parties.
Data Acceptance Criteria Unless otherwise specified in the method or method manual the following general criteria apply to all inorganic tests. All recoveries are to be reported to 3 significant figures.	Failure to meet the internal acceptance criteria will result in sample batch repeats dependent upon investigation outcomes. For data to be accepted: Inorganics (water samples) • For all inorganic analytes the Reagent & Method Blanks must be less than the LOR. • The Calibration Check Standards or Continuous Calibration Verification (CCV) must be within ±15%. • Control Standards must be 80-120% of the accepted value. • The Calibration Check Blanks must be less than the LOR. • Lab Duplicates RPD to be <15%*. Note: If client field duplicates do not meet this criteria it may indicate heterogeneity and shall be noted on the data reports for QC samples. • Sample (and if applicable Control) Matrix Spike♫ Duplicate recovery RPD to be <30%. • Where CRMs are used, results to be within ±2 standard deviations of the expected value. Inorganics (soil samples) • For all inorganic analytes the Reagent & Method Blanks must be less than the LOR. • The Calibration Check Standards or Continuous Calibration Verification (CCV) must be within ±15%. • Control Standards must be 80-120% of the accepted value. • The Calibration Check Blanks must be less than the LOR. • Lab duplicate RPD to be <30%* for sample results greater than 10 times LOR. • Sample Matrix Spike Duplicate (MS♫/MSD) recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike (CMS/D). • Where CRMs are used, results to be within ± 2 standard deviations of the expected value.

Data Acceptance Criteria Unless otherwise specified in the method or method manual the following general criteria apply to all organic tests. All recoveries are to be reported to 3 significant figures.	Organics • Volatile & extractable Reagent & Method Blanks must contain levels less than or equal to LOR. • The Calibration Check Standards or Continuous Calibration Verification (CCV) must be within ±25%. Some analytes may have specific criteria. • Control Standards (LCS/CMS) and Certified Reference Materials (CRM) recoveries are to be within established control limits or as a default 60-140% unless compound specific limits apply. • Retention times are to vary by no more than 0.2 min. • **At least two of three** routine level soil sample Surrogate Spike (SS) recoveries are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as acceptance criterion. Any recoveries outside these limits will have comment. • Water sample Surrogates Spike (SS) recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion. Any recoveries outside these limits will have comment. • Lab Duplicates (D) must have a RPD <30%*. • Sample Matrix Spike Duplicate (MS♬/MSD) recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike (CMS/D).

*Only if results are at least 10 times the LOR otherwise no acceptance criteria for RPD's apply. Application of more stringent criteria shall be applied for clean water sample from water boards and any other nominated client contracts. Nominal 10xLOR criteria are dropped to 5xLOR where specified.

♬Matrix do not readily equate to definitive recovery due to inherent matrix interferences and thus do not have recovery compliance values set. As a guide inorganic recoveries should be between 70-130% and for organics 60-130%

Batch Structure Summary

An analytical batch is nominally considered as 20 samples or smaller. As a standard template the following should be **used as a guide** according to the above Quality Control Types:

1	MB	16	UNK_DUP
2	STD1	17	MS
3	STD2	18	MS_DUP
4	STD3	19	UNK 11
5	LCS	20	UNK 12
6	BLK	21	UNK 13
7	UNK 1	22	UNK 14
8	UNK 2	23	UNK 15
9	UNK 3	24	UNK 16
10	UNK 4	25	UNK 17
11	UNK 5	26	UNK 18
12	UNK 6	27	UNK 19
13	UNK 7	28	UNK 20 (SS if applicable)
14	UNK 8	29	UNK_DUP
15	UNK 9	30	CCV
16	UNK 10 (SS if applicable)	31	CRM / SRM / CMS / LCS

Table QC1 - Containers, Preservation Requirements and Holding Times - Soil

Parameter	Container	Preservation	Maximum Holding Time
Acid digestible metals and metalloids - Total and TCLP (As,Cd.,Cu,Cr,Ni,Pb,Zn)	Glass with Teflon Lid	Nil	6 months
Mercury	Glass with Teflon Lid	Nil	28 days
TPH / BTEX / VOC / SVOC / CHC	Glass with Teflon Lid	4^{o}C, zero headspace	14 days
PAHs (total and TCLP)	Glass with Teflon Lid	4^{o}C [1]	14 days
Phenols	Glass with Teflon Lid	4^{o}C [1]	14 days
OCPs, OPPs and total PCBs	Glass with Teflon Lid	4^{o}C [1]	14 days
Asbestos	Sealed Plastic Bag	Nil	N/A

Table QC2 - Containers, Preservation Requirements and Holding Times - Water

Parameter	Container Volume (mL)	Preservation	Maximum Holding Time
Heavy Metals	125mL Plastic	Field filtration 0.45µm HNO_3 / 4^{o}C	6 months
Cyanide	125mL Amber Glass	pH > 12 NaOH / 4^{o}C	6 months
TPH (C6-C9) / BTEX / VOCs SVOCs / CHCs	4 x 43mL Glass	HCl / 4^{o}C [1]	14 days
TPH (C10-C36) / PAH / Phenolics OCP / OPP / TDS / pH	3 x 1L Amber Glass	None / 4^{o}C [1]	28 days

Notes: [1] = Extraction within 14 days, Analysis within 40 days.

Table QC3 - Analytical Parameters, PQLs and Methods - Soil

Parameter	Unit	PQL	Method Reference
Metals in Soil			
Arsenic - As[1]	mg / kg	1	USEPA 200.7
Cadmium - Cd[1]	mg / kg	0.5	USEPA 200.7
Chromium - Cr[1]	mg / kg	1	USEPA 200.7
Copper - Cu[1]	mg / kg	1	USEPA 200.7
Lead - Pb[1]	mg / kg	1	USEPA 200.7
Mercury - Hg[2]	mg / kg	0.1	USEPA 7471A
Nickel - Ni[1]	mg / kg	1	USEPA 200.7
Zinc - Zn[1]	mg / kg	1	USEPA 200.7
Total Petroleum Hydrocarbons (TPHs) in Soil			
C_6-C_9 fraction	mg / kg	25	USEPA 8260
C_{10}-C_{14} fraction	mg / kg	50	USEPA 8000
C_{15}-C_{28} fraction	mg / kg	100	USEPA 8000
C_{29}-C_{36} fraction	mg / kg	100	USEPA 8000
BTEX in Soil			
Benzene	mg / kg	1	USEPA 8260
Toluene	mg / kg	1	USEPA 8260
Ethylbenzene	mg / kg	1	USEPA 8260
m & p Xylene	mg / kg	2	USEPA 8260
o- Xylene	mg / kg	1	USEPA 8260
Other Organic Contaminants in Soil			
PAHs	mg / kg	0.05-0.2	USEPA 8270
CHCs	mg / kg	1	USEPA 8260
VOCs	mg / kg	1	USEPA 8260
SVOCs	mg / kg	1	USEPA 8260
OCPs	mg / kg	0.1	USEPA 8140, 8080
OPPs	mg / kg	0.1	USEPA 8140, 8080
PCBs	mg / kg	0.1	USEPA 8080
Phenolics	mg / kg	5	APHA 5530
Asbestos			
Asbestos	mg / kg	Presence / Absence	AS4964-2004

Notes:

1. Acid Soluble Metals by ICP-AES

2. Total Recoverable Mercury

Table QC4 - Analytical Parameters, PQLs and Methods - Groundwater

Parameter	Unit	PQL	Method	Parameter	Unit	PQL	Method
Heavy Metals				***Chlorinated Hydrocarbons (CHCs)***			
Antimony - Sb	µg/L	1	USEPA 200.8	1,2-dichlorobenzene	µg/L	1	USEPA 8260B
Arsenic - As	µg/L	1	USEPA 200.8	1,3-dichlorobenzene	µg/L	1	USEPA 8260B
Beryllium - Be	µg/L	0.5	USEPA 200.8	1,4-dichlorobenzene	µg/L	1	USEPA 8260B
Cadmium - Cd	µg/L	0.1	USEPA 200.8	1,2,3-trichlorobenzene	µg/L	1	USEPA 8260B
Chromium - Cr	µg/L	1	USEPA 200.8	1,2,4-trichlorobenzene	µg/L	1	USEPA 8260B
Cobalt - Co	µg/L	1	USEPA 200.8	Hexachlorobutadeine	µg/L	1	USEPA 8260B
Copper - Cu	µg/L	1	USEPA 200.8	1,1,2-trichloroethane	µg/L	1	USEPA 8260B
Lead - Pb	µg/L	1	USEPA 200.8	Hexachloroethane	µg/L	10	USEPA 8270D
Mercury - Hg	µg/L	0.5	USEPA 7471A	Other CHCs	µg/L	1	USEPA 8260B
Molybdenum - Mo	µg/L	1	USEPA 200.8	***Volatile Organic Compounds (VOCs)***			
Nickel - Ni	µg/L	1	USEPA 200.8	Aniline	µg/L	10	USEPA 8260B
Selenium - Se	µg/L	1	USEPA 200.8	2,4-dichloroaniline	µg/L	10	USEPA 8260B
Silver - Ag	µg/L	1	USEPA 200.8	3,4-dichloroaniline	µg/L	10	USEPA 8260B
Tin (inorg.) - Sn	µg/L	1	USEPA 200.8	Nitrobenzene	µg/L	50	USEPA 8260B
Nickel - Ni	µg/L	1	USEPA 200.8	2,4-dinitrotoluene	µg/L	50	USEPA 8260B
Zinc - Zn	µg/L	1	USEPA 200.8	2,4,6-trinitrotoluene	µg/L	50	USEPA 8260B
Total Petroleum Hydrocarbons (TPHs)				***Phenolic Compounds***			
C_6-C_9 fraction	µg/L	10	USEPA 8220A / 8000	Phenol	µg/L	10	USEPA 8041
C_{10}-C_{14} fraction	µg/L	50	USEPA 8000	2-chlorophenol	µg/L	10	USEPA 8041
C_{15}-C_{28} fraction	µg/L	100	USEPA 8000	4-chlorophenol	µg/L	10	USEPA 8041
C_{29}-C_{36} fraction	µg/L	100	USEPA 8000	2, 4-dichlorophenol	µg/L	10	USEPA 8041
BTEX				2,4,6-trichlorophenol	µg/L	10	USEPA 8041
Benzene	µg/L	1	USEPA 8220A	2,3,4,6-tetrachlorophenol	µg/L	10	USEPA 8041
Toluene	µg/L	1	USEPA 8220A	Pentachlorophenol	µg/L	10	USEPA 8041
Ethylbenzene	µg/L	1	USEPA 8220A	2,4-dinitrophenol	µg/L	10	USEPA 8041
m- & p-Xylene	µg/L	2	USEPA 8220A	***Miscellaneous Parameters***			
o-Xylene	µg/L	1	USEPA 8220A	Total Cyanide	µg/L	5	APHA 4500C&E-CN
Polyciclic Aromatic Hydrocarbons (PAHs)				Fluoride	µg/L	10	APHA 4500 F-C
PAHs	µg/L	0.1	USEPA 8270	Salinity (TDS)	mg/L	1	APHA 2510
Benzo(a)pyrene	µg/L	0.01	USEPA 8270	pH	units	0.1	APHA 4500H+
OrganoChlorine Pesticides (OCPs)				***OrganoPhosphate Pesticides (OPPs)***			
Aldrin	µg/L	0.001	USEPA 8081	Azinphos Methyl	µg/L	0.01	USEPA 8141
Chlordane	µg/L	0.001	USEPA 8081	Chloropyrifos	µg/L	0.01	USEPA 8141
DDT	µg/L	0.001	USEPA 8081	Diazinon	µg/L	0.01	USEPA 8141
Dieldrin	µg/L	0.001	USEPA 8081	Dimethoate	µg/L	0.01	USEPA 8141
Endosulfan	µg/L	0.001	USEPA 8081	Fenitrothion	µg/L	0.01	USEPA 8141
Endrin	µg/L	0.001	USEPA 8081	Malathion	µg/L	0.01	USEPA 8141
Heptachlor	µg/L	0.001	USEPA 8081	Parathion	µg/L	0.01	USEPA 8141
Lindane	µg/L	0.001	USEPA 8081	Temephos	µg/L	0.01	USEPA 8141
Toxaphene	µg/L	0.001	USEPA 8081	***Polychlorinated Biphenyls (PCBs)***			
				Individual PCBs	µg/L	0.01	USEPA 8081

Table QC5 - QC Sample Data Acceptance Criteria

QC Sample Type	Method of Assessment	Acceptable Range
Field QC		
Blind Duplicates and Split Samples	The assessment of split duplicate is undertaken by calculating the Relative Percent Difference (RPD) of the duplicate concentration compared with the primary sample concentration. The RPD is defined as: $RPD = 100 \times \frac{\lvert X_1 - X_2 \rvert}{\text{mean} (X1, X2)}$ Where: X_1 and X_2 are the concentrations of the primary and duplicate samples.	The acceptable range depends upon the levels detected: - 0-150% RPD (when the average concentration is <5 times the LOR/PQL) - 0-75% RPD (when the average concentration is 5 to 10 times the LOR/PQL) - 0-50% RPD (when the average concentration is >10 times the LOR/PQL)
Rinsate & Trip Blanks	Each blank is analysed as per the original samples.	Analytical Result <LOR/PQL
Laboratory prepared Trip Spike	The Trip Spike is analysed after returning from the field and the % recovery of the known spike is calculated.	70 - 130%
Laboratory QC		
Laboratory Duplicates	Assessment of Lab Duplicate RPD as per Blind Duplicates and Split Samples.	Lab Duplicate RPD < 15% (Inorganics) Lab Duplicate RPD < 30% (Organics) for sample results > 10 LOR
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the percent recovery of the known surrogate spike (SS) or addition to the sample. $\% \text{ Recovery} = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; and C = Calculated Concentration.	at least 2 SS recoveries to be within 70-130% subject to matrix effects (Organics) 80-120% (Inorganics / Metals) 60-140% (Organics) 10-140% (SVOC and Speciated Phenols) If the result is outside the above ranges, the result must be <3x Standard Deviation of the Historical Mean (calculated over the past 12 months).
Sample Matrix Spike Duplicates	Recovery RPD	<30% (Inorganics & Organics)
Calibration Check Standars	Continuous Calibration Verification (CCV)	CCV must be within ±15% (inorganics) CCV must be within ±25% (inorganics)
Reagent, Method & Calibration Check Blanks	Each blank is analysed as per the original samples.	Analytical Result <LOR/PQL

Note: PQL - Laboratory Practical Quantitation Limit (PQL) or the minimum detection limit for a particular analyte.
LOR = Limit of Reporting